NATIONAL OFFSHORE SAFETY ADVISORY COMMITTEE (NOSAC)

TASK STATEMENT 01-2023 (Rev 1)

REVIEW OF NATIONAL TRANSPORTATION SAFETY BOARD'S FINAL REPORT ON THE SEACOR POWER LIFTBOAT REPORT OF INVESTIGATION (Approved by U.S. Coast Guard and tasked to NOSAC on March 1, 2023.)

TASK TITLE:

Review of the accident investigation report(s) on the loss of the liftboat SEACOR POWER.

Final Report, September 18, 2024

 [1]

[1] Figure 8. SEACOR Power capsized on its starboard side on the evening of the casualty, with a Coast Guard RB-M in the foreground and the liftboat Rockfish in the background. (Source: Coast Guard; page 19 of the NTSB Report.)

This Page is Intentionally Blank.

Table of Contents NOSAC TASK STATEMENT 01-2023 (Rev 1)

Contents

Table of Contents NOSAC TASK STATEMENT 01-2023 (Rev 1) 3
Task Statement 01-2023 (Rev 1) 10
Task Title: 10
Background: 10
Task: 10
Executive Summary: 11
Schedule of Events: 13
Structure of the Report: 13
List of Exhibits: 14
Credits: 15
SPECIFIC TASK NUMBER 1 17
Eighth USCG District Policy 16711: Persons Allowed on Liftboats 17
NVIC 8-91 Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats 17
TS 01-23(1) R1.1A NVIC 8-91 Define “offshore” 17
TS 01-23(1) R5.10A.15 NVIC 8-91 Stability Review on Liftboats? 17
TS 01-23(1) R1.1C NVIC 8-91 Conduct Operating Manual Review? 18
NVIC 3-89 Guidance for the Presentation of Stability Instructions for Operating Personnel 18
TS 01-23(1) R1.1 NVIC 3-89 Computer Stability Programs 18
USCG MSC TN 4-00, Weather Criteria for Liftboat Leg Strength 18
TS 01-23(1) R5.10A.4 MTN 4-00 Establish Wave Conditions for Liftboats 19
46 CFR 170 Stability Requirements for All Inspected Vessels 19
TS 01-23(1) R5.10A.3 46 CFR 170 Review Weather Criteria Equations 20
TS 01-23(1) R5.10B 46 CFR 170 Incorporation by Reference 20
Eighth USCG District Letter to OMSA 20
USCG Offshore Supply Vessel Inspector Job Aid 20
TS 01-23(1) R1.4 OSV Inspector Job Aid 20
CG-543 Policy Letter 07-02, Guidance on the Inspection, Repair, and Maintenance of Liftboats 20
CG-CVC Policy Letter No. 14-03 Evaluating Sea Service Aboard Liftboats 21
TS 01-23(1) R1.5 USCG Updating Internal Procedures 21
USCG Liftboat Addendum 2015 21
Liftboat Plan Review Guide 21

COMDTCHANGENOTE 16000, CH-2 to the Marine Safety Manual, Volume III, Marine Industry Personnel 21

COMDTCHANGENOTE 16000, CH-3 to Marine Safety Manual Volume II (Materiel Inspection). 22

NVIC 3-97, Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels. 23

TS 01-23(1) R1.6 NVIC 3-97 Reference Standards 23

Marine Safety Center Technical Note MTN No. 04-95, CH-2, Lightship Change Determination: Weight – Moment Calculations vs. Deadweight Survey vs. Full Stability Test..... 24

USCG Marine Safety Alert, Alert 04-11, Mariner's Safety Endangered When VHF Radio Distress Alerts by Digital Selective Calling (DSC) Lack Location and Identification Information..... 24

USCG Marine Safety Alert, Alert 06-13, Coast Guard Termination of its 2 MHZ Distress Watchkeeping Service..... 24

USCG Marine Safety Alert, Alert 08-17, Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!..... 25

TS 01-23(1) R1.7 Safety Alert 08-17 Reminder 25

USCG Marine Safety Information Bulletin, MSIB Number 20-20, Change 1, Performing a VHF Marine Radio Check..... 25

USCG Marine Safety Information Bulletin, MSIB Number 10-21, High Frequency Voice Distress Watchkeeping will cease at most locations on 7 February 2022. 25

USCG Outer Continental Shelf NCOE, The Drill Down, Issue No. 21 - OSV, 2023: DSC Distress Alerting. 26

46 USC 2101: General definitions..... 26

46 CFR Part 42, Domestic and Foreign Voyages by Sea..... 27

46 CFR Subchapter L, Offshore Supply Vessels. 27

46 CFR Part 125, General. 28

TS 01-23(1) R1.3C 46 CFR 125 Incorporation by Reference..... 28

46 CFR Part 126, Inspection and Certification..... 28

46 CFR Part 127, Construction and Arrangements..... 28

TS 01-23(1) R1.8 MSIB for Means of Escape..... 29

46 CFR Part 128, Marine Engineering: Equipment and Systems..... 29

46 CFR Part 129, Electrical Installations..... 29

TS 01-23(1) R1.9 46 CFR 129.440 Emergency Lighting..... 29

46 CFR Part 130, Vessel Control, and Miscellaneous Equipment and Systems. 29

46 CFR Part 131, Operations. 30

TS 01-23(1) R1.10 46 CFR 131.320 Safety Orientations 30

TS 01-23(1) R1.11 46 CFR 131.530 Abandon-Ship Training and Drills 31

TS 01-23(1) R1.12 46 CFR 131.530 Davit-Launched Liferafts 31

46 CFR Part 132, Fire-Protection Equipment. 31
46 CFR Part 133, Lifesaving Systems 31
46 CFR Part 134, Added Provision for Liftboats. 32
46 CFR Part 174, Special Rules Pertaining to Specific Vessel Types. 32
47 CFR Part 80, Stations in the Maritime Services. 33
TS 01-23(1) R1.13 47 CFR 80.469 Alaska Maritime Mobile Repeaters 35
47 CFR Subpart K, Personal Locator Beacons and Maritime Survivor Locating Devices. 35
USCG Safety Alert 12-22, Ensuring Proper Operation and Detection of Radar Search and Resue Transponders (SARTs) 35
RECOMMENDATIONS for Specific Task Number 1 35
SPECIFIC TASK NUMBER 2 41
NTSB Capsizing of Liftboat SEACOR POWER, MIR-22/26 41
TS 01-23(1) R2.1 USCG EPIRB Handling Procedures 41
TS 01-23(1) R2.2 NTSB MIR 22/26 Swimming Proficiency 42
TS 01-23(1) R2.3 EPIRBs and GNSS Equipped 42
TS 01-23(1) R2.4 NOAA Weather Broadcast Monitoring 42
TS 01-23(1) R2.5 Correlation of Stability Program with other Documentation 42
TS 01-23(1) R5.10A.5 46 CFR 174 Calculate Stability under Operational Conditions 43
TS 01-23(1) R2.7 Maneuvering Guidance during Heavy Weather 44
TS 01-23(1) R5.10A.12 Direction of turn in heavy weather guidance 44
TS 01-23(1) R2.8 USCG Address NTSB Recommendations 45
TS 01-23(1) R2.9 Personal Locator Beacons 45
TS 01-23(1) R5.10A.10 Calculating Vessel's Maximum Wave Height 45
TS 01-23(1) R2.10A Periodic Revalidation/Reaffirmation Stability Programs 46
RECOMMENDATIONS for Specific Task Number 2 46
SPECIFIC TASK NUMBER 3 50
USCG Load Line Policy Notes 50
TS 01-23(1) R3.1 Update MSM Volume IV Section 6.F 50
TS 01-23(1) R3.2 46 CFR 42 Incorporate Reserve Buoyancy Distribution 50
MOA USCG and NOAA NWS Regarding the Management of Marine Weather Information 51
Public Law 116-224, Save Our Seas 2.0 Act 51
IMO Regulations Associated with Stability 51
IMO MSC.1/Circ. 1229, Annex: Guidelines for the Approval of Stability Instruments. 57
IMO International Code on Intact Stability, 2008. 57
TS 01-23(1) R3.3 USCG Review IMO ICS 2008 on Stability 59

TS 01-23(1) R3.4 USCG Review Definitions from ICS 60
TS 01-23(1) R3.5 USCG Review ICS Provisions Against Capsizing 60
IMO MSC.75(69), Annex 17, Adoption of Amendments to the Code on Intact Stability for all Types of Ships Covered by IMO Instruments (Resolution A.749(18)). 60
IMO Committee MSC.1/Circ. 1228, Revised Guidance to the Master for Avoiding Dangerous Situations in Adverse Weather and Sea Conditions. 60
IMO MSC/Circular.456, Guidelines for the Preparation of Intact Stability Information. 61
IMO MSC/Circ.861, Measures to Reduce Number of False Distress Alerts 61
IMO SN/Circ. 197, Ref T2/6.03, Operation of Marine Radar for SART Detection 62
TS 01-23(1) R3.6 USCG Study of SART technology 62
ABS Guide for Building and Classing Liftboats 62
ABS Guide for Building and Classing Liftboats, Notices and General information 63
IACS UR L5, Computer Software for Onboard Stability Calculations 63
IMO MSC/Circ.1078, Guidelines for Reporting False Alerts 64
TS 01-23(1) R3.7 Reporting False Alerts 64
IMO Resolution A.714(17) Cargo Securing 64
RECOMMENDATIONS for Specific Task Number 3 70
SPECIFIC TASK NUMBER 4 72
USCG MSC Post-Casualty Stability Analysis of Liftboat Seacor Power 72
TS 01-23(1) R5.10A.1 46 CFR 170.160 Exemption Determination 73
TS 01-23(1) R5.10A.2,.4,.6,.7,.8 46 CFR 174 Definitions and Max Wind Speed 73
TS 01-23(1) R5.10.6,.9,.13 MSC Plan Review Guide Varied Wind Direction/Off-Axis Stability 73
TS 01-23(1) R5.9 USCG re-evaluate the stability for all active US liftboats 73
TS 01-23(1) R5.10A.9 46 CFR 174 Orthogonal Tipping 73
TS 01-23(1) R5.10A.14 USCG/ABS Wind Load/Moments Differences 74
TS 01-23(1) R5.9 Active liftboat stability reevaluations 74
TS 01-23(1) R5.10A.11 MSC Post-Casualty Stability Analysis Conclusions 75
USCG: Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power. 75
TS 01-23(1) R4.8 USCG Study of Dynamic Stability Analysis 76
USCG FoC 013-23, Seacor Power Casualty: Findings of Concern Regarding the National Weather Service 76
USCG FoC 014-23, Seacor Power Casualty: Findings of Concern Regarding Liftboats 76
USCG FoC 015-23, Seacor Power Casualty: Dispatcher Training, Draft Reading, and Weather Forecasting for All Commercial Vessels 76
USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER 77

USCG ROI Recommendation 5 78
USCG ROI Recommendation 17 79
TS 01-23(1) R4.9 USCG Study Alternate forms Vessel Tracking 80
USCG ROI Recommendation 23 80
TS 01-23(1) R4.10 46 CFR 199.273 Immersion Suits 80
USCG ROI Recommendation 25 81
TS 01-23(1) R4.11 USCG Unmanned Systems Strategic Plan 82
RECOMMENDATIONS for Specific Task Number 4 82
SPECIFIC TASK NUMBER 5 86
USCG Addendum to the US National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR) 86
TS 01-23(1) R5.1 USCG Contingency Preparedness System 86
NWS Service Instruction 10-315, NWSPD 10-3: Marine Weather Message. 86
TS 01-23(1) R5.2 National Weather Service Frequency of Messages 88
TS 01-23(1) R5.3 Weather Procedures and Company Safety Management System 88
Weather Reporting Assets in Port Fourchon, LA. 88
Non-Traditionally Shaped Vessel Stability Standards, Project Summary 90
TS 01-23(1) R5.4 Non-traditional Shaped Vessel Stability Standards Study 95
StormGeo 95
Radio Technical Commission for Maritime Services (RTCM) 95
USCG GMDSS Task Force 97
Port Fourchon, LA, Weather Reporting and Forecasting. 97
OTC-29289-MS: A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study 98
TS 01-23(1) R5.5 SNAME Wind Load Study 100
USCG: Navigation Center, Maritime Telecommunications 100
CEPT Handling of EPIRBs to Prevent False Alerts 102
IHDB Statistics on EPIRB Alerts and False Alerts 106
Seacor Power Marine Operations Manual 107
TS 01-23(1) R5.6 ABS redo Stability Reviews 108
TS 01-23(1) R5.7 USCG request NTSB reopen Seacor Power Investigation as per Petition 108
TS 01-23(1) R5.8 Revise NVIC 3-97 for more ABS accountability 108
2024 NOSAC Spring Meeting Public Comments 108
RECOMMENDATIONS for Specific Task Number 5 111
Exhibit 1: References. 117
Post-Casualty Reports 117

USCG Navigation and Vessel Inspection Circulars (NVICs) 118
USCG Guidance and Policy 118
United States Legislation 121
International and Industry References 123
Miscellaneous References 125
Exhibit 2: NTSB Seacor Power Final Report Regulatory References 126
Exhibit 3: Executive Summary, Conclusions, and Recommendations from NTSB Report MIR-22-26. 129
Exhibit 4: USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26. 134
Exhibit 5: MSC Seacor Power Post-Casualty Analysis Regulatory References. 140
Exhibit 6: Conclusions from the MSC Post-Casualty Stability Analysis of Liftboat Seacor Power. 142
Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power. 145
Exhibit 8: USCG Seacor Power Final Report Regulatory References. 165
Exhibit 9: USCG Commandant's Responses to the *USCG Seacor Power Final Report Recommendations* [plus identified Best Practices] 171
Exhibit 10: SEACOR POWER Investigation Results - Brief to NOSAC on June 21, 2023. 185
Exhibit 11: SEACOR POWER Investigation Results - Additional Topics for NOSAC. 191
Exhibit 12: Compilation and Categorization of NOSAC Recommendations 199
Table 12.1 Stability Recommendations. 201
Table 12.2 Documentation Recommendations. 212
Table 12.3 Further Study Recommendations. 217
Exhibit 13: NOSAC Suggested Solutions to Selected Recommendations 224
Recommendation 1.1A: Draft Definition for "Offshore" 224
Recommendations 1.4 and 2.5: OSV Inspector Job Aid and Vessel Name Change 225
Recommendation 1.7: Marine Safety Alert 8-17 update 225
Recommendations 1.8 and 1.10: MSIB Emergency Escape Windows and Safety Orientation 227
Recommendation 2.4: Weather Broadcast Monitoring 228
Recommendation 2.7: Maneuvering Guidance in Liftboat Operating Manual 230
Recommendation 3.4: Stability Definitions 231
Recommendation 3.7: Cancelling False Distress Alerts 231
Recommendation 5.8: Draft update to NVIC 3-97 233
Recommendation 5.10A.2: Definitions of Stability Terms 234
Commandant's Request, Recommendation 5 from the USCG ROI 236

This Page is Intentionally Blank.

NATIONAL OFFSHORE SAFETY ADVISORY COMMITTEE (NOSAC)

Task Statement 01-2023 (Rev 1)

REVIEW OF NATIONAL TRANSPORTATION SAFETY BOARD'S FINAL REPORT ON THE SEACOR POWER LIFTBOAT REPORT OF INVESTIGATION (Approved by U.S. Coast Guard and tasked to NOSAC on March 1, 2023.)

Task Title:

Review of the accident investigation report(s) on the loss of the liftboat SEACOR POWER.

Background:

The Coast Guard is seeking the assistance of the National Offshore Safety Advisory Committee (NOSAC) in reviewing the National Transportation Safety Board's (NTSB) report of the incident that was released on October 18, 2022 concerning the April 13, 2021, capsizing of the US-flagged liftboat SEACOR POWER about 7 miles off the coast of Port Fourchon, Louisiana, in a severe thunderstorm with heavy rain, winds exceeding 80 knots, and 2- to 4-foot seas and the recommendations in the report to identify those areas where NOSAC is strategically positioned to advise the Coast Guard on regulations and or policies could be modified or updated to better enhance the safety on liftboats. The Committee should also consider reviewing any Navigation and Vessel Inspection Circulars, U.S. Coast Guard policy letters and or other public reports associated with liftboats, liftboat operations and or the capsizing of the SEACOR POWER.

Task:

Form a subcommittee to review the NTSB's report on the SEACOR POWER; existing Coast Guard policies, Navigation and Inspection Circulars and regulations related to liftboats, their stability, and their operations. If appropriate, recommend changes to the regulations, policies, NVICs or other areas under the purview of the Coast Guard. This review should also include industry and / or Classification Society standards used for liftboats.

The subcommittee should:

- Review CG existing policy letters, NVICs, Commandant Instruction Manuals, and regulations that are applicable to the stability, operations, and operational limitations for liftboats operating on the U.S. OCS and propose recommended changes if appropriate. [**Specific Task Number 1**]

- Review the NTSB's Final Report's recommendations and identify areas where NOSAC's expertise could be utilized to assist the USCG with updating policies and or regulations for liftboats. [**Specific Task Number 2**]

- Review classification society and industry standards for liftboats and identify areas where gaps may exist respective to liftboats. [**Specific Task Number 3**]

- Review any additional public reports on the capsizing and identify areas where the Committee believes the U.S. Coast Guard should take action to reduce risks of future incidents. [**Specific Task Number 4**]

- Provide any additional recommendations that the subcommittee believes are relevant to this tasking. [**Specific Task Number 5**]

Executive Summary:

On April 13, 2021, the US-flagged liftboat SEACOR POWER capsized about 7 miles off the coast of Port Fourchon, Louisiana, in a severe thunderstorm with heavy rain, winds exceeding 80 knots, and 2- to 4-foot seas. The bodies of six fatally injured personnel were recovered; seven bodies were never found and presumed dead; and six personnel were rescued. The Seacor Power incident was classified as a total constructive loss of approximately $25 million.

The National Offshore Safety Advisory Committee (NOSAC) was charged with a task statement by the US Coast Guard to assess reports on this incident and other documentation related to liftboats at the NOSAC Spring meeting on March 1, 2023. Co-Chairs of this requested report were Kim Parker, Fallon Dominique, and Lincoln Stroh.

The general consensus from the various reports concerning the probable cause of the incident was a loss of stability when the vessel was struck by severe thunderstorms which exceeded the vessel's operational wind speed limits.

The Seacor Power is identified as a non-traditionally shaped vessel [basically square-shaped hull] with inherently different stability characteristics than traditional vessel designs for forward, aft, port, and starboard dimensions where length overall is generally greater than breadth. Between 1976 and 2021, nine non-traditionally shaped vessels were involved in casualties, of which five were completely lost and four were damaged to varying degrees. Personnel casualties ranged from 100% of personnel rescued to 100% of personnel lost.

This report, while lengthy, is divided into five separate specific tasks with clarifying and supporting Exhibits. There are over 40 recommendations from the NOSAC which are collated in Exhibit 12. Exhibit 12 breaks down the various recommendations as to Stability, Documentation, and Further Studies. Each of these sections are further prioritized by the NOSAC into high, medium, and low issues.

Note that in Exhibit 12, each recommendation contains four parts: the stated recommendation, related documentation or recommendations (if any), the proposed applicability to types of vessels, and the full reference, if any, from which the recommendation was derived. When the applicability in this report states that a recommendation should apply to all vessels, the committee is suggesting that the Coast Guard first start by applying the recommendation to US flag vessels. Then, the Coast Guard should consider whether the recommendation should be further expanded to apply to foreign flag vessels.

As a means of assisting the US Coast Guard in developing documentation for policy, marine safety information bulletins, etc., the NOSAC developed Exhibit 13 with draft language for selected recommendations. This draft language provides the NOSAC and industry's sense of what is important to be communicated to the liftboat industry and the marine industry in general, as appropriate.

NOSAC requests the US Coast Guard to venture beyond the current regulations and policies associated with stability and evaluate other processes that could provide more accurate estimations of how vessels will respond under different environmental conditions.

As the introduction and innovation of diesel and electric vehicles has significantly affected vehicular industry standards, so, too, should the USCG move to more accurate and reliable methods of predicting wind loads affecting the stability of vessels using wind tunnel testing and Computational Fluid Dynamics (CFD), augmenting or replacing the empirical building block procedure (46 CFR 174, Subpart C) currently in use.

Companies and individuals engaged in offshore activities on the US OCS should persistently seek to leverage the Best Available and Safest Technologies (BAST) available. Continual design and process improvements have, and continue to be, the most effective means to achieving the utmost in safe and reliable offshore operations. Understanding that environmental risks will always be present when conducting offshore operations, offshore organizations are exceptionally persistent in their dedication and application of innovative methods that have resulted in a remarkable safety record as compared to other unrelated heavy-industry environments.

However, notwithstanding exceptional offshore safety performance, opportunities for further improvement continue to be a foundational objective to operating in dynamic, ever-changing environmental conditions. The broader offshore industry interests engage in unprecedented safety-share frameworks that provide vital information up and down the upstream supply-chain and across the world. Having experienced the profoundly catastrophic SEACOR POWER incident, we fully expect that lessons learned because of the investigation into this matter will prove highly critical to sustaining the safe operation of current and future offshore assets around the world.

The NOSAC has expended considerable effort to provide workable recommendations for the US Coast Guard and we hope that as many of these recommendations as possible can be

implemented in the shortest order. The prevention of vessel and personnel casualties are of paramount importance to the NOSAC and to the mission of the US Coast Guard.

Thank you for your review and consideration of the NOSAC's work on this Task Statement.

Schedule of Events:

Date	Subject	Comments
March 28, 2023	First Meeting	9 Attendees
April 27, 2023	Second Meeting	9 Attendees
June 8, 2023	Third Meeting	12 Attendees
June 21, 2023	Fourth Meeting with Briefing by Captain Tracy Phillips and Andrew Lawrence, Eric Verdin, to provide a brief of the USCG Report of Investigation	9 Attendees
July 12, 2023	Fifth Meeting	24 Attendees
July 26, 2023	Sixth Meeting with Briefing by Captain Tracy Phillips and Andrew Lawrence, Eric Verdin, to provide a brief of the USCG Report of Investigation.	17 Attendees
August 23, 2023	Seventh Meeting	13 Attendees
September 12, 2023	Eighth: **Fall Meeting** (with public on September 13, 2023)	
October 12, 2023	Ninth Meeting	10 Attendees
November 16, 2023	Tenth Meeting	8 Attendees
January 25, 2024	Eleventh Meeting	11 Attendees
March 13, 2024	Twelfth Meeting	2024 Spring Meeting
April 18, 2024	Thirteenth Meeting	5 Attendees
May 15, 2024	Fourteenth Meeting	11 Attendees
June 27, 2024	Fifteenth Meeting	10 Attendees
July 25, 2024	Sixteenth Meeting	16 Attendees
August 22, 2024	Seventeenth Meeting	12 Attendees
September 5, 2024	Eighteenth Meeting	16 Attendees
September 18, 2024	Fall Meeting	Final Report

Structure of the Report:

The scope and breadth of this Task Statement has resulted in a lengthy report. The Table of Contents is designed to assist in navigating to various sections and exhibits of interest to the reader.

There are five main sections of this second interim report; one for each specific task that was assigned to the subcommittee. The section number corresponds to the specific task number. Each section is formatted in the same way and the structure of each section is as follows:

A) A repeat of the Specific Task statement.

B) An enumeration of the various documents reviewed. For each document reviewed, the report lists:

   1) The full name of the document.

   2) A brief summary of the document's contents and areas of particular interest to the subcommittee.

   3) A statement regarding any NOSAC recommendations related to the document.

C) A compilation of the recommendations identified within the section.

The reference from which each recommendation is derived is set in the Table of Contents. A summary listing of the recommendations is listed at the end of each Specific Task.

After the last section of the report, there are 13 Exhibits that were developed by the subcommittee or were received from other sources. Exhibit 1 is a list of references used by the subcommittee. Exhibit 12 is a compilation of all recommendations identified within the report. This list of recommendations is grouped by category and prioritized as high, medium, and low. The intention of the prioritization is to help the US Coast Guard focus on issues that are of more importance or are simpler to address. Exhibit 13 provides draft language for selected NOSAC recommendations as input for the US Coast Guard to promulgate more expeditious action. The names of the remaining exhibits are listed as follows and in the Table of Contents.

NOTE: While developing this NOSAC report, the Subcommittee decided to consolidate several individual stability recommendations into two separate recommendations with several related parts. The first recommendation requests that the USCG review all active liftboats and reevaluate their stability. This first recommendation would provide quantifiable data for the USCG's use. The second recommendation would be to use the collected data to make regulatory changes and updates and policy updates that were individually recommended in an earlier version of the report. A cross reference of original verses new recommendation numbers is documented in Exhibit 12. The body of the report, Exhibit 12, and Exhibit 13, have been revised to address these changes where applicable.

List of Exhibits:

Exhibit 1: *References*.

National Transportation Safety Board Exhibits

Exhibit 2: *NTSB Seacor Power Final Report Regulatory References*.
Exhibit 3: *Executive Summary, Conclusions, and Recommendations from NTSB Report MIR-22-26*.
Exhibit 4: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*.

MSC Seacor Power Post-Casualty Analysis Exhibits

Exhibit 5: *MSC Seacor Power Post-Casualty Analysis Regulatory References.*
Exhibit 6: *Conclusions from the MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.*
Exhibit 7: *USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.*

USCG Seacor Power Final Report Exhibits

Exhibit 8: *USCG Seacor Power Final Report Regulatory References.*
Exhibit 9: *USCG Commandant's Responses to the USCG Seacor Power Final Report Recommendations [plus identified Best Practices].*

SEACOR POWER Investigation Results Exhibits

Exhibit 10: *SEACOR POWER Investigation Results - Brief to NOSAC on June 21, 2023.*
Exhibit 11: *SEACOR POWER Investigation Results - Additional Tops for NOSAC.*

Compilation and Grouping of NOSAC Recommendations vs. NTSB, USCG, and MSC Reports

Exhibit 12: *Compilation and Categorization of NOSAC Recommendations*.
Exhibit 13: *NOSAC Suggested Solutions to Selected Recommendations*

Credits:

The NOSAC Subcommittee acknowledges the following personnel who were instrumental in providing information to the Subcommittee in the development of this report.

Mrs. Fallon Dominique was the original Co-Chair with Captain Kim Parker in the development of this report. Ms. Dominique was required to resign from NOSAC for personal reasons after the Spring 2024 Meeting.

LCDR Kelly Brown, Office of Commercial Vessel Compliance, for identifying the U.S. legislation related to liftboats, and the statistics on operating liftboats.

LCDR Andrew Czarniak, Office of Commercial Vessel Compliance, replaced LCDR Brown who was transferred to another station, for providing statistics regarding EPIRB alerts.

Mr. William Peters, P.E., Naval Architect, Office of Design and Engineering Standards, Naval Architecture Division; U.S. Coast Guard (CG-ENG-2) and **Mr. Andrew Lawrence, P.E.**, Principal Naval Architect, Salvage Engineering Response Team (SERT) for their responses to stability questions raised from the NTSB and the Maritime Safety Committee (MSC) Reports. Mr. Peters is a member of the OC-08 Wind Technologies Committee with the Society of Naval Architects and Marine Engineers (SNAME).

Mr. Eric Verdin, OSV Master/Advisor/Inspector, Outer Continental Shelf National Center of Excellence, for his many contributions of notices and publications and research regarding maritime telecommunications.

Captain Tracy Phillips (retired), for providing analysis of the USCG Report of Investigation of the Capsizing of the Seacor Power and many other contributions.

Chett C. Chiasson, MPA Executive Director, Greater Lafourche Port Commission, for providing weather facilities information in Port Fourchon, LA.

Each member of the NOSAC Subcommittee for this Task Statement, who contributed their knowledge and expertise.

The NOSAC invites the USCG to review any of the referenced documents in this report whether the Committee had a comment or recommendation or not in furtherance of improving safety and environmental protection practices in the liftboat industry, or as may be appropriately extrapolated to other types of vessels.

Respectfully submitted:

Captain Kim Parker, Co-Chair	Mr. Lincoln Stroh, Co-Chair

Members of the National Offshore Safety Advisory Committee (NOSAC).

The next five sections of this NOSAC report will address the specific tasks contained within the Task Statement.

SPECIFIC TASK NUMBER 1

The [NOSAC] Subcommittee should: Review CG existing policy letters, NVICs, Commandant Instruction Manuals, and regulations that are applicable to the stability, operations, and operational limitations for liftboats operating on the U.S. OCS and propose recommended changes if appropriate.

Eighth USCG District Policy 16711: Persons Allowed on Liftboats

Policy from Commander, Eighth Coast Guard District, 16711/LIFTBOAT, October 9, 1998, Subject: *Persons Allowed on Liftboats*.

This policy references Navigation and Vessel Inspection Circular (NVIC) 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) and 46 CFR 126.170 (*Stability Requirements for ALL Inspected Vessels*). No recommendation was identified in this Policy Letter.

NVIC 8-91 Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats

NVIC 8-91, dated May 21, 1991, COMDTPUB P16700.4; Subject: *Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats.* Enclosures include manning of Offshore Supply Vessels (OSVs), Guidance pertaining to Inspecting and certifying existing OSVs including Liftboats, and additional guidance pertaining to inspecting and certifying existing Liftboats (respectively (1), (2), and (3)).

In the cover letter to NVIC 8-91, paragraph 3 (Background), subparagraph b, “Offshore" is not defined by statute or regulation.”

TS 01-23(1) R1.1A NVIC 8-91 Define “offshore”

Enclosure (1) (*Manning of Offshore Supply Vessels*), discusses statutory and regulatory manning requirements for any vessels meeting the definition of offshore supply vessel. No recommendation was identified in Enclosure (1).

Enclosure (2) (*Guidance Pertaining to the Inspection and Certification of Existing Offshore Supply Vessels Including Liftboats*), states that stability of an existing OSV is considered adequate if a USCG Stability Letter or Stability Statement has been issued.

TS 01-23(1) R5.10A.15 NVIC 8-91 Stability Review on Liftboats?

[Formerly TS 01-23(1) R1.1B]

Enclosure (3) (*Additional Guidance Pertaining to the Inspection and Certification of Existing Liftboats*), states that stability instructions should provide “simple guidance” on

safely operating the vessel. Instructions can be found in the Stability Letter or in the Operating Manual. Owners are responsible to review NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*) and ensure that information incorporated into the Operating Manual is accurate and represents the current condition of the vessel. The Operating Manual should provide guidance preparing for severe storms and bad weather and shifting loads, among other requirements. Minimum freeboard requirements for liftboats without Load Lines amidships should be the vessel's depth divided by 4 (D/4). The liftboat's vertical center of gravity (KG) should not be exceed the maximum KG when wind the heeling moments curve is superimposed over the vessel's righting moment curve for a 50-knot wind. For leg-strength calculations, a 50-knot wind is used and should be highlighted in the Operating Manual.

TS 01-23(1) R1.1C NVIC 8-91 Conduct Operating Manual Review?

NVIC 3-89 Guidance for the Presentation of Stability Instructions for Operating Personnel

NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*). NVIC 3-89 is referenced from Enclosure (3) of NVIC 8-91. "The purpose of this Circular is to provide the marine industry with guidelines for the preparation of stability information…" No recommendation was identified in the cover letter.

Enclosure (1) (*Guidelines for the Presentation of Stability Information to Operating Personnel*) requires all vessels which obtain a Certificate of Inspection and/or a US Load Line Certificate must be provided with stability information for operating personnel. Paragraph 10 (Computer Applications) discusses the use of computers to help the ship operator evaluate stability.

Enclosure (2) (*Guidelines for the Preparation of Intact Stability Information*) refers to MSC/Circ.456 from the International Maritime Organization Maritime Safety Committee at its fifty-third session (13 October 1986) which adopted preparation of intact stability information for the master. In the Annex, paragraph 6 [*Addendum*], the USCG is reminded of the following sentence "It [*computers*] should not replace approved documentation." The NOSAC Subcommittee has determined that the guidance in Enclosure (1), subject to 3-89A under Recommendation 1.1, is preferable.

TS 01-23(1) R1.1 NVIC 3-89 Computer Stability Programs

USCG MSC TN 4-00, Weather Criteria for Liftboat Leg Strength

USCG Marine Safety Center Technical Note MTN 4-00; 16717/LIFTBOATS; August 30, 2000; Subject: Weather Criteria for Liftboat Leg Strength

This Technical Note references 46 CFR 174.255(c) for *On-bottom Stability of Liftboats*, and 46 CFR 134.140(a), *Leg Strength of Liftboats*. This Note states that there is some uncertainty in the liftboat design community regarding wave conditions associated with 70-knot winds, particularly of short-term duration. Coast Guard states that liftboat designers "may assume normal wave and current conditions (appropriate to the location) in conjunction with a 70-knot wind speed."

TS 01-23(1) R5.10A.4 MTN 4-00 Establish Wave Conditions for Liftboats

[Formerly TS 01-23(1) R1.2]

Current version of 46 CFR 174.255(c) for *On-bottom Stability of Liftboats*, *states* "The waves and currents must be appropriate for the winds and place."

Current version of 46 CFR 134.140(a), *Leg Strength of Liftboats*, states that each liftboat must comply with ABS Rules for Building and Classing MODUS (except as noted in (b)), assuming "…70 knots for liftboats in restricted service under normal operations conditions and 100 knots under severe storm conditions…"
Note: (b) states: "Standards of classification societies other than the ABS, and other established standards acceptable to the Commandant (CG-ENG), may be used."

46 CFR 170 Stability Requirements for All Inspected Vessels

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter S, Subdivision and Stability, Part 170, *Stability Requirements for All Inspected Vessels*; including Subparts A through I.

46 CFR 170 has nine subparts: General Provisions; Definitions; Plan Approval; Stability Instructions for Operating Personnel; Intact Stability Criteria; Determination of Lightweight Displacement and Centers of Gravity; Special Installations; Watertight Bulkhead Doors; and Free Surface.

The original source for this regulation is CGD 79-023, 48 FR 51010, November 4, 1983. The latest amendments to the various regulations within this Part are as follows: 1986 (1), 1988 (2), 1989 (2), 1996 (2), 2000 (1), 2004 (1), 2008 (1), 2010 (20), 2013 (2), and 2017 (2).

Under §170.090(d), the Assumed Average Weight Per Person (AAWPP) is 185 lb. from December 1, 2011. Updates for the AAWPP are derived from a report released by the Centers for Disease Control and Prevention (CDC) through the National Center for Health Statistics (NCHS), or successor. An updated AAWPP value will be incorporated into regulation only if the sum equals or exceeds 10 pounds more than the AAWPP in effect.

The last update to Subpart A, §170.015 *Incorporation by reference*, was in 2013. Subpart D contains *Stability instructions for Operating Personnel*. The last update to §170.110 *Stability booklet*, was in 2010. §170.110(f), onboard computers may be used as an adjunct; however, the booklet must contain all necessary information for stability evaluation of any intact condition that can be evaluated by the computer. §170.170 discusses *Weather criteria*. This regulation was last amended in 2010. Subpart F, *Determination of Lightweight Displacement and Centers of Gravity*, was last amended in 2010. Subpart I, *Free Surface*, was last amended in 1989.

TS 01-23(1) R5.10A.3 46 CFR 170 Review Weather Criteria Equations

[Formerly TS 01-23(1) R1.3]

TS 01-23(1) R5.10B 46 CFR 170 Incorporation by Reference

[Formerly TS 01-23(1) R1.3B]

Eighth USCG District Letter to OMSA

Policy Letter from District 8 on August 25, 1999 (16711 Rescue Boats) to Mr. Christopher Sullivan, Vice President, Offshore Marine Service Association.

The NOSAC Subcommittee has no comment or recommendation regarding this document. The NOSAC Subcommittee concurs with the content of this document.

USCG Offshore Supply Vessel Inspector Job Aid

USCG *Offshore Supply Vessel Inspector Job Aid* (Job Aid OSV, Rev. September 2018, DCN: MPS-JA, TCY-OI (3).

Item 7 under *Certificates & Documents*, the inspector is to examine the stability letter, book, and loading criteria. The following regulations are cited within this Item: 46 CFR §127.230, §§170.105-140 (Subpart D), §126.150, and §131.513.

TS 01-23(1) R1.4 OSV Inspector Job Aid

CG-543 Policy Letter 07-02, Guidance on the Inspection, Repair, and Maintenance of Liftboats

CG-543 Policy Letter 07-02, (16711), dated March 4, 2008, Subject: *Guidance on the Inspection, Repair, and Maintenance of Liftboats*.

The NOSAC Subcommittee has no comment or recommendation regarding this document. The NOSAC Subcommittee concurs with the content of this document.

CG-CVC Policy Letter No. 14-03 Evaluating Sea Service Aboard Liftboats

CG-CVC Policy Letter No. 14-03 (16721), dated April 6, 2015. Subject: *Evaluating Sea Service Aboard Liftboats*.

This USCG policy describes evaluating and crediting sea service on Liftboats to quality for national officer endorsements on Merchant Marine Credentials (MMCs). This policy letter was to have been included in the next revision of Volume III of the Marine Safety Manual. An email follow up to MMCPolicy@uscg.mil indicated that this update was not accomplished. Volume III, Change 2 was published on July 5, 2017.

TS 01-23(1) R1.5 USCG Updating Internal Procedures

USCG Liftboat Addendum 2015

USCG Liftboat Addendum 2015

Tasks included in this document are as follows: OIA-LM01 (*Examine Operating Manual*), OIA-LS01 (*Inspect rescue boat installation*), OIA-FF01 (*Inspect fire main systems*), OIA-TE01 (*Examine jacking systems*), OIA-TE02 (*Examine hydraulic lifting [self elevating] system(s)*], OIA-TE03 (*Inspect freeboard markings*), OIA-HE01 (*Conduct leg inspection*), and OIA-WR01 (*Evaluate structural repair proposals for compliance with minimum standards*).

The NOSAC Subcommittee has no comment or recommendation regarding this document. The NOSAC Subcommittee concurs with the content of this document.

Liftboat Plan Review Guide

SP PRG.C2-30.2021.04.05. *Liftboat Plan Review Guide*.

This Plan Review Guideline (PRG) applies to vessels requesting reviews of liftboat general arrangements, stability, structures, and other submissions to the Marine Safety Center. Section 5b (*Afloat Stability Submissions*), states that if the vessel's stability is reviewed under NVIC 3-97 (*Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels*), the MSC stability review is not required.

The NOSAC Subcommittee has no comment or recommendation regarding this document. The NOSAC Subcommittee concurs with the content of this document.

COMDTCHANGENOTE 16000, CH-2 to the Marine Safety Manual, Volume III, Marine Industry Personnel

COMDTCHANGENOTE 16000, dated 5 July 2017. Subject: *CH-2 to the Marine Safety Manual, Volume III, Marine Industry Personnel, COMDTINST M16000.8B*.

> "The Marine Safety Manual [MSM], Volume III, Marine Industry Personnel, COMDTINST M16000.8B, provides information and interpretations on international conventions and U.S. statutory and regulatory issues relating to marine industry personnel." Guidance regarding liftboats is found in Part A (*Mariner Credentialing*), Chapter 10 (*Licenses for Deck Officers*), Section I (*Liftboat Licenses*). Additional Guidance for Liftboats is found in Part B (*Vessel Manning*), Chapter 2 (*Sample Vessel Manning Scales*), Section L (*Offshore Supply Vessels (OSVs)*), Subsection 2 (*Sample Scales - Liftboats*) [dated 2017]. In this latter section is the following NOTE: "NOTE: Liftboats are required to maintain a full crew as required by the COI while operating. Liftboats are considered to be operating both while underway and elevated. (2017)."
>
> Volume III was updated from CG-543, Policy Letter (PL) 07-02 Encl. (1), Paragraph 13; Subject: *Guidance on the Inspection, Repair and Maintenance of Liftboats* which is in the New MSM III Location: B2L.
>
> The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

COMDTCHANGENOTE 16000, CH-3 to Marine Safety Manual Volume II (Materiel Inspection).

COMDTCHANGENOTE 16000, dated 20 September 2021. Subject: CH-3 to Marine Safety Manual Volume II (*Materiel Inspection*), COMDTINST M16000.7B.

> Guidance regarding Liftboats is found in Section G (*Outer Continental Shelf Activities*), Chapter 6 (*Procedures Applicable to Other Vessels Engaged in OCS Activities*), and Section B (*Liftboats*). This CH-3 supersedes CH-2 from 20 July 2016.
>
> "Existing liftboats will be inspected initially and subsequently under the guidance provided in NVIC 8-91. 46 CFR Subchapter L is applicable to new vessels contracted for or delivered after 15 March 1996."
>
> "Most liftboats now fall under the same regulatory standards as conventional hulled OSVs; however there are several areas of inspection that are unique to this type of vessel to include: automation, steel wastage, tail shaft inspection intervals, drydock inspections, lifesaving systems, firefighting equipment, systems/equipment for general operation, crane inspection and manning."

In Section 12 (*General Operations*) Subsection a. (*Operating Manual*) the following Operating Manual is to be approved by the Officer in Charge Marine Inspection (OCMI). This section describes 12a (*Dead Man Switch*), 12b (*Anemometer*), and 12c (*Anchors*).

Section 12c states: "If the liftboat's approved operating manual specifies required actions based upon wind speed, the vessel should have a reliable means to determine wind speed such as a properly operating anemometer (portable or fixed) onboard."

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

NVIC 3-97, Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels.

NVIC 3-97, COMDTPUB P16700.4, Subject: *Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels*.

USCG, through the Marine Safety Center (MSC) authorizes the American Bureau of Shipping (ABS) to issue stability letters on their behalf. MSC maintains oversight authority for stability related reviews by ABS. MSC is responsible to provide ABS with guidance and/or stability letter formats reflecting current USCG policies. MSC is responsible to keep ABS abreast of changes in U.S. laws and regulations, and USCG policy interpretations that might affect ABS stability reviews.

In paragraph 2.c. of NVIC 3-97, Enclosure 1, ABS may dispense with a stability letter as per 46 CFR 170.120(b) (*Stability Letter*) if the stability information can be included in the Load Line Certificate. 46 CFR 170.120(b) also includes the Certificate of Inspection.

Enclosure 2 references temporary stability letter guidelines in the Marine Safety Manual, Volume IV, section 6.C.2. This reference is correct. Stability test procedures are referenced in 46 CFR 170.085 (*Information required before a stability test*), 46 CFR 170.185 (*Stability test procedures*), NVIC 17-91 (*Guidelines for Conducting Stability Tests*), and American Society for Testing and Materials (ASTM) Standard Guide F 1321-90 (*Standard Guide for Conducting a Stability Test (Inclining and Lightweight Survey) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel*). ASTM F1321-14 (2021) (*Standard Guide for Conducting A Stability Test (Lightweight Survey and Inclining Experiment) To Determine The Light Ship Displacement And Centers Of Gravity Of A Vessel*) has been published.

TS 01-23(1) R1.6 NVIC 3-97 Reference Standards

Marine Safety Center Technical Note MTN No. 04-95, CH-2, Lightship Change Determination: Weight – Moment Calculations vs. Deadweight Survey vs. Full Stability Test.

Marine Safety Center Technical Note MTN No. 04-95, CH-2, 16710/Lightship Change, dated January 11, 2016: *Lightship Change Determination: Weight – Moment Calculations vs. Deadweight Survey vs. Full Stability Test*.

The purpose of this MTN is to describe the process of determining when weight changes to a vessel are significant enough to warrant a new deadweight survey or a full stability test.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Marine Safety Alert, Alert 04-11, Mariner's Safety Endangered When VHF Radio Distress Alerts by Digital Selective Calling (DSC) Lack Location and Identification Information.

USCG Marine Safety Alert, Alert 04-11, dated September 1, 2011: *Mariner's Safety Endangered When VHF Radio Distress Alerts by Digital Selective Calling (DSC) Lack Location and Identification Information*.

Alert 04-11 provides guidance to mariners to set up their Digital Selective Calling (DSC) system with location and identification information to

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Marine Safety Alert, Alert 06-13, Coast Guard Termination of its 2 MHZ Distress Watchkeeping Service.

USCG Marine Safety Alert, Alert 06-13, dated June 18, 2013, *Coast Guard Termination of its 2 MHZ Distress Watchkeeping Service*.

Alert 06-13 discontinues its radio guard of international voice distress, safety and calling frequency 2182 Khz and international Digital Selective Calling (DSC) 2187.5. The USCG will continue to monitor VHF 16 (156.8 MHz) and DSC frequencies 4/6/8/12.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Marine Safety Alert, Alert 08-17, dated August 3, 2017, *Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!*

USCG Marine Safety Alert, Alert 08-17, Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!

Alert 08-17 identifies how mariners can best contact the USCG in time of emergency and which systems are no longer valid.

TS 01-23(1) R1.7 Safety Alert 08-17 Reminder

USCG Marine Safety Alert, Alert 03-23, dated March 2, 2023, *Ensuring Proper Configuration of Digital Selective Calling (DSC)-Equipped Radios*.

Alert 03-23 provides guidance and a strong recommendation regarding setting up Digital Selective Calling (DSC) configuration and use of the red DSC button in an emergency.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Marine Safety Information Bulletin, MSIB Number 20-20, Change 1, Performing a VHF Marine Radio Check.

USCG Marine Safety Information Bulletin, MSIB Number 20-20, Change 1, dated October 29, 2020, *Performing a VHF Marine Radio Check*.

MSIB 20-20, Change 1, states that the Automated Radio Check System on VHF 24 and 28 was discontinued on October 2, 2020. For DSC radios equipped with a Test Call feature, the USCG continues to offer test capability on VHF 70. VHF voice radio checks are to be conducted on VHF 9, which the USCG does not monitor. Do not use VHF 16. All fixed-mount marine radios certified by the Federal Communications Commission since 1999 are required to have DSC capability; all radios sold since 2011 are to have DSC capability.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Marine Safety Information Bulletin, MSIB Number 10-21, High Frequency Voice Distress Watchkeeping will cease at most locations on 7 February 2022.

USCG Marine Safety Information Bulletin, MSIB Number 10-21, dated 7 December 2021, *High Frequency Voice Distress Watchkeeping will cease at most locations on 7 February 2022*.

MSIB 10-21 states that the USCG will cease monitoring all High Frequency shortwave voice distress frequencies within the contiguous United States and Hawaii; however, maintaining a watch in Alaska and Guam. The reason for the cessation was minimal use and interest by the marine sector. The USCG provides alternative means and that the Rescue 21 VHF distress on channel 16 and DSC are not affected.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

USCG Outer Continental Shelf NCOE, The Drill Down, Issue No. 21 - OSV, 2023: DSC Distress Alerting.

USCG Outer Continental Shelf National Center of Expertise, *The Drill Down*, Issue No. 21 - OSV, dated March 30, 2023: *DSC Distress Alerting*.

The Drill Down Issue No. 21 is a comprehensive summary which summarizes what DSC is, DSC requirements, Watch Requirements, Distress Alerting Information, Coast Guard DSC Watch, Distress Repetition and Acknowledgement, and references to other sources of information (i.e., Safety Alerts 04-11 [*Mariner's Safety Endangered When VHF Radio Distress Alerts by Digital Selective Calling (DSC) Lack Location and Identification Information*] and 03-23 [*Ensuring Proper Configuration of Digital Selective Calling (DSC)-Equipped Radios*]).

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 USC 2101: General definitions.

Title 46: Shipping; United States Code (USC); Subtitle II: Vessels and Seamen; Part A: General Provisions; Chapter 21: General; Section 2101: *General definitions* (laws in effect on September 22, 2023).

46 USC 2101 compiles 56 definitions with historical and revision notes, references in text, amendments, effective dates of various amendments, transfer of functions, , towing vessels operating outside boundary line, fishing and fish tender vessels, applicability date for revised regulations, tank vessel definition clarification, and definitions of terms used in Title II of Public Law 115-265.

Examples of definitions include (4) “commercial service”; (20) “mobile offshore drilling unit”; and (25) “offshore supply vessel”.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 42, Domestic and Foreign Voyages by Sea.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter E, Load Lines; Part 42, *Domestic and Foreign Voyages by Sea*.

The purpose of these regulations (§42.01-10) is to identify lawful placement of load line marks, identify uniform minimum requirements of the marks, issuance of load line certificates, and enforcement procedures.

Applicable vessels engaged in international and/or domestic voyages by sea are subject to these regulations, including liftboats. Exceptions for certain types of ships are specified (§42.03-5). The requirement for affixing load lines is found in §42.07-1 (*Load lines required*). §42.07-15 discusses zones and seasonal areas. ABS is authorized to be an assigning authority (§42.07-35). Types and specifications of load line certificates are specified in §42.07-45. Type “A” vessels are primarily tankers, while Type “B” vessels are any vessel not defined as Type “A” (§42.009-5). Requirements for stability, subdivision, strength, and light ship data for all vessels is found in §42.09-10. Type of surveys, i.e., initial, periodical, and annual are described in §42.09-15. Free surface effect must be included in stability calculations (§42.20-10).

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Subchapter L, Offshore Supply Vessels.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, *Offshore Supply Vessels*.

Subchapter L comprises Parts 125 through 134. In 46 CFR 134.100(a) is the following statement: “This part [Part 134, *Added Provisions for Liftboats*], as well as parts 125 through 133 of this subchapter, applies to each liftboat of United States flag to which this subchapter applies.” The review of the Subcommittee regarding these integral Parts to Subchapter L follows.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 125, General.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 125, *General*.

46 CFR 125 applies to each offshore supply vessel of United States Flag contracted for, or the keel laid on or after March 15, 1996. §125.180 [*Incorporation by reference*] (b) states "American Bureau of Shipping (ABS), ABS Plaza, 16855 Northchase Drive, Houston, TX 77060, 281–877–5800, *http://www.eagle.org*." The current location for ABS is at 1701 City Plaza Drive, Spring, Texas 77389, US.

TS 01-23(1) R1.3C 46 CFR 125 Incorporation by Reference

46 CFR Part 126, Inspection and Certification.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 126, *Inspection and Certification*.

46 CFR 126 has five subparts: General; Certificate of Inspection; Initial Inspection; Inspection for Certification; and Annual, Periodic, and Alternative Annual Inspections. Under §126.170, the maximum number of offshore workers carried on an offshore supply vessel is 36, unless a smaller number of workers is endorsed on the vessel's Certificate of Inspection. Vessels carrying more than 36 offshore workers must meet the requirements of 46 CFR 127, Subpart F, *Construction and Arrangements for OSVs Carrying More Than 36 Offshore Workers*.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 127, Construction and Arrangements.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 127, *Construction and Arrangements*.

46 CFR 127 has five subparts: Plan Approval; Particular Construction and Arrangements; Rails and Guards; Construction of Windows, Visibility, and Operability of Coverings; and

Construction and Arrangements for OSVs Carrying More Than 36 Offshore Workers. 46 CFR 127.240, *Means of escape*, discusses windows, ladders, and other means of escape. Anecdotally, some liftboat crew members on liftboats were under the impression that windows in cabins were emergency egress similar to helicopter windows. 46 CFR 127.240 dispels this notion.

TS 01-23(1) R1.8 MSIB for Means of Escape

46 CFR Part 128, Marine Engineering: Equipment and Systems.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 128, *Marine Engineering: Equipment and Systems*.

46 CFR 128 has four subparts: General; Material and Pressure Design; Main and Auxiliary Machinery; and Design Requirements for Specific Systems.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 129, Electrical Installations.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 129, *Electrical Installations*.

46 CFR 129 has five subparts: General Provisions; General Requirements; Power Sources and Distribution Systems; Lighting Systems; and Miscellaneous Electrical Systems.

Subpart D, *Lighting Systems*, covers lighting fixtures; branch circuits for lighting on OSVs of 100 or more gross tons; navigational lighting; emergency lighting; and portable lighting.

TS 01-23(1) R1.9 46 CFR 129.440 Emergency Lighting

46 CFR Part 130, Vessel Control, and Miscellaneous Equipment and Systems.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 130, *Vessel Control, and Miscellaneous Equipment and Systems*.

46 CFR 130 has four subparts: Vessel Control; Miscellaneous Equipment and Systems; Navigational Equipment; and Automation of Unattended Machinery Spaces.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 131, Operations.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 131, *Operations*.

46 CFR 131 has nine subparts: General Provisions: Notice of Casualty and Records of Voyage; Marking on Vessels; Preparations for Emergencies; Sufficiency and Supervision of Crew of Survival Craft; Tests, Drills, and Inspections; Logs; Work Vests; Marking for Fire Equipment and Emergency Equipment; and Miscellaneous.

46 CFR 131.100, *Preemptive effect*, states: "The regulations in this part have preemptive effect over State or local regulations in the same field.

46 CFR 131.310, *List of crew members and offshore workers*, describes the requirement for the master to keep a correct list of each person embarking and disembarking the vessel, which must be prepared before the vessel's departure on a voyage and deposited ashore.

46 CFR 131.320, *Safety orientation for offshore workers*, describes the required safety orientation for offshore workers. [Refer to NTSB ROI 1.1.2 on page 10; and USCG ROI 8.1.4.]

TS 01-23(1) R1.10 46 CFR 131.320 Safety Orientations

46 CFR 131.510, *Draft and loadline marking*, requires the master to enter the forward and aft draft in the vessel's logbook when leaving port. [Refer to USCG ROI 8.1.2 and 8.1.13; and NTSB 1.10.1.]

For the emergency lighting required by 46 CFR 129.440, *Emergency lighting*, the master is to test this equipment in compliance with 46 CFR 525, *Emergency lighting and power*.

46 CFR 131.530, *Abandon-ship training and drills*, (b)(6) states the following: "Each lifeboat must be launched with its assigned crew aboard during an abandon-ship drill, and be maneuvered in the water, at least once each 3 months that the vessel is operated."

46 CFR 131.530, *Abandon-ship training and drills*, (d)(4) states the following: "Training in the use of davit-launched inflatable liferafts must take place at intervals of not more than 4 months on each vessel with such liferafts. Whenever practicable this must include the

inflation and lowering of a liferaft. If this liferaft is a special one intended for training only, and is not part of the vessel's lifesaving system, it must be conspicuously so marked."

TS 01-23(1) R1.11 46 CFR 131.530 Abandon-Ship Training and Drills

TS 01-23(1) R1.12 46 CFR 131.530 Davit-Launched Liferafts

46 CFR Part 132, Fire-Protection Equipment.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 132, *Fire-Protection Equipment*.

46 CFR 132 has three subparts: General Provisions: Firemain; Portable and Semiportable Fire Extinguishers; and Miscellaneous.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 133, Lifesaving Systems.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 133, *Lifesaving Systems*.

46 CFR 133 has two subparts: Lifesaving Systems; and Requirements for ALL OSVs. §133.10, Applicability, (a) states: "Unless expressly provided otherwise in this part, this part applies to all inspected OSVs of the United States flag, including liftboats." §133.60(a) describes requirements for carriage of Emergency Position Indicating Radiobeacons (EPIRBs). §133.70(c) describes requirements for immersion suits or anti-exposure suits.

§133.130, *Stowage of survival craft*, (b)(7) states: "Each liferaft or group of liferafts must be arranged for float-free launching. The arrangement must ensure that the liferaft or liferafts when released and inflated, are not dragged under by the sinking OSV. A hydrostatic release unit used in a float-free arrangement must be approved under approval series §160.162."

§133.170, *Line-throwing appliance*, describes the requirement for line-throwing appliances.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 134, Added Provision for Liftboats.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 134, *Added Provision for Liftboats*.

46 CFR 134 covers several additional provisions specifically associated with liftboats.

§134.140, *Structural standards*, (a) states: "Except as provided by paragraph (b) of this section, each liftboat must comply with the ABS's "Rules for Building and Classing Mobile Offshore Drilling Units", assuming a steady wind speed of 100 knots for liftboats in unrestricted service, and 70 knots for liftboats in restricted service under normal operating conditions and 100 knots under severe storm conditions, as follows: [with references to parts of the ABS document]" and (b) which states: "Standards of classification societies other than the ABS, and other established standards acceptable to the Commandant (CG-ENG), may be used."

§134.170(b), *Operating manual*, defines the requirements for the liftboat's Operating Manual. The stability information provided to the crew in the Operating Manual must meet relevant sections of 46 CFR 170, *Stability Requirements for All Inspected Vessels*, and 46 CFR 174, *Special Rules Pertaining to Specific Vessel Types*.

The NOSAC Subcommittee has no comment or recommendation regarding PLBs in reference to this document. The NOSAC Subcommittee concurs with the content of this document.

46 CFR Part 174, Special Rules Pertaining to Specific Vessel Types.

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter S, Subdivision and Stability, Part 174, *Special Rules Pertaining to Specific Vessel Types*.

46 CFR 174 has eight subparts: General; Special Rules Pertaining to Deck Cargo Barges; Special Rules Pertaining to Mobile Offshore Drilling Units; Special Rules Pertaining to Tugboats and Towboats; Special Rules Pertaining to Offshore Supply Vessels; Special Rules Pertaining to Liftboats; Hopper Dredges with Working Freeboard Assignments; and Special Rules Pertaining to Dry Cargo Ships.

Subpart G, *Special Rules Pertaining to Offshore Supply Vessels*, applies to Offshore Supply Vessels except liftboats inspected under subchapter L of this Chapter.

Subpart H, Special Rules Pertaining to Liftboats, applies to each liftboat inspected under Subchapter L of this Chapter. Additionally, each liftboat must comply with §§174.210 through 174.225. These sections cover Watertight doors in watertight bulkheads; Drainage of weather deck; Hatches and coamings; and Hull penetrations and shell connections.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document, except that may be raised regarding Maritime Safety Committee (MSC) USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power (Exhibit 7).

47 CFR Part 80, Stations in the Maritime Services.

Code of Federal Regulations (CFR), Title 47, Telecommunication, Chapter I Federal Communications Commission [FCC], Subchapter D, Safety and Special Rado Services, Part 80, *Stations in the Maritime Services*.

47 CFR 80 has 25 Subparts: A through Y. Subparts of relevance to this task statement include the following:

- Subpart B: *Applications and Licenses* (§80.11 through §80.60).
- Subpart C: *Operating Requirements and Procedures* (§80.61 through §80.149).
- Subpart D: *Operator Requirements* (§80.151 through §80.179).
- Subpart E: *General Technical Standards* (§80.201 through §80.233).
- Subpart F: *Equipment Authorization for Compulsory Ships* (§80.251 through §80.293).
- Subpart G: *Safety Watch Requirements and Procedures* (§80.301 through §80.335).
- Subpart J: *Public Coast Stations* (§80.451 through §80.481).
- Subpart O: *Alaska Fixed Stations* (§80.701 through §80.711).
- Subpart V: *Emergency Position Indicating Radiobeacons (EPIRBs)* (§80.1051 through §80.1061).

47 CFR 80.59: Ships subject to inspections under the Communications Act of the Safety Convention are conducted by an FCC-licensed technician, not normally the FCC.

47 CFR 80.103 states Digital Selective Calling (DSC) operating procedures. Coast and ship stations must use maritime mobile service identities (MMSI) assigned by the FCC.

47 CFR 80.109 grants Land Stations authority to send group calls to vessels including storm warnings, ordinary weather, and hydrographic information.

47 CFR 80.141(b)(2) discusses that in times of direct danger to a vessel, particularly related to winds of force 10 or above on the Beaufort scale for which no storm warning

has been received to transmit this danger to ships and land stations in the vicinity, if the first ship to report.

47 CFR 80.148 requires vessels to monitor VHF Channel 16 (156.8 MHz) while underway with exceptions allowed for vessels using handheld bridge-to-bridge VHF radios or participating in Vessel Traffic Service (VTS) system.

47 CFR 80.179 authorizes the following unattended transmitter operation: (a) "EPIRB operations when emergency conditions preclude attendance of the EPIRB transmitter by a person."

47 CFR 80.233 discusses the technical requirements for Automatic Identification System Search and Rescue Transmitters (AIS-SART) equipment.

47 CFR 80.273 identifies the standards to be followed regarding radar installations on board ships required by the Safety Convention or the USCG to be so equipped.

47 CFR 80.312 states that distress calls have absolute priority over all other transmissions. Other stations hearing the distress call must cease transmissions if their calls could interfere with distress traffic. Distress communications are prefaced by MAYDAY as per 47 CFR 80.314.

47 CFR 80.325 requires other vessels to transmit distress messages if the station in distress is unable to do so, if the master of the distressed vessel needs more help, or the initial distress message goes unanswered.

47 CFR 80.334 discusses the prohibition of sending false distress alerts. Cancelling inadvertent EPIRB activation is identified in 47 CFR 80.335(e).

47 CFR 80.453(c) authorized public coast stations to transmit meteorological and navigational information for benefit to mariners.

47 CFR 80.469 grants use of maritime mobile repeater stations in Alaska to extend the range of communications between a VHF public coast station located in Alaska and ship stations.

47 CFR 80.701 describes that Alaska Fixed stations are either public or private. These stations are to give priority to distress, urgency or safety signals as per 47 CFR 80.703.

47 CFR 80.1061 describes EPIRB requirements. §1061(e) identifies the information required to be included with registration of each EPIRB which is assigned a unique identification code recognized by the National Oceanic and Atmospheric Administration (NOAA). Registration must include the owner's name, contact information, and alternate emergency contact information. NOAA issues the "Official 406 MHz EPIRB Registration

Form" with instructions to register the form at www.beaconregistration.noa.gov. For questions regarding completion of the form, personnel can call 1-888-212-SAVE (7283) or 301-817-4515. This form is authorized by OMB Auth. (0648-0295) which expires 30 September 2025.

TS 01-23(1) R1.13 47 CFR 80.469 Alaska Maritime Mobile Repeaters

47 CFR Subpart K, Personal Locator Beacons and Maritime Survivor Locating Devices.

Code of Federal Regulations (CFR), Title 47, Telecommunication, Chapter I Federal Communications Commission [FCC], Subchapter D, Safety and Special Rado Services, Part 95, Personal Radio Services, Subpart K, *Personal Locator Beacons and Maritime Survivor Locating Devices*.

47 CFR 95.2901 through 95.2993 discuss Personal Locator Beacons (PLBs) and Maritime Survivor Locating Devices (MSLDs). Owners are required to register these beacons with NOAA and ultimate changes in ownership. Both devices are for emergency use only.

The NOSAC Subcommittee has no comment or recommendation regarding PLBs in reference to this document. See **Recommendation 5.10A.10** regarding personal locator beacons relative to the NTSB's *Final Report on The Seacor Power Liftboat Report of Investigation*.

USCG Safety Alert 12-22, Ensuring Proper Operation and Detection of Radar Search and Resue Transponders (SARTs)

United States Coast Guard, Marine Safety Alert, Safety Alert 12-22, *Ensuring Proper Operation and Detection of Radar Search and Resue Transponders (SARTs)*, dated November 25, 2022.

Safety Alert 12-22 addresses issues which "may reduce the effectiveness of a radar Search and Rescue Transponder (SART) during an emergency."

Limitations include X-band radar settings, sea and rain clutter, tuning, and range. Limitations with the SART include orientation and height of the antenna.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. Refer to **Recommendation 3.6** from IMO NAV SN/Circ. 197.

RECOMMENDATIONS for Specific Task Number 1

TS 01-23(1) R1.1 The NOSAC recommends that the USCG review and update NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*) to account for technological advances, changes to the regulations referenced within these

NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding **NVIC 3-89**.

Add language to Enclosure (1) (*Guidelines for the Presentation of Stability Information to Operating Personnel*), paragraph 10 (*Computer Applications*), which requires validation and / or revalidation of computer stability programs when design changes that affect the stability characteristics of the vessel occur, or every ten (10) years, whichever comes first.

TS 01-23(1) R1.1A The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding **NVIC 8-91.**

Develop a statutory or regulatory definition for the word “offshore”, which is found in the cover letter, Background, 3b.

TS 01-23(1) R5.10A.15 The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding **NVIC 8-91.** [Formerly TS 01-23(1) R1.1B]

The NOSAC recommends that the USCG evaluate whether there is a need to conduct a stability review on each existing liftboat, given the lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG consider the information contained in the *Marine Safety Center Post-Casualty Stability Analysis of Seacor Power* Report (and the references on page 63 of this document) which highlights the unique features of liftboats, the various interpretations used when calculating liftboat stability, and the different wind profile standards that exist.

References:

Santen, J.A. van, "Problems met in stability calculation of offshore rigs and how to deal with them," Proceedings of the 13th International Ship Stability Workshop, 2013.

Breuer, J.A. and K. Sjölund, "Steepest Descent Method. Resolving and Old Problem," Proceedings of the 10th International Conference on Stability of Ships and Ocean Vehicles, 2009.

Santen, J.A., "The use of energy build up to identify the most critical heeling axis direction for stability calculations for floating offshore structures, review of various methods," Proceedings of the 10th International Conference on Stability of Ships and Ocean Vehicles, 2009.

Breuer, J.A. and K. Sjölund, "Orthogonal Tipping in Conventional Offshore Stability Evaluations," Proceedings of the 9th International Conference on Stability of Ships and Ocean Vehicles, 2006.

TS 01-23(1) R1.1C The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding **NVIC 8-91.**

The NOSAC recommends that the USCG evaluate whether there is a need to conduct an Operating Manual review on each existing liftboat, given the lessons learned from the capsizing of the Seacor Power. This Operating Manual review should assess whether the document contains sufficient guidance to prepare for sudden severe weather and appropriate actions to take in the event of sudden severe weather.

TS 01-23(1) R5.10A.4 The NOSAC recommends that the USCG review and update the August 30, 2000, Marine Safety Center Technical Note MTN 4-00 (*Weather Criteria for Liftboat Leg Strength*) and the associated regulatory references, to account for lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG establish wave conditions to apply in conjunction with a 70-knot wind or other identified maximum wind speed. [Formerly TS 01-23(1) R1.2]

TS 01-23(1) R5.10A.3 The NOSAC recommends that the USCG review and update the following sections of 46 CFR 170 (*Stability Requirements for All Inspected Vessels*) to account for lessons learned from the capsizing of the Seacor Power: Subpart A (*General Provisions*) §170.015 (*Incorporation by reference*); Subpart E (*Intact Stability Criteria*) (§170.160 through §170.173. The following section is of relevance. [Formerly TS 01-23(1) R1.3]

Subpart E (*Intact Stability Criteria*), §170.170 (*Weather criteria*): The NOSAC recommends that the USCG review the weather criteria equations and constants to determine if they are still valid.

TS 01-23(1) R5.10B The NOSAC recommends that the USCG review and update the following sections of 46 CFR 170 (*Stability Requirements for All Inspected Vessels*). The following section is of relevance. [Formerly TS 01-23(1) R1.3B]

46 CFR Subpart A (*General Provisions*), §170.015 (*Incorporation by reference*) the NOSAC recommends that the USCG determine if the references listed in (a) through (d) are still valid for the purpose of Subchapter S (*Subdivision and Stability*).

TS 01-23(1) R1.3C The NOSAC recommends that the USCG review and update the following sections of 46 CFR 125 (*General*). The following section is of relevance.

46 CFR 125.180 (*Incorporation by reference*) the NOSAC recommends that the USCG determine if the references listed in (a) through (j) are still valid for the purpose of Subchapter L (*Offshore Supply Vessels*).

TS 01-23(1) R1.4 The NOSAC recommends that the USCG review and update the *Offshore Supply Vessel Inspector Job Aid*, to account for lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update item 7 in the *Certificates & Documents* section to include a check that if the stability letter or book is amended, then a corresponding check is made to determine if the Operating Manual should be amended as well.

TS 01-23(1) R1.5 The NOSAC recommends that the USCG review and update their internal processes to ensure that policy letters are incorporated into appropriate manuals in a timely manner. In particular, the NOSAC recommends that the USCG incorporate CG-CVC Policy Letter No. 14-03 (*Evaluating Sea Service Aboard Liftboats*) into Volume III (*Marine Industry Personnel*) of the *Marine Safety Manual*.

TS 01-23(1) R1.6 The NOSAC recommends that the USCG review and update NVIC 3-97 (*Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels*) to ensure that all the referenced regulations and standards are current, i.e.,

46 CFR 93.20 (*Bulk Grain Cargoes*)

46 CFR Subchapter E (*Load Lines*)

Paragraph 1c.: “The MSC will keep the ABS abreast of any changes to U.S. laws and regulations, interpretations and policies of the Coast Guard that will affect stability related reviews performed by the ABS.”

46 CFR 170.120(b) (*Stability letter*)

Marine Safety Manual, Vol. IV, section 6.C.2 (*Stability Letters And Trim And Stability Booklets (46 CFR 170, Subpart D): Temporary Stability Letters*)

46 CFR 170.085 (*Information required before a stability test*)

46 CFR 170.185 (*Stability test preparations*)

NVIC 17-91 (*Guidelines for Conducting Stability Tests*)

ASTM F-1321 (American Society for Testing and Materials (ASTM) *Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel*)

TS 01-23(1) R1.7 The NOSAC recommends that the USCG review and update Safety Alert 08-17, *Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!* to account for lessons learned from the capsizing of Seacor Power. In particular, "This Safety Alert reminds all mariners of the appropriate use of Single Side Band High Frequency (SSB-HF) radios when attempting to contact the Coast Guard outside the normal range of Very High Frequency-Frequency Modulation (VHF-FM) marine radios."

TS 01-23(1) R1.8 The NOSAC recommends that the USCG issue a Marine Safety Information Bulletin (MSIB) regarding the means of escape that are required by 46 CFR 127.240 (*Means of escape*), and how those provisions apply to liftboat accommodations. The capsizing of Seacor Power revealed that many liftboat crew members believed their cabin windows were a means of escape. Additional options include the following.

a) Annotating the location of emergency escape windows on the vessel's Safety Plan.

b) Affixing decals or other effective means to cabin windows not installed as escape emergency windows stating to the effect: "This window is not for emergency escape".

c) Affixing decals or other effective means to cabin windows which are designated as emergency escape windows.

d) Including discussion regarding emergency escape windows in vessel safety and orientation meetings.

TS 01-23(1) R1.9 The NOSAC recommends that the USCG review 46 CFR 129.440 (*Emergency lighting*) in conjunction with the results of the Seacor Power investigation. In particular, the NOSAC recommends that the USCG determine whether the requirements continue to be satisfactory, given that Seacor Power was carrying offshore workers who were unfamiliar with the vessel's layout, that the vessel capsized too quickly for the emergency generator to start, and that none of the survivors reporting seeing any emergency lighting while attempting to escape. In addition, the NOSAC recommends that

consideration be given to requiring emergency battery-driven lights for placement in strategic locations on the vessel.

TS 01-23(1) R1.10 The NOSAC recommends that the USCG remind liftboat owners, operators, and Masters to ensure safety orientations are conducted for offshore workers, as required by 46 CFR 131.320 (*Safety orientation for offshore workers*) in a Marine Safety Information Bulletin (MSIB) or other appropriate communications vehicle.

TS 01-23(1) R1.11 The NOSAC recommends that the USCG review the Final Report and Recommendations from the *NOSAC Task Statement of April 26, 2022 – Review of Coast Guard's Final Report on the Floating OCS Facility – Tension Leg Platform FPS Auger Lifeboat Fall with Loss of Life on June 30, 2019* – Published on December 16, 2021. The *NOSAC also recommends that the USCG review the USCG issued Final Report concerning the June 30, 2019, lifeboat accident on the Shell Auger TLP* and associated recommendations contained within. The purpose of the review is to determine whether 46 CFR 131.530 (b)(6) (*Abandon-ship training and drills*) should be amended in accordance with the previous NOSAC committee recommendations.

TS 01-23(1) R1.12 The NOSAC recommends that the USCG review 46 CFR 131.530(d)(4) (*Abandon-ship training and drills*) in conjunction with the results of the Seacor Power investigation and the Final Report and Recommendations from the *NOSAC Task Statement of April 26, 2022 – Review of Coast Guard's Final Report on the Floating OCS Facility – Tension Leg Platform FPS Auger Lifeboat Fall with Loss of Life on June 30, 2019* – Published on December 16, 2021. In particular, the NOSAC recommends that the USCG determine whether it is realistic to require regular inflation and launching of davit-launched liferafts. (Reference 46 CFR 131.530(d)(4): "Training in the use of davit-launched inflatable liferafts must take place at intervals of not more than 4 months on each vessel with such liferafts. Whenever practicable this must include the inflation and lowering of a liferaft. If this liferaft is a special one intended for training only, and is not part of the vessel's lifesaving system, it must be conspicuously so marked.)

TS 01-23(1) R1.13 The NOSAC recommends that the USCG conduct a study to determine if the Alaska maritime mobile repeater stations system, as outlined in 47 CFR 80.469 (*Maritime mobile repeater stations in Alaska*), can be adapted to the Gulf of Mexico and other USCG districts. The Seacor Power investigation highlighted limitations of NAVTEX and VHF radio coverage in the Gulf of Mexico, and the Alaska system might provide a solution for extending geographical coverage to deliver critical weather information and other notices of interest. This recommendation should be conducted in coordination with the National Weather Service.

End of Specific Task Number 1.

SPECIFIC TASK NUMBER 2

The [NOSAC] Subcommittee should: Review the NTSB's Final Report's recommendations and identify areas where NOSAC's expertise could be utilized to assist the USCG with updating policies and or regulations for liftboats.

NTSB Capsizing of Liftboat SEACOR POWER, MIR-22/26

From the report of the National Transportation Safety Board (NTSB) Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022, refer to Exhibit 2, *NTSB Seacor Power Final Report Regulatory References*. Exhibit 2 describes the citation, the title of the citation, and the page number (s) on which the citation is located within the report.

Exhibit 3, *Executive Summary, Conclusions, and Recommendations from NTSB Report MIR-22-26*, contains the following information extracted from the NTSB report: Executive Summary (*What Happened*), Conclusions (*Findings* and *Probable Cause*), and Recommendations.

> New Recommendations that NTSB identified were three (3) recommendations for the USCG, one (1) recommendation to the National Weather Service (NWS), one (1) recommendation to the Federal Aviation Administration and the US Air Force, one (1) recommendation to the Offshore Marine Service Association, three (3) recommendations to Seacor Marine. NTSB reiterated one (1) previous recommendation to the USCG.

Exhibit 4: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*, provides responses from the USCG which addresses questions that the NOSAC Subcommittee posed regarding stability within the NTSB Report.

The following sections from the NTSB report are presented for review by the USCG.

Section 1 (*Factual Information*); Subsection 1.2 (*Response*) (page 10)

> "The Sector New Orleans command duty officer noted that Sector watchstanders were "very heavily inundated with potential distress calls from both commercial and recreational vessels." The [Rescue Coordination Center] RCC was resolving seven cases before SEACOR Power capsized."

TS 01-23(1) R2.1 USCG EPIRB Handling Procedures

Section 1 (*Factual Information*); Subsection 1.2 (*Response*) Sub-subsection 1.2.3 (*Rescue Operations*) (Page 20)

"The Coast Guard crews continued to encourage the survivors to enter the water. At least one survivor stated he could not swim. Bristow 739 eventually left the scene to refuel, while the RB-M CG-45687 returned from Port Fourchon."

TS 01-23(1) R2.2 NTSB MIR 22/26 Swimming Proficiency

Section 1 (*Factual Information*); Subsection 1.6 (*Survival Factors*); Sub-subsection 1.6.3 (*Global Maritime Distress and Safety Systems*); Sub-Sub-subsection 1.6.3.4 (*Emergency Position Indicating Radio Beacon*) (Pages 41-42)

"In 2016, the FCC incorporated by reference the updated Radio Technical Commission for Maritime Services standard that requires, among other things, specific vessels (including vessels like the SEACOR Power) to carry GNSS-equipped EPIRBs as of January 17, 2023.[18] Similar requirements by the IMO were approved in 2019. The SEACOR Power's ACR RLB-27 EPIRB, mounted outside on the port side of the wheelhouse, was not GNSS-equipped, nor was the SEACOR Power required at the time of the casualty to carry a GNSS-equipped EPIRB.

[18] See 47 CFR Part 80.1061(a) [*Special requirements for 406.0–406.1 MHz EPIRB stations*]."

TS 01-23(1) R2.3 EPIRBs and GNSS Equipped

Section 1 (*Factual Information*); Subsection 1.8 (*Environmental Information*); Sub-subsection 1.8.4 (*Meteorological Communications*); Sub-Sub-subsection 1.8.4.1 (*Nautical Weather Service*); Sub-Sub-Sub-subsection 1.8.4.1.3 (*NOAA Weather Radio*) (Pages 52-53)

"The SEACOR Power was equipped with three VHF radios capable of picking up the NWR signal (see section 1.6.3: *Global Maritime Distress and Safety System*). However, the radios would have to be tuned to the weather radio channels to receive the broadcast. Typically, shipboard radios are tuned to marine communications channels, such as channel 16 ("distress, safety, and calling" channel), and there is no requirement to monitor NWR broadcasts. According to the mate, there was no radio on board the casualty vessel that was dedicated to monitoring weather radio channels."

TS 01-23(1) R2.4 NOAA Weather Broadcast Monitoring

Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.3 (*Safety Management System*); Sub-Sub-subsection 1.9.3.1 (*Verification and Certification*) (Page 56)

"A report from the previous year's internal audit, conducted on April 9, 2020, also noted that stability was calculated using the 'Dixie Endeavor Stability program."

TS 01-23(1) R2.5 Correlation of Stability Program with other Documentation

Section 1 (*Factual Information*); Subsection 1.10 (*Stability*); Sub-subsection 1.10.2 (*Intact Stability*); Sub-Sub-subsection 1.10.2.2 (*Regulations*) (Page 62)

> "Stability criteria established in regulations set numeric bounds for a vessel's stability as determined through a set of calculations that account for the vessel's physical characteristics. The criteria are generally recognized as providing an adequate level of safety for vessels that are operated prudently, which means not overloaded and not operating in dangerous conditions, such as violent storms. A margin of safety is built into the stability criteria to accommodate forces that can act on a vessel, such as winds or waves."
>
> The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

Section 1 (*Factual Information*); Subsection 1.10 (*Stability*); Sub-subsection 1.10.3 (*Coast Guard Marine Safety Center Post-Casualty Stability Analysis*); Sub-Sub-subsection 1.10.3.3 (*Regulatory Requirements and Operational Guidance*) (Pages 69-70)

> "In the conclusions to its report, the MSC noted that the 60- and 70-knot winds used in the regulatory requirements for stability are also used 'explicitly and without context within SEACOR POWER's Marine Operations Manual and on the vessel's Certificate of Inspection." The report cautions that the regulatory wind speeds are used for stability calculations that only consider static response in still water, not the actual conditions that a vessel may experiencee (wind and wave action). The MSC concluded that "regulatory criteria wind speeds are not appropriate for operational guidance.'"

TS 01-23(1) R5.10A.5 46 CFR 174 Calculate Stability under Operational Conditions

[Formerly TS 01-23(1) R2.6]

Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*) (Page 88)

> "The SEACOR Power met stability criteria when subjected to the maximum wind thresholds in the regulations (70 knots) in calm seas, but actual winds during the capsizing were above the regulatory threshold, with gusts to 80 knots. The ABS CFD analysis found that, with the SEACOR Power in the casualty loading condition (9 feet 3 inches load line draft with 2.5 feet of trim by the stern; legs lowered 10 feet), the vessel was vulnerable to capsizing with winds off the beam and seas at 4 feet (see Figure 24 [*Not shown in this NOSAC Subcommittee report*]). Although the storm initially hit the SEACOR Power from astern, the mate turned the liftboat to port in an attempt to put the bow into the wind and slow the vessel down to soft tag the bottom. This maneuver put the winds on the vessel's port beam. The CFD model of the vessel capsized in 80-knot winds when the wind direction was just forward of the port beam (285° relative) and swells of 4 feet were

coming from off the starboard bow (023° relative). The CFD model of the vessel also capsized when these wind and swell conditions were combined with wind-generated waves moving in the same direction as the winds."

This statement was one that the NOSAC Subcommittee requested clarification in Exhibit 4: [NTSB Possible Rec. 3 (88, 2.2.3)] Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*) (Page 88). The response from the USCG Naval Architecture Division (CG-ENG-2) was as follows.

> "*The Executive Summary of the Coast Guard's MBI Report concludes that "The Coast Guard Investigation determined that the biggest factor that contributed to SEACOR POWER's capsizing was the fact that the vessel was caught in unpredicted weather conditions that exceeded the vessel's operating limits." The ABS analysis corroborates this statement since the design limit for wind for the SEACOR POWER was 60 knots and the analysis shows it shows the vessel capsizing in wind of 80 knots – a factor of 1/3 and which, by formula, increase the applied wind force and moments to approaching double the forces and moments for which the vessel was approved. The consideration of recommending maneuvering characteristics should take into account the degree to which maneuvering a liftboat in very strong wind could improve or compromise the safety of the vessel.*"

TS 01-23(1) R2.7 Maneuvering Guidance during Heavy Weather

TS 01-23(1) R5.10A.12 Direction of turn in heavy weather guidance

Newly Issued Recommendations in the NTSB Report to the USCG.

Develop procedures to inform mariners in affected areas whenever there is an outage at a navigational telex broadcasting site. (M-22-6)

> The NOSAC Subcommittee concurs with this NTSB Recommendation.

Modify restricted-service liftboat stability regulations to require greater stability for newly constructed restricted-service liftboats. (M-22-7)

> The NOSAC Subcommittee concurs with this NTSB Recommendation. Note that there are several stability-related recommendations specified within this NOSAC Report. Refer to Exhibit 12.

Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate. (M-22-8)

The NOSAC Subcommittee concurs with this NTSB Recommendation.

TS 01-23(1) R2.8 USCG Address NTSB Recommendations

Previously Issued Recommendations Reiterated in the NTSB Report to the USCG:

"Require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival. (M-17-45)"

TS 01-23(1) R2.9 Personal Locator Beacons

Exhibit 4: USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26.

The NOSAC Subcommittee submitted several questions to the USCG Naval Architecture Division (CG-ENG-2) to clarify statements within the NTSB report related to stability on liftboats. These questions and responses are in Exhibit 4.

[NTSB Q. 2 (58,1.9.4.1.2)] Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.4 (*Marine Operations Manual*); Sub-Sub-subsection 1.9.4.1 (*Coast Guard Requirements*); Sub-Sub-Sub-subsection 1.9.4.1.2 (*Design Operating Limits*) (Page 58).

"This section included a table of underway operating limits that showed a maximum wind speed of 70 knots, which matched the "severe storm" wind speed used in regulatory intact-stability calculations for liftboats in restricted service (see section 1.10.2.2 for regulatory intact stability requirements). The maximum wave height was 5 feet; the NTSB could not determine the origin of this threshold."

Extracted Partial Response: "*To have the maximum wave height for afloat operations correspond to the maximum wind speed for afloat operations would seem to [be] a logical element of the operational guidance for a liftboat.*"

TS 01-23(1) R5.10A.10 Calculating Vessel's Maximum Wave Height

[Formerly TS 01-23(1) R2.10]

[NTSB Q. 3 (60, 1.9.4.1.5)] Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.4 (*Marine Operations Manual*); Sub-Sub-subsection 1.9.4.1 (*Coast Guard Requirements*); Sub-Sub-Sub-subsection 1.9.4.1.5 (*Stability*) (Page 60).

"According to the mate and off-rotation captain and chief engineer, the crew did not use the form provided in the Marine Operations Manual to calculate stability, but instead used a Microsoft Excel spreadsheet. The weights and locations of

loads, liquids, and personnel were input into the spreadsheet, and the application completed the calculations. The off-rotation engineer stated that, if a value computed by the stability spreadsheet was outside of allowable parameters, the cell in the spreadsheet containing the value would turn red. The off-rotation captain told investigators that the only value that was regularly out of specification was trim. He stated, '"the comment that [the spreadsheet] says that you should achieve within 6 inches of trim is not reasonable. But the stability program was still accurate and would tell you that you're not within 6 inches. But that was expected.'"

Response: "*The stability program or spreadsheet was not revalidated by either the Coast Guard or ABS. The stability program or spreadsheet should be identified in the SMS as requiring revalidation periodically. (See response to 1.9.3.1 above.)* [Full response to 1.9.3.1 is found in Exhibit 4.]

TS 01-23(1) R2.10A Periodic Revalidation/Reaffirmation Stability Programs

RECOMMENDATIONS for Specific Task Number 2

TS 01-23(1) R2.1 The NOSAC recommends that the USCG evaluate their procedures for responding to multiple EPIRB alerts in a short period of time. As noted in the National Transportation Safety Board (NTSB) Seacor Power investigation, the District Command Center was "heavily inundated" with EPIRB alerts on the day of the capsizing, and they handled those alerts in the order they were received. The USCG should evaluate whether there are protocols which could provide a quicker method of eliminating false EPIRB alerts and a quicker response to actual emergencies.

One option may include automatically transferring EPIRB alerts to another USCG District when the initial District is "heavily inundated."

Another option may include developing an automated callback system to the contact information on file in the EPIRB registry to verify if an alert is valid such that false alerts are discounted (but recorded and documented) and possible or actual alerts are relayed directly to a USCG Dispatcher for direct handling.

Another option to consider is replacement of EPIRBs with vessel float-free Personal Locator Beacons (PLBs).

Another option is to require EPIRB and other emergency training for company dispatchers and other associated shore-side emergency response personnel.

TS 01-23(1) R2.2 The NOSAC recommends that the USCG develop a task statement for the NOSAC and/or appropriate Federal Advisory Committee(s) to evaluate whether

"swimming proficiency" requirements for personnel who work on ships and offshore facilities should be established. Following is a list of areas and documentation that could be assessed in this task.

- International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)
- USCG and other Flag State Regulations
- Industry Standards, such as the American Red Cross
- IMO Resolution A.1079(28) recommendations for the Training and Certification of Personnel on Mobile Offshore Units (MOUs), paying particular attention to the categories of offshore personnel in Section 5.
- IMO Model Courses
- State and Federal Maritime Academy Courses
- Class Societies
- Previous NOSAC and Federal Advisory Committee reports on this subject.

TS 01-23(1) R2.3 The NOSAC recommends that the USCG have owners or operators of U.S. inspected vessels verify that their EPIRB meets the requirements of 47 CFR Part 80.1061(a) (*Special requirements for 406.0–406.1 MHz EPIRB stations*) which includes the technical and performance standards contained in Radio Technical Commission for Maritime Services (RTCM) RTCM 11000 (*406 MHz Satellite Emergency Position Radiobeacons (EPIRBs)*) beginning January 17, 2023. In particular, the USCG should focus on confirming that EPIRBs are Global Navigation Satellite System (GNSS) equipped.

TS 01-23(1) R2.4 The NOSAC recommends that the USCG create a new regulation or policy for liftboats that recommends shoreside personnel and the crew to monitor National Oceanic and Atmospheric Administration (NOAA) Weather Radio broadcasts and requires minimum intervals for monitoring, such as prior to departure, while underway, while on position, and so forth.

TS 01-23(1) R2.5 The NOSAC recommends that the USCG create a new regulation or policy for liftboats that use stability computers or other computer programs for stability related purposes. The new regulation or policy should establish a requirement to validate or affirm that the stability computer or program compared with the stability book, Operating Manual, Stability Letter, and / or the Certificate of Inspection, as applicable, whenever there is a name change, or a major modification to the vessel is correct. This action is an administrative review function rather than a call for conducting deadweight surveys or complete stability analyses.

TS 01-23(1) R5.10A.5 The NOSAC recommends that the USCG review and update Title 46 (*Shipping*)*;* Chapter I (*Coast Guard, Department of Homeland Security*); Subchapter S

(*Subdivision and Stability*); Part 174 (S*pecial Rules Pertaining to Specific Vessel Types*) to account for lessons learned from the capsizing of Seacor Power. In particular, the NOSAC recommends that the USCG update the regulations to evaluate liftboat stability under operational conditions, rather than evaluating stability using fixed wind speeds under static (still water) conditions. [Formerly TS 01-23(1) R2.6]

TS 01-23(1) R2.7 The NOSAC recommends that the USCG create a new regulation or policy which requires liftboat owners and operators to provide the vessel's Master and crew with specific guidance for maneuvering characteristics during heavy weather. Due to the unique features of liftboats, these vessels may have relative wind directions that risk less stability than other relative wind directions. As a result, there could be a preferred direction of turn for a liftboat maneuvering in heavy weather. This guidance must be very clear to the Master and crew. Refer to the NTSB Report for the "Capsizing of Liftboat SEACOR Power", on April 13, 2021, Report Number MIR-22/26, adopted October 18, 2022; Page 88, Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*), Figure 24. *Most vulnerable wind direction axes for port side of the SEACOR Power as determined by CFD analysis.* Within this report, refer to Exhibit 4, USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26 (NTSB Possible Rec. 3 (88,2.2.3)).

TS 01-23(1) R2.8 The NOSAC recommends that the USCG address the new NTSB recommendations M-22-6, M-22-7, and M-22-8 related to NAVTEX, Stability, and Mass Rescue Operations Plans, respectively.

M-22-6 Develop procedures to inform mariners in affected areas whenever there is an outage at a navigational telex broadcasting site.

M-22-7 Modify restricted-service liftboat stability regulations to require greater stability for newly constructed restricted-service liftboats.

M-22-8 Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate.

TS 01-23(1) R2.9 The NOSAC recommends that the USCG **DOES NOT** pursue the NTSB previous recommendation (M-17-45) regarding personal locator beacons for all personnel on vessels in coastal, Great Lakes, and ocean service. The NOSAC does not believe that the USCG infrastructure is sufficiently equipped to handle additional monitoring at this time.

M-17-45 "To the United States Coast Guard: Require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival."

TS 01-23(1) R5.10A.10 Recommendations from Exhibit 4: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*. The NOSAC recommends that the USCG create a new regulation or policy which provides liftboat owners and operators with guidance for calculating a vessel's maximum wave height for afloat operations. [Formerly TS 01-23(1) R2.10]

TS 01-23(1) R2.10A Recommendations from Exhibit 4: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*. The NOSAC recommends that the USCG create a new regulation or policy for liftboats and other types of vessels that use stability computers or other computer programs for stability-related purposes. The new regulation or policy should establish a requirement to include periodic revalidation and / or reaffirmation of stability computers or programs in the company's Safety Management System. The periodic revalidation and / or reaffirmation should include support from the American Bureau of Shipping (ABS) or the USCG Marine Safety Center (MSC), as applicable, and should occur in the following situations:

a) Every ten (10) years, at minimum, from the previous revalidation and / or reaffirmation.

b) Upon significant changes in the structure or the stability characteristics of the liftboat.

c) Upon name change of liftboat (reaffirmation would typically include a name change in the documentation within the stability program or spreadsheet as opposed to a full revalidation as required in a) or b). Note: if the computer program cannot be revised to address a vessel name change, then the Operating Manual or other documentation should be revised to state that the program which includes a previous vessel name is acceptable to the current vessel name.

d) As required by the Owner or operator.

Note: Recommendation 2.10A is in conjunction with NOSAC 2.5. A possible location for this new regulation, if approved, is 46 CFR 170.110 (*Stability booklet*).

End of Specific Task Number 2.

SPECIFIC TASK NUMBER 3

The [NOSAC] Subcommittee should: Review classification society and industry standards for liftboats and identify areas where gaps may exist respective to liftboats.

The following documentation was reviewed.

USCG Load Line Policy Notes

***Load Line Policy Notes*: U.S. Coast Guard, Naval Architecture Division (CG-5212), Office of Design and Engineering Standards, Washington, D.C., revised 22 September 2008.**

> "These "Load Line Policy Notes" (LLPN) were originally written and posted by the U.S. Coast Guard Naval Architecture Division in March, 2006. They consolidate into a single document current USCG load line policies that have evolved since the previous (1990) revision of Chapter 6.F, "Load Lines," of the Marine Safety Manual [*Volume IV*]. The Notes also include expanded discussions and clarifications for both domestic U.S. and international (ICCL) load line regimes. The LLPN will eventually form the basis of a future revision to MSM Chapter 6.F." Note, previous COMDNTNOE 16000 dated 29 September 2004, was cancelled 28 September 2005.

TS 01-23(1) R3.1 Update MSM Volume IV Section 6.F

> Within the LLPN, Liftboats are discussed in Section 17.k (*Liftboats*). Liftboats are required to have load lines when operating outside the Boundary Line. There are two special load line issues for Liftboats: minimum bow height and reserve buoyancy distribution. ABS may authorize Liftboat bow height waivers directly as long as USCG (CG-5212: Naval Architecture Division) is notified. Other assigning authorities must request waivers from the Marine Safety Center. All vessels, including Liftboats, must comply with the reserve buoyance distribution requirement. No international load line exemption will be granted. The reserve buoyancy distribution requirement is not incorporated into domestic load line regulations. Exemptions for domestic load lines are considered on a case-by-case basis by CG-5212 by application.

TS 01-23(1) R3.2 46 CFR 42 Incorporate Reserve Buoyancy Distribution

> Marine Safety Manual Volume IV, Chapter 6.E contains special stability provisions when assigning load lines to certain vessel types such as MODUs, open hopper barges, etc.). Chapter 6.E.1 applies to *Offshore Supply Vessels* (OSVs). Regulation 46 CFR 170.170 is referenced. Topics discussed in Chapter 6.E.1 under OSVs include a. *Righting Energy Criterion*, and b. *Towline Pull Criterion*. Chapter 6.3.4 discusses *Mobile Offshore Drilling Units* (46 CFR 174, Subpart C). The term "liftboat" is not used in Volume IV.

MOA USCG and NOAA NWS Regarding the Management of Marine Weather Information.

Memorandum of Agreement Between the United States Coast Guard and the National Oceanic and Atmospheric Administration National Weather Service Regarding the Management of Marine Weather Information.

This Memorandum of Agreement (MOA) became effective when both the USCG Director of Prevention Policy and the NOAA Assistant Administrator for Weather Services signed the document in March, 2020. This MOA is to be reviewed every five years (next review March 2025) and terminates ten (10) years from signing (March 2030).

The common goal for the USCG and NOAA/NWS is to protect life and property on the various waters of the United States. NOAA/NWS issues forecasts and warnings and the USCG disseminates safety information which includes weather information.

These two entities form the **U**nited States Coast Guard - **N**ational Weather Service **C**oordination-**L**iaison W**o**rking **G**roup (UNCLOG).

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

Public Law 116-224, Save Our Seas 2.0 Act

Public Law 116-224, Save Our Seas 2.0 Act, dated 18 December 2020.

This Act was enacted for three purposes: combat marine debris (Title I), enhance global engagement to combat marine debris (Title II), and improve domestic infrastructure to prevent marine debris (Title III).

USCG involvement with this Act is in Title II, Section 202 (*Prioritization of Efforts and Assistance to Combat Marine Debris and Improve Plastic Waste Management*) (b) (*Officials Specified*) (7) with the Commandant of the USCG with respect to pollution from ships as one of the Officials Specified to lead and coordinate efforts to implement the policy in section 201 (Statement of Policy on International Cooperation to Combat Marine Debris).

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO Regulations Associated with Stability

[**The purpose of this section of the NOSAC Subcommittee report is to provide a summary of IMO regulations associated with stability.**]

General Information regarding IMO Ship Design and Stability (from their website)

The IMO instruments governing safe ship designs.

> "The work of the IMO on ship design is mainly carried by the Sub-Committee on Ship Design and Construction (SDC) which is directed by the Maritime Safety Committee as the parent IMO organisation. The safe design of a ship is primarily regulated in SOLAS chapter II-1, parts A (*General*), A-1 (*structure of ships*) and B (*subdivision and stability*); the 1966 Load Line Convention and the 1988 Protocol relating thereto; the 1969 Tonnage Measurement Convention; and the International Code on Intact Stability, 2008."

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

SOLAS Chapter II-1

> "SOLAS chapter II-1 requires ships to comply with safety regulations concerning the construction, structure, subdivision, stability, the machinery and electrical installations on board ships. IMO's Sub-Committee on Ship Design and Construction (SDC) is the responsible IMO body tasked to develop any necessary amendments to relevant conventions and other mandatory and non-mandatory instruments, as well as the preparation of new mandatory and non-mandatory instruments, guidelines and recommendations, for:
>
> 1. design, construction, subdivision and stability, buoyancy, sea-keeping and arrangements, including evacuation matters, of all types of ships, vessels, craft and mobile units covered by IMO instruments;
> 2. testing and approval of construction and materials;
> 3. load line matters;
> 4. tonnage measurement matters;
> 5. safety of fishing vessels and fishermen; and
> 6. survey and certification."

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

1966 Load Line Convention

"**Introduction and history**

It has long been recognized that limitations on the draught to which a ship may be loaded makes a significant contribution to her safety. These limits are given in the form of freeboards, which constitute, besides external weathertight and watertight integrity, the main objective of the Convention.

The first International Convention on Load Lines, adopted in 1930, was based on the principle of reserve buoyancy, although it was recognized then that the freeboard should also ensure adequate stability and avoid excessive stress on the ship's hull as a result of overloading. In the 1966 Load Lines convention, adopted by IMO, provisions are made for determining the freeboard of ships by subdivision and damage stability calculations. The regulations take into account the potential hazards present in different zones and different seasons. The technical annex contains several additional safety measures concerning doors, freeing ports, hatchways and other items. The main purpose of these measures is to ensure the watertight integrity of ships' hulls below the freeboard deck. All assigned load lines must be marked amidships on each side of the ship, together with the deck line. Ships intended for the carriage of timber deck cargo are assigned a smaller freeboard as the deck cargo provides protection against the impact of waves.

Load Lines 1966 - Annexes

The Convention includes Annex I, divided into four Chapters:

- Chapter I - General;
- Chapter II - Conditions of assignment of freeboard;
- Chapter III - Freeboards;
- Chapter IV - Special requirements for ships assigned timber freeboards.

Annex II covers Zones, areas, and seasonal periods.

Annex III contains certificates, including the International Load Line Certificates.

Adoption of tacit amendment procedure 1988

The 1988 Protocol Adoption: 11 November 1988 Entry into force: 3 February 2000

The Protocol was primarily adopted to harmonize the Convention's survey and certification requirements with those contained in SOLAS and MARPOL 73/78.

All three instruments require the issuing of certificates to show that requirements have been met and this must be done by means of a survey which can involve the ship being out of service for several days.

The harmonized system alleviates the problems caused by survey dates and intervals between surveys which do not coincide, so that a ship should no longer have to go into port or repair yard for a survey required by one Convention shortly after doing the same thing in connection with another instrument.

The 1988 Load Lines Protocol revised certain regulations in the technical Annexes to the Load Lines Convention and introduced the tacit amendment procedure (which was already applicable to the 1974 SOLAS Convention). Amendments to the Convention may be considered either by the Maritime Safety Committee or by a Conference of Parties.

Amendments must be adopted by a two-thirds majority of Parties to the Convention present and voting. Amendments enter into force six months after the deemed date of acceptance - which must be at least a year after the date of communication of adoption of amendments unless they are rejected by one-third of Parties. Usually, the date from adoption to deemed acceptance is two years.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

Intact Stability Code

IMO has long developed intact stability criteria for various types of ships, culminating in the completion of the Code on Intact Stability for All Types of Ships Covered by IMO Instruments (IS Code) in 1993 (resolution A.749(18)) and later amendments thereto (resolution MSC.75(69)). The IS Code included fundamental principles such as general precautions against capsizing (criteria regarding metacentric height (GM) and righting lever (GZ)); weather criterion (severe wind and rolling criterion); effect of free surfaces and icing; and watertight integrity. The IS Code also addressed related operational aspects like information for the master, including stability and operating booklets and operational procedures in heavy weather.

In 2008, the IMO Maritime Safety Committee, at its eighty-fifth session, adopted the International Code on Intact Stability, 2008 (2008 IS Code), following extensive considerations by the SLF Sub-Committee

(Subcommittee on Stability and Load Lines and on Fishing Vessels Safety) and taking into account technical developments, to update the 1993 Intact Stability Code. MSC 85 also adopted amendments to the SOLAS Convention and to the 1988 Load Lines Protocol to make the 2008 IS Code mandatory, which entered into force on 1 July 2010. The 2008 IS Code provides, in a single document, both mandatory requirements and recommended provisions relating to intact stability that will significantly influence the design and the overall safety of ships.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

Second Generation Intact Stability Criteria

Ships vary widely in type, size, operational profile and associated environmental conditions which has made it difficult to develop generic dynamic stability criteria which are applicable for all ships subject to the *International Code on Intact Stability, 2008* as it has been acknowledged that some ships are more at risk of encountering critical stability in waves than others.

The IMO is currently in the process of developing performance-based criteria for assessing five dynamic stability failure modes in waves, namely, dead ship condition, excessive acceleration, pure loss of stability, parametric rolling and surf-riding/broaching. One of the obstacles encountered by the IMO has been that the physics and evaluation methods for these five stability failure modes had not been well understood or developed when the mandatory intact stability criteria were established.

The current draft *Interim Guidelines on second generation intact stability criteria* (Interim Guidelines) have been finalized by the IMO Sub-Committee on Ship Design and Construction (SDC) at its seventh session (3 to 7 February 2020) and awaiting approval at the next session of the IMO Maritime Safety Committee (MSC). The Interim character of the draft *Guidelines* reflect a certain degree of uncertainty in the recommendations developed but it is the first standalone instrument developed by IMO* to address dynamic stability failures building on best practices and the most advanced scientific tools available. The methodologies contained in these Interim guidelines are based on general first-principle approaches derived from the analysis of ship dynamics and latest technology, as opposed to predominant use of casualty records which form the basis of the mandatory intact stability criteria. For this reason, the presented dynamic

stability criteria may be considered as the second generation intact stability criteria. However, in the development process, it was also necessary to simplify some of the assessment methodologies and to perform some semi-empirical tuning.

Once MSC approves the Interim Guidelines on second generation intact stability criteria, they may be used by Administrations to assess and approve ship designs which deviate from conventional concepts. In order to facilitate the use of the Interim Guidelines the SDC Sub-Committee is also in the process of developing associated Explanatory notes on the second generation intact stability criteria. However, neither the Interim Guidelines nor their associated Explanatory Notes are intended to be mandatory.

* Currently ship masters are advised to follow the *Revised guidance to the master for avoiding dangerous situations in adverse weather and sea conditions (MSC.1/Circ.1228)* [which generally applies to conventional ship designs].

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

Damage Stability

In 2006, MSC 82 adopted comprehensive amendments to SOLAS chapter II-1 in relation to subdivision and damage stability requirements in order to harmonize the provisions for passenger and cargo ships. The revision of SOLAS chapter II-1 was intensively debated over the past decade by the SLF Sub-Committee, based on the "probabilistic" method of determining damage stability, which is different from the previously used "deterministic" method. However, although the method is different, the objective of both methods is the same as, i.e. “Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended. The degree of subdivision shall vary with the subdivision length of the ship and with the service, in such manner that the highest degree of subdivision corresponds with the ships of greatest subdivision length, primarily engaged in the carriage of passengers. [Ship paragraph on passenger vessels.]

The damage control plan and damage control booklet, which are required by SOLAS regulation II 1/19, are intended to provide ships’ officers with clear information on the ship’s watertight subdivision and equipment related to maintaining the boundaries and effectiveness of the subdivision

so that, in the event of damage to the ship causing flooding, proper precautions can be taken to prevent progressive flooding through openings therein and effective action can be taken quickly to mitigate and, where possible, recover the ship's loss of stability."

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO MSC.1/Circ. 1229, Annex: Guidelines for the Approval of Stability Instruments.

International Maritime Organization, Maritime Safety Committee, MSC.1/Circ. 1229, dated 11 January 2007, Annex: *Guidelines for the Approval of Stability Instruments*. Ref. T1/2.04.

Circular 1229 provides additional guidance on approval procedures of stability instruments to support the safe operation of ships.

IMO regulations for subdivision and stability are mainly found in SOLAS Chapter II-1 part B. IMO enacted the 1966 Load Line Convention with several annexes and amendments. The *Code on Intact Stability for All Types of Ships Covered by IMO Instruments* (IS Code) in 1993 (resolution A.749(18)) and later amendments thereto (resolution MSC.75(69)" *Adoption of Amendments to the Code on Intact Stability for all Types of Ships Covered by IMO Instruments (Resolution A.749(18))*) covers fundamental principles regarding capsizing prevention, weather criterion, free surface, watertight integrity, and information for stability and operating books in heavy weather. Further information on these IMO instruments are detailed below.

IMO is currently in the process of developing performance-based criteria for assessing five dynamic stability failure modes in waves, namely, dead ship condition, excessive acceleration, pure loss of stability, parametric rolling, and surf-riding/broaching.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO International Code on Intact Stability, 2008.

International Maritime Organization, *International Code on Intact Stability, 2008*

The *International Code on Intact Stability, 2008* (*2008 IS Code* [Revision 9]) is divided into the following sections:

Preamble and Introduction.
Part A, Mandatory Criteria.

Part B, Recommendations for certain types of ships and additional guidelines.
Annex 1, Detailed guidance for the conduct of an inclining test.
Annex 2, Recommendations for skippers of fishing vessels on ensuring a vessel's endurance in conditions of ice formation.

The *2008 IS Code* took effect on 1 July 2010. The *2008 IS Code* contains intact stability criteria for types of ships listed in the Introduction, paragraph 1.2.5 (special purpose ships), 1.2.6 (offshore supply vessels), and 1.2.7 (mobile offshore drilling units [MODUs]), among other types of vessels. Definitions for special purpose ships are in 2.6; offshore supply vessels in 2.7; and MODUs in 2.8.

2.6 *Special purpose ship* has the same definition as in the Code of Safety for Special Purpose Ships, 2008 (resolution MSC.266(84)).
2.7 *Offshore supply vessel* means a vessel which is engaged primarily in the transport of stores, materials, and equipment to the offshore installations and designed with accommodation and bridge erections in the forward part of the vessel and an exposed cargo deck in the after part for the handling of cargo at sea.
2.8 *Mobile offshore drilling unit* (MODU or unit) is a ship capable of engaging in drilling operations for the exploration or exploitation of resources beneath the seabed such as liquid or gaseous hydrocarbons, sulphur or salt.

46 CFR 125.160 (Definitions) defines a *Liftboat* as "an OSV with movable legs capable of raising its hull above the surface of the sea." Additionally, "*Offshore supply vessel* or *OSV* means a vessel that:
(1) Is propelled by machinery other than steam;
(2) Does not meet the definition of a passenger-carrying vessel in 46 U.S.C. 2101(22) or 46 U.S.C. 2101(35);
(3) Is more than 15 gross tons; and
(4) Regularly carries goods, supplies, individuals in addition to the crew, or equipment in support of exploration, exploitation, or production of offshore mineral or energy resources."

Annex 17, Resolution MSC.266(84), adopted on 13 May 2008: *Code of Safety for Special Purpose Ships, 2008*, in the Preamble, paragraph 3, defines Special Purpose Ship as follows:

> "For the purposes of this Code, a special purpose ship is a ship of not less than 500 gross tonnage which carries more than 12 special personnel, i.e. persons who are specially needed for the particular operational duties of the ship and are carried in addition to those persons required for the normal navigation, engineering and

> maintenance of the ship or engaged to provide services for the persons carried on board."
>
> Chapter 1 (General), Definitions: 1.3.11: "'Special personnel' means all persons who are not passengers or members of the crew or children of under one year of age and who are carried on board in connection with the special purpose of that ship or because of special work being carried out aboard that ship…"

Research by the USCG indicates that no Special Purpose Ship (SPS) certificates have been issued to any US-documented liftboats. The USCG would likely allow an SPS certificate to be issued if requested by an Owner, and if the vessel was compliant with the SPS Code. The SPS Code is non-mandatory in the US; however, a port or a Flag state may require this certification.

The NOSAC Subcommittee makes no further comment or recommendation regarding application of the Special Purpose Ship Code regarding liftboats.

Aspects of the 2008 IS Code for which the NOSAC Subcommittee recommends review by the USCG.

Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.1.6 discusses stability booklets and stability instruments used to supplement the stability booklet. Stability booklets and computers are located in CFR 170.110(e) and (f). Part B, Chapter 3.6 discusses the *Stability booklet*. Part B, Chapter 3.8 (*Operating booklets for certain ships*) mentions the need for additional information in the stability booklet. Part B, Chapter 4 (*Stability calculations performed by stability instruments*) covers: general, types of stability software, functional requirements, acceptable tolerances, approval procedure, specific approval, user manual, installation testing, periodical testing, and other requirements.

TS 01-23(1) R3.3 USCG Review IMO ICS 2008 on Stability

Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.3 (*Severe wind and rolling criterion (weather criterion)*)****** identifies the calculations for wind heeling levers. The formula used in this Section is similar to the one in 46 CFR 170.170(a) (*Weather criteria*).

> The definition of "P" in the similar formulae in the IS Code is: "P =wind pressure of 504 Pa. The value of P used for ships in restricted service may be reduced subject to the approval of the Administration." "P" in 46 CFR 170.170(a) is not similarly defined.

The definition of "GM" in the IS Code is "GM = metacentric height corrected for free surface effect (m)." In 46 CFR 170.170(a), GM is defined as greater than or equal to PAH divided by W *x* tan(T). The terms, other than "P" are defined within the US regulation. Determination of GM corrected for free surface effect is not clear in 46 CFR 170.170(a) or 46 CFR 170.170(d).

****** Note: In the footnote referenced from Part A, 1.1 (*Application*), 1.1.1: "Offshore supply vessels and special purpose ships are not required to comply with provisions of Chapter 2.3 of Part A. For special purpose ships, provisions of chapter 2.5 of Part B may be applied as an alternative to the application of chapter 2.2 of this part."

TS 01-23(1) R3.4 USCG Review Definitions from ICS

Part B, Chapter 5 (*Operational provisions against capsizing*) provides recommendatory guidance on General precautions against capsizing, Operational precautions in heavy weather, and ship handling in heavy weather. 46 CFR 134.170, *Operating manual*, contains the regulations on Operating manuals. Item (6) of this regulation states: "Guidance on preparing the vessel for heavy weather and on what to do when heavy weather is forecast, including when critical decisions or acts—such as leaving the area and heading for a harbor of safe refuge, or evacuating the vessel—should be accomplished."

TS 01-23(1) R3.5 USCG Review ICS Provisions Against Capsizing

IMO MSC.75(69), Annex 17, Adoption of Amendments to the Code on Intact Stability for all Types of Ships Covered by IMO Instruments (Resolution A.749(18)).

International Maritime Organization, Maritime Safety Committee Resolution MSC.75(69), Annex 17, *Adoption of Amendments to the Code on Intact Stability for all Types of Ships Covered by IMO Instruments (Resolution A.749(18))*, adopted on 14 May 1998.

Annex 17 details the specific amendments to Resolution A.749(18) in eight chapters. Annex 1 (*Detailed Guidance for the Conduct of an Inclining Test*) is included.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO Committee MSC.1/Circ. 1228, Revised Guidance to the Master for Avoiding Dangerous Situations in Adverse Weather and Sea Conditions.

International Maritime Organization, Maritime Safety Committee MSC.1/Circ. 1228, dated 11 January 2007, *Revised Guidance to the Master for Avoiding Dangerous Situations in Adverse Weather and Sea Conditions*.

MSC.1/Circ. 1228 supersedes MSC/Circ.707, *Guidance to the master for avoiding dangerous situations in following and quartering seas*. MSC.1/Circ. 1228 provides masters with a basis for decision-making on ship handling in adverse weather and sea conditions in avoidance of dangerous phenomena that could be encountered in such circumstances.

Section 1.3 states that "software should be approved by the Administration." In Section 2.1, a caution states that the Guidance is designed to accommodate all types of merchant ships, which may be too restrictive or too generous for certain types of ships. Section 3.1.1 describes dangers of "surf-riding and broaching to". Section 3.1.2 discusses "Reduction of intact stability when riding a wave crest amidships". Sections 3.2 and 3.3 describe synchronous and parametric rolling motions, respectively.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO MSC/Circular.456, Guidelines for the Preparation of Intact Stability Information.

International Maritime Organization, Maritime Safety Committee MSC/Circular.456, *Guidelines for the Preparation of Intact Stability Information*, adopted on 13 October 1986.

Member Governments, as denoted in the included Annex, by the same name, are encouraged to have owners and designers use the guidelines to prepare necessary documentation for the proper operation of the ship and to provide a simplified but meaningful summary of intact stability information, while acknowledging the availability of electronic aids as a supplement to information otherwise provided.

The Annex describes three categories of information. Category 1A includes basic data needed to obtain trim and stability characteristics of the ship. Category 1B contains optional information. Category 2 provides the master with a ready means to ensure that the ship's stability parameters for their service or condition are within prescribed limits set by the Administration.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO MSC/Circ.861, Measures to Reduce Number of False Distress Alerts

International Maritime Organization, Maritime Safety Committee, MSC/Circ.861, *Measures to Reduce the Number of False Distress Alerts*, 22 May 1998 (Ref T2/6.04).

This Circular identified that false distress alerts from GMDSS impose burdens on Rescue Coordination Centers which divert Search and Rescue resources away from real distress situations. The Circular identifies eight actions, urging Member Governments to implement them.

The NOSAC Subcommittee has no comment or recommendation regarding this document. The NOSAC Subcommittee concurs with the content of this circular.

IMO SN/Circ. 197, Ref T2/6.03, Operation of Marine Radar for SART Detection

International Maritime Organization, Subcommittee on Safety of Navigation (NAV), SN/Circ. 197, Ref T2/6.03, Operation of Marine Radar for SART Detection, Annex: *Operation of Marine Radar for SART Detection*, 1 November 1997.

This document describes the operation of the Search and Rescue Transmitter (SART) and the various limitations with the transmitter and radars used to detect an activated SART signal.

SN/Circ. 197, Corr. 1 from 10 February 1998 identified a typographical error paragraph 4, first sentence of the Annex to replace “low” with “slow”.

Limitations covered include use of only X-band (3cm) radars for detection. Radar issues include use of correct range scale, SART range errors, radar bandwidth, radar side lobes, detuning the radar, gain, anti-clutter sea control, anti-clutter rain control.

TS 01-23(1) R3.6 USCG Study of SART technology

ABS Guide for Building and Classing Liftboats

American Bureau of Shipping (ABS) *Guide for Building and Classing Liftboats*, dated July 2023.

This Guide is divided into four main parts regarding conditions of class (Part 1), hull construction and equipment (Part 3), machinery and systems (Part 4), and surveys after construction (Part 5). Chapter 3 of Part 3 describes subdivision and stability of liftboats. [Note, there is no Part 2 in this *Guide*.]

Topics covered in Chapter 3 of Part 3 include Stability (1), Stability Criteria (3), Load Lines (5), Weathertight / Watertight Integrity (7), and Onboard Computers for Stability Calculations (9). Appendix 1 of this Chapter discusses Computer Software for Onboard Stability Calculations (2018). ABS states that using onboard computers are not a

requirement of Class; however, for vessels contracted after 1 July 2005, stability computers should comply with Appendix 1 herein.

Part 3, Chapter 3, Appendix 1 describes the following guidance: General (1); Calculation Systems (3); Types of Software (2018); Function Requirements (7); Acceptance Tolerances (9); Approval Procedure (11); Operation Manual [for the software] (13); Installation Testing [master's responsibility] (15); Periodical Testing (17), and Other Requirements (19).

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

ABS Guide for Building and Classing Liftboats, Notices and General information

American Bureau of Shipping (ABS) *Guide for Building and Classing Liftboats*, *Notices and General information*, dated July 2023.

Table 1 of this *Guide* lists the seven applicable Editions of Booklets Comprising the July 2023 Liftboat Guide as follows:

Notices and General Information.
Guide for Building and Classing Liftboats: Parts 1, 3, 4, and 5.
Rules for Conditions of Classification – Offshore Units and Structures, Part 1.
Rules for Material and Welding, Part 2.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IACS UR L5, Computer Software for Onboard Stability Calculations

International Association of Classification Societies (IACS) Unified Requirement (UR) L5, *Computer Software for Onboard Stability Calculations* (Rev 4, June 2020; IACS Req. 2004/Rev.4 2020).

UR L5 applies to stability software on ships contracted after 1 July 2005. UR L5 is applicable for ships subject to compliance with the 1966 Load Line Convention; or the 1988 Protocol to the Load Line Conventions, as amended; the IMO MODU Code; and/or the 2008 Intact Stability Code. Use of onboard computers is not a requirement of Class.

Topics covered in UR L5 include its application; General (1); Calculation Systems (2); Types of Stability Software (3); Functional requirements (4); Acceptable Tolerances (5); Approval

Procedure (6); Operation Manual (7); Installation Testing (8); Periodical Testing (9); and Other Requirements (10).

American Bureau of Shipping (ABS) *Guide for Building and Classing Liftboats*, dated July 2023, closely follows the structure of UR L5.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

IMO MSC/Circ.1078, Guidelines for Reporting False Alerts

International Maritime Organization, Maritime Safety Committee, MSC/Circ.1078, *Guidelines to Administrations on Reporting False Alerts*, 6 June 2003 (Ref. T2.6.04).

This Circular provides information and guidance to Member Governments on reporting false alerts from GMDSS installations, including EPIRBs.

"With the installation of GMDSS radio equipment, false distress alerts have become a major problem to the efficient operation of search and rescue services, thus having potentially serious effects on real distress situations and the safety of life at sea."

The definition of "false alerts" is identified in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual as "*Any alert received by the SAR system indicating an actual or potential distress situation, when no such situation actually exists*."

At the time of the circular's publication, "Statistics from (M)RCCs [Maritime Rescue Coordination Centers] show that the percentage of false alerts are approximately 95-100% of the total alerts received, mainly caused by lack of knowledge of the relevant conventions, codes and regulations."

General categories of operational false alerts are mishandling, human error, technical, mounting failure, or environmental conditions.

Note: the reader is directed to Specific Task Section 5 regarding CEPT Handling of EPIRBS for additional information.

TS 01-23(1) R3.7 Reporting False Alerts

IMO Resolution A.714(17) Cargo Securing

International Maritime Organization (IMO) Resolution A.714(17), *Code of Safe Practice for Cargo Stowage and Securing*, Adopted 6 November 1991.

There are seven chapters, fourteen Annexes, and four Appendices in this Code. Relevant parts of this document are reproduced here to provide context.

Preface

> "Upon instructions by the Maritime Safety Committee (MSC), the Sub- Committee on Containers and Cargoes (which was later superseded by the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers) developed the Code of Safe Practice for Cargo Stowage and Securing. The Code was approved by the Committee at its fifty-eighth session (May 1990) and was adopted by the Assembly at its seventeenth regular session (November 1991) by resolution A.714(17).
>
> The Code includes, as appendices, various texts which have been issued by the Organization and are considered relevant to cargo stowage and securing. Any amendments or revisions, which may be made in future, will be included in subsequent editions of this Code."

Forward to the *Code of Safe Practice for Cargo Stowage and Securing*

> "The proper stowage and securing of cargoes is of the utmost importance for the safety of life at sea. Improper stowage and securing of cargoes has resulted in numerous serious ship casualties and caused injury and loss of life, not only at sea but also during loading and discharge."
>
> The accelerations acting on a ship in a seaway result from a combination of longitudinal, vertical and predominantly transverse motions. The forces created by these accelerations give rise to the majority of securing problems.
>
> General Principles
>
> > All cargoes should be stowed and secured in such a way that the ship and persons on board are not put at risk.
> > The safe stowage and securing of cargoes depend on proper planning, execution and supervision.
> > Personnel commissioned to tasks of cargo stowage and securing should be properly qualified and experienced.
> > Personnel planning and supervising the stowage and securing of cargo should have a sound practical knowledge of the application and content of the Cargo Securing Manual, if provided.
> > In all cases, improper stowage and securing of cargo will be potentially hazardous to the securing of other cargoes and to the ship itself.

Decisions taken for measures of stowage and securing cargo should be based on the most severe weather conditions which may be expected by experience for the intended voyage.
Ship-handling decisions taken by the master, especially in bad weather conditions, should take into account the type and stowage position of the cargo and the securing arrangements."

Chapter 1 *General*

"1.1 Application
This Code applies to cargoes carried on board ships (other than solid and liquid bulk cargoes and timber stowed on deck) and, in particular, to those cargoes whose stowage and securing have proved in practice to create difficulties.

1.2 Definitions of the terms used

For the purposes of this Code:

Cargo unit means a vehicle, container, flat, pallet, portable tank, packaged unit, or any other entity, etc., and loading equipment, or any part thereof, which belongs to the ship but is not fixed to the ship as defined in Assembly resolution A.489(XII).

Unit load means that a number of packages are either:
.1 placed or stacked, and secured by strapping, shrink-wrapping or other suitable means, on to a load board such as a pallet; or
.2 placed in a protective outer packaging such as a pallet box; or
.3 permanently secured together in a sling.

1.3 Forces

1.3.2 Transverse forces alone, or the resultant of transverse, longitudinal and vertical forces, normally increase with the height of the stow and the longitudinal distance of the stow from the ship's centre of motion in a seaway. The most severe forces can be expected in the furthest forward, the furthest aft and the highest stowage position on each side of the ship.

1.3.4 Cargo should be so distributed that the ship has a metacentric height in excess of the required minimum and, whenever practicable, within an acceptable upper limit to minimize the forces acting on the cargo.

1.3.5 In addition to the forces referred to above, cargo carried on deck may be subjected to forces arising from the effects of wind and green seas.

1.3.6 Improper shiphandling (course or speed) may create adverse forces acting on the ship and the cargo.

1.5 Criteria for estimating the risk of cargo shifting

1.5.1 When estimating the risk of cargo shifting, the following should be considered:

. dimensional and physical properties of the cargo;
. location of the cargo and its stowage on board;
. suitability of the ship for the particular cargo;
. suitability of the securing arrangements for the particular cargo;
. expected seasonal weather and sea conditions;
. expected ship behaviour during the intended voyage;
. stability of the ship;
. geographical area of the voyage; and
. duration of the voyage."

Chapter 2 ***Principles of safe stowage and securing of cargoes***

"2.2 Cargo distribution

2.2.1 It is of utmost importance that the master takes great care in planning and supervising the stowage and securing of cargoes in order to prevent cargo sliding, tipping, racking, collapsing, etc.

2.2.2 The cargo should be distributed so as to ensure that the stability of the ship throughout the entire voyage remains within acceptable limits so that the hazards of excessive accelerations are reduced as far as practicable.

2.2.3 Cargo distribution should be such that the structural strength of the ship is not adversely affected."

Chapter 3 ***Standardized stowage and securing systems***

Chapter 4 ***Semi-standardized stowage and securing***

Chapter 5 ***Non-standardized stowage and securing***

Chapter 6 ***Actions which may be taken in heavy weather***

"**6.1 General**

The purpose of this chapter is not to usurp the responsibilities of the master, but rather to offer some advice on how stresses induced by excessive accelerations caused by bad weather conditions could be avoided.

6.2 Excessive accelerations

Measures to avoid excessive accelerations are:
.1 alteration of course or speed or a combination of both;
.2 heaving to;
.3 early avoidance of areas of adverse weather and sea conditions; and
.4 timely ballasting or deballasting to improve the behaviour of the ship, taking into account the actual stability conditions (see also 7.2).

6.3 Voyage planning

One way of reducing excessive accelerations is for the master, as far as possible and practicable, to plan the voyage of the ship carefully so as to avoid areas with severe weather and sea conditions. The master should always consult the latest available weather information."

Chapter 7 ***Actions which may be taken once cargo has shifted***

"7.1 The following actions may be considered:
.1 alterations of course to reduce accelerations;
.2 reductions of speed to reduce accelerations and vibration;
.3 monitoring the integrity of the ship;
.4 restowing or resecuring the cargo and, where possible, increasing the friction; and
.5 diversion of route in order to seek shelter or improved weather and sea conditions.

7.2 Tank ballasting or deballasting operations should be considered only if the ship has adequate stability."

Annex 1 ***Safe stowage and securing of containers on deck of ships which are not specially designed and fitted for the purpose of carrying containers***

Annex 2 ***Safe stowage and securing of portable tanks***

Annex 3 ***Safe stowage and securing of portable receptacles***

Annex 4 ***Safe stowage and securing of wheel-based (rolling) cargoes***

Annex 5 ***Safe stowage and securing of heavy cargo items such as locomotives, transformers, etc.***

Annex 6 ***Safe stowage and securing of coiled sheet steel***

Annex 7 ***Safe stowage and securing of heavy metal products***

Annex 8 ***Safe stowage and securing of anchor chains***

Annex 9 ***Safe stowage and securing of metal scrap in bulk***

Annex 10 ***Safe stowage and securing of flexible intermediate bulk containers***

Annex 11 ***General guidelines for the under-deck stowage of logs***

Annex 12 ***Safe stowage and securing of unit loads***

Annex 13 ***Methods to assess the efficiency of securing arrangements For semi-standardized and non-standardized cargo***

Appendix 1 ***Calculated Example 1***

Appendix 2 ***Explanations and Interpretation of Methods to Assess the Efficiency of Securing Arrangements***

Appendix 3 ***Advanced Provisions and Considerations Applicable to Very Heavy and/or Very Large Cargo Items***

Appendix 4 ***Advanced Provisions and Considerations Applicable to Semi-Standardized Cargoes***

Annex 14 ***Guidance on Providing Safe Working Conditions for Securing of Containers on Deck***

None of the investigation reports indicated that deck loads on the Seacor Power contributed to the capsizing. However, the above information could be valuable to the Master as guidance for securing cargo and other units on deck, no matter the size of the vessel or type.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this document.

RECOMMENDATIONS for Specific Task Number 3

TS 01-23(1) R3.1 The NOSAC recommends that the USCG update the *Marine Safety Manual*, Volume IV (*Technical*), section 6.F (*Load Lines*), using the *Load Line Policy Notes* (LLPN), dated 22 September 2008, as a basis for the revision. Note that stated within the LLPN, "The LLPN will eventually form the basis of a future revision to MSM Chapter 6.F."

TS 01-23(1) R3.2 The NOSAC recommends that the USCG review and update the U.S. Load Line regulations (46 CFR 42, *Domestic and Foreign Voyages by Sea*). In particular, the NOSAC recommends that the USCG incorporate reserve buoyancy distribution requirements and include a process for granting exemptions.

TS 01-23(1) R3.3 The NOSAC recommends that the USCG review the International Maritime Organization (IMO) *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update 46 CFR 170.110 (f) (*Stability booklet*). In particular, the NOSAC recommends the USCG review the following sections:

Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.1 (*General*), Paragraph 2.1.6 discusses stability booklets and stability instruments used to supplement the stability booklet.

Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 3 (*Guidance in preparing stability information*), Chapter 3.6 (*Stability booklet*) discusses the guidance on working language of the Stability booklet, approval by Administrations, format, and possible alternatives to Stability booklets.

Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 3 (*Guidance in preparing stability information*), Chapter 3.8 (*Operating booklets for certain ships*) mentions the need for additional information in the stability booklet.

Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 4 (*Stability calculations performed by stability instruments*) discusses general, types of stability software, functional requirements, acceptable tolerances, approval procedure, specific approval, user manual, installation testing, periodical testing, and other requirements.

TS 01-23(1) R3.4 The NOSAC recommends that the USCG review the International Maritime Organization *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update Title 46 (*Shipping*), Chapter I (*Coast Guard, Department of Homeland Security*), Subchapter S (*Subdivision and Stability*), § 170.170 (*Weather Criteria*). In particular, the NOSAC recommends the USCG review the definitions of "P"

and "GM" found in Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.3 (*Severe wind and rolling criterion (weather criterion)*).

TS 01-23(1) R3.5 The NOSAC recommends that the USCG review the International Maritime Organization *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update 46 CFR 134.170 (*Operating manual*), Paragraph (6). In particular, the NOSAC recommends the USCG review the information contained in Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 5 (*Operational provisions against capsizing*) of the *Code*.

TS 01-23(1) R3.6 The NOSAC recommends that the USCG conduct a study to evaluate the use of radar Search and Rescue Transponders (SARTs). The Seacor Power investigation revealed that SARTs were not detected on a radar unless the radar was set to a specific range and gain. If the crew on a nearby vessel crew did not know they are looking for a SART, then they would probably not adjust their radar settings and would not detect the SART. The USCG should determine whether there is a more efficacious system that could serve as a viable replacement for radar SARTs and adjust the requirements as appropriate.

TS 01-23(1) R3.7 The NOSAC recommends that the US Coast Guard develop a Marine Safety Information Bulletin (MSIB) or other appropriate communication vehicle to provide guidance to mariners regarding cancelling false distress alerts.

End of Specific Task Number 3.

SPECIFIC TASK NUMBER 4

The [NOSAC] Subcommittee should: Review any additional public reports on the capsizing and identify areas where the Committee believes the U.S. Coast Guard should take action to reduce risks of future incidents.

USCG MSC Post-Casualty Stability Analysis of Liftboat Seacor Power

USCG Marine Safety Center (MSC) Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022; Enclosure (1) to MSC Memo, Serial # A0-2201141.

This Analysis covers the following ten (10) sections: Vessel Description; Regulatory Review; Stability Criteria; Operations Requirements for Afloat Stability; Stability Tests; Departure and Loss Loading Conditions; MSC's Independent Stability Analysis; Conclusions; References; and Appendices.

Regulatory references identified within this document are found in Exhibit 5, *MSC Seacor Power Post-Casualty Analysis Regulatory References*.

Conclusions from this Analysis are found in Exhibit 6, *Conclusions from the MSC Post-Casualty Stability Analysis of Liftboat Seacor Power*.

USCG Responses to stability questions posed by the NOSAC Subcommittee are in Exhibit 7: *USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.* Within this document, the exhibit was annotated to identify each question and response [in brackets] for easier reference.

3.2.1, Stability Requirements in Part 170 for All Vessels (page 7)

> "Although Mobile Offshore Drilling Units (MODUs) are exempt from the intact stability criteria in Part 170 of Subchapter S, liftboats are not explicitly noted as exempt in §170.160. Because of this, either the intact stability criteria listed in §170.170 "Weather Criteria" or §170.173 "Criterion for Vessels of Unusual Proportion and Form" could be applied to liftboats. It is apparent from the stability criteria that most liftboats are not intended to meet §170.170 which is for vessels of "ordinary proportions and form." Most liftboats cannot meet §170.173 because liftboats have very low range of stability (20° or less) with downflooding angles as low as 10-15°. For even the most benign "protected" route, §170.173 requires positive righting arms to 25°, and no submergence of downflooding points to angles of inclination of at least 15°. MSC has historically not applied these criteria to liftboats."

TS 01-23(1) R5.10A.1 46 CFR 170.160 Exemption Determination

[Formerly TS 01-23(1) R4.1]

3.2.2, Stability Requirements in Part 174, Specific to Liftboats (pages 7-8)

"Stability criteria contained in Part 174 are silent regarding wind direction. The terms "heel" and "heeling moment" are used throughout but not defined in Part 174, which leaves evaluation of liftboat inclination and wind direction to the interpretation of the naval architects conducting an analysis. Given the hull shape, it is unreasonable to assume that the regulations intend only for an analysis of wind forces acting on the beam and inclining the vessel in a transverse direction (about the longitudinal axis) because this type of analysis will not consider the stability failure directions most likely to affect a liftboat."

TS 01-23(1) R5.10A.2,.4,.6,.7,.8 46 CFR 174 Definitions and Max Wind Speed

[Formerly TS 01-23(1) R4.2]

"The MSC has not documented their policies for varied wind direction or off-axis stability analyses. A review of MSC's past liftboat stability reviews indicate an inconsistent application of off-axis stability prior to 2018."

TS 01-23(1) R5.10.6,.9,.13 MSC Plan Review Guide Varied Wind Direction/Off-Axis Stability

[Formerly TS 01-23(1) R4.3]

"For liftboats and MODUs, Part 174 is also silent regarding whether the vessel should be allowed to trim freely (orthogonally tip) when evaluating righting arm curves (notably, Part 174 is not silent about this for Tugboats, Offshore Supply Vessels, or Hopper Dredges). Using fixed trim is not a suitable way to evaluate liftboat stability; this is due to potentially weak righting characteristics in trim and the location of downflooding points away from amidships where they are particularly affected by trim. For this report, MSC always allowed the model to freely trim and freely tip in the direction orthogonal to inclination."

TS 01-23(1) R5.9 USCG re-evaluate the stability for all active US liftboats

TS 01-23(1) R5.10A.9 46 CFR 174 Orthogonal Tipping

[Formerly TS 01-23(1) R4.4]

7.4, Wind Moment Comparison (page 20)

"MSC wind load and moment values are generated using the regulatory shape factors in Table 6 [*Not Shown*]. MSC's analysis accounts for shielding between components (other than the legs) and vessel structure as it emerges from the

water with heels. It is not known why the values differ so significantly with ABS' values (the proprietary, in-house DRILWIND program used by ABS is now obsolete). Because the largest wind moment differences between ABS and MSC models occurs when wind is coming from the stern and quarter, this may indicate significantly different modeling treatment of the helideck as it inclines and is affected by the wind."

TS 01-23(1) R5.10A.14 USCG/ABS Wind Load/Moments Differences

[Formerly TS 01-23(1) R4.5]

7.6, Stability Analysis Conducted by MSC (page 22)

"Free surface effects of partially filled tanks are not included in MSC's analysis of the allowable vertical centers of gravity because free surface effects are calculated as a formal VCG correction in the Marine Operating Manual when evaluating an actual condition to ensure it falls under the maximum VCG curve. However, true free surface effect (the actual shifting of liquid center of gravity based on inclination angle) is calculated by MSC when evaluating the departure and casualty conditions where tank contents are known (Part 174 is silent on the treatment of free surface effect for liftboats). The true free surface method within GHS software used by MSC most closely models actual inclined conditions of the tanks, especially at angles of inclination greater than 5°."

8, Conclusions (pages 60-62)

There are eight separate conclusions from the MSC Post-casualty Stability Analysis, numbered 8.1 through 8.8.

8.1. *When trim was limited to zero, SEACOR POWER passed the stability criteria in the 2001 ABS MODU Rules.*
8.2. *SEACOR POWER did not pass the regulatory standards of Part 174 for all wind directions.*
8.3. *SEACOR POWER passed the regulatory standards of Part 174 for beam winds.*
8.4. *SEACOR POWER was operated with significant aft trim which was not considered in any stability analysis.*
8.5. *SEACOR POWER did not meet the regulatory standards of §170.173.*
8.6. *SEACOR POWER passed Part 174 intact stability criteria using the varied axis method.*
8.7. *Regulatory stability analysis calculation requirements are not clear.*
8.8. *Regulatory criteria wind speeds are not appropriate operational guidance.*

TS 01-23(1) R5.9 Active liftboat stability reevaluations

TS 01-23(1) R5.10A.11 MSC Post-Casualty Stability Analysis Conclusions

[Formerly TS 01-23(1) R4.7]

USCG: Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.

USCG: Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.

The NOSAC Subcommittee reviewed the *USCG Marine Safety Center (MSC) Post-Casualty Stability Analysis of Liftboat SEACOR POWER*, Revision 4, 28 July 2022, and developed questions on stability to present to the USCG Naval Architecture Division (CG-ENG-2) for responses. These stability questions and their CG-ENG-2 responses are located in Exhibit 7.

The NOSAC Subcommittee made recommendations in 4.1 through 4.7 from the report. After reviewing the responses from CG-ENG-2, most of these responses have been incorporated into these seven recommendations. With the exception of recommendation 4.6, the other six (6) recommendations have been integrated into TS 01-23(1) R5.10, as also noted in the Introductory section of this report under "Structure of the Report".

There is one question and response from Exhibit 7 that the NOSAC Subcommittee brings forward as follows.

"[MSC Q. 18 (12,4a)] Page 12: Section 4. Operating Requirements for Afloat Stability

"The Operating Manual lists a limiting wave height of 5 feet or twice the freeboard as shown in Figure 5. However, regulatory and ABS MODU Rules stability criteria do not include requirements for stability in waves and the origin of this 5-foot limit is not known.[4] Statutory and class rule requirements for liftboats are evaluated using static, sustained wind, still-water conditions only.

[4] NVIC 8-81, Change 1 (published March 1988 and cancelled by NVIC 8-91 published in May of 1991) included a wave height restriction of twice the freeboard for liftboats (a minimum freeboard requirement of 2 feet was required)."

Should stability in waves be included in stability analyses?

Response: Dynamic stability analysis of liftboats in waves is difficult. Likewise, the ability to perform such analysis – to the extent possible -- and to develop regulations that incorporate such analyses would be very difficult."

One aspect of this question and response that is not addressed is whether or not dynamic stability analysis would contribute to better safety in stability for liftboats. Another aspect is that the origin of the 5-foot limit is a mystery. Conducting a study of whether dynamic stability analysis would benefit the liftboat industry would be useful. Advances in computer technology could be leveraged accordingly.

TS 01-23(1) R4.8 USCG Study of Dynamic Stability Analysis

USCG FoC 013-23, Seacor Power Casualty: Findings of Concern Regarding the National Weather Service.

USCG Finding of Concern 013-23, *Seacor Power Casualty: Findings of Concern Regarding the National Weather Service*, dated June 26, 2023.

This Finding of Concern is the implementation of Recommendation Number 6 in the USCG Report of Investigation.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this circular.

USCG FoC 014-23, Seacor Power Casualty: Findings of Concern Regarding Liftboats

USCG Finding of Concern 014-23, *Seacor Power Casualty: Findings of Concern Regarding Liftboats*, dated June 26, 2023.

This Finding of Concern is the implementation of Recommendation Number 7 in the USCG Report of Investigation.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this circular.

USCG FoC 015-23, Seacor Power Casualty: Dispatcher Training, Draft Reading, and Weather Forecasting for All Commercial Vessels

USCG Finding of Concern 015-23, *Seacor Power Casualty: Dispatcher Training, Draft Reading, and Weather Forecasting for All Commercial Vessels*, dated June 26, 2023.

This Finding of Concern is the implementation of Recommendation Number 8 in the USCG Report of Investigation.

The NOSAC Subcommittee has no comment or recommendation regarding this document related to Liftboats. The NOSAC Subcommittee concurs with the content of this circular.

USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER

USCG: *Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290)*

This Report of Investigation (ROI) for the Seacor Power was provided to the NOSAC Subcommittee on June 20, 2023. This report, its recommendations, and actions by the Commandant were analyzed, and further recommendations are herein provided.

From the USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290), refer to Exhibit 8, *USCG Seacor Power Final Report Regulatory References*. This exhibit describes the citation, the title of the citation, and the page number (s) on which the citation is located within the report.

Within this USCG ROI, there are 27 Safety Recommendations, 16 Best Practices, and four Administrative Recommendations. These Recommendations are contained in Exhibit 9: USCG Commandant's Responses to the *USCG Seacor Power Final Report Recommendations* [plus identified Best Practices]. See Table 4.1.

Table 4.1: Commandant's Action on Recommendations

Table 4.1: *Commandant's Action on Recommendations*

Commandant's Action	**Recommendation Numbers**
Concurred	1, 2, 6, 7, 8, 9, 12, 14, 16, 19, 26, 27
Concurred with the intent	5, 10, 11, 13, 21, 22, 23
Did not concur	3, 4, 15, 17, 20
Partially concurred	18, 24, 25
Commandant's Action	**Administrative Recommendation Numbers**
Concurred	4
Concurred with the intent	2, 3
Did not concur	1

The NOSAC Subcommittee evaluated other documentation as noted in Sections 1, 2, 3, and 5 of this report prior to obtaining this USCG Report of Investigation. Similar conclusions were independently identified by the NOSAC Subcommittee which can be used to augment the USCG report recommendations. See Table 4.2.

Table 4.2: Correlation of USCG Recommendations vs. NOSAC Recommendations

Table 4.2: *Correlation of USCG Recommendations vs. NOSAC Recommendations*

USCG ROI Recommendations	NOSAC Recommendation
1	5.1
2	1.1, 5.10A.4, 5.10A.3, 1.4, 2.5, 5.10A.5, 2.7, 2.10A, 3.3, 3.4, 3.5, 5.10A.2.4.6.8, 5.10A.6.9.13, 5.10A.9, 5.10A.14, 5.10A.11, 4.8
5	2.7, 3.5, Exhibit 13
6	1.13
9	2.1, 2.3
10	2.3
11	5.1
14	2.1, 5.1
15	2.1
17	4.9
20	3.6
21	3.6
22	5.1
23	4.10
25	4.11
26	2.7
27	5.1

The NOSAC Subcommittee evaluated each recommendation and action taken by the Commandant and developed the following responses for recommendations that the NOSAC Subcommittee recognized requires more review. These responses are structured as follows:

- Repeat of the text of the identified recommendation and the Commandant's primary action.
- NOSAC Subcommittee's comments and recommendations.

USCG ROI Recommendation 5

USCG Recommendation 5: "The Commandant should consider a new regulation or policy requiring liftboat owners and operators to create a quick reference guide for each vessel. The quick reference guide would establish clear and simple operating information, and could include topics such as wave limits, wind limits, draft restrictions, trim conditions, and emergency procedures for sudden changes in weather or weather that exceeds the vessel's operating limits.

Action: I concur with the intent of this recommendation. A Finding of Concern will be published recommending that owners and operators of liftboats review their operations manuals to ensure they are easily accessible and understood by the

crew when making time-sensitive decisions. *The Coast Guard will share this recommendation with the National Offshore Advisory Committee (NOSAC) for their consideration and direct them to develop standardized quick reference card templates for liftboats that can be used by the industry.* NOSAC has been tasked to consider the SEACOR POWER National Transportation Safety Board (NTSB) report and any available public-facing reports, which will include this ROI once released, and propose recommendations. The Coast Guard will reevaluate this recommendation pending a response from NOSAC regarding any necessary regulatory or policy changes."

Italics in the above Action were added to highlight the Commandant's request that the NOSAC develop a quick reference guide for liftboats. The NOSAC consulted with industry for advice. The result of this draft quick reference guide can be found in Exhibit 13.

USCG ROI Recommendation 17

USCG Recommendation 17: "The Commandant should consider whether there is a need to provide District and Sector Command Centers with additional means of tracking commercial vessel locations, in order to allow Command Centers to quickly and easily correlate distress alerts with vessel locations." **Action**: I do not concur with this recommendation.

NOSAC Response to 17: The Commandant referenced mandatory and voluntary methods such as the Long-Range Identification and Tracking (LRIT) system and the Automatic Identification System (AIS) as sufficient to track vessels.

Some liftboats are not classed or subject to the requirements of SOLAS. Thus, installing and maintaining LRIT or AIS as a voluntary measure may not be a viable solution. In this case, alternative measures should be considered for tracking these vessels. One alternative would be the installation of an AIS-SART which can be detected on a ship's AIS system (reference 8.9.6 of the USCG ROI). "The District Eight Command Center views AIS data on a Coast Guard program called CG One View." (reference 8.10.6 of the USCG ROI).

Note that the USCG HC0-144 Airplane included AIS Receiver on board. However, the USCG MH-65 and MH-60 helicopters do not have AIS Receivers. (reference 8.10.37 of the USCG ROI). Note: ABS publishes a guide for class notation for helicopter decks.

The final transmission for the Seacor Power's AIS was at 1539 on April 13, 2021. (reference 8.1.46 of the USCG ROI). The distress call from the Seacor Power was the eighth potential emergency situation reported to the USCG after 1500 this date. The USCG was addressing a sea-going tug and a houseboat which were

taking on water (reference 8.10.66 of the USCG ROI). Should the cessation of AIS transmissions be a trigger for more urgent response and investigation by the USCG during times of severe weather when there is a greater risk of emergency situations?

The NOSAC Subcommittee discussed the use of the Vessel Traffic Service (VTS) to monitor vessel activities in the ports and waterways. Could cameras, such as those in Port Fourchon, (reference 8.4.23 of the USCG ROI), be integrated into a VTS system for tracking?

TS 01-23(1) R4.9 USCG Study Alternate forms Vessel Tracking

USCG ROI Recommendation 23

USCG Recommendation 23: "The Commandant should re-evaluate the regulatory requirement that exempts vessels operating between 32 degrees N and 32 degrees S latitude from carrying immersion suits. While water temperatures in some of these areas may remain warm all year round, water temperatures in some areas of this region can drop to levels that quickly cause hypothermia, especially during winter and spring." **Action**: I concur with the intent of the recommendation.

NOSAC Response to 23: The NOSAC Subcommittee agrees the intent that the USCG should re-evaluate the regulatory requirements for immersion suits.

However, exceptions should be made for the liftboat industry because of cost, storage requirements, different sizes of immersion suits to purchase, the generally higher water temperatures in the Gulf of Mexico, and because of the operational areas of the liftboats' general proximity to land and other vessels and facilities on the OCS which would mitigate the amount of time that a person could be in the water during a casualty.

Other forms of lifesaving equipment such as life rafts could be used by personnel to keep out of the water and life rings could be used to assist in flotation rather than exhaustingly treading water.

Other recommendations within the USCG ROI and this NOSAC report could be used to more advantage as precautionary measures with severe weather communications improvements which would advise vessel Masters, particularly of liftboats, not to depart protected ports and waterways in the first place.

TS 01-23(1) R4.10 46 CFR 199.273 Immersion Suits

USCG ROI Recommendation 25

USCG Recommendation 25: "The Commandant should consider a study to assess the usefulness of drones or remote operated life rings for delivering rescue equipment to individuals who are out of reach of a Coast Guard asset." **Action**: I partially concur with this recommendation.

NOSAC Response to 25: The NOSAC Subcommittee refers the reader to the United States Coast Guard, *Unmanned Systems Strategic Plan*, from March 2023. VADM Peter W. Gautier, Deputy Commandant for Operations (DCO), in his introductory message, used the following statements regarding this *Plan*.

> "humanitarian first responders"
> "Unmanned Systerms (UxS) can help us find mariners in distress."
> "…the adoption of automation, autonomy, and unmanned systems promises to transform the maritime industry."

Other statements of interest in this *Plan* include the following.

> "UxS can remove human beings from the often dirty, occasionally dull, and potentially dangerous work of some missions."
> "Unmanned systems can augment or supplant manned systems in these capability areas to greatly improve maritime domain awareness, allow more proactive employment of Coast Guard personnel and assets, and enable faster and more efficient search and rescue,…"
> "…allow us [USCG] to execute dangerous or difficult tasks safely and efficiently, saving time, saving money, and most importantly, saving lives."
> Strategic Goal #2, Objective 2.2: "Develop expertise in remotely operated and autonomous systems to support prevention and response activities."

The NOSAC Subcommittee offers additional consideration in coordination with the *Plan* as follows.

1. Incorporate standards and drills for private training organizations to train personnel to interact safely and efficiently with USCG search and rescue activities and equipment.
2. Identify precautions with UxS equipment when involved in search and rescue activities, e.g., possible static discharge of lowered rescue lines similar to those used by helicopters.
3. The DCO references "artificial intelligence (AI)". Investigate use of AI to automatically respond to EPIRB transmissions to filter out false alarms, and direct USCG personnel to focus on transmissions that are more likely to be viable emergencies.
4. Strategic placement of UxS equipment on manned / or unmanned platforms for more rapid deployment in case of emergencies (considering security and maintenance of the equipment, among other things).

TS 01-23(1) R4.11 USCG Unmanned Systems Strategic Plan

RECOMMENDATIONS for Specific Task Number 4

TS 01-23(1) R5.10A.1 The NOSAC recommends that the USCG review and update Title 46 (*Shipping*); Chapter I (*Coast Guard, Department of Homeland Security*); Subchapter S (*Subdivision and Stability*); §170.160 (*Specific applicability*). In particular, the NOSAC Subcommittee recommends that the USCG clarify whether liftboats should explicitly be exempt from this subpart, since most liftboats cannot meet the requirements of §170.170 (*Weather criteria*), or §170.173 (*Criterion for vessels of unusual proportion and form*). If some liftboats would have to comply with §170.160 (*Specific applicability*), then the regulations should be updated to state these requirements. [Formerly TS 01-23(1) R4.1]

TS 01-23(1) R5.10A.2,.4,.6,.7,.8 The NOSAC recommends that the USCG review and update Title 46 (*Shipping*); Chapter I (*Coast Guard, Department of Homeland Security*); Subchapter S (*Subdivision and Stability*); Part 174 (S*pecial Rules Pertaining to Specific Vessel Types*) to account for lessons learned from the capsizing of Seacor Power. In particular, the NOSAC Subcommittee recommends that the USCG update 46 CFR 174.255 to include the following: [Formerly TS 01-23(1) R4.2]

4.2.1 A requirement to address the effects of wind acting on the vessel from all directions, calculated at a minimum of 10° increments. (TS 01-23(1) R5.10A.6)

4.2.2 A definition of "*Heel*" for a liftboat. (TS 01-23(1) R5.10A.2)

4.2.3 A definition of "*heeling moment*" for a liftboat. (TS 01-23(1) R5.10A.2)

4.2.4 In addition, the NOSAC Subcommittee recommends that the USCG evaluate whether the severe-storm conditions of operation afloat found in 46 CFR 174.255(a)(2) (*Restricted service. Intact stability*) should be increased from wind speeds of 70 knots to 100 knots. Alternatively, if the calculated maximum wind speed based on the design of the vessel is less than 100 knots, identify that maximum wind speed. Correlation of maximum severe storm conditions and the vessel's emergency evacuation plans should be considered. (TS 01-23(1) R5.10A.4)

4.2.5 "Update wind calculation shape factors for cylindrical legs with racks." (TS 01-23(1) R5.10A.8)

4.2.6 Update the regulations to ensure liftboat stability calculations examine wind encountering the vessel from all different directions, spaced at no greater than 10-degree intervals (or a smaller interval, if appropriate) around the vessel. (TS 01-23(1) R5.10A.6)

TS 01-23(1) R5.10.6,.9,.13 The NOSAC recommends that the USCG review and update the USCG Marine Safety Center (MSC) *Plan Review Guide for Liftboat Submissions* to account for lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC Subcommittee recommends that the USCG document the policies for addressing varied wind direction and off-axis stability analyses during liftboat stability reviews. (Note, this recommendation is also specified in Conclusion 8.2 on page 60 of the *MSC Post-casualty Stability Analysis*.) [Formerly TS 01-23(1) R4.3]

TS 01-23(1) R5.10A.9 The NOSAC recommends that the USCG review and update Title 46 (*Shipping*)*;* Chapter I (*Coast Guard, Department of Homeland Security*); Subchapter S (*Subdivision and Stability*); Part 174 (S*pecial Rules Pertaining to Specific Vessel Types*) to account for lessons learned from the capsizing of Seacor Power. In particular, the NOSAC Subcommittee recommends that the USCG update the regulations used for evaluating righting arm curves to address orthogonal tipping (trimming freely). [Formerly TS 01-23(1) R4.4]

TS 01-23(1) R5.10A.14 The NOSAC recommends that the USCG analyze the reason(s) why the Marine Safety Center's wind load and moment values for Seacor Power "significantly" differed from ABS' values. Based on this analysis, the USCG should determine whether there is a need to create additional regulations or policy for future liftboat stability reviews.

TS 01-23(1) R5.10A.11 The NOSAC recommends that the USCG evaluate the eight conclusions in the *MSC Post-casualty Stability Analysis* and determine whether there is a need to create additional regulations or policy for liftboat stability. The eight conclusions are listed here for easy reference. [Formerly TS 01-23(1) R4.7]

8.1. When trim was limited to zero, SEACOR POWER passed the stability criteria in the 2001 ABS MODU Rules.

8.2. SEACOR POWER did not pass the regulatory standards of Part 174 (*Special Rules Pertaining to Specific Vessel Types*) *for all wind directions.*

8.3. SEACOR POWER passed the regulatory standards of Part 174 (*Special Rules Pertaining to Specific Vessel Types*) *for beam winds.*

8.4. SEACOR POWER was operated with significant aft trim which was not considered in any stability analysis.

8.5. SEACOR POWER did not meet the regulatory standards of §170.173 (*Criterion for vessels of unusual proportion and form*).

8.6. SEACOR POWER passed Part 174 (*Special Rules Pertaining to Specific Vessel Types*) *intact stability criteria using the varied axis method.*

8.7. Regulatory stability analysis calculation requirements are not clear.

8.8. Regulatory criteria wind speeds are not appropriate operational guidance.

TS 01-23(1) R4.8 The NOSAC recommends that the USCG conduct a study to determine whether dynamic stability analysis is a viable tool for calculating liftboat stability, and whether this would increase the safety of liftboats. The study could also include other types of vessels, and Best Available and Safest Technologies (BAST) principles as appropriate. Based on the results of the study, the USCG should determine whether there is a need to update existing regulations or policies such as 46 CFR 170 (*Stability Requirements for All Inspected Vessels*), NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*), and NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*).

TS 01-23(1) R4.9 The NOSAC recommends that the USCG conduct a study to evaluate alternative forms of tracking vessels, other than Automatic Identification System (AIS) or Long-Range Tracking and Identification (LRIT). [NOTE: LRIT is not a means of real-time tracking, but may be useful in some circumstances.] Additional forms of tracking vessels could provide the USCG with information that allows quicker response to emergencies. Alternative forms of tracking vessels could include, but are not limited to, port cameras, Vessel Traffic Services (VTS), AIS-SART, and AIS cessation transmission triggering.

TS 01-23(1) R4.10 The NOSAC recommends that the USCG maintain the existing requirements for the carriage of immersions suits on liftboats for areas between 32° North and 32° South latitudes as specified in 46 CFR 199.273 (*Immersion suits*). However, NOSAC suggests that Companies can voluntarily add immersion suits as part of their safety gear in this region as per risk assessment.

TS 01-23(1) R4.11 The NOSAC recommends that the USCG augment its Unmanned Systems Strategic Plan, dated March 2023, to include studies of the following.

4.11A Integrating private training organizations into the *Plan*.

4.11B Identifying risks and precautions associated with the use of Unmanned Systems during search and rescue.

4.11C Incorporating Artificial Intelligence capabilities at USCG Rescue Coordination Centers to filter out false EPIRB transmissions.

4.11D Placing Unmanned Systems on offshore facilities.

End of Specific Task Number 4.

SPECIFIC TASK NUMBER 5

The [NOSAC] Subcommittee should: Provide any additional recommendations that the subcommittee believes are relevant to this tasking.

The following chart provides a report of current United States Flag Liftboats in operation in May 2023. According to the report, there are a total of 65 US-Flag Liftboats in operation. Broken down by routes, Table 5.1 summarizes that information.

Table 5.1: United States Liftboats as of May 2023

Table 5.1: United States Liftboats as of May 2023

Route	Number of Vessels
Coastwise	5
Lakes, Bays, and Sounds	10
Lakes, Bays, and Sounds plus Limited Coastwise	4
Oceans	46
Total	**65**

USCG Addendum to the US National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)

U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), COMDTINST M16130.2F, dated January 2013.

The Addendum contains six (6) chapters regarding 1) Search and Rescue (SAR) System, 2) SAR Communications, 3) SAR Operations, 4) General SAR Policies, 5) Coast Guard Search and Rescue Units (SRUs), and 6) Procedures for Underwater Incidents.

Section 1.5 details Liaison and Contingency Exercises with six (6) subsections with headings: Contingency Response Community; SAR Facility List; Mass Rescue Operations Contingency Exercises; Information Sharing and Case Coordination; SAR Assessments; and Sharing Computer SAR Applications.

TS 01-23(1) R5.1 USCG Contingency Preparedness System

NWS Service Instruction 10-315, NWSPD 10-3: Marine Weather Message.

National Weather Service Instruction 10-315, February 11, 2020, Operations and Services; Marine and Coastal Weather Services, NWSPD 10-3: *Marine Weather Message*.

"This procedural directive describes the marine weather message products issued by National Weather Service (NWS) Weather Forecast Offices (WFOs) serving the U.S. coastal waters and Great Lakes (except in Alaska), guidelines associated with this product, and detailed content and format. Marine Hazard products issued under the Marine Weather Message (MWW) have changed their format and Small Craft Advisories have been consolidated into one product."

This directive defines seven (7) types of marine watch "product names" The seven types are:

- Gale Watch;
- Storm Watch;
- Hurricane Force Wind Watch;
- Heavy Freezing Spray Watch;
- Hazardous Seas Watch;
- Tropical Storm Watch for the Atlantic, Eastern Pacific, Central Pacific, and western North Pacific Hurricane basins; and
- Hurricane/Typhoon Watch for the Atlantic.

Ther are eight (8) Marine Weather Warning Products. These warnings are:

- Ashfall Warning;
- Gale Warning;
- Storm Warning;
- Hurricane Force Wind Warning;
- Heavy Freezing Spray Warning;
- Hazardous Seas Warning;
- Tropical Storm Warning for the Atlantic, Eastern Pacific, Central Pacific, and Western North Pacific Hurricane basins; and
- Hurricane/Typhoon Warning for the Atlantic, Eastern Pacific, Central Pacific, and western North Pacific Hurricane basins.

There are seven (7) types of Marine Weather Advisory Products. These seven types are:

- Ashfall Advisory;
- Brisk Wind Advisory;
- Dense Fog Advisory;
- Dense Smoke Advisory;
- Freezing Spray Advisory;
- Low Water Advisory; and
- Small Craft Advisory.

The Marine Weather Watch is an event-driven product and is issued at least every 12 hours until a warning or advisory is issued or cancelled. "Marine Weather Watches

provide our users and partners 12 to 48 hours advance notice of hazardous marine weather events which have the potential to threaten life or property."

Marine Weather Warnings are issued when hazardous marine weather is imminent, occurring or highly likely over part or all of the forecast area. Updated warnings should be issued "at least once every six to eight hours until the event ends or is cancelled".

"Marine Weather Advisories provide our users and partners advance notice of hazardous marine weather events which could lead to life-threatening situations if caution is not exercised." Updated advisories should be issued "at least once every six to eight hours until the event ends or is canceled".

All Marine Weather Messages follow the same bulleted format with the following information.

- Universal Geographic Code (UGC) Type
- Mass News Disseminator (MND) Broadcast Instruction Line
- MND Product Type Line
- Marine Weather Message Content
- Segmented Forecast Information

Full Explanation of each item can be found in 5.3 (*Watches*), 6.3 (*Warnings*), and 7.3 (*Advisories*).

Appendix A provides examples of Marine Weather Messages (MWWs) associated with various Watches, Warnings, and Advisories. Information contained within these messages appears to be satisfactory.

TS 01-23(1) R5.2 National Weather Service Frequency of Messages

Weather Procedures and Company Safety Management System

The NOSAC Subcommittee discussed the documentation of risk and response to weather situations of high winds and heavy weather conditions in a Company's Safety Management System (SMS). While Companies may have procedures in place, one suggestion from this report is to review and update procedures as necessary or to develop new procedures as necessary. The purpose of this exercise is to ensure that the Master and other licensed personnel have clear instructions and guidance in order to best address increasingly challenging environmental conditions to protect life, the vessel and assets (e.g., cargo, equipment, etc.), and the environment.

TS 01-23(1) R5.3 Weather Procedures and Company Safety Management System

Weather Reporting Assets in Port Fourchon, LA.

The NOSAC Subcommittee has identified that Port Fourchon, LA, does not have its own weather station. This information was obtained from the Executive Director of the Port Fourchon/SL Airport. "We do not have a weather station in Fourchon. NOAA has some equipment there, but it's basically a fancy tide gauge. We work with WWLTV in New Orleans for a Port Fourchon weather product that they produce for us daily." Here is a sample of a weather report provided by WWLTV in New Orleans.

Figure 1: Example 4WWL Weather and Tide Information for Port Fourchon

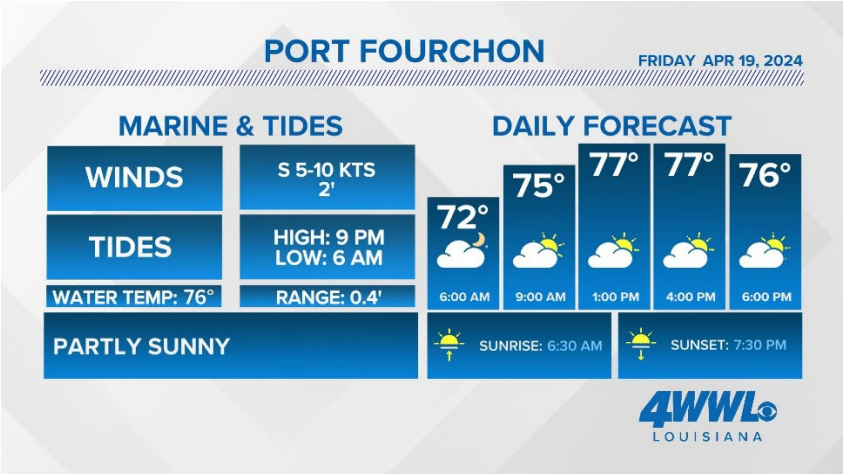

Figure 1: Example 4WWL Weather and Tide Information for Port Fourchon

A survey was conducted with the following questions and response from industry. The survey was administered by **Mr. Aaron Smith**, President and CEO of Offshore Marine Service Association (OMSA) and **Captain Tracy Phillips**, Retired USCG, Chair of Seacor Power Investigation.

1. "It is the NOSAC Subcommittee's understanding that a mariner must proactively search for Special Marine Warnings instead of such warnings being sent directly to the mariners or broadcast. If this understanding is correct, are there steps or actions that vessel operators take to ensure mariners are provided with Special Marine Warnings? If you have such a system, are there parts of it that are especially effective?"

   Response: "Our crews complete a "Vessel Voyage Plan" checklist prior to departure. This requires that they reference any and all available weather services for relevant information, special marine warnings or any other weather that may impact their area of operation. This has proven effective in our fleet."

2. "It is understood that the National Weather Service radar stations cannot accurately see all of the areas close to the Gulf Coast. Have you found this understanding to be accurate, if so, does this understanding cause a gap in local weather knowledge and have you taken any steps to address this gap through your own equipment or third-party equipment?"

Response: "After speaking with several of our Senior Captains there is absolutely a gap in accurate coastal weather information and its accuracy. Our Captains have access to several third-party weather services that can give more detailed forecasts for the area the vessel is operating in. All of our vessels are equipped with STARLINK internet, that reliable internet connection plays a large role in their access to accurate, timely and emergency weather information."

Refer to TS 01-23(1) R1.13 which addresses these survey results by requesting the USCG to evaluate better coverage for the areas along the Gulf Coast.

Non-Traditionally Shaped Vessel Stability Standards, Project Summary

Acquisition Directorate, Research & Development Center (RDC), *Non-Traditionally Shaped Vessel Stability Standards, Project Summary*; Project No. 1024, Final, Contract #GS00Q14OADU420; February 2024.

This publication was developed in collaboration with David Muller (G&C), John Cross Whiter (G&C), Todd Carrico (G&C), David Bourg (MiNO Marine), Leila Marshall (MiNO Marine), LT Dean Gilbert (RDC), Matthew Lees (RDC). The report addresses Recommendation #2 of the USCG (p. iii): *Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021*. Recommendation #2 follows.

"**Recommendation 2**: The Commandant should expedite their current study of liftboat stability, and then immediately use the results of that study to revise liftboat stability regulations. The Commandant should consider the following actions:

- Clearly define appliable stability requirements for liftboats inspected under 46 CFR Subchapter I and Subchapter L.
- Require liftboat stability calculation to evaluate realistic loading conditions and realistic trim conditions.
- Impose additional safety margins to mitigate the risks posed by environmental variability of wind and waves.
- Update the wind speed vs height profile used to calculate wind loads.
- Update wind calculation shape factors for cylindrical legs with racks.
- Provide clear procedures to establish operating restrictions without relying on oversimplified regulatory thresholds.

Action: I concur with the recommendation. The results of the Coast Guard's Research and Development Center (R&DC) stability study are scheduled to be completed in the Fall of 2023. The Coast Guard will use the results of the study to either validate or revise its liftboat stability regulations, with particular focus on the following:

- Definition of applicable stability requirements for liftboats inspected under both Subchapter I and Subchapter L of Chapter I of 46 CFR;
- Requirements for realistic loading and trim conditions to be evaluated in liftboat stability calculations;
- Requirements for safety margins to mitigate the risks posed by wind and wave variability; and
- Establishing procedures to set operating restrictions that do not relay on oversimplified regulatory thresholds.

The Coast Guard will also consider updating the wind speed versus height profile based on references identified in the MBI report. Additionally, technical literature will be reviewed to assess the basis on which wind calculation shape factors can be updated for cylindrical legs with racks. This response will be shared with R&DC for consideration regarding any additional areas of study."

"This study includes a comprehensive review of the current state of non-traditional vessel stability evaluation techniques while also proposing a five-step procedure to address identified deficiencies. Deficiencies addressed directly by the study include definition of non-traditional hull forms, identification of critical axes, and application of current wind overturning moment estimation in stability software, such as General Hydrostatics (GHS). However, when studying dynamic response in waves, wind force estimation, and free twist righting arm calculations, it becomes clear that the existing body of knowledge does not currently support the development of comprehensive stability criteria that address the failure modes of all non-traditional vessels. This report includes recommendations and conclusions that will guide a path forward to the eventual development of improved no-traditional vessel stability criteria." (p. iii, *Abstract*)

Non-traditional hull (NTH) forms are not necessarily similar. Four types of NTH forms were analyzed in this report: liftboats, jack-up drilling rigs, column-stabilized Mobile Offshore Drilling Units (MODUs: semi-submersibles), and wind turbine installation vessels.

"Non-traditional hull forms in the offshore energy, oil and gas industries are typically characterized by hull shapes that may be asymmetrical or have low length-to-beam (L/B) ratios when compared to traditional ship-shaped hull forms. However, there is no concise, published definition, and some rules of thumb are deceiving." (p. 3, 2.2.1)

"Current stability criteria in CFR 46 Subchapter S {*Subdivision and Stability*, Parts 170-174} are derived from traditional hull form criteria that have been implemented since the 1940's." (p. 3, 2.2.1)

"CFR regulatory requirements still require fixed trim or free trim righting arm calculations using traditional methods and are silent on other righting arm calculation algorithms;

although, the American Bureau of Shipping (ABS) does implement free twist methods in their evaluations." (p. 4, 2.2.1)

Table 3, Summary of deficiencies in stability rules, (p. 6) lists 12 deficiencies such as extrapolation, critical axis, range of stability, righting arm solver, wind, waves, non-traditional, policy, downflooding angle, free surface corrections, GMt, and secondary effects. Explanations for each deficiency are listed in the table.

"A tabulation of accidents and other incidents was made to determine if any patterns are present in the failure modes of non-traditional vessels. National Transportation Safety Board (NTSB), USCG, and ABS reports were reviewed along with online articles to establish common failure modes. The results showed that five common failure modes exist, which were:

- Excessive wind
- Excessive waves
- Progressive flooding
- Flooding from structural failures
- Operational issues (forecast data, towlines, failure to follow procedures)"

Table 5.2: Table 4. NTH failure mode summary, from the report.

Type	Operator	Name	Distance Offshore	General Area	Date	Intact or Damage	Failure Description	Weather	Waves (ft)	Wind
Liftboat	SEACOR	POWER	7 mi	Gulf of Mexico	4/13/2021	I	Excesssive wind and wave, capsize	Un-named Weather	2 to 4	80 kts
Cargo Ship	TOTE Services	SS EL FARO	40 nm	South Atlantic	10/1/2015	I	Downflooding, Engine Failure, Capsize	Hurricane Joaquin		104 kts
MODU/Jack-Up	Rowan Companies Inc.	ROWAN GORILLA I	500 nm	North Atlantic	12/15/1998	D	Hull Fractures, Downflooding, Capsize	Un-named Weather	50	60 mph +
Liftboat	Montco Offshore	M/V CHRISTIE		Gulf of Mexico	3/30/1993	I	Unexpected Capsize	Un-named Weather	5 to 7	15-20 kts
Liftboat	Chevron USA (charter)	M/V AVCO V	8 mi	Gulf of Mexico	7/31/1989	I	Water on Deck, Shifted Cargo, Capsize	Hurricane Chantal	15	30 kts
Liftboat		MV TITAN		Gulf of Mexico	6/29/1989	D	Mode Changing, Flooded Leg, Capsize	---		
Semi-Sub	ODECO/MOBIL	OCEAN RANGER	166 nm	East of St. John's, NF	2/15/1982	I	Flooding of Chain Lockers, Excessive List, Capsize	Un-named Weather	50 plus max	90-100 kt
MODU/Jack-Up	Dan-Tex Int'l	DAN PRINCE	300 mi	Gulf of Alaska	10/22/1980	D	Hull Fractures, Downflooding, Capsize	Un-named Weather	60 ft	75 kts
MODU/Jack-Up		OCEAN EXPRESS		Gulf of Mexico	4/15/1976	D	Leaking, Tug Engine Failure, Broken Towline, Capsize	Un-named Weather	25	

Table 4. *NTH failure mode summary.* (p. 8, 2.2.5)

Table 5.3: Table 5. Summary of NTH Casualty Statistics

Name	Persons on Board	Fatalities	Missing	Rescued
Seacor Power[1]	19	6	7	6
SS El Faro[2]	33	33	0	0

[1] NTSB: National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022*.

[2] NTSB: National Transportation Safety Board (NTSB): *Sinking of US Cargo Vessel SS El Faro Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas October 1, 2015*. Accident Report NTSB/MAR-17/01; PB2018-100342, Adopted December 12, 2017.

Rowan Gorilla I[3]	27	0	0	27
M/V Christie[4]	4	0	0	4
M/V Avco V[5]	14	7	3	4
MV Titan[6]	9	1	2	6
Ocean Ranger[7]	84	22	62	0
Dan Prince[8]	18	0	0	18
Ocean Express[9]	35	13	0	22

Table 5. Summary of NTH Casualty Statistics

This study resulted in limit values for non-traditional hull forms as follows.

Table 5.4: Table 6. Non-traditional vessel criteria, from the report.

Criteria	Limit
1. Multiple hulls and/or columns	Yes
2. Significant fore-aft hull volume asymmetry	Yes
3. Low length-to-beam ratio	<2.5
4. High beam-to-draft ratio	>10
5. High beam-to-freeboard ratio	>10
6. Non-ship-shaped hull	Yes
7. Significant waterplane asymmetry in evaluation load conditions	Yes
8. Sensitivity to Wind - windage to displacement.	>5

Table 6. *Non-traditional vessel criteria*. (p. 11, 3.1.2)

[3] NTSB: National Transportation Safety Board (NTSB): *Capsizing and Sinking of the Mobile Offshore Drilling Unit Rowan Gorilla I in the North Atlantic Ocean December 15, 1988*; Marine Accident Report PB89-916406; NTSB/MAR-89/06, dated September 12, 1989.

[4] USCG: *Investigation Activity Report, MC93005646-M/V Christie: Capsize*, MISLE Case Number 39079, Activity Start Date, March 30, 1993.

[5] NTSB: National Transportation Safety Board (NTSB): *Capsizing and Sinking of the U.S. Liftboat M/V Avco V, Gulf of Mexico, July 31, 1989*; Marine Accident Report NTSB/RAR-91/02, PB91-916402, Adopted April 16, 1991.

[6] NTSB: National Transportation Safety Board (NTSB): *Safety Recommendation from Admiral J. William Kime, Commandant, US. Coast Guard, dated January 14, 1991 for MV Titan*

[7] USCG: United States Coast Guard (USCG): Marine Casualty Report: *Mobile Offshore Drilling Unit (MODU) Ocean Ranger, O.N. 615641, Capsizing and Sinking in the Atlantic Ocean, on 15 February 1982 with Multiple Loss of Life*; Report No. USCG 16732/0001 HQS 82; dated 20 May 1983.

[8] Associated Press, "Drilling rig capsizes, plunges to bottom", The Anchorage Times, October 22, 1980, page B-2.

[9] NTSB: National Transportation Safety Board (NTSB): *Capsizing and Sinking of the Self-elevating Mobile Offshore Drilling Unit Ocean Express Near Port O-Connor, Texas, April 15, 1976*; Marine Accident Report NTSB-MAR-79-4, dated April 5, 1979.

How the various types of non-traditional hull forms relate to the criteria above are as follows.

Table 5.5: Table 7. Non-traditional vessel criteria results, from the report.

CRITERIA	LIFTBOAT	JACK-UP	MODU Semi in Transit	WTIV
1. Multiple hulls and/or columns	No	No	Yes	No
2. Significant fore-aft hull volume asymmetry	Yes	Yes	No	No
3. Low length-to-beam ratio	1.6	0.9	1.4	2.9
4. High beam-to-draft ratio	10.5	13.7	7.8	7.5
5. High beam-to-freeboard ratio	26.2	27.9	70.0	11.3
6. Non-ship-shaped hull	No	Yes	Yes	No
7. Significant waterplane asymmetry	Yes	Yes	Yes	No
8. Sensitivity to Wind	7.7	22.1	6.5	14.8

Table 7. *Non-traditional vessel criteria results*. (p. 11, 3.1.2)

"…IMO MSC.1/Circ.1200 [*Interim Guidelines for Alternative Assessment of the Weather Criterion*] guidelines specifically allow for model tests to determine the relevant characteristics of a candidate vessel to apply the weather criteria." (p. 15, 3.2.1)

The report goes into detail regarding Wind Forcing Considerations from ABS, DNV, SNAME OC-8 [from e. a. Hodapp], and the MiNO Marine Experience. (pp. 15-22)

Procedures for non-traditional stability evaluations are found in section 3.4. (pp.24-27)

Analysis methodology verification for liftboats is found in section 4.1.1. (pp. 27-28). The other three types of vessels (jack-ups, semis, and wind turbine installation vessels) are found on the subsequent pages.

"To address the wave dynamics problem highlighted in Section 3.2 [*Stability Evaluation Criteria for Non-Traditional Hull forms*], a time-domain simulation analysis was performed to provide a better understanding of the dynamics of non-traditional hull forms and to attempt to apply this knowledge to updating the stability criteria. A typical Liftboat was selected for this study, because this is a vessel type which is commonly used throughout the world, there have been a number of serious stability incidents involving this type of vessel, and this type of vessel exhibits many hydrostatic and hydrodynamic characteristics which are not handled well by conventional ship stability rules (see Section 3.1 [*Identification of Non-Traditional Vessels*])" (pp. 61-77, 5).

[Note: Mr. Bill Peters identified a couple of clarifications within the report for the benefit of NOSAC (20 May 2024 email at 1044):

"1. You are correct that the term "Liftboat" in the first sentence of 4.3.3.3. should be replaced with "MODU SEMI"; and
2. The initials "RAO" mean "response amplitude operator". This term is identified in SNAME's Principles of Naval Architecture (ed. 1989, Vol. III, Ch. 8 "Motions in Waves", pg. 85) – "… when response amplitude operator or RAO is used here it will mean the ratio of the (scalar) amplitude of response and the exciting regular wave amplitude, …" In other words, at a certain wave encounter frequency, the wave amplitude (feet or meters – equal to one-half the wave height) can be multiplied by the RAO to obtain the motion amplitude for that frequency (with consistent units). There are different RAOs for different motion types (e.g., roll, heave, etc.)."]

The authors of the report recommend that more study be made in the areas of wind force estimation, wave dynamics, and righting arm analysis refinement. (pp. 77-79, 6)

TS 01-23(1) R5.4 Non-traditional Shaped Vessel Stability Standards Study

StormGeo

One of the subscription weather services used by some liftboat owners and operators is StormGeo. StormGeo is web-based at https://stormgeo.com/. "Whenever possible, we combine weather data with data from the client to provide advanced solutions for optimization and efficiency. Importantly, we connect the power of both AI and human expertise, striking the balance between fully automated and human-led solutions – safely and securely." StormGeo uses industry experts, experienced analysts, meteorologists, and engineers to develop information and solutions.

The NOSAC has no specific recommendation regarding StormGeo; however, liftboat companies and other types of vessels that need weather services, may consider researching StormGeo for their company. The NOSAC Subcommittee concurs with the content of this document.

Radio Technical Commission for Maritime Services (RTCM)

The website for RTCM is at https://www.rtcm.org/. RTCM is a member subscription service.

"In the United States, the Federal Communications Commission and U.S. Coast Guard use RTCM standards to specify radar systems, Emergency Position Indicating Radio Beacons, and the basic

version of Digital Selective Calling radios. Personal Locator Beacons used on land in the U.S. are required to meet an RTCM standard.

> RTCM standards are used internationally for Differential Global Navigation Satellite Systems and Electronic Chart Systems.
>
> RTCM members also have the opportunity to monitor and participate in the development of international standards for maritime radio communication and electronic navigation systems."

RTCM Operates in the following manner.

- "Facilitates the dissemination of Marine Safety Information (MSI) from producers to users
- Supports governmental delegations to the International Maritime Organization (IMO) and International Telecommunication Union (ITU) by providing a channel for private sector experts to assist in the formulation of policy
- Convenes special committees at the request of government authorities and others to resolve issues requiring private sector input and experts
- Provides technical cooperation and support to the National Search and Rescue Committee, International Electrotechnical Commission, National Marine Electronics Association and others
- Cooperates with organizations representing land mobile and aviation users to ensure that shared systems such as emergency satellite beacons and standards for autonomous vehicles utilize internationally-harmonized standards
- Represents Emergency beacon (406 MHz) manufacturers at international Cospas-Sarsat meeting"

A list of what RTCM does is as follows.

- "Leads policy initiatives to ensure vital processes, systems, trained users and spectrum are available for maritime users and protected from encroachment
- Provides forums to enable training, policy development and standards for distress and safety systems, saving thousands of lives yearly
- Oversees the ongoing evolution of radio from Morse Code with data rates of about 13 bits per second to satellite systems providing megabit per second capabilities
- Supports worldwide emergency beacon programs and their evolution; more than 2 million beacons have assisted in saving more than 40,000 lives to date
- Ensures vessel and shore-based radar systems and associated transponders work effectively together with related electronic charts for navigation purposes

- Creates standards for satellite positioning and navigation systems such as GPS to facilitate all modes of transportation, surveying, geodesy, precision agriculture, and autonomous vehicles, ensuring vital high integrity and centimeter-accuracy capabilities
- Represents members' interests in many national and international bodies including IMO, ITU, IEC, the FCC and the USCG amongst others, and provides feedback on matters of interest to members
- Conducts an annual assembly with prominent speakers, exhibits, and collaborative meetings of interest to all in the communities we serve"

Since the US Coast Guard uses RTCM standards for communication and navigation equipment, there is no specific recommendation from the NOSAC. The NOSAC Subcommittee concurs with the content of this document.

USCG GMDSS Task Force

Information regarding the USCG GMDSS task force can be found at Task Force Background | Navigation Center (uscg.gov); https://navcen.uscg.gov/task-force-background.

"The U. S. Coast Guard, with the support of other government maritime organizations, chartered the GMDSS Task Force in 1993 to assist the private sector in implementing the GMDSS. In 2005, the Coast Guard passed direct sponsorship of the Task Force to the Radio Technical Commission for Maritime Services (RTCM), a non-profit public interest group which provides secretarial support and hosts Task Force meetings. The National Marine Electronics Association (NMEA), a non-profit Trade Organization representing Marine Electronic manufacturers and service agents, also hosts a Task Force meeting annually."

The NOSAC has no specific recommendation regarding the GMDSS Task Force except to continue finding ways to improve telecommunications technology and practical use for mariners.

Port Fourchon, LA, Weather Reporting and Forecasting.

The South Lafourche Airport provides real-time weather to the National Weather Service (NWS). The National Oceanic and Atmospheric Administration (NOAA) has a PORTS® Station in Port Fourchon, LA, that is only for tides and water levels, not a full weather station. The Port of Fourchon pays for PORTS® system maintenance. The Port of Fourchon works with WWL TV Channel 4 to provide daily weather forecasts.

"NOAA's PORTS® program is a decision support tool that improves the safety and efficiency of maritime commerce and coastal resource management. PORTS® collects and disseminates observations of water levels, currents, salinity, bridge air gap and

meteorological parameters (e.g., winds, atmospheric pressure, air and water temperatures) that mariners need to navigate safely. The objectives of the PORTS® program are to promote navigation safety, improve the efficiency of U.S. ports and harbors, and ensure the protection of coastal marine resources." [reference: https://www.tidesandcurrents.noaa.gov/ports_info.html; Physical Oceanographic Real-Time System (noaa.gov).]

The NOSAC has no specific recommendation for the US Coast Guard regarding the Port of Fourchon. The NOSAC Subcommittee concurs with the content of this document.

OTC-29289-MS: A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study.

OTC-29289-MS; A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study; Kevin Berto, Texas A&M University; David Hodapp, Chevron Energy Technology Company; Jeffrey Falzarano, Texas A&M University; for Offshore Technology Conference (OTC) 6-9 May 2019; © 2019.

This OTC paper was designated as *Exhibit 37 - 2017 SNAME OC-8 Comparative Wind Load Study* as referenced by the *USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021*. Excerpts of this report are provided below.

Abstract.

"This paper documents the results from the 2017 Society of Naval Architects and Marine Engineers (SNAME) OC-8 Panel Comparative Wind Load Study. Initial unpublished results were presented at a one-day panel at the 2017 SNAME Maritime Convention; however, the final results are brought together for the first time in this paper.

A blind, comparative study was organized through the SNAME OC-8 Panel in 2017 to assess the relative accuracy and repeatability of existing wind load estimation methods. Twenty-five companies and organizations throughout the world participated in this study, which encompassed three available wind load estimation methods: empirical building block procedures, wind tunnel testing, and Computational Fluid Dynamics (CFD). To permit an 'apples-to-apples' comparison, the same representative semisubmersible design was used by all participants, including a single physical model shipped consecutively to each of the five wind tunnel facilities participating in the study.

The most significant finding from the study is the remarkably low variability in wind tunnel and CFD results relative to the empirical building block method incorporated in the U.S. Code of Federal Regulations (CFR), classification rules, and industry codes for stability calculations. Moreover, only wind tunnel and CFD results were able to accurately quantify the contribution of a lifting force and its effect on the overturning moment. The lessons

learned from the comparative study will be incorporated into a long-awaited revision to SNAME's wind tunnel testing guideline, and has inspired the development of a new industry guideline which will broadly address wind load estimation methods in design, including the use of CFD throughout the design spiral."

Introduction.

"Current U.S. regulation of floating offshore production platform stability mandates that final wind load estimates be completed using a *traditional building block method*."

"*Wind tunnel testing*, as the name implies, involves physical measurements of the wind loads (drag and lift forces & overturning moment) acting on a scale model. Systematic wind tunnel testing is the de facto industry standard for accurately predicting forces and moments on offshore units. Nevertheless, wind tunnel test results are not currently accepted by U.S. regulatory authorities for use in stability calculations.

"*CFD*, simply stated, is the numerical equivalent of wind tunnel testing."

[**Note**: italics used in the above three paragraphs were provided by the NOSAC.]

"The central finding of the study was the remarkably low variability of the experimental (wind tunnel) and numerical (CFD) results relative to the empirical method. The identification of erroneous experimental data in the study also suggests the value of adopting a simple verification model to ensure the accuracy of wind tunnel results."

Set-up.

"A 1:240 scale was dictated by the model test facilities. Tests were performed for a typical in-place operating condition."

Methods/Process: Empirical Methods Program.

"The empirical methods working group consisted of eleven individual participants representing the following stakeholder groups: classification societies, operators, engineering companies, and research institutions."

Methods/Process: CFD Program.

"Ten organizations, relying on individual best practices, provided CFD data for the SNAME OC-8 Panel Comparative Wind Load Sudy. The following stakeholder groups were represented: classification societies, operators, engineering companies, research institutions, and academia. In the absence of an industry guideline, the intent was to quantify the 'real-world' accuracy of CFD relative to wind tunnel testing based on current

industry practice, and the 'real-world' variability in CFD estimates from one participant to the next."

Methods/Process: Wind Tunnel Program.

"The primary objective of the wind tunnel program was for five independent and established wind tunnels to produce above waterline force and moments for the eight-column semisubmersible model."

Conclusion.

"This report of the SNAME OC-8 Panel Comparative Wind Load Study for offshore floating platforms is a pioneering comparison of three approaches to wind load estimation; namely, the empirical building block method, the wind tunnel test, and Computational Fluid Dynamics (CFD). The rigorous assessment of available wind load estimation approaches is supported by a large data-set and diversity among the 25 study participants. Significant among the findings is a remarkably low variability and thus consistency in wind tunnel and CFD results relative to the traditional empirical building block method specified in the U.S. Code of Federal Regulations (CFR), classification rules, and industry codes for stability calculations. Importantly, only wind tunnel and CFD results were capable of quantifying the lifting force and its effect on the overturning moment."

"Historically, regulatory acceptance of wind tunnel testing has been hampered by the lack of a governing industry standard. The present study, conducted in accordance with a draft of the upcoming revision to SNAME T&R Bulletin 5-4 [*Guidelines for Wind Tunnel Testing of Offshore Units (2020)*], attempts to close this gap. The close agreement of wind loads for the studied geometry from one facility to the next (and for replicate testing at the same facility) evidences the accuracy and repeatable results of wind tunnel tests."

"The present study highlights CFD as a promising new technology for the offshore industry in the estimation of wind loads. The CFD results presented herein are largely indistinguishable from the wind tunnel measurements for the studied geometry. Ongoing industry efforts, including those of the SNAME OC-8 Panel, are focused on developing an industry standard to ensure the accuracy and repeatability of CFD wind load estimates for a variety of hull forms and orientations."

TS 01-23(1) R5.5 SNAME Wind Load Study

USCG: Navigation Center, Maritime Telecommunications

USCG: Navigation Center, *Maritime Telecommunications*, website.

The USCG Navigation Center is located in Alexandria, Virginia. Information regarding maritime telecommunications can be found on the web at Maritime Telecommunications | Navigation Center (uscg.gov); https://navcen.uscg.gov/maritime-telecommunications.

Various other sources of information such as Navigation Rules Broadcast Notices to Mariners (BNM), Local Notices to Mariners (LNM). Global Positioning System (GPS), Communications, Maritime Safety Information (MSI), Automatic Identification System (AIS), Ice Patrol, Space Operations, and archived information are readily available and can be used by Owners, Operators, and Mariners.

The NOSAC Subcommittee discussed usage of cell phones as a tool of emergency equipment for mariners. From the information following, cell phones may be a useful tool while a vessel is in inland waters; however, its capability is reduced as the vessel travels farther from shore. Information regarding maritime telecommunications and use of cell phones from the website follows.

"Although telecommunications technology is improving quickly, people at sea do not have access to the same telecommunications infrastructure people ashore have. Like people ashore, Mariners need to access international shore telephone and data public switched networks. Additionally they need to access many maritime specific communications listed below:

- Mariners need to be able to communicate with other ships of any size or nationality.
- Mariners need to be able to receive and send urgent maritime safety information.
- Mariners need to be able to send or receive distress alerts in an emergency to or from rescue coordination centers ashore and nearby ships anywhere in the world.
- Maritime telecommunications systems must be internationally interoperable. Bringing new telecommunications technology to mariners can be difficult, since to be interoperable, the technology must be affordable, acceptable and available to most ships and maritime countries.

The Coast Guard does not advocate cellular telephones as substitute for the regular maritime radio distress and safety systems recognized by the Federal Communications Commission and the International Radio Regulations -- particularly VHF maritime radio. However, cellular phones can have a place on board as an added measure of safety.

Cellular Phone Limitations in an Emergency

- The Coast Guard does not endorse cellular phones as a primary means of distress notification in the maritime environment. Cell phones have several shortcomings in the maritime environment that can delay search and rescue authorities.
- During a search and rescue (SAR) case, the Coast Guard attempts to broadcast as much information as possible about the case. These broadcasts provide information

to mariners that may be in the vicinity of the SAR case so that they can respond appropriately. A cell phone limits communications between the Coast Guard and the mariner in distress, because other possible rescuers in the area are not immediately made aware of the SAR case. In contrast, a marine radio call allows all other mariners in the area to overhear the distress call and respond if possible.

- Most cellular phones are designed for a land-based service. Their offshore coverage is limited and may change without notice.
- Locating a cellular caller can be difficult. If you don't know your position precisely, the Coast Guard may have difficulty locating you."

Additional information regarding maritime information found on this website include the following: Telecommunications, GMDSS, Rescue 21 Distress System Coverage, Digital Selective Calling, US VHF Channel Frequencies, HF Distress Frequencies, MF and HF Channel Information, What frequency do you mean?, International VHF Channels and Frequencies, IMO Information, Marine Safety Information Broadcasts, Maritime Mobile Service Identity (MMSI) [used in EPIRBs and other emergency equipment], Radio Information for Boaters, Radio Watch Requirement, Reference Information, and Contact Our Watch or Subject Matter Expert (SME).

The NOSAC has no specific recommendation regarding the USCG Navigation Center but encourages interested stakeholders to take advantage of the significant amount of information available in this public forum. The NOSAC Subcommittee concurs with the content of this document.

CEPT Handling of EPIRBs to Prevent False Alerts

European Radiocommunications Committee (ERC) within the European Conference of Postal and Telecommunications Administrations (CEPT); ERC Report 110, *Handling and Usage of Emergency Position Indicating Radio Beacon (EPIRB) to Prevent False Alerts*, Bergen, June 2001.

"The European Conference of Postal and Telecommunications Administrations - CEPT - was established in 1959 by 19 countries, which expanded to 26 during its first ten years. Original members were the monopoly-holding postal and telecommunications administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardisation issues. Today 46 countries are members of CEPT." [https://www.cept.org/cept, July 5, 2024]

Selected passages from the ERC Report 110 follow.

"1. **Introduction**. Many vessels, aircraft and in some circumstances individuals, are equipped with battery powered emergency radio beacons, so that, in case of an emergency, the beacon can be activated and located. The transmissions from the beacons

are received by satellite systems operated by Cospas-Sarsat and Inmarsat to be forwarded to the appropriate control centre for search and rescue operations.

However, search and rescue organisations have, on many occasions, identified sources which are unlikely to be genuine emergencies, in particular, those indicating a land based location. In these circumstances, the search and rescue organisations, in some countries, seek the assistance Enforcement authorities to locate and deactivate the source. These alerts are often found to be due to poor handling, inefficient maintenance, careless disposal etc. of the device.

One of the objectives of administrations is to keep the radio spectrum clear of interference. In achieving this objective it is necessary to prioritise the investigation of categories of interference. Emergency beacons attract the highest priority of investigation, requiring urgent attention, resulting in a high resource implication for the administrations. In many cases such investigations could be avoided by greater attention being given to the correct usage and handling of the devices by the user or owner."

"**3. History**. In the [nineteen] seventies an aeroplane with two US congressmen crashed in a remote region of Alaska. A massive search and rescue effort was mounted, but no trace of the aircraft has ever been found. In reaction to this tragedy, the US Congress mandated that all aircraft in the United States carry an Emergency Locator Transmitter (ELT).

This device was designed to automatically activate after a crash and transmit a homing signal. Satellite technology was still in its infancy and the frequency selected for transmissions at that time was 121,5 MHz, the international aeronautical emergency frequency. This system worked, but had many limitations.

The frequency was cluttered, there was no way to verify from where the signal was originating and most importantly, another aircraft had to be within range to receive the signal. Thus began development of the present EPIRB satellite systems, by Cospas-Sarsat and Inmarsat satellite systems."

"**4. What is an EPIRB?** When activated, an EPIRB transmits an emergency signal, which is picked up by satellites, stored and forwarded to rescue co-ordination centres. There are basically three different applications used and (see chapter 5). EPIRBs are solely intended to be used in the case of emergency situations. Other use is prohibited."

"**5. Applications**. Beacons transmit on four dedicated emergency frequencies:

- 121.5 MHz: This frequency is used by older beacons which do not transmit any encoded information.
- 243.0 MHz: This frequency is used in some older beacons deployed by the U.S. military and NATO forces. Some new 406 MHz ELTs operate on 243,0 MHz;

- 406.0 to 406.1 MHz: beacons which transmit, within the alert, digitally encoded information containing at least the identity of the ship, aircraft or person. In addition to the 406 MHz signal, a 121,5 MHz transmission may be included for homing purposes;
- 1.6 GHz similar to the 406 MHz models. In addition they carry coded geographical position information."

"**8. Examples of Typical False Alert Interference Reports**". Portions of the table are included here for examples of maritime false alerts.

Table 5.6: Table 8. Examples of Typical False Alert Interference Reports

Operating frequency (MHz)	Source	Reason for Activation
121.5	Life Raft EPIRB	Activated due to sea water damage
121.5	Fishing Boat	Vandalism of moored boat resulting in EPIRB being thrown into water and being activated
121.5, 243	Life Jacket	Careless handling after use
121.5, 243	EPIRB traced to private house (Marine type)	Activation caused by pin becoming dislodged during storage
121.5, 243	Yacht	Faulty switch.
121.5	Stand alone EPIRB (Marine)	Located to rubbish dump where it had been disposed of without battery being removed.
121.5	Marine Yacht Race	Faulty equipment activation
121.5	Vessel	Mishandling of EPIRB
121.5	Marine	Traced to business premises - activated when device fell off desk
406	French vessel	Traced to landfill site. Disposed of carelessly

Table 8. *Examples of Typical False Alert Interference Reports.*

"**9. Statistics**. Information provided by some ERC member administrations on the number of false alerts their enforcement authorities have dealt with are as follows:

Table 5.7: Table 9. False Alert Statistics by Country 1997-2001

Country	1997	1998	1999	2000	2001
Austria	-	-	-	9	-

Norway	-	-	-	-	10
Switzerland	9	13	12	17	-
The Netherlands	65	94	93	-	-
United Kingdom	115	147	116	-	-
Sweden	186	179	233	202	-
Portugal	-	-	-	1	1

Table 9. *False Alert Statistics by Country 1997-2001.*

"**10. Conclusions**. It is the conclusion that the main cause of false alerts are associated with:

a) poor handling;
b) poor maintenance;
c) a lack of awareness by both maintenance personnel and users of the consequences of not taking due regard to 1) and 2)."

"**11. Recommendations**.

c. General Recommendations, *Administrations should endeavor to*:

- establish close links with ship operators, aircraft operators and the associated maintenance personnel who use or service EPIRBS in order to improve their understanding of potential problems;
- make users fully aware of the potential problems, during beacon maintenance and testing, of poor operation/handling and the possible resultant enforcement action that may follow;
- provide guidance and information to educate owners, salvage companies, scrap yards and brokers on the proper disposal of beacons;
- encourage ship and aircraft crews to be aware of methods to cancel a false distress alert and that they adhere to the Resolution 349 (WRC-97) as detailed in Annex B;
- inform other Administrations and the specific manufacturer when a model fails to operate correctly. If a particular EPIRB type repeatedly gives rise to false alerts due to malfunction, then the procedures concerning non compliance with the essential requirements contained in the RTTE Directive and Marine Equipment Directive shall be followed;
- liaise with local coast-guards to obtain information from existing databases of registered beacons in order to aid detection and location of false alerts;"

As noted in Annex A regarding COSPAS-SARSAT statistical information, 1008 persons in maritime distress were rescued in 216 SAR events.

In addition, 17 participants provided a breakdown of the number of reported false alerts by category for the year 1999.

Table 5.8: Table 10. False alerts by category, number and percentage, 17 participants, 1999.

Category of False Alert	Number Reported by Category	% by Category
Beacon Mishandling	1.660	40%
Beacon Malfunction	112	10%
Mounting Failure	246	6%
Environmental Conditions	158	4%
Unknown	1.652	40%
Total Reported	**4,128**	**100%**

Table 10. *False alerts by category, number and percentage, 17 participants, 1999.*

In 1999, based on the number of confirmed real distresses and the number of false and other unconfirmed alerts, the SAR false alert rate (ratio of false alerts to the total number of alerts provided to SAR forces) was 94.1% (6.773 / 7.198)."

Note: the reader is directed to Recommendation TS 01-23(1) R3.7 CEPT Handling of False Distress Alerts.

IHDB Statistics on EPIRB Alerts and False Alerts

The NOSAC Subcommittee requested information from the USCG regarding actual and false EPIRB alerts. The following information was provided from the Incident History Database (IHDB), which is maintained by the National Oceanic and Atmospheric Administration (NOAA).

Table 5.9: IHDB Statistics on EPIRB Alerts

Alerts	2020	2021	2022	2023	2024 (YTD*)	TOTAL
Distress	88	78	80	60	44	350
FALSE	2014	1971	2209	2066	1038	9298
Total	**2102**	**2049**	**2289**	**2126**	**1082**	**9648**
%-age False	**95.8%**	**96.2%**	**99.6%**	**97.2%**	**95.9%**	**96.4%**

* YTD Figure is through August 2024.

Table 5.9: IHDB Statistics on EPIRB Alerts

Table 5.9 shows the information provided by the IHDB. This information correlates with the false alert data from the European Radiocommunications Committee (ERC) within the European Conference of Postal and Telecommunications Administrations (CEPT); ERC

Report 110, *Handling and Usage of Emergency Position Indicating Radio Beacon (EPIRB) to Prevent False Alerts*, Bergen, June 2001, above.

Recommendations TS 01-23(1) R2.1 (USCG EPIRB Handling Procedures) and TS 01-23(1) R3.7 (CEPT Handling of False Distress Alerts) address the findings in Table 5.9. No further recommendation is noted.

Seacor Power Marine Operations Manual

Seacor Power Marine Operations Manual (Rev. 4) stamped "REVIEWED" by the American Bureau of Shipping (ABS) on behalf of the USCG.

The Seacor Power Marine Operations Manual (Rev. 4) contains 325 pages. Thirteen pages were available for review by the NOSAC Subcommittee. The following errors were identified within the reviewed pages.

- Page 4-1, Section 4.1.1, the lightship draft (7'-11.5") and lightship displacement (2,295.85 LT) are incorrect. The even keel lightship draft is off by over 6 inches (8'-6" from Table 8.15 [interpolated from Hydrostatic Table]) and the displacement by over 220 long tons (2,520.5 LT from Table 4.1).
- Page 4-1, Section 4.1.2.2, the TCG (2.32') when compared to ROI Exhibit 246, MSC Post-Casualty Stability Analysis TCG (0.80') is incorrect, off by 290%.
- Page 4-6, Table 4-6, only one condition of trim was evaluated (zero trim). Table 4-6 is where this very limiting trim condition should have been highlighted per ROI Exhibit 68, 46 CFR 134.170.
- Page 4-6, Table 4-6, the wave (roll) period was not included as required by ROI Exhibit 68.
- Page 4-6, Table 4-6, the origins of the wave height/maximum seas of 5 feet were unknown per ROI Exhibit 246 and never verified by ABS against roll or roll period.
- Page 4-7, Figure 4-1, the forward draft mark locations are incorrect. The actual draft marks are over 6 feet further forward in front of the pads. See photographs of the hull, ROI Exhibits 73 and 74, for actual locations.
- Page 4-7, Figure 4-1, the aft draft mark numbers are incorrect. The actual draft mark numbers range from 4 to 16 instead of 0 to 12. See photographs of the hull, ROI Exhibits 73 and 74, for actual numbers. See also page 17 of ROI Exhibit 246.
- Page 4-7, Section 4.2.2.2, the midship example draft calculation is wrong; the modifier (0.58) is incorrect because the forward draft marks are further forward per above errors and cites. There is also no correction for the aft draft marks having a different baseline. The midship draft location is 83' 3" aft of the bow, which differs from the LCF draft and Plimsol mark locations. The Plimsol mark location is approximately 79.5' aft of the bow. The LCF draft location varies from approximately 77' aft of the bow at zero trim to 82' aft of the bow with 3' of trim by the stern (NOSAC calculations).

- Page 4-7, Section 4.2.2.2, there is no example calculation for draft at the Plimsol mark location. The Plimsol mark location is approximately 79.5' aft of the bow.
- Page 4-7, Section 4.2.2.2, there is no example calculation for LCF draft which moves aft as the vessel trims by the stern. The LCF draft location varies from approximately 77' aft of the bow at zero trim to 82' aft of the bow with 3' of trim by the stern.
- Page 4-7, Section 4.2.2.2, there is no longitudinal correlation or correction provided between midship, LCF and load line drafts (LCF draft needed for hydrostatics, load line draft for AVCG).
- Page 4-7, Table 4-7, the example draft calculation is incorrect for calculating midship, LCF, or load line locations. The example also uses a trim not evaluated by ABS.
- Page 8-6, Section 8.8, the TCG moment is incorrect when compared to the MSC post-casualty stability analysis. See TCG error above. The TCG moment uses the incorrect TCG. This TCG moment seriously impacts departure condition assumptions later.
- Page 8-6, Section 8.8, the "no more than 6" trim by the stern" restriction was never evaluated by ABS. The Seacor Power typically operated with 2.5 to 3.5 feet of trim by the stern. See picture on the front of the MOM of marine growth on hull. See also page 12 of ROI Exhibit 246. See also picture of departure condition the day of the casualty, page 16 of ROI Exhibit 246.
- Page 8-24, Section 8.15, the Table of Hydrostatics, uses LCF draft with no explanation of how to calculate LCF draft or correlate it to midship draft or load line draft locations for a given trim. From zero to 3 feet of trim by the stern, the LCF draft location moves aft approximately 5 feet. If the change in LCF location is not considered, the draft for hydrostatics could be off as much as 1.7" and the displacement could be off as much as 60 long tons for 3' of trim.
- Page 8-25, Section 8.16, stamped "APPROVED" AVCG Curve, there is no indication of what trim the AVCG curve is good for. The ACVG curve was not representative of or even close to the vessel's typical loaded trim conditions as well as the departure condition the day of the capsizing.

TS 01-23(1) R5.6 ABS redo Stability Reviews

TS 01-23(1) R5.7 USCG request NTSB reopen Seacor Power Investigation as per Petition

TS 01-23(1) R5.8 Revise NVIC 3-97 for more ABS accountability

2024 NOSAC Spring Meeting Public Comments

During the 2024 NOSAC Spring meeting, public comments were received from Captain Tracy Phillips, Retired USCG, Chair of the Seacor Power Investigation. The comments were appended to the Spring 2024 Public Meeting Minutes.

While Captain Phillips' comments were recommendations that were directed at Coast Guard District 8 or Coast Guard Sectors, the NOSAC Subcommittee agreed to describe the link between

Captain Phillips' comments and the associated recommendations within this report to fully close out this task statement. The relevant portion of Captain Phillips' comments and NOSAC responses are as follows [letter designations added by the subcommittee]:

Note, to differentiate between the actual public comments from Captain Phillips and the responses by the NOSAC, NOSAC responses are highlighted in grey highlighting as shown here.

"Now that the Seacor Subcommittee has presented draft recommendations at this meeting, there are also opportunities to take action on some of these immediately.

A. In regards to Subcommittee recommendation 1.4, District 8 or Sectors could provide guidance to inspectors to ensure that if stability information is changed, then the operations manual is also changed.

   Refer to Exhibit 13, *Recommendations 1.4 and 2.5: OSV Inspector Job Aid and Vessel Name Change* in which changes to the *Offshore Supply Vessel Inspector Job Aid* have been suggested.

B. In regards to Subcommittee recommendation 1.8 and 1.10, District 8 or Sectors could draft an information bulletin regarding safety orientations and emergency escape windows.

   Refer to Exhibit 13, *Recommendations 1.8 and 1.10: MSIB Emergency Escape Windows and Safety Orientation* in which a draft Marine Safety Information Bulletin has been developed for USCG review.

C. In regards to Subcommittee recommendation 2.1, District 8 could create procedures for responding to multiple EPIRB alerts.

   Refer to Exhibit 12, TS 01-23(1) R2.1. This recommendation provides four options that the USCG can consider when they are evaluating their procedures for handling multiple EPIRB alerts. NOSAC leaves the decision to the USCG on whether they should implement one or more of these options and how to develop internal procedures for implementation.

D. In regards to Subcommittee recommendation 2.3, District 8 or Sectors could establish a campaign to verify EPIRBs are GNSS equipped (meaning they can send a position).

   Refer to Exhibit 12, TS 01-23(1) R2.3. The NOSAC leaves the mechanics of implementing an EPIRB verification campaign to the USCG.

E. In regards to Subcommittee recommendation 2.4, District 8 or Sectors could create a policy or information bulletin for vessels to monitor NOAA broadcasts at established intervals while underway.

Refer to Exhibit 13, *Recommendation 2.4: Weather Broadcast Monitoring*, in which draft language has been suggested for the USCG to publish a Policy, Marine Safety Information Bulletin (MSIB), or Navigation and Vessel Inspection Circular (NVIC) as appropriate.

F. In regards to Subcommittee recommendation 2.7, District 8 or Sectors could create policy requiring liftboats to provide the crew with information on maneuvering characteristics.

Refer to Exhibit 13, *Recommendation 2.7: Maneuvering Guidance in Liftboat Operating Manual*, in which the NOSAC has developed a draft methodology for the USCG to review. The draft methodology is designed to assist liftboat owners and operators in providing guidance on maneuvering characteristics relative to wind forces, lowering legs, vessel speed, and the Master's overriding authority.

G. In regards to Subcommittee recommendation 2.10B and 3.3, District 8 or Sectors could create policy related to stability computer validation or revalidation. They could use the Intact Stability Code as a template for this.

[Administrative Note: the original 2.10A was consolidated into TS 01-23(1) R5.10A.10. Recommendation 2.10B was then renumbered TS 01-23(1) R2.10A.]

Refer to Exhibit 12, *TS 01-23(1) R2.10A*, in which a list of four criteria is provided for stability computer revalidation and/or reaffirmation.

Refer to Exhibit 12, *TS 01-23(1) R3.3*, in which the NOSAC recommends the USCG use four sections of the International Maritime Organization (IMO) *International Code on Intact Stability, 2008*, to update 46 CFR 170.110(f).

There are two additional items that are not contained in the Coast Guard Report or the Subcommittee draft recommendations, but they have been discussed by the Subcommittee.

1. District 8 or Sectors could provide guidance to liftboats that says they need to create a quick reference guide or other guidance for the crew on what to do in unexpected heavy weather.

Refer to Exhibit 13 which contains the quick reference guide for liftboats that was requested by the Commandant in the Action for Recommendation 5 in Exhibit 9: *USCG Commandant's Responses to the USCG Seacor Power Final Report Recommendations [plus identified Best Practices]*.

2. District 8 or Sectors could provide an information bulletin or alert reminding liftboats that in heavy weather, they should ensure the crew and offshore worker are awake and alert. Alternatively, they could muster the crew in a location with easy emergency egress.

The NOSAC combined these two items into Exhibit 13: *Recommendations 1.8 and 1.10: MSIB Emergency Escape Windows and Safety Orientation* as follows in the draft MSIB.

- Ensure that the master of a liftboat will take immediate action to prepare the crew when heavy weather is encountered. This action could involve waking and alerting the crew and offshore workers, or it could involve mustering the crew and offshore workers at an accessible emergency egress point.

That completes my list of ideas and opportunities for action now. I want to conclude my comment by saying that thirteen mariners lost their lives in the Seacor Power incident, and I want to thank everyone who is using lessons learned to make the industry safer for the future."

RECOMMENDATIONS for Specific Task Number 5

TS 01-23(1) R5.1 The NOSAC recommends that the USCG review their Contingency Preparedness System (CPS) to determine if the database contains any lessons learned that can be correlated with the Seacor Power recommendations from the NTSB and the USCG Reports of Investigation. Any relevant information found in the CPS should be used to update the appropriate USCG policy or guidance, including, but not limited to, the *USCG Addendum to the National Search and Rescue Supplement (NSS)*. In particular, the NOSAC recommends that the USCG search the CPS for lessons learned related to the following:

USCG Recommendation 1: Commandant Instructions 3140.2D (*Commandant Instruction: Marine Weather Reporting*) and 3140.3D (*Commandant Instruction: Coastal Weather Program*) regarding weather observations and reporting.

USCG Recommendation 11: U.S. Search and Rescue Satellite Aided Tracking (SARSAT) system.

USCG Recommendation 14: phone infrastructure and communications capabilities.

USCG Recommendation 22: NAVTEX.

USCG Recommendation 27: SAR cases and underwater rescue.

NTSB New Recommendation M-22-8: "Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate."

USCG BP 11.2.7 "Vessel owners and operators should provide additional weather training to their Masters and licensed crew members. Training could include items such as options for checking weather underway, minimum intervals to check

weather while underway, emergency procedures for unexpected weather changes, and providing voluntary weather reports to the National Weather Service."

TS 01-23(1) R5.2 The NOSAC recommends that the USCG coordinate with the National Weather Service (NWS) to request an increase in the frequency of Marine Weather Messages to at least every two (2) hours, particularly for the benefit of small craft, liftboats, and other vessels that are particularly vulnerable to rapid changes in weather and sea conditions and potential loss of stability.

TS 01-23(1) R5.3 The NOSAC recommends that USCG develop a Navigation and Vessel Inspection Circular (NVIC) or other applicable vehicle to address urging vessel Owners/Operators to either update current procedures or develop new procedures related weather and other environmental conditions. The following items should be considered when conducting this exercise.

- Content of Operations Manuals.
- Content of Stability Letters, Stability Manuals, and stability computer programs.
- Maneuvering guidance in various weather conditions.
- Evacuation Procedures.
- Emergency Procedures, including drills and exercises.
- Securing cargo and gear on and below decks.
- Check of emergency lifesaving, firefighting, and communications equipment.
- Recovery procedures when severe weather conditions have passed.

TS 01-23(1) R5.4 The NOSAC recommends that the USCG continue further study in the areas of wind force estimation, wave dynamics, and righting arm analysis refinement for liftboats and other non-traditional vessel stability characteristics. Use Best Available and Safest Technology (BAST) principles, as appropriate.

TS 01-23(1) R5.5 The NOSAC recommends that the Society of Naval Architects and Marine Engineers (SNAME) request its Technical and Research OC-8 Wind Technologies Panel to follow-up its Comparative Wind Load Study to prepare a guideline of the Best Practice for Use of the empirical building block method for estimation of wind loads on offshore structures and to recommend whether the regulations for calculation of wind loads (e.g., 46 CFR Section 174.055) should be updated and/or amended to include state-of-the-art processes for wind load estimation, such as wind tunnel testing or Computational Fluid Dynamics (CFD). The Panel should endeavor to include representation from the US Coast Guard, classification societies, operators, engineering companies, research institutions, and academia.

TS 01-23(1) R5.6 The NOSAC recommends the US Coast Guard request the American Bureau of Shipping redo (pro bono) their liftboat stability reviews completed between 1997 and 2021 under NVIC 3-97, Stability Related Review Performed by the American Bureau of

Shipping for U.S. Flag Vessels that did not receive oversight from the Coast Guard for those liftboats still in service.

TS 01-23(1) R5.7 The NOSAC recommends that the US Coast Guard request the National Transportation Safety Board (NTSB) re-open the Seacor Power investigation in light of the recently submitted Petition for Reconsideration with new matters.

TS 01-23(1) R5.8 The NOSAC recommends NVIC 3-97, Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels, be updated to hold the American Bureau of Shipping more accountable for their stability reviews on behalf of the Coast Guard and to clearly outline the selection process for oversight of vessel types.

TS 01-23(1) R5.9

A) The NOSAC recommends that the USCG re-evaluate the stability for all active US liftboats. (Refer to Table 5.1, *United States Liftboats as of May 2023*.) Due to the number of interpretations and nuances associated with liftboat modeling and stability calculations, this work should not be assigned to an outside party. The sub-committee recommends that this re-evaluation be completed by at least two USCG naval architects from the Marine Safety Center.

The stability re-evaluation should include all of the items listed below for each active liftboat:

1) The USCG should use the vessel's original stability calculations, if available, and the vessel's Marine Operating Manual (MOM) or stability booklet to:
   a) Examine the vessel's original stability calculations and information to identify:
      i) The regulatory subchapter and/or Navigation and Vessel Inspection Circular (NVIC) applied to vessel stability;
      ii) the service (restricted or unrestricted);
      iii) the loading conditions (draft, trim, list);
      iv) the wind directions (beam winds or beam winds plus additional directions).
   b) Determine whether the original calculations addressed fading stability.
   c) Examine the vessel's original calculations to see if there are any errors.
2) The USCG should use current modeling techniques, analysis tools, and regulatory interpretations to:
   a) Recalculate whether the vessel meets the stability requirements of 46 CFR 174, Subpart H (*Special Rules Pertaining to Liftboats*), or other applicable regulatory/NVIC stability requirements (as appropriate).
   b) While recalculating the vessel's stability, examine winds encountering the vessel from all different directions, spread at

intervals of one to ten degrees around the vessel. The interval should be dependent on the sensitivity of the vessel's stability.

c) Identify the wind speed at which the vessel capsizes using the loading conditions from the MOM or stability booklet and the stability calculations found in 46 CFR 174, Subpart H (or other applicable stability requirements).

d) Calculate the wind heeling moments using the step function found in 46 CFR 174.055 (or other applicable stability requirements), and also using the API 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design* standard. Identify the wind speed at which the vessel capsizes when the larger wind heeling moments are applied.

e) Calculate the wind heeling moments using the shape coefficients found in 46 CFR 174.055, *Calculation of wind heeling moment (Hm)*, (or other applicable stability requirements), and using updated shape coefficients for legs with racks (such as the coefficients identified for chords with racks in the ABS and GustoMSC paper). Identify the wind speed at which the vessel capsizes when larger shape coefficients are applied.

f) Calculate the vessel's stability using techniques that mitigate the effects of fading stability (such as allowing free twist or use of potential energy build up). Compare the wind speeds at which the vessel capsizes for both sets of calculations.

g) Request the owner/operator provide the vessel's actual draft marks (as reported by the crew) from the last three departure conditions. If these actual loading conditions are different from the loading conditions used for the original stability calculations, then use these actual loading conditions to calculate the vessel's stability. Identify the wind speed at which the vessel capsizes for these actual loading conditions.

h) Identify the wind speed at which the vessel capsizes when calculating stability using a combination of the API Recommended Practice 2A-WSD to calculate wind heeling moments, updated shape coefficients (such as those found in the ABS and GustoMSC paper), fading stability, the actual loading conditions reported by the owner/operator, and wind from all directions.

i) Apply the intact stability criteria found in 46 CFR 170.170 and 170.173 and determine the extent to which the vessel passes or fails.

B) While conducting the stability reevaluations described above, the USCG should gather a list of interpretations, decisions and judgment calls made by the naval architects.

C) The USCG should share the stability reevaluation results with the vessel's owner/operator immediately, so that they can consider imposing additional operational restrictions if necessary.

TS 01-23(1) R5.10

A) The NOSAC recommends that the USCG use the results of the liftboat stability re-evaluation (from Recommendation 5.9) to:

1) Update the regulations to explicitly exempt or include liftboats in the requirements of 46 CFR 170.170 (*Weather criteria*) and 170.173 (*Criterion for vessels of unusual proportion and form*).
2) Update the regulations to include a definition of "heel" and "heeling moment" for a liftboat.
3) Assess whether the regulatory equations and constants used for liftboat stability calculations are still valid and whether they provide a sufficient safety margin.
4) Decide whether to increase the regulatory wind speeds for restricted and/or unrestricted service.
5) Assess whether the regulations should be updated to evaluate liftboat stability under operational conditions, rather than evaluating stability using fixed wind speeds under static (still water) conditions.
6) Update the regulations to ensure liftboat stability calculations examine wind encountering the vessel from all different directions, spaced at no greater than 10-degree intervals (or a smaller interval, if appropriate) around the vessel.
7) Update the wind heeling moment equation in the regulations to replace the step function with a more up-to-date standard, such as the API 2A-WSD standard.
8) Update the shape coefficients in the regulations to account for recent studies or conduct wind tunnel testing in order to update the shape coefficients.
9) Update the regulations to include guidance on how to address fading stability.
10) Update the regulations to provide liftboat owners and operators with guidance for calculating a vessel's maximum wave height for afloat operations.
11) Update the regulations to include a provision that states if the vessel cannot realistically operate in a condition documented in the stability calculations, then the stability calculations must be redone.
12) Update the regulations to require that liftboat owners and operators provide the vessel's Master and crew with specific guidance for maneuvering characteristics during heavy weather, especially if there is a preferred direction of turn for the liftboat in heavy weather.
13) Update the regulations and policies to include relevant guidance for issues that require interpretation during the stability calculation process.

14) Assess the American Bureau of Shipping's (ABS's) past performance for liftboats previously reviewed under NVIC 3-97. If ABS's performance was not acceptable, the USCG should take action, as appropriate, to ensure future ABS liftboat stability evaluations are correct.
15) Update NVIC 8-91 to apply any necessary changes to existing liftboats.

B) While updating the regulations found in 46 CFR Subchapter S, the USCG should also take the opportunity to determine whether the references listed in 46 CFR Subpart A (*General Provisions*), §170.015 (*Incorporation by reference*) are still valid. If the references are no longer valid, then the USCG should update the regulation.

End of Specific Task Number 5.

Exhibit 1: References.

[The text in brackets following the Reference is in two parts. The first part is a number which represents the Specific Task Number Sections of the report to which the Reference pertains. The second part is the file name of the document located on Homeport.]

Post-Casualty Reports

NTSB: National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER*, MIR-22/26, Adopted 18 October 2022. [2. NTSB Investigation Report SEACOR POWER - MIR2226]

USCG: USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat SEACOR POWER*, Revision 4, 28 July 2022. [4. 2022 07 28 CG Ex 246 - MSC Post-Casualty Stability Analysis of SEACOR POWER - Rev 4]

USCG: *Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021*. MSLE Activity Number: 7175076, MISLE Case Number 1256196 (which includes the following). [4. 2023 06 21 USCG SEACOR POWER_Report of Investigation_Redacted]

> USCG: *The Capsizing of the Commercial Liftboat SEACOR POWER (O.N. 1115290) Resulting in Multiple Losses of Live approximately Seven Nautical Mile South of Port Fouchon, LA in the Gulf of Mexico on April 13, 2021*: Action by the Commandant. 16732/IIA #7175076, Dated 18 May 2023. [4. 2023 06 21 USCG 7175076_SEACOR_POWER_FAM-Signed 18MAY23_Redacted]
>
> USCG: *Marine Board of Investigation Concerning the Capsizing of the SEACOR POWER (O.N. 115290) Approx. 7 NM South of Port Fourchon, Louisiana, with Multiple Losses of Life*; Memorandum #16732, 19 April 2021. [4. 2023 06 21 USCG SEACOR POWER_Report of Investigation_Redacted]

The website with links to approximately 130 Exhibits referenced by the USCG Report of Investigation out of approximately 270 considered by the Marine Board of Investigation is: Seacor Power - Coast Guard Marine Board of Investigation (uscg.mil)

Associated Press, "Drilling rig capsizes, plunges to bottom", The Anchorage Times, October 22, 1980, page B-2. [5. Anchorage Times Dan Prince]

National Transportation Safety Board (NTSB): *Capsizing and Sinking of the Self-elevating Mobile Offshore Drilling Unit Ocean Express Near Port O-Connor, Texas, April 15, 1976*; Marine Accident Report NTSB-MAR-79-4, dated April 5, 1979. [5. NTSB MAR-79-5-Ocean-Express]

National Transportation Safety Board (NTSB): *Capsizing and Sinking of the Mobile Offshore Drilling Unit Rowan Gorilla I in the North Atlantic Ocean December 15, 1988*; Marine Accident Report PB89-916406; NTSB/MAR-89/06, dated September 12, 1989. [5. NTSB MAR-89-06-Rowan-Gorilla-I]

National Transportation Safety Board (NTSB): *Capsizing and Sinking of the U.S. Liftboat M/V Avco V, Gulf of Mexico, July 31, 1989*; Marine Accident Report NTSB/RAR-91/02, PB91-916402, Adopted April 16, 1991. [5. NTSB AVCO V Casualty Report]

National Transportation Safety Board (NTSB): Safety Recommendation from Admiral J. William Kime, Commandant, US. Coast Guard, dated January 14, 1991 for MV Titan. [5. NTSB M90_85_99 MV Titan]

National Transportation Safety Board (NTSB): *Sinking of US Cargo Vessel SS El Faro Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas October 1, 2015*. Accident Report NTSB/MAR-17/01; PB2018-100342, Adopted December 12, 2017. [5. NTSB mar1701 SS El Faro]

USCG: *Investigation Activity Report, MC93005646-M/V Christie: Capsize*, MISLE Case Number 39079, Activity Start Date, March 30, 1993. [5. USCG MV Christie Investigation Activity Report]

United States Coast Guard (USCG): Marine Casualty Report: *Mobile Offshore Drilling Unit (MODU) Ocean Ranger, O.N. 615641, Capsizing and Sinking in the Atlantic Ocean, on 15 February 1982 with Multiple Loss of Life*; Report No. USCG 16732/0001 HQS 82; dated 20 May 1983. [5. USCG Ocean Ranger Casualty Report]

USCG Navigation and Vessel Inspection Circulars (NVICs)

NVIC No. 3-89: *Guidance for the Presentation of Stability Instructions for Operating Personnel*. [1. NVIC 3-89]

NVIC No. 8-91: *Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*, 21 May 1991. [1. NVIC 8-91]

NVIC No. 17-91: *Guidelines for Conducting Stability Tests*, COMDTPUB P16700.4, dated 4 November 1991. [1. NVIC 17-91 Guidelines for Conducting Stability Tests]

NVIC No. 3-97: *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels; COMDTPUB P16700.4. [1. NVIC 3-97]*

USCG Guidance and Policy

USCG: U*. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) To The International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)*, COMDTINST M16130.2F, dated January 2013. [5. COMDTINST M16130.2F SAR]

USCG: CG-543 Policy Ltr 07-02, (16711), dated March 4, 2008, Subject: *Guidance on the Inspection, Repair, and Maintenance of Liftboats*. [1. SP CG-543-Poicy Letter 07-02 Gudance on the Inspection, Repair and Maintenance of Liftboats]

USCG: CG-CVC Policy Letter No. 14-03 (16721), dated April 6, 2015. Subject: *Evaluating Sea Service Aboard Liftboats*. [1. SP CG-CVC-Policy Letter 14-03 Evaluating Sea Service Aboard Liftboats]

USCG: D-8: Policy from Commander, Eighth Coast Guard District, 16711/LIFTBOAT, October 9, 1998, Subject: *Persons Allowed on Liftboats*. [1. SP D8 Policy Leter 98-21 Persons Allowed on Liftboats (16711)]

USCG: D-8: Policy Letter from District 8 on August 25, 1999 (16711 Rescue Boats) to Mr. Christopher Sullivan, Vice President, Offshore Marine Service Association. [1. SP D8-Policy Letter 99-18 Rescue Boats to OMSA]

USCG Finding of Concern 013-23, *Seacor Power Casualty: Findings of Concern Regarding the National Weather Service*, dated June 26, 2023. [4. 2023 06 26 USCG FOC 013-23 Seacor Power and NWS]

USCG Finding of Concern 014-23, *Seacor Power Casualty: Findings of Concern Regarding Liftboats*, dated June 26, 2023. [4. 2023 06 26 USCG FOC 014-23 Seacor Power and Liftboats]

USCG Finding of Concern 015-23, *Seacor Power Casualty: Dispatcher Training, Draft Reading, and Weather Forcecasting for All Commercial Vessels*, dated June 26, 2023. [4. 2023 06 26 USCG FOC 015-23 Seacor Power Training, Drafts, etc.]

USCG: *Liftboat Addendum 2015*. [1. SP LiftBoat Addendum b2015]

USCG: *Load Line Policy Notes*: U.S. Coast Guard, Naval Architecture Division (CG-5212), Office of Design and Engineering Standards, Washington, D.C., revised 22 September 2008. [3. SP Load Line Policy Notes USCG]

USCG Marine Safety Alert, Alert 04-11, dated September 1, 2011: *Mariner's Safety Endangered When VHF Radio Distress Alerts by Digital Selective Calling (DSC) Lack Location and Identification Information*. [1. 0411no2 DSC Identity]

USCG Marine Safety Alert, Alert 06-13, dated June 18, 2013, *Coast Guard Termination of its 2 MHZ Distress Watchkeeping Service*. [1. 2MHzDistressWatchkeepingClosureSafetyAlert]

USCG Marine Safety Alert, Alert 08-17, dated August 3, 2017, *Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!* [1. CGSafetyAlert0817]

USCG: United States Coast Guard, Marine Safety Alert, Safety Alert 12-22, *Ensuring Proper Operation and Detection of Radar Search and Resue Transponders (SARTs)*, dated November 25, 2022. [1. USCG SA 12-22]

USCG Marine Safety Alert, Alert 03-23, dated March 2, 2023, *Ensuring Proper Configuration of Digital Selective Calling (DSC)-Equipped Radios*. [1. USCGSA_0323 DSC Alert]

USCG Marine Safety Center Technical Note MTN 4-00; 16717/LIFTBOATS; August 30, 2000; Subject: *Weather Criteria for Liftboat Leg Strength*. [1. SP Marine Safety Center Technical Note NTM 4-00 Weather Criteria for Lifboat Leg Strength]

USCG: Marine Safety Center Technical Note MTN No. 04-95, CH-2, 16710/Lightship Change, dated January 11, 2016: *Lightship Change Determination: Weight – Moment Calculations vs. Deadweight Survey vs. Full Stability Test*. [1. MTN.04-95.CH-2.2016.01.11.Lightship_Change_Determination]

USCG Marine Safety Information Bulletin, MSIB Number 20-20, Change 1, dated October 29, 2020, *Performing a VHF Marine Radio Check*. [1. MSIB-20-20-Change-1 DSC Test Calls on VHF]

USCG Marine Safety Information Bulletin, MSIB Number 10-21, dated 7 December 2021, *High Frequency Voice Distress Watchkeeping will cease at most locations on 7 February 2022*. [1. MSIB_10_21_HF_Voice discontinued]

USCG: Marine Safety Manual Volume II (Materiel Inspection), COMDTCHANGENOTE 16000, dated 20 July 2016, CH-2 to Marine Safety Manual Volume II, COMDTINST M16000.7B. [1. USCG Marine Safety Manual Volume II - *Material Inspection*]

USCG: Marine Safety Manual Volume II (Materiel Inspection), COMDTINST M16000.7B, COMDTCHANGENOTE 16000, dated 20 September 2021. Subject: *CH-3 to Marine Safety Manual Volume II, COMDTINST M16000.7B*. [1. SP Marine Safety CI-16000.76-OCS-Activities for MSM Volume II]

USCG: Marine Safety Manual, Volume III, Marine Industry Personnel, COMDTINST M16000.8B. COMDTCHANGENOTE 16000, dated 5 July 2017. Subject: *CH-2*. [1. COMDTINST 16000.8B Change 2 Marine Safety Manual Volume III Marine Industry Personnel]

USCG: Marine Safety Manual Volume IV (Engineering Systems), COMDTNOTE 16000, dated Sep 29, 2004, Cancelled Sep 28, 2005, Subject: *CH-3 TO COMDTINST M16000.9, Marine Safety Manual, Volume IV – Technical, Chapter 3 – Engineering Systems*. [3. USCG Marine Safety Manual Volume IV Technical]

USCG *Offshore Supply Vessel Inspector Job Aid* (Job Aid OSV, Rev. September 2018, DCN: MPS-JA, TCY-OI (3). [1. SP Offshore Supply Vessel Inspector Job Aid Oct 2018]

USCG Outer Continental Shelf National Center of Expertise, The Drill Down, Issue No. 21 – OSV, dated March 30, 2023: *DSC Distress Alerting*. [1. 2023.03.30-DD21-DSC-Distress-Alerting]

USCG: PRG.C2-30.2021.04.05 *Liftboat Plan Review Guide*. [1 SP PRG.C2-30.2021.04.05.Liftboat Plan Review Guide]

USCG: United States Coast Guard, *Unmanned Systems Strategic Plan*, Deputy Commandant for Operations, March 2023. [4. USCG 2023 Unmanned Systems Strategic Plan]

United States Legislation

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter E, Load Lines, Part 42, *Domestic and Foreign Voyages by Sea*. [1. 46 CFR Part 42 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter H, Passenger Vessels, Part 80, *Disclosure of Safety Standards and Country of Registry*. [1. 46 CFR Part 80 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, *Offshore Supply Vessels* [Parts 125 through 134].

> Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels, Part 125, *General*. [1. SP 46 CFR Part 174 Subpart H (up to date as of 4-18-2023)]
>
> Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels, Part 126, *Inspection and Certification*. [1. 46 CFR Part 126 (up to date as of 9-21-2023)]
>
> Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels, Part 127, *Construction and Arrangements*. [1. 46 CFR Part 127]
>
> Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 128, *Marine Engineering: Equipment and Systems*. [1. 46 CFR Part 128 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 129, *Electrical Installations*. [1. 46 CFR Part 129 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 130, *Vessel Control, and Miscellaneous Equipment and Systems*. [1. 46 CFR Part 130 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels, Part 131, *Operations*. [1. 46 CFR Part 131 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 132, *Fire-Protection Equipment*. [1. 46 CFR Part 132 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 133, *Lifesaving Systems*. [1. 46 CFR Part 133 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels, Part 134, *Added Provisions for Liftboats*. [1. 46 CFR Part 134 (up to date as of 3-17-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter S, Subdivision and Stability; Part 170, *Stability Requirements for all Inspected Vessels*; including Subparts A through I. [1. SP 46 CFR Part 170 (up to date as of 4-18-2023)]

Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter S, Subdivision and Stability; Part 174, *Special Rules Pertaining to Specific Vessel Types*. [1. 46 CFR Part 174]

Code of Federal Regulations (CFR), Title 47, Telecommunication, Chapter I Federal Communications Commission [FCC], Subchapter D, Safety and Special Rado Services, Part 80, *Stations in the Maritime Services*. [1. 47 CFR Part 80 (up to date as of 9-21-2023)]

Code of Federal Regulations (CFR), Title 47, Telecommunication, Chapter I Federal Communications Commission [FCC], Subchapter D, Safety and Special Rado Services, Part 95, Personal Radio Services, Subpart K, *Personal Locator Beacons and Maritime Survivor Locating Devices*. [1. 47 CFR 95 Subpart K (up to date as of 9-29-2023)]

United States Code: Title 46, Shipping; Subtitle II, Vessels and Seamen, Part A, General Provisions, Chapter 21, General, 46 USC 2101, *General definitions*. [1. 46 USC 2101]

United States Public Law 116-224, *Save Our Seas 2.0 Act*, 18 December 2020. [3. Public Law 116-224 Save our Seas 2.0 Act]

International and Industry References

American Bureau of Shipping (ABS) *Guide for Building and Classing Liftboats*, July 2023. [3. ABS Guide for Building and Classing Liftboats]

American Bureau of Shipping (ABS) *Guide for Building and Classing Liftboats, Notices and General Information*, July 2023. [3. ABS Notices and General Information Liftboats]

American Bureau of Shipping (ABS) *Guide for the Class Notation: Helicopter Decks and Facilities (HELIDK and HELIDK(SRF))*, April 2008, Updated October 2015. [3. ABS Helicopter_Decks_Guide_for Class Notation Oct15]

ASTM International, formerly known as American Society for Testing and Materials, ASTM F 1321: *Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine Light Ship Displacement and Centers of Gravity of a Vessel*. [1. ASTM F1321-92 STABILITY STANDARD TEST PROCEDURE]

European Radiocommunications Committee (ERC) within the European Conference of Postal and Telecommunications Administrations (CEPT); ERC Report 110, *Handling and Usage of Emergency Position Indicating Radio Beacon (EPIRB) to Prevent False Alerts*, Bergen, June 2001. [5. ERC CEPT Preventing False EPIRB Alerts]

International Association of Classification Societies (IACS) Unified Requirement (UR) L5, *Computer Software for Onboard Stability Calculations*, Rev. 4, June 2020. [3. IACS UR L5 Computer Software for Onboard Stability Calculations]

International Maritime Organization Resolution A.714(17), *Code of Safe Practice for Cargo Stowage and Securing*, Adopted 6 November 1991. [3. IMO A.714(17)]

International Maritime Organization Resolution A.749(18), adopted on 4 November 1993: *Code on Intact Stability for all Types of Ships Covered by IMO Instruments*. [3. IMO A.749(18)]

International Maritime Organization, Subcommittee on Safety of Navigation (NAV), SN/Circ. 197, Ref T2/6.03, Operation of Marine Radar for SART Detection, Annex: *Operation of Marine Radar for SART Detection*, 1 November 1997. [1. SN Circ197]

International Maritime Organization, Subcommittee on Safety of Navigation (NAV), SN/Circ. 197/Corr. 1, Ref T2/6.03, Operation of Marine Radar for SART Detection, Annex: *Operation of Marine Radar for SART Detection*, 10 February 1998. [1. SN Circ197Corr1]

International Maritime Organization Resolution MSC.75(69), adopted on 14 May 1998: *Adoption of Amendments to the Code on Intact Stability for all Types of Ships Covered by IMO Instruments (Resolution A.749(18))*. [3. MSC.75(69)]

International Maritime Organization, Annex 17, Resolution MSC.266(84), adopted on 13 May 2008: *Code of Safety for Special Purpose Ships, 2008*. [3. MSC.266(84)]

IMO Resolution A.1079(28) *Recommendations for the Training and Certification of Personnel on Mobile Offshore Units (MOUs)*, adopted 4 December 2013. [2. IMO A.1079(28)]

International Maritime Organization, *International Code on Intact Stability, 2008*, 2009 Edition. [3. IMO International Code on Intact Stability, 2008]

International Maritime Organization, *International Convention on Load Lines*, adopted 5 April 1966. [not downloaded]

International Maritime Organization, Maritime Safety Committee, MSC/Circular.456, *Guidelines for the Preparation of Intact Stability Information*, adopted on 13 October 1986). [3. MSC Circular.456 Preparation of Intact Stability Information]

International Maritime Organization, Maritime Safety Committee, MSC/Circ.861, *Measures to Reduce the Number of False Distress Alerts*, 22 May 1998 (Ref T2/6.04). [3. MSC.1-Circ.861]

International Maritime Organization, Maritime Safety Committee, MSC/Circ. 1078, *Guidelines to Administrations on Reporting False Alerts*, 6 June 2003 (Ref. T2.6.04). [3. MSC.1-Circ.1078]

International Maritime Organization, Maritime Safety Committee, MSC.1/Circ. 1228, dated 11 January 2007, *Revised Guidance to the Master for Avoiding Dangerous Situations in Adverse Weather and Sea Conditions*. [3. MSC.1-CIRC.1228]

International Maritime Organization, Maritime Safety Committee, MSC.1/Circ. 1229, dated 11 January 2007, Annex: *Guidelines for the Approval of Stability Instruments*. Ref. T1/2.04. 3. IMO MSC.1 Circ 1229 Guidelines for the Approval of Stability Instruments]

International Maritime Organization, website: *Ship Design and Stability*, Ship Design and Stability (imo.org) (or https://www.imo.org/en/OurWork/Safety/Pages/ShipDesignAndStability-default.aspx) on 2023 08 23. [3. IMO Ship Design and Stability Webpage]

National Oceanic and Atmospheric Administration, "*Official 406 MHz EPIRB Registration Form*", OMB Auth. (0648-0295). [1. EPIRB Registration Form]

Miscellaneous References

Memorandum of Agreement Between the United States Coast Guard and the National Oceanic and Atmospheric Administration National Weather Service Regarding the Management of Marine Weather Information. [3. 20 03 31 uscg - NWS moa 2020] [4. USCG NWS MOA]

National Weather Service Instruction 10-315, February 11, 2020, Operations and Services; Marine and Coastal Weather Services, NWSPD 10-3: *Marine Weather Message*. [5. 2020 02 11 NWS Instruction 10-315 Marine Weather Messages]

Petition for Reconsideration of the Marine Investigation of the Capsizing of Liftboat Seacor Power, dated May 7, 2024, to the National Transportation Safety Board (NTSB), from Lincoln Stroh. [5. Seacor Power Petition for Reconsideration]

Society of Naval Architects and Marine Engineers (SNAME); OTC-29289-MS; *A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study*; Kevin Berto, Texas A&M University; David Hodapp, Chevron Energy Technology Company; Jeffrey Falzarano, Texas A&M University; for Offshore Technology Conference 6-9 May 2019; © 2019. [5. OTC-29289-MS, 2017 SNAME OC-8 Wind Load Study]

Stability Questions for MSC NTSB Report [2. 2023 06 12 Stability Questions for MSC NTSB Report-USCG-ENG-2Response]

Stability Questions for MSC Post-Casualty Stability Analysis (with USCG Responses). [4. 2023-06-12-NOSAC-Stability-Questions-for-MSC-Post-Casualty Stability Analysis-Responses]

Presentation Questions from MSC Post-Casualty Stability Analysis (with USCG Responses) [4. 2023JuneNOSAC-SeacorPower-SubCommittee-MSC PresentationResponses]

United States Liftboats, Active. [5. 2023 04 25 Liftboat Vessel Population_Inspected LCDR Brown]

USCG: Acquisition Directorate, Research & Development Center (RDC), *Non-Traditionally Shaped Vessel Stability Standards, Project Summary*; Project No. 1024, Final, Contract #GS00Q14OADU420; February 2024. [5. USCG-RDC-UDI2013-NonTraditionallyShapedVesselStability Standards-report]

USCG: Exhibit 59, Partial ABS SEACOR POWER Marine Operations Manual dated 31 October 2024. [5. Exhibit 59 - Partial - ABS SEACOR POWER Marine Operations Manual]

End of Exhibit 1.

Exhibit 2: NTSB Seacor Power Final Report Regulatory References.

Citation	Title	NTSB Report Page(s)
ABS Class	Not specified	33
Load Lines	Protocol of 1988 Relating to the International Convention on Load Lines, 1966, Consolidated Edition 2018	33, 60, 110
SOLAS	Not specified	33, 119
IOPP	International Oil Pollution Prevention (IOPP)	33
46 CFR Subchapter L	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Parts 125-134	34
46 CFR 127	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 127: Construction and Arrangements	36
SOLAS Chapter III	Life-saving Appliances and Arrangements	36
CG-543 Policy Letter	Latest is dated 11-01 Guidelines for Coast Guard Evaluations of Compliance with U.S. Environmental Protection Agency's (EPA) Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of the Vessel	36
SOLAS Chapter IV	Radiocommunications	38
40 CFR 80	Title 40: Protection of Environment Chapter I: Environmental Protection Agency Subpart C: Air Programs Part 80: Regulation of Fuels and Fuel Additives	39
40 CFR 80.1061(a)	Title 40: Protection of Environment Chapter I: Environmental Protection Agency Subpart C: Air Programs Part 80: Regulation of Fuels and Fuel Additives 1061(a): Special requirements for 406.0-406.1 MHz EPIRB stations.	41, 76
FCC Regulations	Title 47: Telecommunication Parts 0-199 (not specified)	41
33 CFR 96	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subpart F: Vessel Operating Regulations Part 96: Rules for the Safe Operation of Vessels and Safety Management Systems	55
46 USC 3203	Title 46: Shipping Subtitle II: Vessels and Seamen Part B: Inspection and Regulation of Vessels Chapter 32: Management of Vessels 3203: Safety management system	55

46 CFR 134	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 134: Added Provisions for Liftboats	57
NVIC 3-97	Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels	58, 62
MOM - ABS Approved	None specified	57
Cargo Securing Manual	None specified	58, 60
46 CFR 174 Subpart H	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats	63, 67, 68, 69
46 CFR 170 Subpart S	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subpart S: Subdivision and Stability	63
46 CFR 174 Subpart C	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subpart C: Special Rules Pertaining to Mobile Offshore Drilling Units	63
NVIC 8-91	Initial and Subsequent Inspection of Existing, Uncertified Offshore Supply Vessels, Including Liftboats	63
46 CFR 174 Graph 174.045	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types 174.045: Intact stability requirements	64
1979 MODU Code	1979 Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code)	65
2009 MOU Code	2009 MODU Code (as amended) Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009	65
NTSB M-85-112	The NTSB recommends that the U.S. Coast Guard: using the authority of the Outer Continental Shelf Lands Act, establish stability criteria for self-elevating lift boats that engage in outer continental shelf activities.	75
NTSB M-91-13	The NTSB recommends that the U.S. Coast guard: require that liftboats have on board a severe weather action plan that is tailored to the operating characteristics and limitations of the vessel.	75
46 CFR 134.170(b)(6)	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels 134.170: Operating Manual (b)(6): “Guidance on preparing the vessel for heavy weather…”	75
NTSB M-91-19	The NTSB recommends that the Chevron USA: prepare and include in the Chevron Hurricane Action Plan a system that considers the sea and weather operating limitations of lift boats; use this system as guidance for	75

	evacuating personnel from such vessels or for releasing such vessels to seek shelter during predicted deteriorating weather.	
USCG SA 04-09	EPIRB and PLB Registration	76
NTSB M-10-1	To the Federal Communications Commission: For commercial vessels required to carry 406-MHz emergency position-indicating radio beacons (EPIRBs), mandate that those EPIRBs broadcast vessel position data when activated.	76
NTSB M-17-50	To the Federal Communications Commission: Require that all US vessels required to carry 406-megahertz emergency position-indicating radio beacons (EPIRBs) immediately discontinue the use of EPIRBs that are not global positioning system enabled.	77
NTSB M-17-45	To the United States Coast Guard: Require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival.	77, 78, 79, 97, 101
46 USC 3306	Title 46: Shipping Subtitle II: Vessels and Seamen Part B: Inspection and Regulation of Vessels Chapter 33: Inspection Generally 3306: Regulations	77
46 USC 51	Title 46: Shipping Subtitle II: Vessels and Seamen Part C: Load Lines of Vessels Chapter 51: Load Lines	110
46 USC 5102	Title 46: Shipping Subtitle II: Vessels and Seamen Part C: Load Lines of Vessels Chapter 51: Load Lines 5102: Application	110

Other references (bibliography) are listed on page 120 of the NTSB Report.

NTSB Search URL for Recommendations: https://data.ntsb.gov/carol-main-public/basic-search.

NTSB page: https://www.ntsb.gov/investigations/Pages/DCA21MM024.aspx: Capsizing of Liftboat Seacor Power.

NTSB page: https://data.ntsb.gov/Docket/?NTSBNumber=DCA21MM024: Project Summary: Marine Investigation - 141 Docket Items - DCA21MM024.

End of Exhibit 2.

Exhibit 3: Executive Summary, Conclusions, and Recommendations from NTSB Report MIR-22-26.

Executive Summary (Page x)

What Happened

On April 13, 2021, about 1537 local (central daylight) time, the US-flagged liftboat *SEACOR Power* capsized about 7 miles off the coast of Port Fourchon, Louisiana, in a severe thunderstorm. Eleven crew and eight offshore workers were aboard the liftboat. Vessel operators in the area reported heavy rain, winds exceeding 80 knots, and 2- to 4-foot seas at the time of the capsizing. Search and rescue efforts were hampered by 30- to 40-knot winds and seas that quickly built to 10 to 12 feet and persisted throughout the evening and into the next day. Six personnel were rescued by the US Coast Guard and Good Samaritan vessels, and the bodies of six fatally injured personnel were recovered. Seven personnel were never found and are presumed dead. The vessel, valued at $25 million, was a total constructive loss.

3. Conclusions (Page 99)

3.1 Findings

1. None of the following were safety issues for the casualty voyage: (1) mechanical and electrical systems, (2) watertight integrity, (3) crew experience and qualifications, or (4) fatigue.

2. Commercial pressure was not a factor in the captain's decision to get underway.

3. The weather forecast SEACOR Marine provided to the *SEACOR Power* crew on the morning of the capsizing was insufficient for making weather-related decisions about the liftboat's operation.

4. Given the conditions and the marine weather information available to the captain at the time the liftboat left Port Fourchon, the captain's decision to get underway on the day of the casualty was reasonable; although the captain was not aware of the severe thunderstorm watch, it likely would not have changed his decision.

5. Because the Coast Guard's New Orleans navigational telex site was not operational on the afternoon of the capsizing, the *SEACOR Power* crew did not receive the Special Marine Warning and was not aware of the severity of thunderstorms that were approaching that afternoon.

6. Data gaps, including a lack of low-altitude radar visibility over the Louisiana coastal areas, prevented the National Weather Service office that issued the Special Marine Warning for the casualty site area around the casualty time from identifying and forecasting the surface wind magnitudes that impacted the *SEACOR Power*.

7. Lowering the angle of the lowest radar beam at selected coastal weather radar sites would improve low-altitude radar visibility over coastal waters and, therefore, improve forecasters' ability to accurately monitor, forecast, and notify the public of weather conditions.

8. As designed, the *SEACOR Power* met applicable intact stability criteria.

9. The *SEACOR Power* capsized when it was struck by severe thunderstorm winds that exceeded the vessel's operational wind speed limits and, when combined with sea conditions, resulted in a loss of stability.

10. Although the *SEACOR Power* met stability criteria at the time of the casualty, the vessel's trim by the stern decreased the vessel's ability to resist capsizing.

11. Operation of the *SEACOR Power* with trim by the stern that exceeded the limit specified in the operating manual, stability documentation, and other required guidance was an accepted practice by vessel crews.

12. The *SEACOR Power*'s trim by the stern, its turn to port and speed through the water, a cargo shift, and movement of the vessel's legs may have contributed to the vessel's capsizing.

13. Due to the unpredictability of localized thunderstorm phenomena and the vulnerability of restricted-service liftboats in these storms, operating a restricted-service liftboat in the afloat mode at any time when a Special Marine Warning has been issued for the vessel's planned route increases its risk of capsizing.

14. Increasing minimum stability criteria for liftboats in restricted service would improve vessel survivability in severe thunderstorms.

15. The speed at which the vessel capsized and angle at which it came to rest made egress difficult and likely contributed to the fatalities.

16. The Coast Guard Rescue Coordination Center did not effectively use available information to verify the validity of the location of the *SEACOR Power*'s emergency position indicating radio beacon alerts, which led to a delay in dispatching search and rescue units and notifying Good Samaritan vessels of the emergency.

17. Inaccurate information about the *SEACOR Power*'s location provided to the Coast Guard by a SEACOR Marine employee when contacted regarding the vessel's emergency position indicating radio beacon alert contributed to the delayed response.

18. SEACOR Marine did not have adequate procedures nor did it provide its staff with training for responding to the Coast Guard when contacted regarding emergency position indicating radio beacon alerts.

19. A detailed procedure in Coast Guard mass rescue operations plans combined with mutual aid agreements between the Coast Guard and air rescue providers would improve and expand search and rescue capabilities for future casualties.

20. High winds and heavy seas, combined with underwater and overhead obstructions, prevented both surface and air resources from getting close enough to the vessel to rescue personnel directly from the wreck, which contributed to the loss of life.

21. Mariners have benefited from their employers voluntarily providing personal locator beacons or satellite emergency notification devices.

22. Had the crewmembers of the *SEACOR Power* been required to carry personal locator beacons on board, as recommended in Safety Recommendation M-17-45, and had they been activated when abandoning the vessel, search and rescue crews would have had continuously updated and correct coordinates of individual crewmembers' locations, enhancing their chances of being rescued.

23. Although not causal to the fatalities and despite functioning as designed, the search and rescue transponder held by the mate in the water was not effective in signaling vessels or aircraft due to high seas, no means to hold the device high enough above the water, and lack of rescuer training.

3.2 Probable Cause (Page 101)

The National Transportation Safety Board determines that the probable cause of the capsizing of the liftboat *SEACOR Power* was a loss of stability that occurred when the vessel was struck by severe thunderstorm winds, which exceeded the vessel's operational wind speed limits. Contributing to the loss of life on the vessel were the speed at which the vessel capsized and the angle at which it came to rest, which made egress difficult, and the high winds and seas in the aftermath of the capsizing, which hampered rescue efforts.

4. Recommendations (Page 102)

4.1 New Recommendations

As a result of this investigation, the National Transportation Safety Board makes the following new safety recommendations.

To the US Coast Guard:

Develop procedures to inform mariners in affected areas whenever there is an outage at a navigational telex broadcasting site. (M-22-6)

Modify restricted-service liftboat stability regulations to require greater stability for newly constructed restricted-service liftboats. (M-22-7)

Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate. (M-22-8)

To the National Weather Service:

In collaboration with the Federal Aviation Administration and the US Air Force, determine if it is appropriate to lower the radar angle for coastal weather radar sites without compromising aviation safety or other products, and lower the radar angle at those sites where it is appropriate. (M-22-9)

To the Federal Aviation Administration and the US Air Force:

Work with the National Weather Service to determine if it is appropriate to lower the radar angle for coastal weather radar sites without compromising aviation safety or other products, and lower the radar angle at those sites where it is appropriate. (M-22-10)

To the Offshore Marine Service Association:

Inform your members of the circumstances of this capsizing and encourage them to implement policies to stop afloat operations for restricted-service liftboats when a Special Marine Warning has been issued for the vessel's planned route. (M-22-11)

Notify your members of the availability and benefits of personal locator beacons. (M-22-12)

To SEACOR Marine:

Ensure your vessel crews receive timely and accurate weather forecasts tailored to each vessel's location, including applicable National Weather Service watch and warning products when they are issued. (M-22-13)

Conduct a comprehensive review of your active fleet to ensure your vessels are being operated strictly within the limits specified in operating manuals, stability documentation, and other required guidance. (M-22-14)

Revise your restricted-service liftboat safety management systems and operations manuals to require the vessel to remain in port or jack up when a Special Marine Warning has been issued for the vessel's planned route. (M-22-15)

4.2 Previously Issued Recommendations Reiterated in This Report

The National Transportation Safety Board reiterates the following safety recommendation.

To the US Coast Guard:

Require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival. (M-17-45)

End of Exhibit 3.

Exhibit 4: USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26.

The following questions / comments come from the NTSB Report for the "Capsizing of Liftboat *SEACOR Power*", on April 13, 2021, Report Number MIR-22/26, adopted October 18, 2022.

Responses are from the USCG Naval Architecture Division (CG-ENG-2).

[NTSB Q. 1 (56,1.9.3.1)]

Section 1 Factual Information
Subsection 1.9 Operations
Sub-subsection 1.9.3 Safety Management System
Sub-Sub-subsection 1.9.3.1 Verification and Certification (Page 56)
Question

"During the internal audit, the company auditor verified that stability calculations were conducted based on a sample loading condition dated November 14, 2020. The auditor noted in the record of the audit that stability was "calculated on 'Dixie Endeavor' sheet." The company could not provide a copy of the sample calculations when requested by investigators. A report from the previous year's internal audit, conducted on April 9, 2020, also noted that stability was calculated using the 'Dixie Endeavor Stability program.'"

Was the stability program used by the Seacor Power (originally designated for the "Dixie Endeavor") revalidated? Is there, or should there be, a regulation that ensures that documents / electronic programs used by the Ship's staff are checked whenever changes in structure or other criteria require new lightship calculations or other stability letters are required to be issued?

Response: The stability program used by SEACOR POWER was neither reviewed by the Coast Guard or ABS nor was such a review required. While MODU's subject to the operating manual requirement of 46 CFR 109.121 are not required to meet the stability booklet requirement of 46 CFR 170.110, liftboats subject to the operating manual requirement of 46 CFR 134.170 are not exempt from 46 CFR 170.110. That said, 46 CFR 170.110(f) allows that "on board electronic stability computers may be used as an adjunct to the required booklet, but the required booklet must contain all necessary information to allow for the evaluation of the stability of any intact condition that can be evaluated by use of the computer." Guidance on the use of stability programs is also included in NVIC 3-89. The stability letter places responsibility for maintaining satisfactory stability on the Offshore Installation Manager and does not refer to the stability program. The duty to revalidate or ensure that the stability program is valid for use therefore resides with the OIM.

[NTSB Q. 2 (58,1.9.4.1.2)]

Section 1 Factual Information
Subsection 1.9 Operations
Sub-subsection 1.9.4 Marine Operations Manual
Sub-Sub-subsection 1.9.4.1 Coast Guard Requirements
Sub-Sub-Sub-subsection 1.9.4.1.2 Design Operating Limits (Page 58)

Question

"This section included a table of underway operating limits that showed a maximum wind speed of 70 knots, which matched the "severe storm" wind speed used in regulatory intact-stability calculations for liftboats in restricted service (see section 1.10.2.2 for regulatory intact stability requirements). The maximum wave height was 5 feet; the NTSB could not determine the origin of this threshold."

What relevance does this issue have, if any?

Response: There is no (known) engineering work done to come up with this limit nor does it appear to come from regulatory requirements (either ABS rule or CFR). That said, we note that Encl. (3) to NVIC 8-81, CH-1 contained guidance pertaining to inspection of existing liftboats, which contained the following:

> *"FREEBOARD: Vessels required to have a loadline are to comply with the provisions of 46 CFR, Subchapter E. Vessels not required to meet loadline regulations are to maintain a minimum freeboard of 2 feet amidships. The vessel's stability letter will restrict operations in the floating mode to wave heights not exceeding 2 times the unit's freeboard unless it can be demonstrated by calculation or model test that the vessel may be safely operated in a higher sea state. The purpose of this restriction is to avoid the adverse effects of excessive water on deck."*

For a fully arisen sea, the maximum wave height corresponds to approximately double the significant wave height (which is defined as the average wave height of the 1/3 highest waves). In deep water in which the fetch is not limiting, there is a sustained wind speed that corresponds to the significant wave height for the fully arisen sea. When a maximum wave height of 5 feet is considered, the sustained wind that corresponds to that wave height is in the range of 30 knots or so – perhaps less. This wind speed is significantly less than the 60 knots stated in the Marine Operating Manual. To have the maximum wave height for afloat operations correspond to the maximum wind speed for afloat operations would seem to a logical element of the operational guidance for a liftboat.

While the MBI report does not provide a specific origin of the 5 foot wave height limit for SEACOR POWER, we understand the crew understood that above this limit that jacking down could damage the pads and green water would be on deck. An operational wave height limit is required in 46 CFR 134 and this appears to be a good example even if there is no regulatory basis for calculating it.

[NTSB Q. 3 (60, 1.9.4.1.5)]

Section 1 Factual Information
Subsection 1.9 Operations
Sub-subsection 1.9.4 Marine Operations Manual
Sub-Sub-subsection 1.9.4.1 Coast Guard Requirements
Sub-Sub-Sub-subsection 1.9.4.1.5 Stability (Page 60)
Question

"According to the mate and off-rotation captain and chief engineer, the crew did not use the form provided in the Marine Operations Manual to calculate stability, but instead used a Microsoft Excel spreadsheet. The weights and locations of loads, liquids, and personnel were input into the spreadsheet, and the application completed the calculations. The off-rotation engineer stated that, if a value computed by the stability spreadsheet was outside of allowable parameters, the cell in the spreadsheet containing the value would turn red. The off-rotation captain told investigators that the only value that was regularly out of specification was trim. He stated, '"the comment that [the spreadsheet] says that you should achieve within 6 inches of trim is not reasonable. But the stability program was still accurate and would tell you that you're not within 6 inches. But that was expected.'"

Same question as 1.9.3.1 above: Was the stability program used by the Seacor Power (originally designated for the "Dixie Endeavor") revalidated?

Response: The stability program or spreadsheet was not revalidated by either the Coast Guard or ABS. The stability program or spreadsheet should be identified in the SMS as requiring revalidation periodically. (See response to 1.9.3.1 above.)

[NTSB Q. 4 (62,1.10.2.2)]
Section 1 Factual Information
Subsection 1.10 Stability
Sub-subsection 1.10.2 Intact Stability
Sub-Sub-subsection 1.10.2.2 Regulations (Page 62)
Questions

"Stability criteria established in regulations set numeric bounds for a vessel's stability as determined through a set of calculations that account for the vessel's physical characteristics. The criteria are generally recognized as providing an adequate level of safety for vessels that are operated prudently, which means not overloaded and not operating in dangerous conditions, such as violent storms. A margin of safety is built into the stability criteria to accommodate forces that can act on a vessel, such as winds or waves."

Is this "margin of safety" known to the Company and to the crew? How much is this safety margin?

Response: The margin of safety referred to is qualitative, not quantitative (i.e., no, the precise amount of margin is not known). The current stability criteria is based on criteria developed for self-elevating mobile offshore drilling units. The degree to which this criteria remains valid for modern liftboats is the subject of current work on liftboat stability sponsored by the Coast Guard, which is referred to in the Commandant's response to recommendation number 2 of the Coast Guard's MBI report.

[NTSB Q. 5 (65,1.10.2.3)]

Section 1 Factual Information
Subsection 1.10 Stability
Sub-subsection 1.10.2 Intact Stability
Sub-Sub-subsection 1.10.2.3 Initial Stability Analysis and Stability Review Letter (Page 65)
Question

"After the SEACOR Power's legs were lengthened in 2012, the vessel's Marine Operations Manual was updated in 2013 to include a newly approved lightship weight, revised drawings, and updated AVCG curves. The new AVCG curves were based on the 265-foot configuration values determined in the 2002 stability review. After two additional updates were made to the operations manual in 2014, both reviewed by ABS, a revised stability review letter was issued for the SEACOR Power on October 21, 2014. The updated operations manual was reviewed by the Coast Guard before being placed aboard the vessel."

Did the USCG have any comments or recommendations for the updated operations manual? Was there agreement between the stability letter and the manual?

Response: We are not aware of any documented USCG comments or recommendations related to the stability elements of the operations manual. See the Coast Guard MBI report, paragraph 8.3.15 and following as well as Figure 23.

[NTSB Possible Rec. 1 (69-70,1.10.3.3)]

Section 1 Factual Information
Subsection 1.10 Stability
Sub-subsection 1.10.3 Coast Guard Marine Safety Center Postcasualty Stability Analysis
Sub-Sub-subsection 1.10.3.3 Regulatory Requirements and Operational Guidance (Pages 69-70)
Possible Recommendation

"In the conclusions to its report, the MSC noted that the 60- and 70-knot winds used in the regulatory requirements for stability are also used 'explicitly and without context within SEACOR POWER's Marine Operations Manual and on the vessel's Certificate of Inspection." The report cautions that the regulatory wind speeds are used for stability calculations that only consider static response in still water, not the actual conditions that a vessel may experience (wind and wave action). The MSC concluded that "regulatory criteria wind speeds are not appropriate for operational guidance.'"

Consider aligning MSC and regulatory criteria regarding wind speeds and operational guidance."

Response: The Commandant's Action Memo on the Coast Guard's MBI Report includes responses promising the assessment of stability standards as they apply to design criteria and operating limits. It also directs NOSAC to develop a standardized quick reference card template for a liftboat that can be used by the industry.

[NTSB Possible Rec. 2 (87,2.2.3)]

Section 2 Analysis
Subsection 2.2 Weather and Operations
Sub-subsection 2.2.3 Stability and Capsizing (Page 87)
Possible Recommendation

"In its postcasualty analysis of the SEACOR Power, the Coast Guard MSC confirmed that, using the standard method of calculation used in 2002 (fixed-axis method), the liftboat met regulatory intact stability criteria for maximum AVCG for the vessel at zero trim (even keel) for three of the four stability criteria. For the fourth criterion, range of stability, the vessel passed regulatory standards for all wind directions, except for two cases with the wind 15° off either side of the bow. In these two directions, the vessel passed the regulatory requirements at 8.5 feet of draft. For drafts of 9 feet and greater, the vessel failed the regulatory minimum of 10° of range. The worst failure was at 10 feet of draft with 8.9° of range. The MSC noted that the difference in outcomes between the 2002 ABS stability review analysis (also fixed-axis), which met all conditions, and MSC's postcasualty fixed-axis analysis, which resulted in failures along two axes off the bow, may have been the result of different modeling treatments for the SEACOR Power's helipad."

Consider assessing and agreeing upon stability review analyses between the USCG and ABS.

Response: The Commandant's Action Memo on the Coast Guard's MBI Report includes responses promising the assessment of stability standards as they apply to design criteria and operating limits. This may include review of the elements of a stability review analysis needed to support the issue of a stability letter and/or other regulatory documents.

[NTSB Possible Rec. 3 (88, 2.2.3)]

Section 2 Analysis
Subsection 2.2 Weather and Operations
Sub-subsection 2.2.3 Stability and Capsizing (Page 88)
Possible Recommendation

"The SEACOR Power met stability criteria when subjected to the maximum wind thresholds in the regulations (70 knots) in calm seas, but actual winds during the capsizing

were above the regulatory threshold, with gusts to 80 knots. The ABS CFD analysis found that, with the SEACOR Power in the casualty loading condition (9 feet 3 inches load line draft with 2.5 feet of trim by the stern; legs lowered 10 feet), the vessel was vulnerable to capsizing with winds off the beam and seas at 4 feet (see Figure 24). Although the storm initially hit the SEACOR Power from astern, the mate turned the liftboat to port in an attempt to put the bow into the wind and slow the vessel down to soft tag the bottom. This maneuver put the winds on the vessel's port beam. The CFD model of the vessel capsized in 80-knot winds when the wind direction was just forward of the port beam (285° relative) and swells of 4 feet were coming from off the starboard bow (023° relative). The CFD model of the vessel also capsized when these wind and swell conditions were combined with wind-generated waves moving in the same direction as the winds."

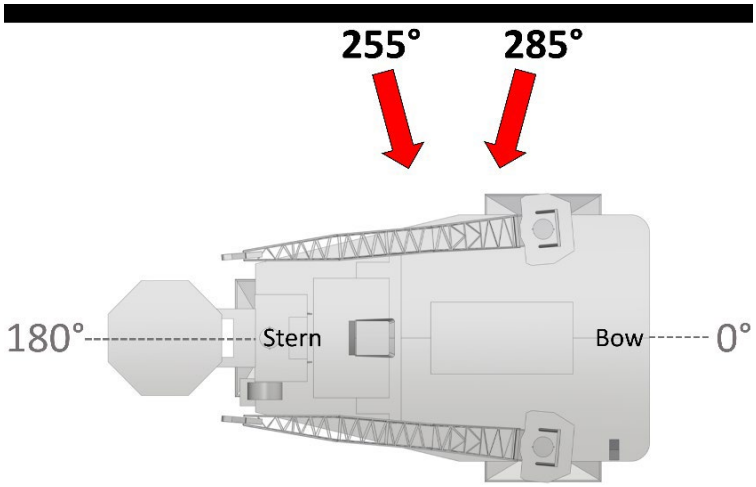

Figure 24. Most vulnerable wind direction" axes for port side of the *SEACOR Power* as determined by CFD analysis.

Consider incorporating recommended maneuvering characteristics (from ABS and in coordination with USCG) in light of potentials for capsizing in weather and sea conditions as encountered by the Seacor Power.

Response: The Executive Summary of the Coast Guard's MBI Report concludes that "The Coast Guard Investigation determined that the biggest factor that contributed to SEACOR POWER's capsizing was the fact that the vessel was caught in unpredicted weather conditions that exceeded the vessel's operating limits." The ABS analysis corroborates this statement since the design limit for wind for the SEACOR POWER was 60 knots and the analysis shows it shows the vessel capsizing in wind of 80 knots – a factor of 1/3 and which, by formula, increase the applied wind force and moments to approaching double the forces and moments for which the vessel was approved. The consideration of recommending maneuvering characteristics should take into account the degree to which maneuvering a liftboat in very strong wind could improve or compromise the safety of the vessel.

End of Exhibit 4.

Exhibit 5: MSC Seacor Power Post-Casualty Analysis Regulatory References.

Citation	Title	NTSB Report Page(s)
NVIC 3-97	Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels	4
46 CFR 170 Subchapter S	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability	6, 10
46 CFR 170.160	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 170 - Stability Requirements for All Inspected Vessels Subpart E - Intact Stability Criteria 170.160: Specific Applicability	7
46 CFR 170.170	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 170 - Stability Requirements for All Inspected Vessels Subpart E - Intact Stability Criteria 170.170: Weather Criteria	7
46 CFR 170.173	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 170 - Stability Requirements for All Inspected Vessels Subpart E - Intact Stability Criteria 170.173: Criterion for vessels of unusual proportion and form	7, 23, 47, 61
46 CFR 174 Subpart H	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats	7
46 CFR Subchapter L	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Parts 125-134	7
46 CFR 174.255	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats 174.255: Restricted Service	7, 11, 12, 28, 29, 30, 41, 43, 44, 49, 50, 55, 56
46 CFR 174.045	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security	7

	Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart C: Special Rules Pertaining to Mobile Offshore Drilling Units 174.045: Intact stability requirements	
46 CFR 174	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types	8, 10, 22, 60, 61, 62
46 CFR 174.055	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart C: Special Rules Pertaining to Mobile Offshore Drilling Units 174.055: Calculation of wind heeling moment (Hm).	8, 9
ABS	ABS Rules for Building and Classing Mobile Offshore Drilling Units (2001)	8, 10, 12, 23, 43, 44, 60, 61, 62
2009 MOU Code	2009 MODU Code (as amended) Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009	8
46 CFR 28.575	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter C: Uninspected Vessels Part 28: Requirements for Commercial Fishing Industry Vessels Subpart E: Stability 28.575: Severe wind and roll	9
IMO MSC.1 Circ, 1229	International Maritime Organization Maritime Safety Committee Guidelines for the Approval of Stability Instruments	45
MTN 04-95, CH-2	Marine Safety Center Technical Note 16710/Lightship Change, dated January 11, 2016 Lightship Change Determination: Weight – Moment Calculations vs. Deadweight Survey vs. Full Stability Test	45
46 CFR 134.170	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels 134.170: Operating Manual	62

End of Exhibit 5.

Exhibit 6: Conclusions from the MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.

8. Conclusions

8.1. When trim was limited to zero, SEACOR POWER passed the stability criteria in the 2001 ABS MODU Rules

The MSC model passed ABS MODU Rules for intact and damaged stability for all zero trim conditions and wind directions. When aft trim was considered, MSC's analysis indicated that, at an initial 10-foot draft with 3 feet of aft trim, damage to the starboard engine room, and 50-knots of wind from a direction of 285° relative (15° forward of the port beam), SEACOR POWER would capsize and thus not meet the requirement that downflood points remain above the waterline. However, this condition was outside the allowable operating range of the vessel as SEMCO and ABS only considered zero trim in their analyses and the Marine Operations Manual contained a 6-inch aft trim limit. Additionally, the molded load line draft of SEACOR POWER was 9.75 feet which is below the analyzed 10-foot draft.

8.2. SEACOR POWER did not pass the regulatory standards of Part 174 for all wind directions

MSC analysis indicated many off-axis wind conditions that resulted in capsize in the orthogonal tipping direction--prior to attaining the required 10° inclination range.

In 2002, ABS used a different model to analyze SEACOR POWER. Comparison of MSC and ABS model wind overturning moments indicated significantly different modeling treatment of the helideck. This may be the reason why the ABS model indicated that SEACOR POWER passed each of the regulatory criteria in 2002.

8.3. SEACOR POWER passed the regulatory standards of Part 174 for beam winds

MSC analysis indicates that, for solely beam wind directions, SEACOR POWER passed all stability criteria of Part 174. This includes intact criteria for 60-knot winds, 70-knot winds, and damaged stability criteria for 50-knot winds and the range of drafts and allowable vertical centers of gravity prescribed by ABS in 2002. In addition to the zero trim conditions prescribed by ABS, MSC checked aft trims up to 3 feet.

The departure and casualty condition also passed all stability criteria of Part 174 for beam winds.

8.4. SEACOR POWER was operated with significant aft trim which was not considered in any stability analysis

The Marine Operations Manual includes a 6" limit on aft trim, but this note appears only on a calculation sheet and not in any other areas of the manual relevant to afloat stability and crewmembers stated that they did not use this worksheet. The SEMCO and ABS stability analyses only considered zero trim for SEACOR POWER. No statements requiring

zero trim or stating that stability was only reviewed with zero trim are given by ABS in plan review or stability letters. Trim has a significant and mostly negative effect on stability and should be considered for an accurate stability analysis when trimmed loading conditions are anticipated.

8.5. SEACOR POWER did not meet the regulatory standards of §170.173

By precedent, MSC does not review liftboats using §170.173, the criterion for vessels of unusual proportion and form. However, liftboats are not explicitly exempt from this criterion (like MODUs). MSC's SEACOR POWER model did not satisfy this criterion in any operational condition, including the departure and casualty conditions.

8.6. SEACOR POWER passed Part 174 intact stability criteria using the varied axis method

When MSC applied the "minimum ascent" method of varied-off-axis stability analysis, SEACOR POWER passed all intact stability criteria for all conditions, including the departure and casualty condition. This method of stability analysis is not typically performed as part of a regulatory or class analysis; however, it is well documented in technical papers on the subjects of orthogonal tipping and free twist.

8.7. Regulatory stability analysis calculation requirements are not clear

As noted in CG-ENG-2's letter to MiNO Marine, Part 174 is silent on the direction of wind required for liftboat stability analysis. Although the ABS MODU Rules and CG-ENG-2's letter both require winds from any direction, the analysis technique to perform this analysis is not defined. Traditional righting arm curves only consider one direction of inclination: heel, while the trim direction must either be held constant or allowed to vary until the trimming moment is zero throughout calculation of the righting arm. The shape of liftboats makes the varied trim assumption problematic for calculation purposes when using the fixed-interval, off-axis stability analysis method because of fading stability. These calculation problems make the stability curves truncate prior to completion (vanishing stability is usually where the righting arm curve crosses the x-axis). Due to this truncation, some of the required stability criteria, especially range of stability, is problematic to calculate.

The term "critical axis" is used in both ABS Rules and CG-ENG-2's letter but not defined in regulation or either of these documents. Critical axis can be assumed as the axis that results in the least favorable condition with respect to the pass/fail criteria. However, range of stability is the first failing regulatory criteria for SEACOR POWER as demonstrated in this analysis. Each of the failing range of stability criteria cases for SEACOR POWER is affected by fading stability and the failing cases all occur with wind directions very near the bow or stern where righting energy is much higher than other inclination directions. Additionally, failures of the range of stability criteria can be "mitigated by sufficient righting energy" as described in CG-ENG-2's letter. Range of stability is not considered for intact stability in the ABS MODU Rules. It is therefore not clear if range of stability criteria results in a reasonable critical axis.

The location point for heeling and righting moment application in the regulations and ABS MODU Rules is not the same. In some cases, this could cause the comparison of these moments to be invalid if the center of buoyancy and center of resistance are significantly separated (the distance of separation that is significant is not known). However, neither regulation nor ABS MODU Rules provide guidance on when separation between center of buoyancy and center of resistance becomes critical.

8.8. Regulatory criteria wind speeds are not appropriate operational guidance

46 CFR 134.170 requires that a liftboat Operating Manual list "designed limits" for wind and waves. 46 CFR Part 174's regulatory wind speeds are used explicitly and without context as operational guidance within SEACOR POWER's Marine Operations Manual and on the vessel's Certificate of Inspection. These regulatory wind speeds are listed in Part 174 as 70 knot “severe-storm” and 60 knots “normal condition of operation afloat” for restricted liftboats and they are used for stability calculations that only consider static response in still-water (no motion of the vessel and no waves) to establish minimum safety characteristics. These regulatory wind speeds are engineering benchmarks that do not represent actual operational conditions which are combinations of wind and wave magnitude, direction, and encounter time in a dynamic setting.

End of Exhibit 6.

Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC Post-Casualty Stability Analysis of Liftboat Seacor Power.

The following questions / comments are from the "USCG Marine Safety Center (MSC) Post Casualty Stability Analysis of Liftboat *Seacor Power*", Revision 4, July 28, 2022. This document is Enclosure (1) to MSC Memo, Serial # A0-2201141.

Responses are from the USCG Naval Architecture Division (CG-ENG-2) in *italics*.

[MSC Q. 1 (4,2)]

Page 4: Section 2. Regulatory Review

"Stability review of and subsequent stability letters for SEACOR POWER were produced by the American Bureau of Shipping (ABS) on behalf the of USCG as outlined in Navigation and Vessel Inspection Circular (NVIC) 3-97: 'Stability related review performed by the American Bureau of Shipping for U.S. Flag Vessels.'"

This NVIC is 26 years old and still valid as noted on the USCG NVIC website. Should this NVIC be reviewed in light of this report?

Response: There is no indication that USCG review would have had a different outcome than ABS review. No specific conclusions were made about NVIC 3-97.

[MSC Q. 2 (4,2)]

Page 4: Section 2. Regulatory Review

"ABS' stability analysis considered both the as built 250' legs and the future extension of the legs to 265' as documented in their letter dated 14 August 2002. Because of this, no subsequent stability analysis of SEACOR POWER was conducted after 2002."

Is this normal procedure to extrapolate stability analysis without using actual ship's weight, etc.?

Response: The procedure to "extend" plan approval to other vessels (or, in this case, the same vessel) is appropriate when the type of analysis allows it. In this case, the stability analysis results in a "Max VCG curve" based on the buoyant envelope and subdivision of the vessel, which makes it appropriate. The bridge management team uses the most current weights (from the 2012 stability test) on their spreadsheet to verify the vessel's loading condition meets the Max VCG curve.

[MSC Q. 3 (7,3.2.1)]

Page 7: Section *3.2.1. Stability Requirements in Part 170 for All Vessels*

"Although Mobile Offshore Drilling Units (MODUs) are exempt from the intact stability criteria in Part 170 of Subchapter S, liftboats are not explicitly noted as exempt in §170.160.[1] Because of this, either the intact stability criteria listed in §170.170 "Weather Criteria" or §170.173 "Criterion for Vessels of Unusual Proportion and Form" could be applied to liftboats. It is apparent from the stability criteria that most liftboats are not intended to meet §170.170 which is for vessels of "ordinary proportions and form." Most liftboats cannot meet §170.173 because liftboats have very low range of stability (20° or less) with downflooding angles as low as 10-15°. For even the most benign "protected" route, §170.173 requires positive righting arms to 25°, and no submergence of downflooding points to angles of inclination of at least 15º. MSC has historically not applied these criteria to liftboats.[2]

[1] As part of the Coast Guard's interim rulemaking for Offshore Supply Vessels, Federal Register Volume 60, No. 221 of November 16, 1995, page 57637 explicitly states: "It was never the Coast Guard's intention to impose on liftboats criteria for stability of conventional ship-shaped hull...Liftboats in restricted service must now, according to §174.255, meet the criteria for intact, damaged, and on-bottom stability in §174.255 itself."
The final rule for Offshore Supply Vessels (Federal Register Volume 62, No. 182 of September 19, 1997) does not address this issue, nor does it make any changes of §170.160.
The addition of MODU's to the list of vessel types exempt from §170.170 and §170.173 is noted in Federal Register Volume 48, No. 115 of November 4, 1983. Page 50999 of this Federal Register entry explicitly states that MODUs are exempt because "a separate wind heel criterion is applied to MODU's in §174.045. Offshore supply vessels and liftboats did not have specific regulations at that time.

[2] §170.173(a) gives MSC discretion on the applicability of the stability criteria within §170.173"

If stability criteria for liftboats is now contained in §174, should the regulation be updated to "explicity" *[sic]* exempt liftboats from §170.160? Refer to Note 1 in which this issue was not addressed.
If liftboats are not intended to meet §170.170 and §170.173, shouldn't the regulations so state?
From Note 2, should discretion be allowed on whether §170.173 is applicable or not?

Response: The applicability of regulations should be clear. Parts of 46 CFR Subchapter S should be applied to liftboats as this section is meant for all vessels. However, the regulations in 170.173 should explicitly state what vessels are exempt.

[MSC Q. 4 (7)]

7 Would exempting liftboats from 46 CFR 170.170 and 170.173 'clean-up' the stability regulations?

Response: The criteria listed in 46 CFR 170.173 is used for almost all vessels. It is well known how to apply the criteria and it does not require calculation of external forces like wind and waves. However, most U.S. liftboats do not satisfy these criteria (none that I know of).

Although exempting liftboats from 46 CFR 170.170 and 170.173 would provide clarity, whether this is a safe solution needs to be verified. Liftboats share characteristics with both MODUs and vessels to which "intact stability for all vessels" apply.

Exempting liftboats makes their regulatory stability identical to jack up MODUs. However, liftboats in transit vastly differ from MODUs in several respects: liftboats are self-propelled, have no attending or standby vessel, carry navigational crew, offshore workers, cargo, and have signficantly less reserve buoyancy and freeboard.

On the other hand, existing liftboats are much different than "normal" boats and don't meet 170.170 and 170.173. It appears from Federal Register regulatory comment discussion that the USCG didn't intend for liftboats to meet these criteria.

[MSC Q. 5 (7,3.2.2)]

Page 7: Section *3.2.2. Stability Requirements in Part 174, Specific to Liftboats*

"Stability criteria contained in Part 174 are silent regarding wind direction. The terms "heel" and "heeling moment" are used throughout but not defined in Part 174, which leaves evaluation of liftboat inclination and wind direction to the interpretation of the naval architects conducting an analysis. Given the hull shape, it is unreasonable to assume that the regulations intend only for an analysis of wind forces acting on the beam and inclining the vessel in a transverse direction (about the longitudinal axis) because this type of analysis will not consider the stability failure directions most likely to affect a liftboat."

Why is wind direction not included as a parameter for stability criteria? As stated, "heel" and "heeling moment" are not defined, and thus naval architect must use interpretation when conducting the analysis. Should the regulation be updated to correct the unreasonable assumption for analyzing wind forces only on the beam and in a transverse direction?

Response: Yes, as the Commandant's response to the MBI Report's Recommendation No. 2 states, the regulations should be validated or updated. However, analyzing wind forces and moments from all directions using the Part 174 criteria can result in calculation problems, specifically for the "range" criteria in 174.255(a)(1)(ii). Hence, including a requirement for evaluating wind forces and moments from all directions in Part 174 would have to address those possible calculation issues to ensure that they are sufficiently robust for regulatory use.

[MSC Q. 6 (7,61)]

7, 61 Should 46 CFR 174 address wind direction requirements (define analysis technique)?

Response: Part 174 does not currently state that winds should be evaluated from all directions. The normal definition of "heel" in this section indicated that only beam winds

were intended. Analyzing winds from all directions using the Part 174 criteria results in calculation problems, specifically for the "range" criteria in 174.255(a)(1)(ii). Including a requirement for winds from all directions in Part 174 would have to address those calculation issues.

[MSC Q. 7 (7,3.2.2)]

Page 7: Section *3.2.2. Stability Requirements in Part 174, Specific to Liftboats*

"The MSC has not documented their policies for varied wind direction or off-axis stability analyses. A review of MSC's past liftboat stability reviews indicate an inconsistent application of off-axis stability prior to 2018."

Should MSC update policies to eliminate the inconsistent application of off-axis stability?

Response: Policies should ensure to the maximum extent possible consistent application of critical axis stability. However, the regulatory calculation method is currently unclear and MSC is evaluating liftboats on a case-by-case basis because a generalized methodology has not yet been determined.

[MSC Q. 8 (8,3.2.2)]

Page 8: Section *3.2.2. Stability Requirements in Part 174, Specific to Liftboats*

"A letter from the Chief of the Naval Architecture Division of the Coast Guard Office of Design and Engineering Standards (CG-ENG-2) dated November 7, 2018, to MiNO Marine, LLC (a naval architecture and professional services firm that designs lift boats) states that Part 174 "is silent on the issue" of off-axis stability but that wind directions should be checked incrementally from 0º to 360º of yaw. This position is also reflected in informal correspondence between the Marine Safety Center, COMDT(CG-ENG-2) and ABS in 2009."

Regarding the advice from MiNO Marine, should the regulations be updated accordingly?

Response: Yes, as the Commandant's response to the MBI Report's Recommendation No. 2 states, the regulations should be validated or updated. Because the regulatory calculation method is currently unclear for off-axis stability, current evaluation of liftboats is on a case-by-case basis. The stability characteristics discussed in the MiNO marine letter may not be applicable to all liftboats.

[MSC Q. 9 (8,3.2.2)]

Page 8: Section *3.2.2. Stability Requirements in Part 174, Specific to Liftboats*

"For liftboats and MODUs, Part 174 is also silent regarding whether the vessel should be allowed to trim freely (orthogonally tip) when evaluating righting arm curves (notably, Part 174 is not

silent about this for Tugboats, Offshore Supply Vessels, or Hopper Dredges). Using fixed trim is not a suitable way to evaluate liftboat stability; this is due to potentially weak righting characteristics in trim and the location of downflooding points away from amidships where they are particularly affected by trim. For this report, MSC always allowed the model to freely trim and freely tip in the direction orthogonal to inclination."

Should future stability analyses be required to allow the vessel to trim freely?

Response: Fixed trim righting arm curves often are not conservative and should not be used. However, liftboat stability analysis can experience calculation problems when allowing free trim, which can designers in a difficult position when trying to document regulatory compliance.

[MSC Q. 10 (8)]

8 Should 46 CFR 174 address vessels being allowed to trim freely when evaluating righting area curves?

Response: Fixed trim righting arm curves are not conservative and should not be used. However, because liftboat stability analysis can experience calculation problems when allowing free trim, demonstrating regulatory compliance can be difficult for designers.

[MSC Q. 11 (8,26)]

8, 26 Should the USCG better document (provide guidance to industry) on off-axis stability analyses rather than a CG-ENG-2 letter to a private company in 2018 and a letter to ABS in 2009?

Response: The USCG does not have a generalized methodology for all vessels and a case-by-case solution is appropriate at this time.

[MSC Q. 12 (9)]

9 Should the USCG adopt the more conservative wind profile standards of API, NPD, SNAME or 46 CFR 28.575 for liftboats?

Response: As stated in the Commandant's response to Recommendation No. 2 of the USCG MBI Report, consideration will be given to revising the wind profile standard provided in the regulation.

[MSC Q. 13 (10,3.3)]

Page 10: Section *3.3. ABS MODU Rules*

"At the time of SEACOR POWER's construction, ABS had its own requirements for liftboat stability which were contained in the ABS Rules for Building and Classing Mobile Offshore Drilling Units, 2001 (ABS MODU Rules). These classification requirements included the stability criteria listed in

Table 1. Notably, ABS MODU Rules explicitly require the vessel to satisfy stability criteria with winds from any horizontal direction. Like Part 174, the ABS MODU Rules are silent regarding whether the vessel should be allowed to trim freely when checking stability criteria."

Should ABS Rules be updated accordingly and NVIC 3-97 also updated to reflect this silence issue?

Response: Fixed trim was an expedient way to perform calculations by hand before the use of modern hydrostatics software. Free trim methods are more conservative and more representative of actual vessel response. ABS was using free trim methods to analyze SEACOR POWER but it is not clear if it was (or is currently) a requirement).

[MSC Q. 14 (10,3.3)]

Page 10: Section *3.3. ABS MODU Rules*

"ABS MODU Rules for intact stability are similar to the Code of Federal Regulations except that Part 174 also requires residual righting energy and range of stability criteria."

Should ABS MODUE Rules be updated to require residual righting energy and range of stability criteria as stated in Part 174?

Response: For SEACOR POWER, residual righting energy was never a limiting criterion. Significant calculation problems result from the range of stability criteria when performing off-axis (wind from any direction) calculations. Because ABS rules explicitly require wind evaluation from any direction, inclusion of the range of stability criteria could result in significant calculation problems.

[MSC Q. 15 (10-11,3.3)]

Pages 10-11: Section *3.3. ABS MODU Rules*

"ABS' stability plan review letter (MBI Ex. 55) and calculations indicate that ABS reviewed SEACOR POWER to both ABS MODU Rules and 46 CFR Subchapter S. Calculation summary results provided with that letter and included in MBI Exhibit 55 indicate that ABS identified the CFR criteria as the limiting stability criteria during their review."

How were these limiting criteria applied to the stability letter?

Response: ABS and SEMCO used the criteria to develop SEACOR POWER's max VCG curve which appears in the MOM. The stability letter refers to the MOM.

[MSC Q. 16 (11,16)]

11, 16 Should the USCG change what is provided under "Operational Requirements" in Marine Operation Manuals? For example, remove max wave height, highlight max trim, provide max wind speed other than regulatory values, add max VCG for deck cargo, add max wind area for deck cargo. See also related question under GENERAL QUESTIONS.

Response: The USCG does not have the vessel-specific expertise to generate operating limits. The MOM requirements are each important for actual operation of the vessel. As stated in the Commandant's response to Recommendation No. 2 of the USCG MBI Report, operating limits will be considered in USCG actions.

[MSC Q. 17 (12,4)]

Page 12: Section 4. Operating Requirements for Afloat Stability

"Trim is not discussed in the ABS stability review letters provided to MSC. ABS calculations for stability were performed with zero initial trim. The Marine Operations Manual includes one discrete trim limit on page 8-13 stating that "the vessel should have no more than 6" of trim by the stern." This page is a calculation worksheet page and the limit appears in finer print and a different color than other text on the page. Deck officers testified at the MBI that they did not use this worksheet to evaluate stability. The source of this limit could not be identified in engineering documentation, however, zero initial operating trim is apparently the only initial trim considered by ABS or SEMCO. Because MBI testimony indicated that SEACOR POWER normally operated with aft trim, this post-sinking analysis report considers aft trims from 0 to 3 feet."

Should regulations be updated to include "trim" as part of the analysis. Would trim calculations, if reduced stability is identified, deter the liftboat's crew from sailing with these conditions?

Response: MSC policy requires trimmed hydrostatics to be used when trim is permitted beyond 1% of length. This would have been about 1.5 feet for SEACOR POWER. Because SEACOR POWER sailed with 2.5 feet of aft trim, neither the hydrostatics table used by the crew nor the Max VCG curve in the MOM were valid. This means the crew could not have accurately evaluated stability in that trimmed condition. However, MSC post-casualty analysis showed that SEACOR POWER was still in compliance with the regulations. Further, as the Commandant's response to the MBI Report's Recommendation No. 2 states, the regulations should be validated or updated to consider realistic loading.

[MSC Q. 18 (12,4a)]

Page 12: Section 4. Operating Requirements for Afloat Stability

"The Operating Manual lists a limiting wave height of 5 feet or twice the freeboard as shown in Figure 5. However, regulatory and ABS MODU Rules stability criteria do not include requirements

for stability in waves and the origin of this 5-foot limit is not known.[4] Statutory and class rule requirements for liftboats are evaluated using static, sustained wind, still-water conditions only.

[4] NVIC 8-81, Change 1 (published March 1988 and cancelled by NVIC 8-91 published in May of 1991) included a wave height restriction of twice the freeboard for liftboats (a minimum freeboard requirement of 2 feet was required)."

Should stability in waves be included in stability analyses?

Response: Dynamic stability analysis of liftboats in waves is difficult. Likewise, the ability to perform such analysis – to the extent possible -- and to develop regulations that incorporate such analyses would be very difficult.

[MSC Q. 19 (12,4b)]

NVIC 8-91 allows for two methods to present stability information: 1. "Simple" Stability information, or 2. Stability Instructions as Part of the Operating Manual. Would the USCG evaluate whether the method submitted was satisfactory for the liftboat's crew?

Response: Yes, ABS (on behalf of the USCG MSC under NVIC 3-97) evaluated the stability criteria and ensured that the Operating Manual contained the relevant stability instructions.

[MSC Q. 20 (15,6)]

Page 15: Section 6. Departure and Loss Loading Condition

"Cargo manifests indicate SEACOR POWER loaded approximately 100 long tons of cargo before departure (MBI Exhibits 24-30). Survivor testimony indicated that cargo was not secured on deck. This post-sinking stability analysis assumes the cargo remains without shifting."

Would there be appreciable different results to conduct the stability analysis with shifting cargo as opposed to the cargo not shifting?

Reesponse [sic]: Shifted cargo changes the righting arms of a vessel and would likely result in worse stability characteristics. For SEACOR POWER, testimony and examination of the deck for scarring/scratches did not indicate that cargo had shifted before the vessel overturned.

[MSC Q. 21 (16,7)]

Page 16: Section 7. MSC's Independent Stability Analysis

"MSC conducted a post-casualty regulatory stability analysis of SEACOR POWER to determine if the operating conditions of the vessel met regulatory stability criteria. MSC did not conduct any

stability analysis or stability oversight of ABS as part of SEACOR POWER's initial certification in 2002 or subsequent leg lengthening in 2012."

Are there criteria at MSC for when oversight would be conducted?

Response: MSC performs targeted oversight of Classification Societies who perform plan review on behalf of the USCG. However, there are no specific triggers for what type of plans or vessels for which oversight is performed.

[MSC Q. 22 (16)]

16 Who enters vessel models in software at MSC? one person for consistency? What is the education, qualifications, certifications, and experience of MSC modeler?

Response: Each plan reviewer/naval architect creates models at MSC. Almost all reviewers have both bachelor's and master's degrees in engineering, and many have professional engineering licenses. Experience varies significantly. Due to the time constraints of plan review (30 days) many engineers rely on the models submitted by commercial naval architects and perform validation on that model.

[MSC Q. 23 (16,20)]

16, 20 Is there a modeling protocol to ensure "modeling treatment" is done consistently? Is it shared with ABS? Does ABS use the same software as USCG? Should the ABS modeler train under the USCG modeler for NVIC 3-97 work?

Response: There is no modeling protocol. USCG MSC almost exclusively uses GHS software for stability modeling. It is understood that ABS uses HecSalv, Sea Safe, and mostly GHS. For SEACOR POWER, ABS used an obsolete software called "DrilWind." MSC was using GHS at the time SEACOR POWER was built but did not perform oversight of ABS' work on the SEACOR POWER. At this time, ABS and MSC have similar modeling competence.

[MSC Q. 24 (19)]

19 The difference in TCG between ABS and the USCG from the inclining test is significant (perhaps a red flag to conduct further 3-97 oversight?). Is the assumption "any off-center weight is corrected by loading on opposite side" reasonable or safe? given unsecured deck cargo, 90-tons of unknown weight, and the vessel capsized to starboard? Though it is obvious, should stability analyses consider initial heel at fixed intervals? and warn the operator of the effects of initial heel in the Operating Limits of the Marine Operations Manual?

Response: While the TCG difference is significant, accurate TCG calculation is not always included during an inclining test. The MSC analysis fits a curve to the inclining data differently than SEMCO, but the source of the discrepancy is not known. As the plan

reviewer under NVIC 3-97, ABS would have been responsible to identify any of SEMCO's calculation discrepancies. MSC would not be aware of discrepancies until it performed an oversight review—in this case, the results are not reported to MSC unless requested as part of the oversight process.

Regarding initial heel, an off center TCG could be used during analysis and would result in a more conservative analysis. However, like considering trim, considering initial heel would add significant complexity to a stability analysis.

[MSC Q. 25 (20,7.3)]

Page 20: Section *7.3. Light Weight Comparison*

"MSC and SEMCO calculated light weight characteristics closely match except for transverse center of gravity. The source of the transverse center of gravity discrepancy between MSC and SEMCO calculations cannot be determined based on available information. However, regulatory maximum vertical center of gravity analysis will assume zero initial heel (MSC assumes that any off-center weight is corrected by loading cargo on the opposite side of the centerline so that the resulting initial heel of the vessel is 0°)."

Is the stability analysis used by SEMCO acceptable to the USCG and by extension, ABS? The discrepancy is 1.52 feet closer to the centerline with the MSC calculation. The average width of the hull is 82.5 feet (103 at the forward bow legs and 62 at the stern). Average percentage of distance off the centerline for SEMCO is 2.8% versus 1.0% for MSC. Are these values acceptable to the USCG?

Response: During plan review, the magnitude of these discrepancies would be addressed by either ABS or MSC. There is no established standard for an acceptable TCG but it is not uncommon to have a significant off centerline lightship TCG. The discrepancy could not be identified as part of the MSC's Post-Casualty analysis.

[MSC Q. 26 (20,7.4)]

Page 20: Section *7.4 Wind Moment Comparison*

"MSC wind load and moment values are generated using the regulatory shape factors in Table 6. MSC's analysis accounts for shielding between components (other than the legs) and vessel structure as it emerges from the water with heels. It is not known why the values differ so significantly with ABS' values (the proprietary, in-house DRILWIND program used by ABS is now obsolete). Because the largest wind moment differences between ABS and MSC models occurs when wind is coming from the stern and quarter, this may indicate significantly different modeling treatment of the helideck as it inclines and is affected by the wind."

Are there any other vessels that analysis was conducted using DRILWIND that have not been reevaluated?

Response: No reevaluation of existing vessels, regardless of their stability analysis software, has been undertaken.

[MSC Q. 27 (22)]

22 Is wind banding method generally accepted across different naval architecture stability softwares?

Response: When using the building block method, the wind banding approach is common. An OTC Technical paper indicates that this "empirical building block method" (banding) is not an accurate way to calculate wind pressure (Berto et al., OTC-29289-MS, "A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study," 2019).

[MSC Q. 28 (22)]

22 Should a software be used if it accounts for shielding but the regulations prohibit leg shielding allowances in 46 CFR 174.055?

Response: Such software would not meet the regulation, but the possibility exists that it could meet an equivalent level of safety through modification of drag coefficients or other methods.

[MSC Q. 29 (22-23,7.6)]

Pages 22-23: Section *7.6. Stability Analysis Conducted by MSC*

"Free surface effects of partially filled tanks are not included in MSC's analysis of the allowable vertical centers of gravity because free surface effects are calculated as a formal VCG correction in the Marine Operating Manual when evaluating an actual condition to ensure it falls under the maximum VCG curve. However, true free surface effect (the actual shifting of liquid center of gravity based on inclination angle) is calculated by MSC when evaluating the departure and casualty conditions where tank contents are known (Part 174 is silent on the treatment of free surface effect for liftboats). The true free surface method within GHS software used by MSC most closely models actual inclined conditions of the tanks, especially at angles of inclination greater than 5°."

Should the regulations be updated to address free surface effect?

Response: 46 CFR part 170 requires free surface effects to be provided in the tank tables where they appear in the SEACOR POWER MOM. The free surface effect of tanks causes a virtual rise in the vertical center of gravity and must be calculated by the crew to ensure that the loaded VCG is in compliance with the max VCG curve.

[MSC Q. 30 (23,7.6.1)]

Page 23. Section *7.6.1. Criterion for Vessels of Unusual Proportion and Form*

"MSC evaluated each draft and maximum vertical center of gravity condition using the Criterion for Vessels of Unusual Proportion and Form, §170.173. No axis rotation was used in these analyses and wind force is not modeled. In all conditions, SEACOR POWER fails the §170.173 criteria by large margins because maximum righting arm, downflooding and capsize occur at much lower heel angles than 15° for maximum righting arm and 30°, the minimum range of stability that the criteria require for an open ocean route."

In 3.2.1 of this report (and identified above) this fact that liftboats would regularly fail §170.173 was noted. Should wind force and axis rotation be included in stability analyses?

Response: 46 CFR 170.173 is criteria is largely derived from criteria developed by IMO (then IMCO) and issued as Resolution A.167(ES IV) in 1968 as a response to a recommendation made by the 1960 SOLAS Conference. The Coast Guard made this available to the U.S. industry by way of NVIC 3-73. The IMO criteria was incorporated into the criteria made mandatory for vessels issued either an International Load Line or SOLAS certificate in Part A of the 2008 IS Code. The Explanatory Notes to the 2008 IS Code (IMO MSC.1/Circ.1281) provide the background of the origin of these criteria. The 170.173 criteria incorporates wind and waves considerations that are dependent on route (exposed, partially protected, and protected) in the required righting arm characteristics.

[MSC Q. 31 (23,7.6.1)]

Page 23. Section *7.6.1. Criterion for Vessels of Unusual Proportion and Form*

"We note that §170.173 was not evaluated by ABS as part of their review of SEACOR POWER, nor would it have been if MSC had conducted the stability analysis. However, liftboats are not explicitly exempt from these criteria as discussed in Section 3.2.1 above."

As before identified, should the regulation be amended to explicitly exempt liftboats from the criteria in §170.173?

Response: The applicability of 170.173 should be clear. As the Commandant's response to the MBI Report's Recommendation No. 2 clarifies, the regulations should be validated or updated with respect to their application to liftboats.

[MSC Q. 32 (26)]

26 Does "fading stability" need to be addressed in policy or regulations?

Response: See the answer to "7, 61" above.

[MSC Q. 33 (28,7.6.2.1)]

Page 28: Section *7.6.2.1. Fading Stability*

"When the wind direction was from 135° for 8.5- and 9-foot drafts, the stability analysis software failed to calculate ratio, range, and residual area criteria. An inspection of the righting arm curves indicates that ratio and residual area criteria are satisfied in these cases that all result in fading stability."

Did failure to calculate ratio, range, and residual area criteria for these conditions cause concern and the need to further address the issue?

Response: Yes, they are concerning from Post-Casualty Analysis perspective, and the MSC concluded that the criteria calculation methodology is not clear. Further, whether these issues were encountered during the 2002 stability review of the vessel is not clear.

[MSC Q. 34 (29,7.6.2.1)]

Page 29: Section *7.6.2.1. Fading Stability*

"CG-ENG-2's 2018 letter to MiNO Marine indicated that, at non-critical yaw angles where righting energy meets minimum requirements by a large enough margin, reduced range of stability is mitigated adequately. For all conditions that failed §174.255(a)(1)(ii) range of stability criteria, the righting energy meets the criteria of §174.255(a)(1)(iii). It is not apparent if the margin is large enough to satisfy the stated goal of CG-ENG-2's letter."

If margin is not apparently large enough to satisfy the goal of CG-ENG-2, what is done about it?

Response: The MiNO Marine letter addresses one specific vessel. Other equivalencies or situations could be granted on a case-by-case basis.

[MSC Q. 35 (29)]

29 What are the margins of safety needed to satisfy the stated goal of CG-ENG-2 letter to the private company in 2018? Should MSC margins of safety and goals be promulgated to industry rather than a single private company?

Response: See the answer to "8, 26" above.

[MSC Q. 36 (30,7.6.2.2)]

Page 30: Section *7.6.2.2. Beam Wind Directions*

"As discussed above in Section 3.2, Part 174 is silent regarding wind direction and MSC does not have written guidance on how the Coast Guard applies these criteria or how it should be required on behalf of the Coast Guard when ABS reviews stability using the provisions of NVIC 3-97."

Further, should Part 174 be revised to include guidance on wind direction and how the USCG should apply these criteria or with ABS, revising NVIC 3-97?

Response (repeated from above): Yes, as the Commandant's response to the MBI Report's Recommendation No. 2 states, the regulations should be validated or updated. However, analyzing wind forces and moments from all directions using the Part 174 criteria can result in calculation problems, specifically for the "range" criteria in 174.255(a)(1)(ii). Hence, including a requirement for evaluating wind forces and moments from all directions in Part 174 would have to address those possible calculation issues to ensure that they are sufficiently robust for regulatory use.

Updating the regulations could be done in a way that maintains NVIC 3-97 validity.

[MSC Q. 37 (41)]

41 Should the USCG promulgate guidance on stability analysis methods, and which is best for type of vessel, route and service? For example, varied axis -minimum ascent, fixed intervals, fading stability, wind banding, etc.

Response: MSC does this through our plan review guidelines on our website. See C1-06 "OSV Stability," C1-27 "Chemical Tankship Lightship and Stability," C2-33 "MODU Stability," H1-01 "Review of Stability for Small Passenger Vessels," and H2-04 "Stability (Subchapter I)" for examples. MSC doesn't have a set procedure for analyzing liftboats and the procedure for liftboats is not specific to calculation methods.

[MSC Q. 38 (43,7.6.4)]

Page 43: Section *7.6.4. Damaged Stability*

"Additionally, MSC identified four damage cases that were apparently not part of ABS' 2002 stability review (as provided in MBI Exhibit 55). Three of these cases involved damaging the outer preload tank and adjacent leg which is within the extent of damage for both the §174.255(b) and ABS MODU Rules Criteria (MSC Damage cases 4, 5, and 9). A fourth damage case (MSC Damage Case 8) involves two compartments where Tank T and Tank V are both within the transverse extent of damage. These four damage cases did not result in failure of the stability criteria in MSC's analysis."

Should oversight be more rigorous? In this case, the four damage cases did not result in failure of stability criteria; however, could there be other instances where damage cases, not reviewed by ABS, might result in failure by MSC?

Response: MSC has increased the percentage of its resources spent on oversight to ensure that vessel comply with stability criteria.

[MSC Q. 39 (45.7.7.1)]

Page 45: Section *7.7.1. MSC Assumed Departure Loading Condition*

"Section 6 provides details of the observed capsize condition. MSC used those observations to create a model loading condition for departure. Because the actual location of deck cargo is not known, MSC used the observed draft at the Plimsol *[sic]* Mark (9.25 feet) and the trim (2.5 feet aft) to calculate the displacement. Heel was assumed to be 0.25° to starboard…"

Should the USCG consider requiring liftboat crews to submit relevant stability information to the shore-side company for verification prior to departure?

Response: The USCG MBI Report recommended that auditors and inspectors review the crew's stability when the vessel is in a floating condition and not always in the jacked-up condition.

[MSC Q. 40 (45,7.7.1)]

Page 45: Section *7.7.1. MSC Assumed Departure Loading Condition* [Footnote 9]

"[9] The cargo manifests account for approximately 100 long tons of cargo weight which would have had a longitudinal center of gravity on the deck forward of the house (the forward end of the house is 105 feet aft of the bow). Cargo manifest weights are generally not accurate and the crew of SEACOR POWER weighed items as they were craned onboard on 13 April 2021, but these records were lost in the capsizing. The remaining 90 long tons of calculated unknown weight to attain the departure drafts and trim cannot be identified; MSC assumed that it is weight located longitudinally within the engine rooms and superstructure. This 90-ton unknown weight represents approximately 3.5% of the lightship weight of SEACOR POWER. Marine Technical Note 4-95 and International Maritime Organization Maritime Safety Committee Circular 1229 identifies an acceptable tolerance for lightship displacement (weight) discrepancies of 2% which is of similar magnitude to the calculated unknown weight of 3.5%."

Should the USCG consider tightening cargo manifest information? As above, should stability information be submitted to the shore-side office for verification and recordkeeping? Should out-of-tolerance recommendations by IMO be incorporated into regulations such that Companies could consider analyzing this condition and making applicable changes to stability information?

Response: The crew effectively verified and corrected manifest information by weighing each piece of deck cargo as it came aboard.

Regarding IMO tolerances: The 90LT discrepancy is not necessarily an error or significant. It could be actual cargo weight, additional stores, water/silt in ballast tanks, etc. The weight could have been accounted for by the crew, but the records were lost in

the casualty. MSC assumed this weight was deck cargo, but this can't be verified because the only deck cargo records are manifest weights which the crew did not rely on when loading SEACOR POWER. This section of the report mostly is describes the MSC's analysis method and attempted to highlight the significance of any difference in the post-casualty analysis.

[MSC Q. 41 (45)]

45 The 90-ton unknown weight represents 3.5% of lightship. How is that "similar" to an IMO MSC Circular acceptable tolerance of 2% lightship?

Response: The 90LT discrepancy is not necessarily only lightship weight. It could be actual cargo weight, additional stores, water/silt in ballast tanks, etc. The weight could have been accounted for by the crew, but the records were lost in the casualty. MSC assumed this weight was deck cargo, but this can't be verified because the only deck cargo records are manifest weights on which the crew did not rely when loading SEACOR POWER.

IMO Circular 1229 states that a displacement discrepancy of up to 2% is acceptable. While 3.5% is more than 2%, it is "of similar magnitude" as stated.

[MSC Q. 42 (62)]

62 Should the location point for heeling and righting moment application in the regulations and ABS MODU Rules be aligned?

Response: In a perfect world, rules and regulations would be aligned. While the ABS method appears to be more accurate, especially for vessels with truss-legs (like MODUs), the degree to which this approach together with other considerations should be taken into account for liftboats needs evaluation.

[MSC Conclusion 1 (8)]

Section 8. Conclusions

The following items are from Section 8 on pages 60-62. The main concern here is whether or not USCG would consider revisions to applicable regulations to address these highlighted conclusions.

Response: Please refer to the Commandant's response to the MBI Report's Recommendation No. 2 to learn how the USCG will consider regulatory action.

[MSC Conclusion 2 (8.1)]

8.1. When trim was limited to zero, SEACOR POWER passed the stability criteria in the 2001 ABS MODU Rules

"The MSC model passed ABS MODU Rules for intact and damaged stability for all zero trim conditions and wind directions. When aft trim was considered, MSC's analysis indicated that, at an initial 10-foot draft with 3 feet of aft trim, damage to the starboard engine room, and 50-knots of wind from a direction of 285° relative (15° forward of the port beam), SEACOR POWER would capsize and thus not meet the requirement that downflood points remain above the waterline. However, this condition was outside the allowable operating range of the vessel as SEMCO and ABS only considered zero trim in their analyses and the Marine Operations Manual contained a 6-inch aft trim limit. Additionally, the molded load line draft of SEACOR POWER was 9.75 feet which is below the analyzed 10-foot draft."

[MSC Conclusion 3 (8.2)]

8.2. SEACOR POWER did not pass the regulatory standards of Part 174 for all wind directions

"MSC analysis indicated many off-axis wind conditions that resulted in capsize in the orthogonal tipping direction--prior to attaining the required 10° inclination range.

In 2002, ABS used a different model to analyze SEACOR POWER. Comparison of MSC and ABS model wind overturning moments indicated significantly different modeling treatment of the helideck. This may be the reason why the ABS model indicated that SEACOR POWER passed each of the regulatory criteria in 2002."

[MSC Conclusion 4 (8.4)]

8.4. SEACOR POWER was operated with significant aft trim which was not considered in any stability analysis

"The Marine Operations Manual includes a 6" limit on aft trim, but this note appears only on a calculation sheet and not in any other areas of the manual relevant to afloat stability and crewmembers stated that they did not use this worksheet. The SEMCO and ABS stability analyses only considered zero trim for SEACOR POWER. No statements requiring zero trim or stating that stability was only reviewed with zero trim are given by ABS in plan review or stability letters. Trim has a significant and mostly negative effect on stability and should be considered for an accurate stability analysis when trimmed loading conditions are anticipated."

[MSC Conclusion 5 (8.5)]

8.5. SEACOR POWER did not meet the regulatory standards of §170.173

"By precedent, MSC does not review liftboats using §170.173, the criterion for vessels of unusual proportion and form. However, liftboats are not explicitly exempt from this criterion (like MODUs). MSC's SEACOR POWER model did not satisfy this criterion in any operational condition, including the departure and casualty conditions."

[MSC Conclusion 6 (8.7)]

8.7. Regulatory stability analysis calculation requirements are not clear

"As noted in CG-ENG-2's letter to MiNO Marine, Part 174 is silent on the direction of wind required for liftboat stability analysis. Although the ABS MODU Rules and CG-ENG-2's letter both require winds from any direction, the analysis technique to perform this analysis is not defined. Traditional righting arm curves only consider one direction of inclination: heel, while the trim direction must either be held constant or allowed to vary until the trimming moment is zero throughout calculation of the righting arm. The shape of liftboats makes the varied trim assumption problematic for calculation purposes when using the fixed-interval, off-axis stability analysis method because of fading stability. These calculation problems make the stability curves truncate prior to completion (vanishing stability is usually where the righting arm curve crosses the x-axis). Due to this truncation, some of the required stability criteria, especially range of stability, is problematic to calculate.

The term "critical axis" is used in both ABS Rules and CG-ENG-2's letter but not defined in regulation or either of these documents. Critical axis can be assumed as the axis that results in the least favorable condition with respect to the pass/fail criteria. However, range of stability is the first failing regulatory criteria for SEACOR POWER as demonstrated in this analysis. Each of the failing range of stability criteria cases for SEACOR POWER is affected by fading stability and the failing cases all occur with wind directions very near the bow or stern where righting energy is much higher than other inclination directions. Additionally, failures of the range of stability criteria can be "mitigated by sufficient righting energy" as described in CG-ENG-2's letter. Range of stability is not considered for intact stability in the ABS MODU Rules. It is therefore not clear if range of stability criteria results in a reasonable critical axis."

GENERAL QUESTIONS:

[MSC General Q. 1]

Q: Given NVIC 3-97 discrepancies between ABS and the USCG, is this an "El Faro" moment for the MSC and ABS? Consider the following issues: TCG red flag from the inclining should have triggered oversight; the 5' max wave height (twice the freeboard) negated years eResponseier by NVIC 8-91; no bold warnings on allowable trim; helideck mismodeling treatment; significantly different wind moments, 4 missing damage stability conditions, mismodeling the raised pads as part of the hull (no water plane changes at the interface).

Response: ABS' rules, analysis software, and engineer experience with liftboat stability have been well ahead of USCG MSC's since SEACOR POWER was constructed in 2002. It is not clear if the USCG had the ability to perform off-axis stability in 2002 and unlikely it would have been applied to a liftboat stability review even as late as 2018 (e.g., the MiNO marine letter). Although the TCG discrepancy, failure to analyze trim, and modeling differences were identified, these considerations involved minor effects and as concluded, SEACOR POWER met both ABS rules and CFR criteria as they would have been

applied by MSC. It is therefore unlikely that MSC oversight would have significantly changed ABS' stability approval of SEACOR POWER.

[MSC General Q. 2]

Q: Statutory and class rule requirements for liftboats are evaluated using static, sustained wind, still-water conditions only." Should the USCG move away from allowing dynamic Operating Limits in the marine operations manuals (dynamic conditions such as wave height)? Should USCG pay for work on and creation of dynamic stability software?

Response: Dynamic stability analysis of liftboats in waves is difficult. Likewise, the ability to perform such analysis – to the extent possible -- and to develop regulations that incorporate such analyses would be very difficult.

[MSC General Q. 3]

Q: Did the NTSB have a naval architect on their investigative team for the Seacor Power incident? Very limited/general response/recommendations regarding stability issues in their report.

Response: The MSC representative worked with NTSB and provided technical assistance regarding stability. ABS engineers conducted a wind load study of SEACOR POWER and provided engineering for that technical element.

[MSC General Q. 4]

Q: Should a disclaimer be put on applicable stability analyses to the effect, "A vessel's propulsion and steering can fight free twist and yaw?

Response: The maneuvering capabilities of liftboats was not considered in the casualty investigation. The USCG is not aware of any studies that evaluate the maneuverability characteristics of liftboats.

[MSC General Q. 5]

Q: Should older liftboats' stability be re-evaluated with software that incorporates the latest stability analysis methods?

Response: The USCG Research and Development Center has engaged in a study of the stability of liftboats, to which reference is made in the Commandant's response to the USCG's MBI Report recommendations. With better stability criteria, Reevaluation using improved stability criteria/methods could help an operator better understand stability risks associated with their vessel, even if new criteria are not mandatory.

COMMENTS

[MSC Comment 1]

Statements like "leaves evaluation...to the interpretation of the naval architects", "significantly different modeling treatment", "the MSC has not documented their policies...", infers more 3-97 oversight/direction is required and better documentation of guidance to industry is woefully needed in the form of policy letters, NVICs and/or regulations.

Response: see comments to the first general question above.

[MSC Comment 2]

Statements like "the origin of this 5-foot limit is not known" while the footnote provides an origin, "significantly different modeling treatment", and "it is not known why the values differ so significantly with ABS' values", treat ABS delicately, rather than clearly indicating they made mistakes.

Response: The 5 foot wave height limit is likely a good limit. Although the source of this guidance is not known (despite the footnote), the crew told the MBI that above this limit jacking down could damage the pads and green water would be on deck. An operational wave height limit is required in 46 CFR part 134; a wave height limit of 5 feet appears to be a good example even if there is no regulatory basis for its calculation.

Modeling and analysis software have improved significantly since 2002. Differences between the MSC 2022 post-casualty analysis and the 2002 SEMCO stability analysis which was reviewed and independently checked by ABS don't conclusively indicate a problem, just differences. The conclusions indicate where these differences had a significant impact. We also concluded that the stability analysis calculation requirements themselves are not clear which makes it impossible to "clearly indicate they made mistakes."

End of Exhibit 7.

Exhibit 8: USCG Seacor Power Final Report Regulatory References.

Citation	Title	USCG Report Page(s)
	16732/IIA #7175076, 18 May 2023 Action by the Commandant	
CI 3140.2D	Commandant Instruction: Marine Weather Reporting	2, 3
CI 3140.3D	Commandant Instruction: Coastal Weather Program	2, 3
46 CFR Subchapter I	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter I: Cargo and Miscellaneous Vessels	3
46 CFR Subchapter L	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels	3
Safety Alert 07-21	Unexpected Heavy Weather Dangers: Weather Will Change, Whether You Are Ready or Not!	6
14 USC 521	Saving life and property	7
47 USC 80	Stations in the Maritime Services	8
Marine Safety Alert 12-22	Ensuring Proper Operation and Detection of Radar Search and Rescue Transponders (SARTs)	12
Safety Advisory 01-22	Lithium Battery Fire	12
	USCG Marine Board's Report	
46 CFR 4.09	Marine Board of Investigation	4
46 USC 63	Investigating Marine Casualties	4
46 USC 6308	Information barred in legal proceedings	4
46 USC 6303	Rights of parties in interest	4
SAR Addendum	U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)	5, 116
46 CFR 134.170	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels 134.170: Operating Manual	6, 48, 51, 56
46 CFR Subchapter L	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Parts 125-134	8, 49, 52, 74, 159
ISO 9001	International Organization for Standardization Quality management systems - Requirements	41
ISM Code	SOLAS Chapter IX Management for the safe operation of ships International Safety Management Code	41
ISPS Code	SOLAS Chapter XI Special measures to enhance maritime safety International Ship and Port Facility Security Code	41

46 CFR 125.160	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security 125.160: Definitions	43, 62
33 CFR 155.4030	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subchapter O: Pollution Part 155: Oil or Hazardous Material Pollution Prevention Regulations for Vessels Subpart I: Salvage and Marine Firefighting 155.4030: Required salvage and marine firefighting services to list in response plans.	43
NVIC 10-82	Acceptance of plan review and inspection tasks performed by the American Bureau of Shipping for new construction or major modifications of US Flag vessels. Final report	44
NVIC 3-97	Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels	44, 51
ABS	ABS Rules for Building and Classing Mobile Offshore Drilling Units (2001)	44, 52, 54, 55, 144
46 CFR Subchapter S	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability	44, 51
46 CFR 174, Subpart H	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats	48, 52, 53
33 CFR 96	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subpart F: Vessel Operating Regulations Part 96: Rules for the Safe Operation of Vessels and Safety Management Systems	51
46 CFR 170, Subpart D	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 170: Stability Requirements for All Inspected Vessels Subpart D: Stability Instructions for Operating Personnel	51
46 CFR 170, Subpart F	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 170: Stability Requirements for All Inspected Vessels Subpart F: Determination of Lightweight Displacement and Centers of Gravity	52
46 CFR Subchapter I	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter I: Cargo and Miscellaneous Vessels	52, 74, 159

46 CFR 174	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types	52, 53, 55, 145
46 CFR 174, Subpart C	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subpart C: Special Rules Pertaining to Mobile Offshore Drilling Units	52
46 CFR 174.255(c)	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats 174.255: Restricted service (c) *On-bottom stability*	52, 144
46 CFR 174.055	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart C: Special Rules Pertaining to Mobile Offshore Drilling Units 174.055: Calculation of wind heeling moment (Hm)	53, 54, 145
46 CFR Subchapter C	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter C: Uninspected Vessels	53
API RP 2A-WSD	American Petroleum Institute (API) Recommended Practice (RP) Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design	53, 54
2009 MODU Code	2009 MODU Code (as amended) Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009	54
SNAME T&R 5-04	Guidelines for Wind Tunnel Testing of Offshore Units (2020)	54
46 CFR 28.575	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter C: Uninspected Vessels Subpart E: Stability 28.575: Severe wind and roll	54
46 CFR 4.06	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter A: Procedures Applicable to the Public Part 4: Marine Casualties and Investigations Subpart 4.06: Mandatory Chemical Testing Following Serious Marine Incidents Involving Vessels in Commercial Service	62
46 CFR 15.1105	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter B: Merchant Marine Officers and Seamen Part 15: Manning Requirements Subpart K: Vessels Subject to Requirements of STCW 15.1105: Familiarization and basic training (BT).	63
46 CFR 131.530	Title 46: Shipping	63

	Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 131: Operations Subpart E: Tests, Drills, and Inspections 131.530: Abandon-ship training and drills	
46 CFR 131.535	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 131: Operations Subpart E: Tests, Drills, and Inspections 131.535: Firefighting training and drills	64
46 CFR 131.320	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 131: Operations Subpart C: Preparations for Emergencies 131.320: Safety orientation for offshore workers	64
46 CFR 131.310	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 131: Operations Subpart C: Preparations for Emergencies 131.310: List of crew members and offshore workers	71
SOLAS II-1, Part D	Construction - Structure, subdivision and stability, machinery and electrical installations Part D: Electrical Installations	74
NWS-USCG	Memorandum of Agreement Between the United States Coast Guard and the National Oceanic and Atmospheric Administration National Weather Service Regarding the Management of Marine Weather Information	78
SOLAS Chapter III	Life-saving Appliances and Arrangements	100
SOLAS Chapter IV	Radiocommunications	100
46 CFR 133.70(c)	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 133: Lifesaving Systems Subpart B: Requirements for All OSVs 133.70: Personal lifesaving appliances: (c) *Immersion suits or anti-exposure suits*	104
46 CFR 133.60	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter L: Offshore Supply Vessels Part 133: Lifesaving Systems Subpart B: Requirements for All OSVs 133.60: Communications	104

47 CFR Part 80	Title 47: Telecommunication Chapter I: Federal Communications Commission Subchapter D: Safety and Special Radio Services Part 80: Stations in the Maritime Services	104
47 CFR 80.1061	Title 47: Telecommunication Chapter I: Federal Communications Commission Subchapter D: Safety and Special Radio Services Part 80: Stations in the Maritime Services Subpart V: Emergency Position Indicating Radiobeacons (EPIRB's) 80.1061: Special requirements for 406.0–406.1 MHz EPIRB stations.	105
RTCM 11000	Radio Technical Commission for Maritime Services RTCM Standard 11000.3 (“RTCM 11000”), “406 MHz Satellite Emergency Position Radiobeacons (EPIRBs)”	105
47 CFR Subpart R	Title 47: Telecommunication Chapter I: Federal Communications Commission Subchapter D: Safety and Special Radio Services Part 90: Private Land Mobile Radio Services Subpart R: Regulations Governing the Licensing and Use of Frequencies in the 763–775 and 793–805 MHz Bands	105
47 CFR Subpart S	Title 47: Telecommunication Chapter I: Federal Communications Commission Subchapter D: Safety and Special Radio Services Part 90: Private Land Mobile Radio Services Subpart S: Regulations Governing Licensing and Use of Frequencies in the 806–824, 851–869, 896–901, and 935–940 MHz Bands (§§90.601 - 90.699)	105
47 CFR Subpart W	Title 47: Telecommunication Chapter I: Federal Communications Commission Subchapter D: Safety and Special Radio Services Part 90: Private Land Mobile Radio Services Subpart W: Competitive Bidding Procedures for the 220 MHz Service (§§90.1001 - 90.1025)	105
COMDTINST M3150.1	U.S. Coast Guard Diving Program Manual (series)	116
33 USC 1321	Clean Water Act Oil and hazardous substance liability	134
46 USC 70002	Ports and Waterways Safety Act Special Powers	134
33 CFR 6.04-6.08	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subchapter A: General Part 6: Protection and Security of Vessels, Harbors, and Waterfront Facilities 6.04-6.08: General Provisions	134
33 CFR 155	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subchapter O: Pollution	134, 153

	Part 155: Oil or Hazardous Material Pollution Prevention Regulations for Vessels	
33 CFR 155, Subpart I	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subchapter O: Pollution Part 155: Oil or Hazardous Material Pollution Prevention Regulations for Vessels Subpart I: Salvage and Marine Firefighting	134
33 CFR 155, Subpart J	Title 33: Navigation and Navigable Waters Chapter I: Coast Guard, Department of Homeland Security Subchapter O: Pollution Part 155: Oil or Hazardous Material Pollution Prevention Regulations for Vessels Subpart J: Nontank Vessel Response Plans	134
46 CFR 174.255(a)	Title 46: Shipping Chapter I: Coast Guard, Department of Homeland Security Subchapter S: Subdivision and Stability Part 174: Special Rules Pertaining to Specific Vessel Types Subpart H: Special Rules Pertaining to Liftboats 174.255: Restricted service (a) *Intact stability*	144
14 USC 521	Saving life and property	153, 161
CI 3140.2D	Commandant Instruction: Marine Weather Reporting	158
CI 3140.3D	Commandant Instruction: Coastal Weather Program	158

Website for links to the Exhibits referenced in the USCG report is: Seacor Power - Coast Guard Marine Board of Investigation (uscg.mil)

End of Exhibit 8.

Exhibit 9: USCG Commandant's Responses to the *USCG Seacor Power Final Report Recommendations* [plus identified Best Practices].

16732/IIA #7175076
18 May 2023

THE CAPSIZING OF THE COMMERCIAL LIFTBOAT SEACOR POWER (O.N. 1115290) RESULTING IN MULTIPLE LOSSES OF LIFE APPROXIMATELY SEVEN NAUTICAL MILE SOUTH OF PORT FOURCHON, LA IN THE GULF OF MEXICO ON APRIL 13, 2021

ACTION BY THE COMMANDANT

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. This marine casualty investigation is closed.

COMMENTS ON THE REPORT

1. The capsizing of the commercial liftboat SEACOR POWER (O.N. 1115290) and the loss of 13 lives was a tragic accident. The families of crewmembers who lost their lives have my deepest sympathies. The Coast Guard will take appropriate action on all that we have learned from this investigation.

2. I want to thank members of the Marine Board of Investigation (MBI) for their hard work and dedication during this investigation. The safety recommendations developed by the MBI promote maritime safety and provide areas of improvement for not only the Coast Guard, but also for the Outer Continental Shelf industry and the National Weather Service (NWS).

3. The MBI developed 16 best practices which detail voluntary actions by both Coast Guard leadership and industry stakeholders that can be taken immediately. The Coast Guard recommends that vessel owners and operators review these best practices and incorporate them into their safety management systems and company policies as appropriate.

4. While there were other factors that contributed to this marine casualty, the major factor was the unexpected severity of the weather front that the SEACOR POWER experienced. Although the NWS did issue a Special Marine Warning, the crew did not receive the warning, and the weather front moved much faster and was far worse than predicted. Shortly after encountering the squall, the crew attempted to lower the legs to hold position until the storm passed. However, the vessel capsized before they were able to complete those actions. This casualty highlights the sometimes dangerous and unpredictable nature of the maritime environment and underscores the need for mariners to take precautions to lower the risks and vulnerabilities for all operations.

5. Another factor that contributed to the severity of this marine casualty was the time for the Coast Guard to be notified of the casualty. Due to the speed in which the vessel capsized, the crew was unable to make a MAYDAY call. On the day of the casualty, the Coast Guard received a high volume of calls due to the heavy weather system, including multiple Emergency Position Indicating Radio Beacon (EPIRB) alerts. Although an EPIRB was onboard the SEACOR POWER, it did not alert the Coast Guard to the vessel's correct position. The Coast Guard was not notified until another vessel saw the capsized SEACOR POWER after the squall passed. Additionally, despite the Search and Rescue Transponder (SART) being operational, several vessels in the area did not see the SART due to their radar settings. This unexpected failure of lifesaving equipment increased the time for the Search and Rescue (SAR) teams to arrive on scene. Vessel owners and operators and the Coast Guard need to address these notification failures.

6. The MBI identified several areas where the Coast Guard can improve its SAR program. Although the Coast Guard efficiently and effectively performed during this SAR case once notified of this casualty, there is always room for improvement for this vital mission. The Coast Guard will act on the MBI's recommendations and make improvements in capabilities to facilitate SAR efforts in heavy weather conditions.

7. This investigation emphasiz.es the importance of maritime situational awareness for both the marine industry and the Coast Guard. The Coast Guard will take actions to improve our policies, procedures, and operational capabilities as outlined below. The marine industry should also take appropriate actions to prevent tragedies like this from occurring in the future.

ACTION ON RECOMMENDATIONS

The following are the recommendations from the MBI and Coast Guard final actions based on those recommendations.

Recommendation 1: The Commandant should immediately revise Commandant Instruction 3140.2D (Marine Weather Observation and Reporting) and Commandant Instruction 3140.3D (Coastal Weather Program). The revisions should address the following issues:
• Which Coast Guard units are required to make severe weather radio broadcasts;
• What information is shared in a severe weather radio broadcast;
• When severe weather radio broadcasts are made;
• Which channel(s) are used for severe weather radio broadcasts, including, but not limited to distress channels or channels that are locally required in lieu of distress channels;
• Who is responsible for the decision to send severe weather radio broadcasts;
• How units are expected to balance search and rescue operations with severe weather radio broadcasts;
• How units will quickly receive severe weather radio broadcasts;
• Which Coast Guard units are required to send weather observations to the NWS; and
• How Coast Guard units should send weather observations to the NWS.

Action: I concur with the intent of this recommendation. A Coast Guard working group will be established to review Commandant Instruction 3140.2D (Marine Weather Observation and Reporting) and Commandant Instruction 3140.3D (Coastal Weather Program) to determine the current applicability and gaps of these and other related references and will make any necessary changes based on this recommended action. The working group will also determine if any new references are needed.

Recommendation 2: The Commandant should expedite their current study of liftboat stability, and then immediately use the results of that study to revise liftboat stability regulations. The Commandant should consider the following actions:
• Clearly define applicable stability requirements for liftboats inspected under 46 CFR Subchapter I and Subchapter L.
• Require liftboat stability calculations to evaluate realistic loading conditions and realistic trim conditions.
• Impose additional safety margins to mitigate the risks posed by environmental variability of wind and waves.
• Update the wind speed vs height profile used to calculate wind loads.
• Update wind calculation shape factors for cylindrical legs with racks.
• Provide clear procedures to establish operating restrictions without relying on oversimplified regulatory thresholds.

Action: I concur with this recommendation. The results of the Coast Guard's Research and Development Center (R&DC) stability study are scheduled to be completed in the Fall of 2023. The Coast Guard will use the results of the study to either validate or revise its liftboat stability regulations, with particular focus on the following:

- Definition of applicable stability requirements for liftboats inspected under both Subchapter I and Subchapter L of Chapter I of 46 CFR;
- Requirements for realistic loading and trim conditions to be evaluated in liftboat stability calculations;
- Requirements for safety margins to mitigate the risks posed by wind and wave variability; and
- Establishing procedures to set operating restrictions that do not rely on oversimplified regulatory thresholds.

The Coast Guard will also consider updating the wind speed versus height profile based on references identified in the MBI report. Additionally, technical literature will be reviewed to assess the basis on which wind calculation shape factors can be updated for cylindrical legs with racks. This response will be shared with R&DC for consideration regarding any additional areas of study.

Recommendation 3: The Commandant should immediately require all liftboat owners and operators to reduce the current operating limits for each vessel, in order to provide a temporary additional safety margin while the actions in the previous recommendation are completed. The operating limit changes could include, but are not limited to, changes in wave limits, wind limits, drafts, trim, operating area, or manning.

Action: I do not concur with this recommendation. An immediate reduction in current operating limits for all liftboats is not supported as the MBI determined that the vessel's capsizing occurred in conditions that well exceeded its maximum operating limits. However, the results of the investigation highlight the critical relationship between design criteria and operating limits. As a result, the Coast Guard will use the outcome of the liftboat stability study described in the response to Recommendation 2 and additional analysis to review and update liftboat operating limits, as appropriate.

Recommendation 4: The Commandant should immediately establish a regulation or policy that prohibits offshore workers from riding aboard a liftboat while the vessel is underway unless the vessel meets additional stability requirements to ensure a level of safety equivalent to a crewboat or offshore supply vessel.

Action: I do not concur with this recommendation. Design stability and operating limit criteria of any vessel should ensure the safe operation for the vessel's intended purpose. For liftboats, the intended purpose often includes the safe carriage and transit of offshore workers. As discussed in the response to Recommendation 2, further stability analysis of liftboats will be conducted, and the Coast Guard will continue to assess stability standards as they apply to design criteria and operating limits.

Recommendation 5: The Commandant should consider a new regulation or policy requiring liftboat owners and operators to create a quick reference guide for each vessel. The quick reference guide would establish clear and simple operating information, and could include topics such as wave limits, wind limits, draft restrictions, trim conditions, and emergency procedures for sudden changes in weather or weather that exceeds the vessel's operating limits.

Action: I concur with the intent of this recommendation. A Finding of Concern will be published recommending that owners and operators of liftboats review their operations manuals to ensure they are easily accessible and understood by the crew when making time-sensitive decisions. The Coast Guard will share this recommendation with the National Offshore Advisory Committee (NOSAC) for their consideration and direct them to develop standardized quick reference card templates for liftboats that can be used by the industry. NOSAC has been tasked to consider the SEACOR POWER National Transportation Safety Board (NTSB) report and any available public-facing reports, which will include this ROI once released, and propose recommendations. The Coast Guard will reevaluate this recommendation pending a response from NOSAC regarding any necessary regulatory or policy changes.

Recommendation 6: The Commandant should issue one or more findings of concern to the NWS recommending the following items:
• Identify immediate options for increasing automated weather observation equipment in the highly trafficked areas of Port Fourchon and coastal Louisiana;
• Consider the use of the Emergency Alert System to send special marine warnings to cell phones located in maritime areas;

• Establish industry working groups to collectively identify strategies and/or best practices to increase voluntary weather reporting in the Gulf of Mexico and to ensure this information is provided in a useful, efficient and accurate format;
• Creation of a joint Coast Guard-NWS working group to explore whether there is value in creating a smart phone application that the public could use to provide voluntary weather observations;
• Consider issuing special marine warnings that contain a forecasted range of wind conditions, not just a forecast predicting winds over a certain speed; and
• Establish a working group to evaluate additional methods of describing special marine warning boundaries to the public and/or limiting special marine warning distribution to only the applicable areas.

> **Action**: I concur with this recommendation. The Coast Guard, the National Oceanic and Atmospheric Administration (NOAA), and the NWS have a Memorandum of Agreement (MOA) which formally recognizes the USCG-NOAA/NWS Coordination Liaison Group (UNCLOG). UNCLOG is the principal vehicle through which the agencies coordinate on matters relating to marine weather information. A letter discussing the recommended items and a copy of the report of investigation and safety recommendations will be forwarded to the NWS and UNCLOG for their consideration.

Recommendation 7: The Commandant should issue one or more findings of concern to all liftboat owners and operators stressing the importance of the following items:
• Lashing cargo, cranes, and deck equipment prior to getting underway;
• Taking immediate actions to properly secure all furniture, equipment, stores and other items that could shift in the event of heavy rolls or capsizing;
• Establishing procedures for frequent weather checks in order to monitor for unexpected weather changes while underway;
• Ensuring lifesaving equipment is reasonably spaced throughout the vessel; and
• Conducting liftboat audits while vessels are afloat and/or loading cargo in order to evaluate the crew's actions while preparing to get underway and validate the pre-departure condition is aligned with the operating manual and stability book.

> **Action**: I concur with the recommendation. The Coast Guard will issue a Finding of Concern to liftboat owners and operators stressing the importance of crew familiarity with operating manual requirements with an emphasis on the points raised in this recommendation.

Recommendation 8: The Commandant should issue one or more findings of concern to all commercial vessel owners and operators stressing the importance of the following items:
• Training dispatchers and other individuals on call to know how to handle emergency situations (SMS procedures, quick response cards, or checklists could provide a useful tool for these individuals);
• Providing clear procedures to calculate draft readings, especially if a vessel is listing or if a vessel's draft marks are not aligned with the vessel's baseline; and
• Ensuring that each vessel is equipped with at least two independent methods of obtaining weather forecasts, and that those methods are readily available on the bridge or at the operating station.

Action: I concur with this recommendation. The Coast Guard will issue a Finding Of Concern to draw attention to the recommended points of emphasis. On October 21, 2021, the Coast Guard issued Safety Alert 07-21 *Unexpected Heavy Weather Dangers: Weather Will Change, Whether You Are Ready Or Not!,* which emphasized the importance of vessels having two independent methods of obtaining weather information.

Recommendation 9: The Commandant should direct a concentrated inspection campaign designed to verify proper Emergency Position-Indicating Radio Beacon (EPIRB) registration on all types of vessels. The campaign could provide clear guidance and direction to marine inspectors (foreign and domestic), marine investigators, commercial fishing vessel examiners, cutter boarding teams, station boarding teams, Auxiliarists, and Public Affairs personnel in order to ensure all Coast Guard elements are participating in the campaign.

Action: I concur with this recommendation. The quality and accuracy of the information contained in the Coast Guard's EPIRB registration database is an issue that directly impacts response efforts in the event of marine distress and the Coast Guard has taken several actions to increase the number of accurately registered EPIRBs.

The Office of Boating Safety (CG-BSX) has initiated steps through existing initiatives to inform the recreational boating public on the requirement to register their EPIRBs and to keep the registration up to date. The most recent significant activity was update to the National Boating Education Standard, ANSI/NASBLA 100-2022: *Basic Boating Knowledge - Core* published on 1 June 2022. There is also a campaign that makes April 6th the 406 Beacon Day and encourages registration. The Coast Guard Auxiliary Vessel Safety Check program includes messaging on EPIRBs and Personal Locator Beacons (PLBs) to include registration. CG-BSX will continue to reinforce the message of registration with the recreational boating safety community.

The Office of Search and Rescue is working with NOAA and CG-BSX to develop a business card with a quick reference (QR) Code to be distributed through various Coast Guard interaction with the commercial vessel industry and vessel owners at boat shows, industry days, and other venues.

The Office of Commercial Vessel Compliance (CG-CVC) will continue to confirm EPIRB registration as a part of regular commercial vessel inspections and exams.

Recommendation 10: The Commandant should consider whether there is an opportunity to establish a requirement for vessel owners or operators to provide proof of valid EPIRB registration prior to renewing or obtaining a Certificate of Documentation.

Action: I concur with the intent of this recommendation. However, the Coast Guard believes that existing outreach campaigns described in the response to Safety Recommendation 9 are sufficient to verify EPIRB registration. The Coast Guard also recognizes that NOAA, the federal agency responsible for managing EPIRB registration, has active campaigns to promote and encourage proper registration. Information on registration is posted online at NOAA.gov and NA VCEN.uscg.gov to encourage use and

registration of EPIRBs. Labeling and placarding on individual devices is also required to inform users of the regulatory requirement to maintain up to date registrations. The National Vessel Documentation Center reviews documentation such as evidence of nationality, vessel title, and mortgage among other requirements. Validation of EPIRB registration would require a significant regulatory and procedural overhaul to the Center's current systems. The Coast Guard will consider this recommendation in conjunction with future system upgrades.

Recommendation 11: The Commandant should consider whether there is an opportunity to update the U.S. Search and Rescue Satellite Aided Tracking (SARSAT) system so that when the Coast Guard receives notice of an EPIRB activation, the registered user also receives a notice.

Action: I concur with the intent of this recommendation. Upon receipt of an alert by a Joint Rescue Coordination Center (JRCC), beacon owners are then contacted using the contact information provided on the alert message. The technical ramifications of an automatic owner notification must be assessed by the U.S. Search and Rescue Satellite Aided Tracking (SARSAT) Program. The Coast Guard Office of Search and Rescue (CG-SAR) will present this safety recommendation to the U.S. SARSAT Program Steering Group for consideration.

Recommendation 12: The Commandant should consider publishing additional information regarding false EPIRB alerts, including information about the huge costs associated with these false alerts.

Action: I concur with this recommendation. This information is already available on the U.S. Coast Guard Navigation Center's (NAVCEN) website (https://www.navcen.uscg.gov/instructions-for-canceling-false-distress-alert) and the National Oceanic and Atmospheric Administration (NOAA) website (https://www.sarsat.noaa.gov/preventing-false-alerts/). Addressing false alerts is and will continue to be a U. S. Search And Rescue Satellite-aided Tracking (SARSAT) Program priority.

Recommendation 13: The Commandant should consider creating a Memorandum of Understanding or Memorandum of Agreement (MOA) with the Federal Communications Commission (FCC) so that the Coast Guard can enforce the FCC's EPIRB registration requirements. Alternatively, the Commandant should issue clear guidance to all units explaining how to use the authority found in 14 USC 521 to enforce EPIRB registration.

Action: I concur with the intent of this recommendation. The Coast Guard meets with the FCC on a quarterly basis to discuss matters of mutual concern including potential EPIRB enforcement options and a MOA is not considered necessary. Under current procedures, for documented repeated violations of outdated or improper EPIRB registration, the Coast Guard can either initiate a violation case or make a referral to the FCC Enforcement Bureau for enforcement action. The Coast Guard will provide a copy of this investigation to the FCC and raise the issue of potential EPIRB registration enforcement strategies at the next quarterly meeting.

Recommendation 14: The Commandant should take immediate action to improve phone infrastructure and communications capabilities at all District and Sector Command Centers.

> **Action:** I concur with this recommendation. A project to upgrade the Coast Guard's phone infrastructure is underway. This project will align the Coast Guard's infrastructure with the Department of Defense's (DoD) voice over internet protocol (VoIP). This upgrade will give the Coast Guard new capabilities including the ability to provide interoperability with other government agencies. This initiative was commenced in 2019 starting with 46 Coast Guard Command Centers. To date, 16 of the 46 command centers have completed the upgrades to their phone infrastructure. In 2023, contracting has been initiated with Defense Information System Agency (DISA) to upgrade 15 additional command centers. The remaining 15 are projected to be completed by 2024.

Recommendation 15: The Commandant should consider whether there is an opportunity to establish equipment and processes to receive all types of distress alerts in one location, rather than different Coast Guard units.

> **Action:** I do not concur with this recommendation. The Coast Guard follows Global Marine Distress and Safety System (GMDSS) alert procedures for the delivery of distress alerts to the responsible Rescue Coordination Center (RCC) as provided by international guidance (International Maritime Organization (IMO), International Civil Aviation Organization (!CAO), and the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual). Coast Guard RCCs are responsible for sharing relevant distress event information to the appropriate units when necessary.

Recommendation 16: The Commandant should evaluate options that would allow District and Sector Command Centers to view EPIRB information, Automatic Identification System (AIS) information, and Search and Rescue Optimal Planning System (SAROPS) information in one Common Operating Picture.

> **Action:** I concur with this recommendation. A single, user-friendly interface that ingests, overlays, and displays EPIRB, AIS, and SAROPS in a unified Common Operating Picture (COP) should be available for Coast Guard watchstanders at every Sector, District, and Area Command Center. A single COP would enable Coast Guard watchstanders to assess potential distress situations quickly and efficiently, utilizing information from existing distress alert mechanisms and vessel reporting systems. Execution will likely require system modifications and upgrades **to** achieve full implementation of all desired functionality. As such, the Coast Guard will continue to support numerous initiatives to modernize and improve the COP available for Command Centers.

Recommendation 17: The Commandant should consider whether there is a need to provide District and Sector Command Centers with additional means of tracking commercial vessel locations, in order to allow Command Centers to quickly and easily correlate distress alerts with vessel locations.

Action: I do not concur with this recommendation. The existing capabilities available to Coast Guard Command Centers for maintaining awareness of vessel movement through mandated and voluntary methods such as the Long-Range Identification and Tracking system and AIS are sufficient for tracking commercial vessels. Additionally, a new requirement could contribute to watchstander task saturation, which in tum would further degrade performance during high-consequence events.

Recommendation 18: The Commandant should conduct a study to evaluate whether it would be beneficial to create one distress button that links to a variety of different shipboard systems, including, but not limited to, VHF DSC, MF/HF DSC, INMARSAT, and the vessel's general alarm.

Action: I partially concur with this recommendation. A single "red" distress button is a requirement for "Passenger ships" to comply with the Safety of Life at Sea (SOLAS) Convention, Chapter IV, Regulation 6, paragraph. Conversely, the SEACOR POWER was a SOLAS Cargo Ship greater than 500 Gross Tonnage ITC[1] and was not required to have a single distress button. The Coast Guard has the options of pursuing voluntary adoption or implementation of a new carriage requirement for non-SOLAS vessels.

Coordination with the FCC on updating the Title 47 USC Part 80 rules may also be required. As a result, this Safety Recommendation will be forwarded to the Distress Signal Collaborative (DISCO) working group at Coast Guard Headquarters for review and any potential actions.

[1] Gross Tonnage ITC is defined in 46 CFR 69.9.

Recommendation 19: The Commandant should create a campaign to educate vessel owners, operators, and crew members on Digital Selective Calling (DSC) procedures and benefits.

Action: I concur with this recommendation. The Coast Guard will continue to educate vessel owners, operators, and crew members on the procedures and benefits of DSC.

The Office of Boating Safety (CG-BSX) recently updated the National Boating Education Standard, ANSI/NASBLA 100-2022: Basic Boating Knowledge - Core, published on June 1, 2022. This update ensures that boat operators receive education on DSC and comparisons with other communications methods. The Coast Guard Auxiliary Vessel Safety Check program also includes messaging for Auxiliarists conducting boating safety exams to educate boaters on DSC to include registration for a Maritime Mobile Service Identity. The Coast Guard published Marine Safety Advisory 01-22 on Maritime Distress Communication Devices on September 28, 2022, to educate users on all available communication devices, including DSC. In addition, the Coast Guard published Marine Safety Alert 3-23 on March 2, 2023, to educate vessel owners on how to ensure interconnectivity between DSC and Global Position System (GPS) equipment.

The Safety Alert and Safety Advisory can be accessed at the following link:

https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-PreventionPolicy-CG-5P/Inspections-Compliance-CG-5PC-/Office-of-Investigations-CasualtyAnalysis/Safety-Alerts/

Recommendation 20: The Commandant should conduct a study to assess the usefulness of SARTs, and then use those study results to evaluate whether SARTs should be removed from the domestic and international regulatory requirements. This study could include an assessment of various SART brands, the equipment and equipment settings necessary to receive SART signals, success stories associated with SART use, and costs associated with SART purchase, maintenance, and replacement.

Action: I do not concur with this recommendation. The SART was tested by the manufacturer and the NTSB and was found to operate as designed. The underlying issue was knowing how the SART operates and understanding its limitations. The Coast Guard addressed both in Marine Safety Alert 12-22 and Safety Advisory 01-22, which can be accessed at the following link: https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Office-of-Investigations-Casualty-Analysis/Safety-Alerts/

Recommendation 21: While awaiting the results of the SART study discussed in Recommendation 20 above, the Commandant should create an internal education campaign focused on training Coast Guard personnel to properly detect and identify SART signals.

Action: I concur with the intent of this recommendation. Although the Coast Guard does not intend to conduct a SART study, the existing SART training will be reviewed for appropriate information, delivery method, and target audience.

Recommendation 22: The Commandant should assess the effectiveness and usefulness of NAVTEX, as discussed in paragraph 9.8.9 above, and then use those results to evaluate changes to the Coast Guard's NAVTEX equipment and processes.

Action: I concur with intent of the recommendation. Navigational Telex (NAVTEX) disseminates maritime safety information and is a statutory requirement. NAVTEX is a legacy system that was installed in 1993 and has well exceeded its 20-year expected service life. The Coast Guard is evaluating the capability and potential courses of action to transition to the next generation Navigational Data (NAVDAT) system.

Recommendation 23: The Commandant should re-evaluate the regulatory requirement that exempts vessels operating between 32 degrees N and 32 degrees S latitude from carrying immersion suits. While water temperatures in some of these areas may remain warm all year round, water temperatures in some areas of this region can drop to levels that quickly cause hypothermia, especially during winter and spring.

Action: I concur with the intent of the recommendation. The Coast Guard will reevaluate the statutory and regulatory requirements that exempt vessels operating between 32 degrees

N and 32 degrees S latitude from carrying immersion suits. The Coast Guard will consider a legislative change proposal if appropriate and will update regulations accordingly.

Recommendation 24: The Commandant should require all Coast Guard cutters and small boats to carry line throwing guns and train personnel in their use.

Action: I partially concur with this recommendation. All Coast Guard Cutters, with the exception of inland buoy tenders, currently have a line throwing weapon onboard as part of their weapon allowance. Depending on the class of Coast Guard Cutter, it will have a .30 caliber Shoulder Line Throwing Gun or MK87 Line Throwing Kit affixed to an M16 rifle, or both. Personnel train and fire the line throwing weapons quarterly to maintain qualifications and proficiency. Pre-commissioned cutters receive their Shoulder Line Throwing Gun after the cutter has been accepted by the Coast Guard and certified Ready for Operations.

The Coast Guard does not believe that the MBI's findings support the addition of line throwing guns to all small boats at this time.

Recommendation 25: The Commandant should consider a study to assess the usefulness of drones or remote operated life rings for delivering rescue equipment to individuals who are out of reach of a Coast Guard asset.

Action: I partially concur with this recommendation. The Coast Guard agrees that the use of unmanned aircraft systems (UAS), commonly referred to as drones, to deliver rescue equipment to individuals out of reach of a Coast Guard asset should be studied. One example would be delivering a life ring to an individual caught in shoal water inaccessible from a rescue vessel. On March 3 1, 2023, the Coast Guard released the Unmanned Systems Strategic Plan. The Plan outlines Strategic Goals to integrate unmanned systems into the Coast Guard force structure to support missions such as search and rescue and will guide the Coast Guard as it examines the development of future capabilities. Unfortunately, in this casualty the extreme weather conditions, the severe wind and sea state, as well as the location of the individuals and the orientation of the partially submerged vessel, prevented recovery prior to the vessel capsizing. Currently, unmanned lifesaving systems do not have the capacity, modularity, dexterity, and potentially artificial intelligence necessary to affect such an extreme rescue.

Recommendation 26: The Commandant should consider establishing a policy that creates clear steps and procedures for a Coast Guard Marine Inspector to review and approve liftboat operations manuals each time they are submitted, and then create procedures for documenting the approval and for providing feedback to the vessel owner/operation and any other entity involved in writing or reviewing the manual. The policy could also include a requirement to rereview liftboat operations manuals at each COI inspection.

Action: I concur with this recommendation. The Coast Guard will develop guidance clarifying the Marine Inspector's role to review and/or approve the operating manual.

The guidance will, at a minimum, address the proper level and frequency of review and approval for a liftboat operating manual.

Recommendation 27: The Commandant should evaluate previous SAR cases to determine how many incidents involved underwater rescue and use this information to evaluate whether there is a need for additional measures to prepare Command Centers, Sectors, Cutters, Small Boat Stations, and Air Stations for underwater rescue situations.

Action: I concur with this recommendation. SAR Coordinators should place an emphasis on ensuring units are prepared to carry out SAR Mission Coordinator (SMC) responsibilities with respect to underwater rescues. CG-SAR should review SAR doctrine and policy related to past SAR events involving persons trapped in submerged or overturned vessels to ensure Coast Guard policy reflects this emphasis and make appropriate updates as needed.

Administrative Recommendation 1: The Commandant should release this Report of Investigation to the public immediately, and then generate the Coast Guard's Final Action Memorandum afterwards.

Action: I do not concur with this recommendation. The investigation has been closed in conjunction with issuance of the Coast Guard Final Action Memorandum.

Administrative Recommendation 2: The Commandant should request additional permanent Coast Guard billets to perform the work associated with a Marine Board of Investigation. Alternatively, the Commandant should identify funding and establish a clear process to provide backfills for some or all of the MBI members for at least one year following the convening order. The current practice of assigning members to serve on a MBI as a collateral duty, while they are still required to perform their regularly assigned job, causes extensive delays to all aspects of the investigation process.

Action: I concur with the intent of this recommendation. Over the last several decades, the complexity of marine casualty investigations and the frequency of MB Is has increased. These increases have placed a significant demand on resources, investigation team members and units as a collateral duty. The Office of Investigations and Casualty Analysis (CG-INV) will consider options for enhanced support to future MBIs and reducing the administrative burden currently placed on Board members.

Administrative Recommendation 3: The Commandant should create a working group with NTSB representatives to see if there are any best practices or other options to minimize the duplication of government efforts while still allowing both agencies to conduct separate investigations.

Action: I concur with the intent of this recommendation. The CGMINV will engage with the NTSB's Office of Marine Safety to determine best practices and to evaluate the current Memorandum of Understanding for any appropriate updates that are needed to clarify agency roles.

Administrative Recommendation 4: The Commandant should close this investigation.

Action: I concur with this recommendation. This investigation is closed.

P. W. Gautner,
Vice Admiral, Deputy Commandant for Operations
U.S. Coast Guard

11.2 Best Practices. [Starting on Page 162 of the USCG ROI.]

The following actions could be used as best practices, and they are listed here for members of the Coast Guard and the maritime industry to consider:

11.2.1 *Best Practice 1:* All companies should establish a process to ensure that their employees update their next of kin information at least once a year.

11.2.2 *Best Practice 2:* It can sometimes be difficult to reach a mariner's next of kin, so all companies should consider asking their employees to provide multiple contact numbers for that person(s).

11.2.3 *Best Practice 3:* The registration form for an Emergency Position Indicating Radio Beacon (EPIRB) includes multiple lines for phone numbers. An individual registering an EPIRB should consider adding several different phone numbers that could be used in the event their EPIRB is activated.

11.2.4 *Best Practice 4:* Personal, and non-required, use of PLBs should only be used by a mariner if they are willing to properly register and regularly update their device registration.

11.2.5 *Best Practice 5:* Vessel owners and operators should ensure that any required SART poles are always connected to, or stored in close proximity to, the SART.

11.2.6 *Best Practice 6*: Vessel owners and operators, classification societies, auditors, and Coast Guard Marine Inspectors should ensure that computer programs used to aid in stability calculations are validated on a regular basis, but no less than annually.

11.2.7 *Best Practice 7:* Vessel owners and operators should provide additional weather training to their Masters and licensed crew members. Training could include items such as options for checking weather underway, minimum intervals to check weather while underway, emergency procedures for unexpected weather changes, and providing voluntary weather reports to the National Weather Service.

11.2.8 *Best Practice 8:* Vessel owners and operators should review each vessel's operations manual to ensure that the conditions described in the manual represent realistic operating conditions.

11.2.9 *Best Practice 9:* Companies that own or operate liftboats should review each vessel's operating guidance and establish clear and simple directions for the Master and crew. The review should include, but not be limited to, stability calculation procedures, reading draft marks, operating restrictions, cargo securing processes, and emergency steps for unexpected weather.

11.2.10 *Best Practice 10:* Companies that employ individuals who serve as offshore workers should consider a requirement to have each individual pass basic swim training.

11.2.11 *Best Practice 11:* Vessel owners and operators should consider a requirement to have their crewmembers wear reflective coveralls (or other reflective clothing), and carry flashlights and knives (or another type of cutting device) while underway.

11.2.12 *Best Practice 12:* Coast Guard District and Sector Command Centers should ensure that all of their watchstanders are familiar with the list of outside companies that are available to assist with Search and Rescue activities, which is required by Section 1.5 of the SAR Addendum. They should also review their Quick Response Checklists to ensure they include appropriate steps to check with these outside companies.

11.2.13 *Best Practice 13:* Coast Guard District and Sector Command Centers should ensure that all of their watchstanders are familiar with types of vessels and common geographical references for their area of responsibility, including offshore block names and numbers assigned by the Bureau of Ocean Energy Management.

11.2.14 *Best Practice 14:* During the response to this incident, the Coast Guard Sector Commander provided his direct phone line to the representative for SEACOR POWER's operator.

11.2.15 *Best Practice 15:* Coast Guard Areas, Districts and/or Sectors should identify a list of experienced individuals who can serve as a Subject Matter Expert and/or the Coast Guard's single point of contact for Next of Kin notifications in a Mass Rescue Operation.

11.2.16 *Best Practice 16:* Coast Guard Areas, Districts and/or Sectors should consider establishing processes or procedures to create a continuous channel of communications (via Teams or another application) for Mass Rescue Operations or other cases involving response by numerous different Coast Guard units.

End of Exhibit 9.

Exhibit 10: SEACOR POWER Investigation Results - Brief to NOSAC on June 21, 2023.

SEACOR POWER Investigation Results – Additional topics for NOSAC

Securing Furniture and Equipment

- Many items on SEACOR POWER were not secured on the day of the incident, which hampered the crew's actions to survive. (8.1.39; 8.1.42; 9.1.19; 10.2.1)

The investigation team recommended the following:

- A Finding of Concern to liftboat owners and operators encouraging them to take immediate action to properly secure furniture, equipment, stores, and other items that could shift in heavy rolls or during a capsizing. (11.1.7)

Possible opportunities for NOSAC:

- Suggest additional methods of spreading this information to liftboats.
- Create an industry best practice related to securing items on liftboats.

Transitional Power

- After SEACOR POWER capsized, none of the survivors stated that they saw any emergency lights. SEACOR POWER did not have, and was not required to have, a transitional source of electrical power. (8.7.47; 8.7.48; 9.7.3; 10.5.2)
- A transitional source of electrical power is designed to provide lighting and other emergency services in the time between when the main generator goes offline and when the emergency generator starts providing power. Transitional power is required for many types of passenger vessels, but is not required for liftboats.
- Due to the quick capsizing, the main generator stopped working, and the emergency generator could not start. (9.7.3)
- There were a small number of emergency lights located within the vessel, but these were dim and far apart, so they did not provide enough light to help with escape from the vessel. (8.7.48; 9.7.3)
- SEACOR POWER was certificated to carry up to 36 offshore workers. Offshore workers may not be familiar with a vessel's layout before they get underway, which would make it very difficult to escape in the dark. (Figure 24; 9.7.3)

*The investigation team did not provide a recommendation related to this issue.
Possible opportunities for NOSAC:

- Provide the Coast Guard with information regarding the typical emergency lighting arrangements on liftboats.
- Consider whether the presence of a large number of offshore workers on liftboats should trigger a requirement for transitional power.
- Include information from Best Practice 11 (11.2.11) in an industry best practice.

Immersion Suits

- One crew member succumbed to hypothermia after he escaped from the vessel and donned a life jacket. An immersion suit may have increased this crew member's chances of survival, but SEACOR POWER was not required to carry them. (9.9.3)
- Immersion suits are not required on liftboats that operate in the Gulf of Mexico or between 32 degrees north latitude and 32 degrees south latitude. (8.9.13; 10.5.12)

The investigation team recommended the following:

- A re-evaluation of the immersion suit exemption. (11.1.23)

Possible opportunities for NOSAC:

- Provide the Coast Guard with input regarding immersion suits and the immersion suit exemption.
- Create an industry best practice related to carrying immersion suits during the winter or whenever water temperature in the operating area drops below a certain threshold.

Distress Calls

- There were no distress calls from SEACOR POWER on the day of the incident. The First Mate pressed a GMDSS alert button, which was likely connected to the INMARSAT, but the signal was never received. (8.1.36; 8.9.29; 9.9.5; 10.5.3)
- SEACOR POWER was equipped with DSC on several radios, but the crew did not release a DSC distress call. (8.9.28; 9.9.5; 10.5.3)
- At the time of the capsizing, there was an OSV a half a mile away, and there was a fishing vessel 1 mile away. (8.1.37)

The investigation team recommended the following:

- A study to evaluate the benefits of requiring one distress button that links to a variety of shipboard systems, including VHF DSC, MF/HF DSC, INMARSAT, and the vessel's general alarm. (11.1.18)
- An education campaign related to the procedures and benefits of DSC. (11.1.19)

Possible opportunities for NOSAC:

- Provide the Coast Guard with input regarding the concept of one distress button.
- Identify additional methods of increasing awareness and use of DSC.

EPIRBs

- SEACOR POWER's EPIRB automatically released after the capsizing and immediately began sending distress signals. (8.1.47 to 8.1.49; 8.9.17; 8.10.68 to 8.10.70)
- The signals were sent to the District Eight Command Center, but this was one of five EPIRB alerts received in a span of 10 or 15 minutes, which was an unusually high number. The watchstanders handled alerts in the order received. (8.10.67; 9.10.5)

- At the time of the incident, 98% of EPIRB signals were false alerts. Due to this extremely high number of false alerts, watchstanders always called the EPIRB point of contact to check on the status of the vessel. (8.9.25; 8.10.7; 9.10.6; 10.5.4)
- A Coast Guard watchstander called Seacor at 1605 to check on the EPIRB alert. The Seacor dispatcher said the vessel was at the dock, which delayed the Coast Guard's response to the capsized vessel. (8.1.56; 8.9.19; 8.10.75; 8.10.86; 9.2.4; 9.10.4; 10.5.5)
- Seacor's Dispatchers received on the job training to become familiar with their duties. The SMS did not include a list of duties for the Dispatcher. (8.2.11; 9.2.4; 9.10.4; 10.5.6)

The investigation team recommended the following:

- A Finding of Concern to all commercial vessel owners and operators encouraging them to train dispatchers and other on call individuals for emergencies. (11.1.8)
- A Concentrated Inspection Campaign to verify EPIRB registrations. (11.1.9)
- The team also made eight other recommendations to the Coast Guard related to EPIRB false alerts and response to distress alerts, but these are less applicable to NOSAC and are not listed here. (11.1.10 to 11.1.17)

Possible opportunities for NOSAC:

- Provide ideas or suggestions on how to reduce the number of EPIRB false alerts. This is a systemic problem, so any creative new approaches could be extremely valuable.
- Create an industry best practice related to emergency training for dispatchers or on-call individuals.

Marine Operations Manuals

- There was no evidence that the Coast Guard reviewed or approved the current revision of SEACOR POWER's MOM. (8.3.15; 8.4.21; 10.7.9)
- MOM's are typically huge documents, and there is no guidance related to how to review a MOM or what needs to be part of a review.
- This was identified as an unsafe condition, but it did not contribute to the incident. (10.7.9)

The investigation team recommended the following:

- A policy that provides clear procedures for reviewing and approving MOMs. (11.1.26)

Possible opportunities for NOSAC:

- Consider whether the Coast Guard should review MOMs, or if they should fully delegate review of these documents (similar to stability manuals or cargo securing manuals).
- Provide input and suggestions to help shape the Coast Guard's future policy on MOM reviews, including what would be most valuable for the Marine Inspector to examine.

Cargo Securing

- The cargo on SEACOR POWER was not secured on the day of the incident. (8.1.6; 8.7.13; 9.1.10; 10.7.11)
- The First Mate stated that he did not see the cargo move until the vessel rolled. (8.7.17)
- Many liftboats do not secure cargo due to their limited rolling while underway. (8.7.14; 8.7.16; 9.1.10)
- The vessel's Cargo Securing Manual and MOM provided conflicting guidance regarding cargo securing. (8.7.15; 8.7.16; 9.1.10; 10.7.10)
- These issues were identified as unsafe conditions, but they did not contribute to the incident. (9.1.10; 10.7.10; 10.7.11)

The investigation team recommended the following:

- A Finding of Concern to liftboat owners and operators encouraging them to lash cargo and deck equipment prior to getting underway. (11.1.7)

Possible opportunities for NOSAC:

- Consider whether liftboat cargo securing should be addressed in a Coast Guard policy or regulation, due to the lower safety factors discussed in the stability section above.
- Create an industry best practice related to cargo securing.

Cargo Loading

- SEACOR POWER loaded cargo while the vessel was jacked up, which prevented accurate draft readings until loading was complete. This created a disincentive to correct stability issues. (8.7.5; 9.1.8; 10.7.12)
- This was identified as an unsafe condition, but it did not contribute to the incident. (10.7.12)

The investigation team recommended the following:

- A Finding of Concern to liftboat owners and operators encouraging them to conduct audits while their vessels are loading or after they are fully loaded. (11.1.7)

Possible opportunities for NOSAC:

- Provide the Coast Guard with information regarding the typical procedures for loading cargo on liftboats and assessing liftboat stability after loading is complete.
- Create an industry best practice regarding cargo loading and correcting stability issues.

SARTs

- After the vessel capsized, the First Mate grabbed a SART from the bridge and held onto it until he was rescued. He saw the SART activation light was illuminated, but no one ever saw a SART signal during the rescue. (8.1.40; 8.1.50; 8.9.8; 8.10.91; 9.9.2)

- Radar SARTs, similar to the one on SEACOR POWER, are designed to automatically produce a signal on the radar screen of nearby vessels. Post casualty testing revealed that SEACOR POWER's SART was working properly, but the signal would not display on a nearby radar screen when using normal radar settings. This led to the conclusion that SARTs are not an effective piece of lifesaving equipment. (8.9.6; 8.9.9; 9.9.2; 10.7.17)
- This was identified as an unsafe condition, but it did not contribute to the incident. (10.7.17)

The investigation team recommended the following:

- A study to assess the usefulness of SARTs and an evaluation of whether SARTs should be removed from the regulatory requirements. (11.1.20)

Possible opportunities for NOSAC:

- Provide input to the Coast Guard regarding the usefulness of SARTs and whether the Coast Guard should change or eliminate the requirement to carry SARTs.

Location of Lifesaving Equipment

- SEACOR POWER had extra lifejackets stored on deck, but the boxes were tied up while the vessel was underway. (8.9.10; 8.9.11; 9.9.1)
- The liferafts were located on the main deck. (8.9.2)
- The liferafts were located under the cranes, so they may not have been float free. (9.9.1)
- Due to the vessel's low freeboard, one of the liferafts was knocked overboard during a previous voyage. (8.3.22; 8.7.7; 9.9.1)
- Due to the vessel's breadth, the port side liferafts remained out of the water after the capsizing and did not release. (8.9.3)
- These issues were identified as unsafe conditions, but they did not contribute to the incident. (9.9.1; 10.7.16)

The investigation team recommended the following:

- A Finding of Concern to liftboat owners and operators encouraging them to ensure the proper spacing of lifesaving equipment. (11.1.7)

Possible opportunities for NOSAC:

- Identify additional strategies to improve the location and accessibility of lifesaving equipment on liftboats, especially for underway periods.
- Create an industry best practice related to the location of lifesaving equipment.

Rescuing Survivors

- When the first vessel arrived on scene with the capsized SEACOR POWER, there were five individuals clinging to the hull. The vessel launched their small boat, but SEACOR POWER's superstructure and helo pad prevented the small boat from getting close. None

of the individuals attempted to get in the water. About an hour later, one individual fell into the water and was rescued. (8.1.66; 8.1.72; 8.10.91; 8.10.107; 9.1.25)

- Later, Coast Guard response boats tried to get close to the vessel, but couldn't. Another individual entered the water and was rescued. (8.1.75; 8.1.76; 8.10.115; 8.10.116; 8.10.117; 9.1.27)
- A civilian helicopter lowered their rescue swimmer several times, but due to the angle of the capsized vessel, they could not reach the remaining individuals. (8.1.80; 8.1.86; 8.10.122; 8.10.126; 8.10.134; 8.10.155; 9.1.26)
- Multiple responders testified that the only solution to recover the individuals remaining on the vessel was for them to enter the water and swim away, but the bad weather deterred them from doing that. Unfortunately the weather got worse and the vessel continued to sink into the mud. (9.1.28)
- Three of the five individuals did not survive. (8.1.85; 8.1.89; 8.1.97; 8.10.129; 8.10.130; 8.10.133; 8.10.136; 9.1.27; 9.1.30)

The investigation team recommended the following:

- A study to evaluate the use of drones or remote operated life rings to deliver rescue equipment to survivors who are out of reach. (11.1.25)

Possible opportunities for NOSAC:

- Identify new technologies, ideas, and suggestions for rescuing survivors who are out of reach.

End of Exhibit 10.

Exhibit 11: SEACOR POWER Investigation Results - Additional Topics for NOSAC.

SEACOR POWER Investigation Results – Brief to NOSAC on June 21, 2023

This brief does not cover all of the investigation team's conclusions and recommendations. It focuses on some of the key areas where the NOSAC sub-committee can get involved; however there may be additional areas of interest for the sub-committee. Also, the recommendations listed below are the team's ideas on how to address an issue – the sub-committee's opinions and expertise will be very valuable for identifying additional strategies for improvements.

Report Organization:

- The Marine Board's Report begins with an Executive Summary, which is followed by additional introductory items, including a table of contents, preliminary statement, list of acronyms, definitions, list of figures, and information on the vessel and crew.
- All of the paragraphs in the report are numbered, and the first number corresponds to the section.
- The biggest section of the report begins on page 10. This is section 8, and includes the findings of fact.
- Each finding is cited to a reference. If there is no footnote, the information came from the public hearing. Otherwise, the footnote indicates the source of the information.
- Section 9 is the analysis, where the investigation team used the facts to assess what happened.
- Section 10 includes conclusions, which is where the team identified what contributed to the incident, what was unsafe (but did not contribute), and what was not a factor.
- Section 11 contains the team's recommendations. The team also decided to highlight best practices in this section.

Key Finding:

- The investigation team determined that the biggest factor that contributed to the casualty was the fact that SEACOR POWER was caught in unpredicted weather conditions that exceeded the vessel's operating limits.
- While the report identifies the biggest factor that contributed to the casualty, there was not really just one thing that went wrong. There were many factors that contributed to the unpredicted weather and other aspects of the casualty.

For the remainder of this document, the numbers in parenthesis are references to the corresponding paragraphs in the report.

Factors That Were Ruled Out:

These are things that the investigation team ruled out – they did not contribute to the casualty (Section 10.8):

- The Master was not pressured to get underway on the day of the incident. (8.1.8; 8.1.10; 8.1.25; 8.5.4; 8.7.27; 8.7.28; 8.7.33; 9.1.1; 9.1.2; 9.1.3; 10.8.1)
- The vessel was in good condition and operating properly on the day of the incident. (8.1.3; 8.1.8; 8.3.17 to 8.3.20; 8.3.22; 8.7.7; 8.7.33; 9.1.4; 9.3.1; 10.8.3)
- Seacor's Safety Management System (SMS) was working and was in compliance with the requirements. (8.1.5; 8.1.12; 8.2.15; 8.2.16; 8.3.21; 8.5.9; 8.7.9; 8.7.27; 9.2.1; 9.7.1; 10.8.2)
- The crew had the proper credentials, training and experience. (8.5.1 to 8.5.11; 9.5.1 to 9.5.3; 10.8.4)
- There was no evidence of drug or alcohol use. (8.6.1; 8.6.2; 9.6.1 to 9.6.3; 10.8.5)
- Just before the capsizing, the Master attempted to turn, but this did not contribute. (8.1.35; 9.1.14; 10.8.6)
- Once the Coast Guard was alerted to the incident, the search and rescue was efficient and effective, given the weather conditions. (8.10.17; 8.10.18; 8.10.27; 8.10.30; 8.10.40; 8.10.41; 8.10.63; 8.10.66; 8.10.67; 8.10.78; 8.10.82; 8.10.84; 8.10.87; 8.10.88; 8.10.89; 8.10.92; 8.10.94 to 8.10.96; 8.10.99; 8.10.100; 8.10.108 to 8.10.110; 8.10.113 to 8.10.118; 8.10.121; 8.10.127; 8.10.130; 8.10.135 to 8.10.168; 9.1.21; 9.1.23 to 9.1.27; 9.1.31; 10.8.7)
- There was no evidence of misconduct, negligence, or violations of law/regulation. (10.8.8 to 10.8.11)

The remainder of the brief will cover factors that contributed to the incident (causal factors), and unsafe conditions (factors that did not contribute, but were unsafe and therefore still need to be addressed). In general we will cover the issue, why it was an issue, the associated recommendation, and some ways that NOSAC can help.

Unpredicted Weather:

- On the morning of the incident, the weather reports predicted conditions around 2-4 foot seas, and 10-20 knot winds. (8.1.7; 8.1.8; 8.8.42; 8.8.46; 9.1.1; 9.8.1)
- The National Weather Service (NWS) was tracking a line of storms that day. The line started in Baton Rouge that morning, then moved over the New Orleans area around lunch time. (8.8.44; 8.8.48; 8.8.49; 8.8.57; 9.8.2)
- At 1208, the NWS began issuing Special Marine Warnings (SMWs), but the first several warnings did not apply to SEACOR POWER's location or intended trackline. (8.1.9; 8.1.15; 8.8.51; 8.8.53; 8.8.54; 8.8.59; 8.8.62; 9.8.2)
- At approximately 1400, the line of storms began accelerating south towards Fourchon and coastal Louisiana. (8.8.60; 9.8.2)
- The NWS issued a SMW at 1457, and this warning applied to SEACOR POWER's location. The SMW predicted winds of 34 knots or greater, and large hail. The SMW said that the storms were moving southeast at 25 knots. (8.1.23; 8.8.67; 9.8.2)

- Unfortunately, the weather that hit SEACOR POWER was far worse than predicted and was moving faster than expected. There were 80 knot winds, with gusts to 99 knots. The weather moved through as two squalls. The first hit SEACOR POWER at 1519, the second hit at 1532, and the vessel capsized at 1537. (8.1.28 to 8.1.32; 8.1.38; 8.1.52; 8.1.53; 8.1.55; 8.8.69 to 8.8.74; 8.8.81; 8.8.82; 8.8.83; Figure 45; 8.8.98; 8.8.99; 8.8.100; 9.1.12; 9.1.13; 9.8.4; 9.8.5; 10.1.1)

There were several factors that contributed to the fact that the NWS prediction was not accurate:

- At the time of the incident, the NWS radar was located in Slidell, LA. Due to the distance from Fourchon and the curvature of the Earth, the radar could not "see" what was happening in the atmosphere below 7,000 or 8,000 feet. As a result, the NWS had to examine what was happening up high, and use that to infer what was happening at the surface. Additionally, the radar beam spread out as it got further from the source, which decreased the resolution of the radar and produced a less clear picture. (8.8.13; 9.8.12; 10.1.2)
- Since the NWS could not "see" what was happening below 7,000 feet, they relied on automated weather stations to provide reports that would help them validate and/or adjust their predictions. (8.8.13; 9.8.12)
- However, there were no automated weather stations near the incident. They received automated reports from the New Orleans Airport and the LOOP. They received reports from Galliano once per hour, and reports from Grand Isle on a one hour delay. There used to be automated stations in Fourchon and Terrebonne Bay, but the NWS no longer received reports from those stations, and the information was sorely missed. (8.8.15; 8.8.16; 9.8.12; 10.1.3)
- In the absence of automated weather stations, the NWS could also utilize weather information from real time observations (on land or on sea), but they did not get those on the day of the incident. They rarely ever received any ship reports at all. (8.8.17; 8.8.80; 9.8.13; 10.1.4)
- The Coast Guard had requirements for some of their cutters and land-based units to provide weather observations to the NWS. This was not happening at the time of the incident. (8.8.20; 8.8.22; 8.8.23; 8.8.26; 8.8.27; 9.8.14; 10.1.5)

The investigation team recommended the following:

- A Finding of Concern to the NWS which recommends they identify options for increasing automated weather observation equipment and they establish working groups to increase voluntary weather reporting. (11.1.6)

Possible opportunities for NOSAC:

- Identify a company or multiple companies that already have weather stations in Port Fourchon, and coordinate an automatic feed to the NWS.
- Establish an industry consortium to fund an automated weather station in Port Fourchon.

- Encourage industry participation in any working groups established by the NWS.

Procedures for Unexpected Weather:

- The First Mate described the discussions that he had with the Master when the two squalls hit SEACOR POWER at 1519 and 1532. During the first squall, the First Mate said they discussed whether the wind would lay down the seas. During the second squall they agreed to soft tag due to reduced visibility. There was no indication that they discussed the fact that the wind speeds exceeded their operating limits. In fact, the First Mate could not remember the wind limits for the vessel. (8.7.25; 9.1.12; 9.1.13)
- SEACOR POWER's crew did not have formal written procedures for unexpected weather conditions or weather events that exceeded their operating limits, which was a factor that contributed to the casualty. (8.7.25; 8.7.26; 8.7.41; 9.1.12; 9.1.13; 10.1.6)

The investigation team recommended the following:

- A new regulation or policy requiring quick reference guides for liftboats. (11.1.5)

Possible opportunities for NOSAC:

- What strategy makes the most sense for liftboats?
    - Individualized high wind/heavy weather procedures for each liftboat?
    - A standard quick reference guide for US liftboats?
    - An industry-wide liftboat wind threshold (for example, no underway operations for winds above 45 knots)? Would an industry-wide threshold reduce pressure on Masters and crews by drawing a clear line in the sand?

Frequency of Weather Reports:

- The First Mate, the Company Man, and the shore side Seacor personnel did not re-check the weather forecast on the day of the incident. They received the morning weather forecast, but did not look for updates later in the day. (8.1.10; 8.7.20; 8.7.22; 8.7.23; 8.8.52; 9.8.1; 10.7.2; 10.7.3; 10.7.4)
- The investigation team determined that this did not contribute to the incident, because even if someone had re-checked the weather on the day of the incident, and even if the SEACOR POWER crew had received the Special Marine Warning that was issued at 1457, it is very unlikely that they would have stopped to soft tag or jack up. The SMW predicted wind gusts of 34 knots or greater, which likely would not raise any alarms with the crew. (9.8.3)

The investigation team recommended the following:

- A Finding of Concern to liftboat owners and operators encouraging them to establish procedures for frequent weather checks in order to monitor for unexpected changes while underway. (11.1.7)

Possible opportunities for NOSAC:

- Develop a set of industry best practices for liftboats, including a best practice related to how often the crew should check weather forecasts while underway.
- Identify options, requirements, and/or best practices for getting shore side personnel more involved in checking and re-checking the weather, and sending updates to liftboat crews.

Obtaining Weather Warnings:

- All of the methods of obtaining weather warnings on SEACOR POWER required the crew to seek out the information. (9.8.7)
- If a crew member wanted to use the NWS website or the buoy weather program to check the weather, they had to go down below to use a ship computer. (8.7.21; 9.8.1; 9.8.6; 9.8.7; 10.7.1)
- If a crew member wanted to hear the NOAA weather radio forecast, they had to switch the VHF radio over to a different channel and listen to the report. (8.8.9; 9.8.7)
- If a crew member wanted to view a NAVTEX message, they had to leave the operating station and go to a different part of the bridge. Once they viewed a NAVTEX message, they had to examine the coordinates and decide whether it applied to their location. (8.7.21; 8.9.26; 9.8.7)
- If no one knew that the weather was getting worse, then they had no reason to look for a weather warning with one of the methods described above. (9.8.7)
- This was identified as an unsafe condition, but it did not contribute to the incident. (9.8.3; 10.7.5)

The investigation team recommended the following:

- A Finding of Concern to the NWS which recommends they consider using the Emergency Alert System (EAS) to send weather warnings to cell phones in maritime areas. (11.1.6)

Possible opportunities for NOSAC:

- Share current practices used by liftboats to obtain weather forecasts, especially practices that push the information to the crews.
- Provide additional suggestions on how to send weather warnings to liftboats, since the above recommendation would only cover operating areas with cell phone coverage.

VHF Weather Broadcasts:

- The Coast Guard had agreements and policies requiring units to broadcast unscheduled NWS weather warnings via radio immediately upon receipt. (8.8.24; 8.8.28; 8.8.29)
- On the day of the incident, the Coast Guard did not broadcast NWS warnings via radio in coastal Louisiana. (8.8.81; 8.10.26; 9.8.8; 10.7.6)

- This was identified as an unsafe condition, but it did not contribute to the incident. (9.8.3; 10.7.6)

The investigation team recommended the following:

- Immediate revision of Coast Guard policy to clarify the who, what, when, why and how of broadcasting weather warnings via radio. (11.1.1)

Possible opportunities for NOSAC:

- Share the importance of radio weather broadcasts with the Coast Guard to help them with their policy revisions.
- Provide industry input on which types of weather warnings should be broadcast via radio.
- Provide industry input on what information is necessary in radio weather broadcasts.
- Provide industry input on how often radio weather broadcasts are needed.

NAVTEX Weather Broadcasts:

- The Coast Guard did not send any NAVTEX broadcasts from the New Orleans site between 1000 and 1623 on the day of the incident. (8.8.45; 8.8.85; 9.8.10; 10.7.8)
- This was identified as an unsafe condition, but it did not contribute to the incident. (9.8.10; 10.7.8)
- The investigation team also concluded that NAVTEX does not appear to be an efficient or effective system for the following reasons: (10.7.7)
    - NAVTEX does not provide full coverage of coastal areas. There is no coverage in the western Gulf of Mexico. (8.8.33; Figure 38; 9.8.9)
    - There is a long chain of steps to get a weather message from the NWS to a ship's NAVTEX receiver. One link in the chain relies on commercial internet, which may be subject to weather disruptions. (8.8.31; 8.8.32; 8.8.34; 8.8.37; 9.8.9)
    - NAVTEX messages can describe warning areas in terms of a large number of latitude and longitude coordinates. (8.8.35; Figure 43; 9.8.9)
    - NAVTEX receivers have small screens, which requires scrolling or printing to read full messages. (8.7.21; 8.8.37; 9.8.9)
    - NAVTEX receivers may not be accessible at a vessel's operating station. (8.8.30; 8.9.26; 9.8.7; 9.8.9)
    - Ships may receive NAVTEX warnings for a broad area, which means they have to screen the messages to determine which are applicable. (9.8.9)

The investigation team recommended the following:

- An evaluation of the NAVTEX system to determine effectiveness/usefulness. (11.1.22)

Possible opportunities for NOSAC:

- Provide an industry perspective on the NAVTEX system, including how useful it is, whether it is needed at all, and if it is needed, how to improve it.

Stability

- SEACOR POWER's wave height limit was 5 feet. This limit is much more conservative than the 70/80 knot wind limit. To compare the two with the Beaufort Scale: 5 ft waves occur in Force 5 with 25-30 knot winds; 60 knot winds are Force 10 with 20-30 foot seas. The requirement for a 5-foot wave height is not contained within ABS Rules or the CFR and may have come from NVIC 8-81 (now cancelled). (8.4.21; 9.4.2)
- The regulatory criteria for liftboats do not evaluate floating stability with wave conditions. The requirements evaluate wind speeds of 60 and 70 knot winds in still water, but this is not at all a realistic condition. (8.4.8; 9.4.2; 10.1.8)
- The method used to calculate the wind force on the vessel uses a formula that increases the force of the wind as the height above the water increases. The formula found in the CFRs is not as conservative as the formulas found in other standards. (8.4.13; 8.4.15; Figure 25)
- The regulations provide a coefficient in order to calculate the force of the wind on certain portions of a vessel's superstructure. A paper written in 2019 demonstrates that the shape coefficient for cylindrical liftboat legs is too small, and could actually be 4 times greater than what is listed in the CFRs. The NTSB/ABS Wind Load Study of SEACOR POWER found a much higher drag coefficient of 2.9 during model calibration. (8.4.16; 9.4.4; 10.1.9, note: NTSB/ABS Study was completed after ROI was submitted, link here: https://data.ntsb.gov/Docket/Document/docBLOB?ID=14296571&FileExtension=pdf&FileName=4%20-%20Stability%20-%20ABS%20CFD%20Study%20Report%20-%20SEACOR%20Power_Redacted-Rel.pdf)
- It is not clear how to calculate the CFR range of stability criteria for liftboats. (10.1.10)
- The CFRs do not address the direction of the wind and inclination for liftboat stability calculations. (8.4.17; 9.4.6; 10.1.11)
- The safety factor built into the regulations for liftboats may not be a suitable design standard. (9.4.8; 10.1.12)
- SEACOR POWER departed port on the day of the incident with approximately 2.5 feet of aft trim. This was not in accordance with the limitations found in the MOM, but the crew stated it was unrealistic to operate using the trim limit in the MOM. (8.4.21; 8.4.23; 10.1.7)

The investigation team recommended the following:

- Expedited completion of the current liftboat stability study. (11.1.2)
- Revision of the liftboat stability regulations. (11.1.2)
- Reduction of the current operating limits for liftboats in order to provide a temporary additional margin of safety. (11.1.3)
- A regulation or policy that prohibits offshore workers from riding liftboats while underway, unless they meet additional stability requirements. (11.1.4)

- A regulation or policy requiring liftboat owners and operators to create quick reference guides that include wave limits, wind limits, draft restrictions, and trim conditions. (11.1.5)

Possible opportunities for NOSAC:

- Identify options to address the gaps in the stability requirements.
- Provide suggestions for strategies to keep liftboats safe while the gaps in the stability requirements are being addressed.
- Establish a list of recommendations to keep liftboats safe while operating on the East Coast, given the differences between operations there and on the Gulf Coast.

End of Exhibit 11.

Exhibit 12: Compilation and Categorization of NOSAC Recommendations

The purpose of Exhibit 12 is to organize the recommendations from the NOSAC within this report into general categories. These three categories are represented by three tables as follows.

Table 12.1 *Stability Recommendations*.
Table 12.2 *Documentation Recommendations*.
Table 12.3 *Further Study Recommendations*.

Recommendations are designated in this Exhibit and throughout the report with the following format:

> TS 01-23(1) Rx.x, where TS means Task Statement; 01-23(1) means task statement 01-2023, revision 1; and Rx.x means Specific Task Recommendation Section and assigned number.

Independently reviewing the various national and international documentation referenced within this report has led to overlap and similarity of recommendations. Suggested vessel applicability has been identified for each recommendation. Note: When the applicability in this report says that a recommendation should apply to all vessels, the committee is suggesting that the Coast Guard first start by applying the recommendation to US flag vessels. Then, the Coast Guard should consider whether the recommendation should be further expanded to apply to foreign flag vessels.

> Cross-references to related recommendations are noted in brackets, [ ]. Note only the x.x of the Task Statement designation is used with these brackets for brevity. For example, 1.1 is the same as TS 01-23(1) R1.1.
> References to the related documents from which the recommendations were developed are in braces, { }, unless the related document is clearly expressed within the recommendation.

The following cross reference identifies original recommendations numbers with the new numbers after consolidating related stability recommendations.

Original Recommendation Number	New Recommendation Number
TS 01-23(1) R1.1B	TS 01-23(1) R5.10A.15
TS 01-23(1) R1.2	TS 01-23(1) R5.10A.4
TS 01-23(1) R1.3	TS 01-23(1) R5.10A.3
TS 01-23(1) R1.3B	TS 01-23(1) R5.10B
TS 01-23(1) R2.6	TS 01-23(1) R5.10A.5
TS 01-23(1) R2.7A	TS 01-23(1) R5.10A.12
TS 01-23(1) R2.10	TS 01-23(1) R5.10A.10
TS 01-23(1) R4.1	TS 01-23(1) R5.10A.1

TS 01-23(1) R4.2	TS 01-23(1) R5.10A.6 (4.2.1) TS 01-23(1) R5.10A.2 (4.2.2, 4.2.3) TS 01-23(1) R5.10A.4 (4.2.4) TS 01-23(1) R5.10A.8 (4.2.5) TS 01-23(1) R5.10A.7 (4.2.6)
TS 01-23(1) R4.3	TS 01-23(1) R5.10A.6 TS 01-23(1) R5.10A.9 TS 01-23(1) R5.10A.13
TS 01-23(1) R4.4	TS 01-23(1) R5.10A.9
TS 01-23(1) R4.5	TS 01-23(1) R5.10A.14
TS 01-23(1) R4.7	TS 01-23(1) R5.10A.11

Also note that recommendations TS 01-23(1) R1.3A and TS 01-23(1) R4.6 were removed from the Second Interim report. Therefore, recommendation numbers will not be perfectly sequential.

Abbreviations used in these brackets are as follows.

USCG ROI USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021.

NTSB National Transportation Safety Board (NTSB) Capsizing of Liftboat SEACOR POWER, MIR-22/26.

USCG BP Best practices as noted in the USCG ROI.

NOSAC Recommendations identified within this NOSAC Report for Task Statement 01-2023 (Rev 1).

The NOSAC has prioritized the recommendations into High, Medium, and Low. In addition, some of the recommendations are considered by NOSAC not to be significantly resource intensive and may be easier to address and implement. Each recommendation is selectively color-coded as follows.

	NOSAC considers this Recommendation not to be resource intensive.	
	NOSAC considers this recommendation to be of high priority.	High
	NOSAC considers this recommendation to be of medium priority.	Medium
	NOSAC considers this recommendation to be of low priority.	Low

Table 12.1 Stability Recommendations.

Table 12.1 *Stability Recommendations*.		
TS 01-23(1)R1.1	The NOSAC recommends that the USCG review and update NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding NVIC 3-89. [*Refer to USCG ROI 2; NTSB M-22-7; and NOSAC 2.10A*.] Add language to Enclosure (1) (*Guidelines for the Presentation of Stability Information to Operating Personnel*), paragraph 10 (*Computer Applications*), which requires validation and / or revalidation of computer stability programs when design changes that affect the stability characteristics of the vessel occur, or every ten (10) years, whichever comes first. Applicability: All types of vessels. {Reference: NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*)}	Medium
TS 01-23(1) R1.1A	The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding NVIC 8-91. [*Refer to USCG ROI 2 and NTSB M-22-7*.] Develop a statutory or regulatory definition for the word “offshore”, which is found in the cover letter, Background, 3b. Applicability: Uncertificated Offshore Supply Vessels, including Liftboats. {Reference: NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*)} Refer to Exhibit 13 for NOSAC suggested definition which addresses this NOSAC recommendation.	Low
TS 01-23(1) R1.1C	The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding NVIC 8-91. [*Refer to USCG ROI 2 and NTSB M-22-7*.] The NOSAC recommends that the USCG evaluate whether there is a need to conduct an Operating Manual review on each existing liftboat, given the lessons learned from the capsizing of the Seacor Power. This Operating Manual review should assess whether the document contains sufficient guidance to prepare for sudden severe weather and appropriate actions to take in the event of sudden severe weather.	High

Table 12.1 *Stability Recommendations*.		
	Applicability: Uncertificated Offshore Supply Vessels, including Liftboats. {Reference: NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*)}	
TS 01-23(1) R2.5	The NOSAC recommends that the USCG create a new regulation or policy for liftboats that use stability computers or other computer programs for stability related purposes. The new regulation or policy should establish a requirement to validate or affirm that the stability computer or program compared with the stability book, Operating Manual, Stability Letter, and / or the Certificate of Inspection, as applicable, whenever there is a name change, or a major modification to the vessel is correct. This action is an administrative review function rather than a call for conducting deadweight surveys or complete stability analyses. [*Refer to USCG ROI 2; NTSB M-22-7; USCG BP 11.2.6 (#6), 11.2.8 (#8), and 11.2.9 (#9); and NOSAC 5.10A.3 and 2.10A*.] Applicability: Liftboats only. {Reference: National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR Power*, MIR-22/26, Adopted 18 October 2022. Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.3 (*Safety Management System*); Sub-Sub-subsection 1.9.3.1 (*Verification and Certification*) (Page 56). "A report from the previous year's internal audit, conducted on April 9, 2020, also noted that stability was calculated using the 'Dixie Endeavor Stability program."} Refer to Exhibit 13 for NOSAC suggested draft bullet point in the *Offshore Supply Vessel Inspector Job Aid* which addresses this NOSAC recommendation.	Medium
TS 01-23(1) R2.7	The NOSAC recommends that the USCG create a methodology which assists liftboat owners and operators providing the vessel's Master and crew with specific guidance for maneuvering and operational characteristics during heavy weather. Due to the unique features of liftboats, these vessels may have relative wind directions that risk less destabilization than other relative wind directions. As a result, there could be a preferred direction of turn for a liftboat maneuvering in heavy weather. In addition, lowering of the legs should be included in this guidance to the vessel's Master. This guidance must be very clear to the Master and crew. Refer to the NTSB Report for the "Capsizing of Liftboat SEACOR Power", on April 13, 2021, Report Number MIR-22/26, adopted October 18, 2022; Page 88, Section 2 (Analysis); Subsection 2.2 (Weather and Operations); Sub-subsection 2.2.3 (Stability and Capsizing), Figure 24. Most vulnerable wind direction axes for port side of the SEACOR Power as determined by CFD analysis. Within this report, refer to Exhibit 4, USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26 (NTSB Possible Rec. 3 (88,2.2.3)). [*Refer to USCG ROI 2, 5, and 26; NTSB M-22-7; and NOSAC 1.1C and 5.10A.5*.] Applicability: Liftboats only. {Reference: NTSB Report for the "Capsizing of Liftboat SEACOR Power", on April 13, 2021, Report Number MIR-22/26, adopted October 18, 2022; Page 88, Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*), Figure 24. *Most vulnerable wind direction" axes for port side of the SEACOR Power as determined by CFD analysis.* Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*) (Page 88)}	High

Table 12.1 *Stability Recommendations*.		
	Refer to Exhibit 13 for NOSAC suggested draft methodology which addresses this NOSAC recommendation.	
TS 01-23(1) R2.10A	2.10A Recommendations from Exhibit 4: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*. The NOSAC recommends that the USCG create a new regulation or policy for liftboats and other types of vessels that use stability computers or other computer programs for stability-related purposes. The new regulation or policy should establish a requirement to include periodic revalidation and / or reaffirmation of stability computers or programs in the company's Safety Management System. The periodic revalidation and / or reaffirmation should include support from the American Bureau of Shipping (ABS) or the USCG Marine Safety Center (MSC), as applicable, and should occur in the following situations: [*Refer to USCG ROI 2; NTSB M-22-7; USCG BP 11.2.6 (#6); and NOSAC 1.1.*] a) Every ten (10) years, at minimum, from the previous revalidation and / or reaffirmation. b) Upon significant changes in the structure or the stability characteristics of the liftboat. c) Upon name change of liftboat (reaffirmation would typically include a name change in the documentation within the stability program or spreadsheet as opposed to a full revalidation as required in a) or b). Note: if the computer program cannot be revised to address a vessel name change, then the Operating Manual or other documentation should be revised to state that the program which includes a previous vessel name is acceptable to the current vessel name. d) As required by the Owner or operator. Note: Recommendation 2.10A is in conjunction with NOSAC 2.5. A possible location for this new regulation, if approved, is 46 CFR 170.110 (*Stability booklet*). Applicability: All types of vessels. {Reference: *USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26*. Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.4 (*Marine Operations Manual*); Sub-Sub-subsection 1.9.4.1 (*Coast Guard Requirements*); Sub-Sub-Sub-subsection 1.9.4.1.5 (*Stability*) (Page 60). "According to the mate and off-rotation captain and chief engineer, the crew did not use the form provided in the Marine Operations Manual to calculate stability, but instead used a Microsoft Excel spreadsheet. The weights and locations of loads, liquids, and personnel were input into the spreadsheet, and the application completed the calculations. The off-rotation engineer stated that, if a value computed by the stability spreadsheet was outside of allowable parameters, the cell in the spreadsheet containing the value would turn red. The off-rotation captain told investigators that the only value that was regularly out of specification was trim. He stated, '"the comment that [the spreadsheet] says that you should achieve within 6 inches of trim is not reasonable. But the stability program was still accurate and would tell you that you're not within 6 inches. But that was expected.'" Response: "*The stability program or*	Medium

Table 12.1 *Stability Recommendations*.		
	spreadsheet was not revalidated by either the Coast Guard or ABS. The stability program or spreadsheet should be identified in the SMS as requiring revalidation periodically.}	
TS 01-23(1) R3.3	The NOSAC recommends that the USCG review the International Maritime Organization (IMO) *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update 46 CFR 170.110 (f) (*Stability booklet*). In particular, the NOSAC recommends the USCG review the following sections: [*Refer to USCG ROI 2; NTSB M-22-7; and NOSAC 5.10A.3*.] Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.1 (*General*), Paragraph 2.1.6 discusses stability booklets and stability instruments used to supplement the stability booklet. Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 3 (*Guidance in preparing stability information*), Chapter 3.6 (*Stability booklet*) discusses the guidance on working language of the Stability booklet, approval by Administrations, format, and possible alternatives to Stability booklets. Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 3 (*Guidance in preparing stability information*), Chapter 3.8 (*Operating booklets for certain ships*) mentions the need for additional information in the stability booklet. Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 4 (*Stability calculations performed by stability instruments*) discusses general, types of stability software, functional requirements, acceptable tolerances, approval procedure, specific approval, user manual, installation testing, periodical testing, and other requirements. Applicability: All types of vessels. {Reference: International Maritime Organization *International Code on Intact Stability, 2008*, and as specified above.} {Reference: 46 CFR 170.110 (f) (*Stability booklet*)}	Medium
TS 01-23(1) R3.4	The NOSAC recommends that the USCG review the International Maritime Organization *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update Title 46 (*Shipping*), Chapter I (*Coast Guard, Department of Homeland Security*), Subchapter S (*Subdivision and Stability*), § 170.170 (*Weather Criteria*). In particular, the NOSAC recommends the USCG review the definitions of "P" and "GM" found in Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.3 (*Severe wind and rolling criterion (weather criterion)*). [*Refer to USCG ROI 2; NTSB M-22-7; and NOSAC 5.10A.3*.] Applicability: All types of vessels. {Reference: International Maritime Organization *International Code on Intact Stability, 2008*, Part A (*Mandatory Criteria*), Chapter 2 (*General Criteria*), Section 2.3 (*Severe wind and rolling criterion (weather criterion)*}.	High

Table 12.1 *Stability Recommendations*.		
	{Reference: 46 CFR 170.170 (*Weather Criteria*). Note: the terms "P" and "GM" are not specifically defined in this regulation.} Refer to Exhibit 13 for NOSAC suggested draft additional regulatory text for 46 CFR 170.170(a) which addresses this NOSAC recommendation.	
TS 01-23(1) R3.5	The NOSAC recommends that the USCG review the International Maritime Organization *International Code on Intact Stability, 2008*, and use the information found in the *Code* to update 46 CFR 134.170 (*Operating manual*), Paragraph (6). In particular, the NOSAC recommends the USCG review the information contained in Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 5 (*Operational provisions against capsizing*) of the *Code*. [*Refer to USCG ROI 2 and 5; NTSB M-22-7; and NOSAC 5.10A.3*.] Applicability: Offshore Supply Vessels, including Liftboats. {Reference: International Maritime Organization *International Code on Intact Stability, 2008*, Part B (*Recommendations for certain types of ships and additional guidelines*), Chapter 5 (*Operational provisions against capsizing*)} {Reference: 46 CFR 134.170 (*Operating manual*), Paragraph (6) "Guidance on preparing the vessel for heavy weather and on what to do when heavy weather is forecast, including when critical decisions or acts—such as leaving the area and heading for a harbor of safe refuge, or evacuating the vessel—should be accomplished."}	Medium
TS 01-23(1) R5.6	The NOSAC recommends the US Coast Guard request the American Bureau of Shipping redo (pro bono) their liftboat stability reviews completed between 1997 and 2021 under NVIC 3-97, *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels* that did not receive oversight from the Coast Guard for those liftboats still in service. Applicability: Liftboat only. {NVIC 3-97, *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels*}	High
TS 01-23(1) R5.7	The NOSAC recommends that the US Coast Guard request the National Transportation Safety Board (NTSB) reopen the Seacor Power investigation in light of the recently submitted Petition for Reconsideration with new matters. Applicability: Liftboat only. {Reference: None specific.}	High
TS 01-23(1) R5.8	The NOSAC recommends NVIC 3-97, *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels*, be updated to hold the American Bureau of Shipping more accountable for their stability reviews on behalf of the Coast Guard and to clearly outline the selection process for oversight of vessel types. Applicability: Liftboat only. {NVIC 3-97, *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels*} Refer to Exhibit 13 for NOSAC suggested draft changes to NVIC 3-97 which addresses this NOSAC recommendation.	High

Table 12.1 *Stability Recommendations*.

TS 01-23(1) R5.9	A)	The NOSAC recommends that the USCG re-evaluate the stability for all active US liftboats. (Refer to Table 5.1, *United States Liftboats as of May 2023*.) Due to the number of interpretations and nuances associated with liftboat modeling and stability calculations, this work should not be assigned to an outside party. The sub-committee recommends that this re-evaluation be completed by at least two USCG naval architects from the Marine Safety Center. The stability re-evaluation should include all of the items listed below for each active liftboat: 1) The USCG should use the vessel's original stability calculations, if available, and the vessel's Marine Operating Manual (MOM) or stability booklet to: a) Examine the vessel's original stability calculations and information to identify: i) The regulatory subchapter and/or Navigation and Vessel Inspection Circular (NVIC) applied to vessel stability; ii) the service (restricted or unrestricted); iii) the loading conditions (draft, trim, list); iv) the wind directions (beam winds or beam winds plus additional directions). b) Determine whether the original calculations addressed fading stability. c) Examine the vessel's original calculations to see if there are any errors. 2) The USCG should use current modeling techniques, analysis tools, and regulatory interpretations to: a) Recalculate whether the vessel meets the stability requirements of 46 CFR 174, Subpart H (*Special Rules Pertaining to Liftboats*), or other applicable regulatory/NVIC stability requirements (as appropriate). b) While recalculating the vessel's stability, examine winds encountering the vessel from all different directions, spread at intervals of one to ten degrees around the vessel. The interval should be dependent on the sensitivity of the vessel's stability. c) Identify the wind speed at which the vessel capsizes using the loading conditions from the MOM or stability booklet and the stability calculations found in 46 CFR 174, Subpart H (or other applicable stability requirements). d) Calculate the wind heeling moments using the step function found in 46 CFR 174.055 (or other applicable stability requirements), and also using the API 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design* standard. Identify the wind speed at which the vessel capsizes when the larger wind heeling moments are applied. e) Calculate the wind heeling moments using the shape coefficients found in 46 CFR 174.055, *Calculation of wind heeling moment (Hm)*, (or other applicable stability requirements), and using updated shape coefficients for legs with racks (such as the coefficients identified for chords with racks in the ABS and	High

Table 12.1 *Stability Recommendations*.

GustoMSC paper). Identify the wind speed at which the vessel capsizes when larger shape coefficients are applied.

f) Calculate the vessel's stability using techniques that mitigate the effects of fading stability (such as allowing free twist or use of potential energy build up). Compare the wind speeds at which the vessel capsizes for both sets of calculations.

g) Request the owner/operator provide the vessel's actual draft marks (as reported by the crew) from the last three departure conditions. If these actual loading conditions are different from the loading conditions used for the original stability calculations, then use these actual loading conditions to calculate the vessel's stability. Identify the wind speed at which the vessel capsizes for these actual loading conditions.

h) Identify the wind speed at which the vessel capsizes when calculating stability using a combination of the API Recommended Practice 2A-WSD to calculate wind heeling moments, updated shape coefficients (such as those found in the ABS and GustoMSC paper), fading stability, the actual loading conditions reported by the owner/operator, and wind from all directions.

i) Apply the intact stability criteria found in 46 CFR 170.170 and 170.173 and determine the extent to which the vessel passes or fails.

B) While conducting the stability reevaluations described above, the USCG should gather a list of interpretations, decisions and judgment calls made by the naval architects.

C) The USCG should share the stability reevaluation results with the vessel's owner/operator immediately, so that they can consider imposing additional operational restrictions if necessary.

Applicability: Liftboats only.

{References:

Marine Safety Center Post-Casualty Stability Analysis of Seacor Power Report (and the references on page 63 of this document) which highlights the unique features of liftboats, the various interpretations used when calculating liftboat stability, and the different wind profile standards that exist.

Santen, J.A. van, "Problems met in stability calculation of offshore rigs and how to deal with them," Proceedings of the 13th International Ship Stability Workshop, 2013.

Breuer, J.A. and K. Sjölund, "Steepest Descent Method. Resolving and Old Problem," Proceedings of the 10th International Conference on Stability of Ships and Ocean Vehicles, 2009.

Santen, J.A., "The use of energy build up to identify the most critical heeling axis direction for stability calculations for floating offshore structures, review of various methods," Proceedings of the 10th International Conference on Stability of Ships and Ocean Vehicles, 2009.

Breuer, J.A. and K. Sjölund, "Orthogonal Tipping in Conventional Offshore Stability Evaluations," Proceedings of the 9th International Conference on Stability of Ships and Ocean Vehicles, 2006.

46 CFR 170, *Stability Requirements for all Inspected Vessels*;

Table 12.1 *Stability Recommendations*.			
	46 CFR 173, *Special Rules Pertaining to Vessel Use*; 46 CFR 174, Subpart H, *Special Rules Pertaining to Liftboats*; API Recommended Practice 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design*}		
TS 01-23(1) R5.10	**A)**	The NOSAC recommends that the USCG use the results of the liftboat stability re-evaluation (from Recommendation 5.9) to: **1)** Update the regulations to explicitly exempt or include liftboats in the requirements of 46 CFR 170.170 (*Weather criteria*) and 170.173 (*Criterion for vessels of unusual proportion and form*). {References: 46 CFR 170, *Stability Requirements for all Inspected Vessels*; 46 CFR 170.160, *Specific applicability*; 46 CFR 173, *Special Rules Pertaining to Vessel Use*; USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022*; Enclosure (1) to MSC Memo, Serial # A0-2201141. 3.2.1, Stability Requirements in Part 170 for All Vessels (page 7) "Although Mobile Offshore Drilling Units (MODUs) are exempt from the intact stability criteria in Part 170 of Subchapter S, liftboats are not explicitly noted as exempt in §170.160. Because of this, either the intact stability criteria listed in §170.170 "Weather Criteria" or §170.173 "Criterion for Vessels of Unusual Proportion and Form" could be applied to liftboats. It is apparent from the stability criteria that most liftboats are not intended to meet §170.170 which is for vessels of "ordinary proportions and form." Most liftboats cannot meet §170.173 because liftboats have very low range of stability (20° or less) with downflooding angles as low as 10-15°. For even the most benign "protected" route, §170.173 requires positive righting arms to 25°, and no submergence of downflooding points to angles of inclination of at least 15°. MSC has historically not applied these criteria to liftboats."} **2)** Update the regulations to include a definition of "heel" and "heeling moment" for a liftboat. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*)} **[Refer to Exhibit 13 for NOSAC suggested definitions for "heel" and "heeling moment".]** **3)** Assess whether the regulatory equations and constants used for liftboat stability calculations are still valid and whether they provide a sufficient safety margin. [*Refer to USCG ROI 2; NTSB M-22-7; and NOSAC 1.4, 2.5, 3.3, and 3.5.*] {Reference: 46 CFR 170.170 (*Weather criteria*).} **4)** Decide whether to increase the regulatory wind speeds for restricted and/or unrestricted service. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and Marine Safety Center Technical Note MTN 4-00 (*Weather Criteria for Liftboat Leg Strength*). This Note states that there is some uncertainty in the liftboat design community regarding wave conditions associated with 70-knot winds, particularly of short-term duration. Coast Guard states that liftboat designers "may assume normal wave and current conditions (appropriate to the location) in conjunction with a 70-knot wind speed."} **5)** Assess whether the regulations should be updated to evaluate liftboat stability under operational conditions, rather than evaluating stability	High

Table 12.1 *Stability Recommendations*.			
		using fixed wind speeds under static (still water) conditions. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 174 (*Special Rules Pertaining to Specific Vessel Types*). Note: Evaluating liftboat stability under operational conditions is not specified in this regulation.}	
	6)	Update the regulations to ensure liftboat stability calculations examine wind encountering the vessel from all different directions, spaced at no greater than 10-degree intervals (or a smaller interval, if appropriate) around the vessel. [*Refer to USCG ROI 2; NTSB M-22-7; and Conclusion 8.2 on page 60 of the MSC Post-casualty Stability Analysis.*] {Reference: 46 CFR 174 (Special Rules Pertaining to Specific Vessel Types) and USCG Marine Safety Center (MSC) Plan Review Guide for Liftboat Submissions and USCG Marine Safety Center (MSC) Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022; Enclosure (1) to MSC Memo, Serial # A0-2201141. "The MSC has not documented their policies for varied wind direction or off-axis stability analyses. A review of MSC's past liftboat stability reviews indicate an inconsistent application of off-axis stability prior to 2018."}	
	7)	Update the wind heeling moment equation in the regulations to replace the step function with a more up-to-date standard, such as the API 2A-WSD standard. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*)}	
	8)	Update the shape coefficients in the regulations to account for recent studies or conduct wind tunnel testing in order to update the shape coefficients. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*)}	
	9)	Update the regulations to include guidance on how to address fading stability. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and USCG Marine Safety Center (MSC) *Plan Review Guide for Liftboat Submissions* and USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022*; Enclosure (1) to MSC Memo, Serial # A0-2201141. "The MSC has not documented their policies for varied wind direction or off-axis stability analyses. A review of MSC's past liftboat stability reviews indicate an inconsistent application of off-axis stability prior to 2018."}	
	10)	Update the regulations to provide liftboat owners and operators with guidance for calculating a vessel's maximum wave height for afloat operations. [*Refer to USCG ROI 2; and NTSB M-22-7.*] {Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and USCG Response to NOSAC SC Stability Questions from NTSB Report MIR-22-26. Section 1 (*Factual Information*); Subsection 1.9 (*Operations*); Sub-subsection 1.9.4 (*Marine Operations Manual*); Sub-Sub-subsection 1.9.4.1 (*Coast Guard Requirements*); Sub-Sub-Sub-subsection 1.9.4.1.2 (*Design Operating Limits*) (Page 58). "This section included a table of underway operating limits that showed a maximum wind speed of 70 knots, which matched the "severe storm" wind speed used in regulatory intact-stability calculations for liftboats in restricted service (see section 1.10.2.2 for regulatory intact stability requirements). The maximum wave height was 5 feet; the NTSB could not determine the origin of this threshold." Extracted Partial Response: "*To have the maximum wave*	

Table 12.1 *Stability Recommendations*.

height for afloat operations correspond to the maximum wind speed for afloat operations would seem to [be] a logical element of the operational guidance for a liftboat."}

11) Update the regulations to include a provision that states if the vessel cannot realistically operate in a condition documented in the stability calculations, then the stability calculations must be redone. [*Refer to USCG ROI 2; and NTSB M-22-7.*]

{Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022*; Enclosure (1) to MSC Memo, Serial # A0-2201141. Section 8, Conclusions (pages 60-62)}

12) Update the regulations to require that liftboat owners and operators provide the vessel's Master and crew with specific guidance for maneuvering characteristics during heavy weather, especially if there is a preferred direction of turn for the liftboat in heavy weather.

{Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and NTSB Report for the "Capsizing of Liftboat SEACOR Power", on April 13, 2021, Report Number MIR-22/26, adopted October 18, 2022; Page 88, Section 2 (*Analysis*); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*), Figure 24. Most vulnerable wind direction" axes for port side of the SEACOR Power as determined by CFD analysis. Section 2 (Analysis); Subsection 2.2 (*Weather and Operations*); Sub-subsection 2.2.3 (*Stability and Capsizing*) (Page 88)}

13) Update the regulations and policies to include relevant guidance for issues that require interpretation during the stability calculation process. [*Refer to USCG ROI 2; and NTSB M-22-7.*]

{Reference: 46 CFR 174 (*Special Rules Pertaining to Specific Vessel Types*) and USCG Marine Safety Center (MSC) *Plan Review Guide for Liftboat Submissions* and USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022*; Enclosure (1) to MSC Memo, Serial # A0-2201141. "The MSC has not documented their policies for varied wind direction or off-axis stability analyses. A review of MSC's past liftboat stability reviews indicate an inconsistent application of off-axis stability prior to 2018."}

14) Assess the American Bureau of Shipping's (ABS's) past performance for liftboats previously reviewed under NVIC 3-97. If ABS's performance was not acceptable, the USCG should take action, as appropriate, to ensure future ABS liftboat stability evaluations are correct. [*Refer to USCG ROI 2 and NTSB M-22-7.*]

{Reference MSC *Post-casualty Stability Analysis*, Section 7 (*MSC's Independent Stability Analysis*), Subsection 7.4 (*Wind Moment Comparison*), Table 5 (*Wind Moment Comparison between ABS Model and MSC Model*)}

15) Update NVIC 8-91 to apply any necessary changes to existing liftboats. [*Refer to USCG ROI 2 and NTSB M-22-7.*]

{Reference: NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*)}

Applicability: Liftboats only.

References – See references noted in each sub-paragraph above.

Table 12.1 *Stability Recommendations*.		
	B) While updating the regulations found in 46 CFR Subchapter S, the USCG should also take the opportunity to determine whether the references listed in 46 CFR Subpart A (*General Provisions*), §170.015 (*Incorporation by reference*) are still valid. If the references are no longer valid, then the USCG should update the regulation. [*Refer to USCG ROI 2 and NTSB M-22-7.*] Applicability: All types of vessels. {Reference – 46 CFR 170 (*Stability Requirements for All Inspected Vessels*).}	

Table 12.2 Documentation Recommendations.

Table 12.2 ***Documentation Recommendations***.		
TS 01-23(1) R1.3C	The NOSAC recommends that the USCG review and update the following sections of 46 CFR 125 (*General*). The following section is of relevance. [*Refer to USCG ROI 2 and NTSB M-22-7.*] 46 CFR 125.180 (*Incorporation by reference*) the NOSAC recommends that the USCG determine if the references listed in (a) through (j) are still valid for the purpose of Subchapter L (*Offshore Supply Vessels*). Applicability: Offshore Supply Vessels, including Liftboats. {Reference: 46 CFR 125.180 (*Incorporation by reference*)}	Medium
TS 01-23(1) R1.4	The NOSAC recommends that the USCG review and update the *Offshore Supply Vessel Inspector Job Aid*, to account for lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update item 7 in the *Certificates & Documents* section to include a check that if the stability letter or book is amended, then a corresponding check is made to determine if the Operating Manual should be amended as well. [*Refer to USCG ROI 2; NTSB M-22-7; and NOSAC 5.10A.3.*] Applicability: Offshore Supply Vessels, including Liftboats. {Reference: USCG *Offshore Supply Vessel Inspector Job Aid* (Job Aid OSV, Rev. September 2018, DCN: MPS-JA, TCY-OI (3). "Item 7 under *Certificates & Documents*, the inspector is to examine the stability letter, book, and loading criteria. The following regulations are cited within this Item: 46 CFR §127.230, §§170.105-140 (Subpart D), §126.150, and §131.513."} Refer to Exhibit 13 for NOSAC suggested draft language to place in the *Offshore Supply Vessel Inspector Job Aid* which addresses this NOSAC recommendation.	Medium
TS 01-23(1) R1.5	The NOSAC recommends that the USCG review and update their internal processes to ensure that policy letters are incorporated into appropriate manuals in a timely manner. In particular, the NOSAC recommends that the USCG incorporate CG-CVC Policy Letter No. 14-03 (*Evaluating Sea Service Aboard Liftboats*) into Volume III (*Marine Industry Personnel*) of the *Marine Safety Manual*. Applicability: Liftboats only {Reference: CG-CVC Policy Letter No. 14-03 (*Evaluating Sea Service Aboard Liftboats*) into Volume III (*Marine Industry Personnel*) of the *Marine Safety Manual*. "This USCG policy describes evaluating and crediting sea service on Liftboats to quality for national officer endorsements on Merchant Marine Credentials (MMCs). This policy letter was to have been included in the next revision of Volume III of the Marine Safety Manual. An email follow up to MMCPolicy@uscg.mil indicated that this update was not accomplished. Volume III, Change 2 was published on July 5, 2017."}	Low
TS 01-23(1) R1.6	The NOSAC recommends that the USCG review and update NVIC 3-97 (*Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels*) to ensure that all the referenced regulations and standards are current, i.e., 46 CFR 93.20 (*Bulk Grain Cargoes*) 46 CFR Subchapter E (*Load Lines*)	Low

Table 12.2 *Documentation Recommendations*.		
	Paragraph 1c.: "The MSC will keep the ABS abreast of any changes to U.S. laws and regulations, interpretations and policies of the Coast Guard that will affect stability related reviews performed by the ABS." 46 CFR 170.120(b) (*Stability letter*) Marine Safety Manual, Vol. IV, section 6.C.2 (*Stability Letters And Trim And Stability Booklets (46 CFR 170, Subpart D): Temporary Stability Letters*) 46 CFR 170.085 (*Information required before a stability test*) 46 CFR 170.185 (*Stability test preparations*) NVIC 17-91 (*Guidelines for Conducting Stability Tests*) ASTM F-1321 (American Society for Testing and Materials (ASTM) *Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel*) Applicability: All types of vessels. {Reference: NVIC 3-97 (*Stability Related Review Performed by the American Bureaus of Shipping for U.S. Flag Vessels*) and associated referenced regulations.}	
TS 01-23(1) R1.7	The NOSAC recommends that the USCG review and update Safety Alert 08-17, *Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!* to account for lessons learned from the capsizing of Seacor Power. In particular, "This Safety Alert reminds all mariners of the appropriate use of Single Side Band High Frequency (SSB-HF) radios when attempting to contact the Coast Guard outside the normal range of Very High Frequency-Frequency Modulation (VHF-FM) marine radios." Applicability: All types of vessels. {Reference: update Safety Alert 08-17, *Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore!*} Refer to Exhibit 13 for NOSAC suggested draft Updated Marine Safety Alert which addresses this NOSAC recommendation.	Medium
TS 01-23(1) R1.8	The NOSAC recommends that the USCG issue a Marine Safety Information Bulletin (MSIB) regarding the means of escape that are required by 46 CFR 127.240 (*Means of escape*), and how those provisions apply to liftboat accommodations. The capsizing of Seacor Power revealed that many liftboat crew members believed their cabin windows were a means of escape. Additional options include the following. a) Annotating the location of emergency escape windows on the vessel's Safety Plan. b) Affixing decals or other effective means to cabin windows not installed as emergency escape windows stating to the effect: "This window is not for emergency escape".	Medium

Table 12.2 *Documentation Recommendations*.		
	c) Affixing decals or other effective means to cabin windows which are designated as emergency escape windows. d) Including discussion regarding emergency escape windows in vessel safety and orientation meetings. Applicability: All types of vessels. {Reference Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 127, Construction and Arrangements; 127.240 (*Means of escape*).} Refer to Exhibit 13 for NOSAC suggested draft Marine Safety Information Bulletin which addresses this NOSAC recommendation.	
TS 01-23(1) R1.10	The NOSAC recommends that the USCG remind liftboat owners, operators, and Masters to ensure safety orientations are conducted for offshore workers, as required by 46 CFR 131.320 (*Safety orientation for offshore workers*) in a Marine Safety Information Bulletin (MSIB) or other appropriate communications vehicle. Applicability: All OSVs, including liftboats. {Reference: 46 CFR 131.320 (*Safety orientation for offshore workers*).} Refer to Exhibit 13 for NOSAC suggested draft Marine Safety Information Bulletin which addresses this NOSAC recommendation.	Medium
TS 01-23(1) R2.4	The NOSAC recommends that the USCG create a new regulation or policy for liftboats that recommends the crew to monitor National Oceanic and Atmospheric Administration (NOAA) Weather Radio broadcasts and requires minimum intervals for monitoring, such as prior to departure, while underway, while on position, and so forth. Applicability: Liftboats only. {Reference: National Transportation Safety Board (NTSB) Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022. Section 1 (*Factual Information*); Subsection 1.8 (*Environmental Information*); Sub-subsection 1.8.4 (*Meteorological Communications*); Sub-Sub-subsection 1.8.4.1 (*Nautical Weather Service*); Sub-Sub-Sub-subsection 1.8.4.1.3 (*NOAA Weather Radio*) (Pages 52-53). "The SEACOR Power was equipped with three VHF radios capable of picking up the NWR signal (see section 1.6.3: *Global Maritime Distress and Safety System*). However, the radios would have to be tuned to the weather radio channels to receive the broadcast. Typically, shipboard radios are tuned to marine communications channels, such as channel 16 ("distress, safety, and calling" channel), and there is no requirement to monitor NWR broadcasts. According to the mate, there was no radio on board the casualty vessel that was dedicated to monitoring weather radio channels."} Refer to Exhibit 13 for NOSAC suggested draft Marine Safety Information Bulletin (MSIB) or Navigation and Vessel Inspection Circular (NVIC) which addresses this NOSAC recommendation.	High
TS 01-23(1) R3.1	The NOSAC recommends that the USCG update the *Marine Safety Manual*, Volume IV (*Technical*), section 6.F (*Load Lines*), using the *Load Line Policy Notes* (LLPN), dated 22	Low

Table 12.2 *Documentation Recommendations*.		
	September 2008, as a basis for the revision. Note that stated within the LLPN, "The LLPN will eventually form the basis of a future revision to MSM Chapter 6.F." Applicability: All types of vessels. {Reference: *Load Line Policy Notes*: U.S. Coast Guard, Naval Architecture Division (CG-5212), Office of Design and Engineering Standards, Washington, D.C., revised 22 September 2008. "These "Load Line Policy Notes" (LLPN) were originally written and posted by the U.S. Coast Guard Naval Architecture Division in March, 2006. They consolidate into a single document current USCG load line policies that have evolved since the previous (1990) revision of Chapter 6.F, "Load Lines," of the Marine Safety Manual [*Volume IV*]. The Notes also include expanded discussions and clarifications for both domestic U.S. and international (ICCL) load line regimes. The LLPN will eventually form the basis of a future revision to MSM Chapter 6.F." Note, previous COMDNTNOE 16000 dated 29 September 2004, was cancelled 28 September 2005.}	
TS 01-23(1) R3.2	The NOSAC recommends that the USCG review and update the U.S. Load Line regulations (46 CFR 42, *Domestic and Foreign Voyages by Sea*). In particular, the NOSAC recommends that the USCG incorporate reserve buoyancy distribution requirements and include a process for granting exemptions. Applicability: Liftboats only. {Reference: *Load Line Policy Notes*: U.S. Coast Guard, Naval Architecture Division (CG-5212), Office of Design and Engineering Standards, Washington, D.C., revised 22 September 2008. "Within the LLPN, Liftboats are discussed in Section 17.k (*Liftboats*). Liftboats are required to have load lines when operating outside the Boundary Line. There are two special load line issues for Liftboats: minimum bow height and reserve buoyancy distribution. ABS may authorize Liftboat bow height waivers directly as long as USCG (CG-5212: Naval Architecture Division) is notified. Other assigning authorities must request waivers from the Marine Safety Center. All vessels, including Liftboats, must comply with the reserve buoyance distribution requirement. No international load line exemption will be granted. The reserve buoyancy distribution requirement is not incorporated into domestic load line regulations. Exemptions for domestic load lines are considered on a case-by-case basis by CG-5212 by application."}	Medium
TS 01-23(1) R3.7	The NOSAC recommends that the US Coast Guard develop a Marine Safety Information Bulletin (MSIB) or other appropriate communication vehicle to provide guidance to mariners regarding cancelling false distress alerts. Applicability: All types of vessels. {Reference: International Maritime Organization, Maritime Safety Committee, MSC/Circ.1078, *Guidelines to Administrations on Reporting False Alerts*, 6 June 2003 (Ref. T2.6.04). Also, USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021. MSLE Activity Number: 7175076, MISLE Case Number 1256196: Recommendation 2: "The Commandant should expedite their current study of liftboat stability, and then immediately use the results of that study to revise liftboat stability regulations." Also 47 CFR 80.335, *Procedures for canceling false distress alerts*. Reference Table 5.9: *IHDB Statistics on EPIRB Alerts* }	High

Table 12.2 *Documentation Recommendations*.		
	Refer to Exhibit 13 for NOSAC suggested draft Marine Information Safety Bulletin which addresses this NOSAC recommendation.	
TS 01-23(1) R4.10	The NOSAC recommends that the USCG maintain the existing requirements for the carriage of immersions suits on liftboats for areas between 32° North and 32° South latitudes as specified in 46 CFR 199.273 (*Immersion suits*). [*Refer to USCG ROI 23*.] Applicability: All types of vessels. {USCG: *Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290)*: USCG Recommendation 23: "The Commandant should re-evaluate the regulatory requirement that exempts vessels operating between 32 degrees N and 32 degrees S latitude from carrying immersion suits. While water temperatures in some of these areas may remain warm all year round, water temperatures in some areas of this region can drop to levels that quickly cause hypothermia, especially during winter and spring." Action: I concur with the intent of the recommendation.} {Reference: 46 CFR 199.273 (*Immersion suits*) (c): "The immersion suits required under paragraphs (a) and (b) of this section are not required if the cargo vessel operates only on routes between 32 degrees north and 32 degrees south latitude."}	Low
TS 01-23(1) R5.3	The NOSAC recommends that USCG develop a Navigation and Vessel Inspection Circular (NVIC) or other applicable vehicle to address urging vessel Owners/Operators to either update current procedures or develop new procedures related weather and other environmental conditions. The following items should be considered when conducting this exercise. • Content of Operations Manuals. • Content of Stability Letters, Stability Manuals, and stability computer programs. • Maneuvering guidance in various weather conditions. • Evacuation Procedures. • Emergency Procedures, including drills and exercises. • Securing cargo and gear on and below decks. • Check of emergency lifesaving, firefighting, and communications equipment. • Recovery procedures when severe weather conditions have passed. Applicability: All types of vessels. {Reference: None specific.}	Medium

Table 12.3 Further Study Recommendations.

Table 12.3 *Further Study Recommendations*.		
TS 01-23(1) R1.9	The NOSAC recommends that the USCG review 46 CFR 129.440 (*Emergency lighting*) in conjunction with the results of the Seacor Power investigation. In particular, the NOSAC recommends that the USCG determine whether the requirements continue to be satisfactory, given that Seacor Power was carrying offshore workers who were unfamiliar with the vessel's layout, that the vessel capsized too quickly for the emergency generator to start, and that none of the survivors reporting seeing any emergency lighting while attempting to escape. In addition, the NOSAC recommends that consideration be given to requiring emergency battery-driven lights for placement in strategic locations on the vessel. [*Reference USCG ROI paragraphs 8.7.47, 8.7.48, and 9.7.3; no mention in the NTSB ROI*.] Applicability: Liftboats only. {Reference: 46 CFR 129.440 (*Emergency lighting*), Subpart D.}	High
TS 01-23(1) R1.11	The NOSAC recommends that the USCG review the Final Report and Recommendations from the *NOSAC Task Statement of April 26, 2022 – Review of Coast Guard's Final Report on the Floating OCS Facility – Tension Leg Platform FPS Auger Lifeboat Fall with Loss of Life on June 30, 2019* – Published on December 16, 2021. The *NOSAC also recommends that the USCG review the USCG issued Final Report concerning the June 30, 2019, lifeboat accident on the Shell Auger TLP* and associated recommendations contained within. The purpose of the review is to determine whether 46 CFR 131.530 (b)(6) (*Abandon-ship training and drills*) should be amended in accordance with the previous NOSAC committee recommendations. Applicability: All offshore supply types of vessels that carry lifeboats. {Reference: 46 CFR 131.530, *Abandon-ship training and drills*, (b)(6) states the following: "Each lifeboat must be launched with its assigned crew aboard during an abandon-ship drill, and be maneuvered in the water, at least once each 3 months that the vessel is operated."}	Medium
TS 01-23(1) R1.12	The NOSAC recommends that the USCG review 46 CFR 131.530(d)(4) (*Abandon-ship training and drills*) in conjunction with the results of the Seacor Power investigation and the Final Report and Recommendations from the *NOSAC Task Statement of April 26, 2022 – Review of Coast Guard's Final Report on the Floating OCS Facility – Tension Leg Platform FPS Auger Lifeboat Fall with Loss of Life on June 30, 2019* – Published on December 16, 2021. In particular, the NOSAC recommends that the USCG determine whether it is realistic to require regular inflation and launching of davit-launched liferafts. Applicability: All offshore supply types of vessels that carry liferafts. {Reference: 46 CFR 131.530, *Abandon-ship training and drills*, (d)(4) states the following: "Training in the use of davit-launched inflatable liferafts must take place at intervals of not more than 4 months on each vessel with such liferafts. Whenever practicable this must include the inflation and lowering of a liferaft. If this liferaft is a special one intended for training only, and is not part of the vessel's lifesaving system, it must be conspicuously so marked."} {Reference: *NOSAC Task Statement of April 26, 2022 – Review of Coast Guard's Final Report on the Floating OCS Facility – Tension Leg Platform FPS Auger Lifeboat Fall with Loss of Life on June 30, 2019* – Published on December 16, 2021. Recommendation 1.6: NOSAC recommends that the USCG address the use of simulator-based technology as a means to support competency development and assurance. Absent USCG regulation or policy guidance, operators are encouraged to implement simulator-based technologies as part of their overall competency development and assurance plans.}	Medium

Table 12.3 *Further Study Recommendations*.		
TS 01-23(1) R1.13	The NOSAC recommends that the USCG conduct a study to determine if the Alaska maritime mobile repeater stations system, as outlined in 47 CFR 80.469 (*Maritime mobile repeater stations in Alaska*), can be adapted to the Gulf of Mexico and other USCG districts. The Seacor Power investigation highlighted limitations of NAVTEX and VHF radio coverage in the Gulf of Mexico, and the Alaska system might provide a solution for extending geographical coverage to deliver critical weather information and other notices of interest. [*Refer to USCG ROI 6 and NTSB M-22-6.*] Applicability: All types of vessels. {Reference: 47 CFR 80.469 (*Maritime mobile repeater stations in Alaska*)}	High
TS 01-23(1) R2.1	The NOSAC recommends that the USCG evaluate their procedures for responding to multiple EPIRB alerts in a short period of time. As noted in the National Transportation Safety Board (NTSB) Seacor Power investigation, the District Command Center was "heavily inundated" with EPIRB alerts on the day of the capsizing, and they handled those alerts in the order they were received. The USCG should evaluate whether there are protocols which could provide a quicker method of eliminating false EPIRB alerts and a quicker response to actual emergencies. [*Refer to USCG ROI, 9, 14, and 15; NTSB M-22-6; USCG BP 11.2.3 (#3); and NOSAC 4.11C.*] One option may include automatically transferring EPIRB alerts to another USCG District when the initial District is "heavily inundated." Another option may include developing an automated callback system to the contact information on file in the EPIRB registry to verify if an alert is valid such that false alerts are discounted (but recorded and documented) and possible or actual alerts are relayed directly to a USCG Dispatcher for direct handling. Another option to consider is replacement of EPIRBs with vessel float-free Personal Locator Beacons (PLBs). [*Refer to NOSAC 2.9.*] Another option is to require EPIRB and other emergency training for company dispatchers and other associated shore-side emergency response personnel. Applicability: All types of vessels. {Reference National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022*. Section 1 (*Factual Information*); Subsection 1.2 (*Response*) (page 10): "The Sector New Orleans command duty officer noted that Sector watchstanders were "very heavily inundated with potential distress calls from both commercial and recreational vessels." The RCC was resolving seven cases before SEACOR Power capsized." Reference Table 5.9: *IHDB Statistics on EPIRB Alerts*}	High
TS 01-23(1) R2.2	The NOSAC recommends that the USCG develop a task statement for the NOSAC and/or appropriate Federal Advisory Committee(s) to evaluate whether "swimming proficiency" requirements for personnel who work on ships and offshore facilities should be established. Following is a list of areas and documentation that could be assessed in this task. • International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995	Low

Table 12.3 *Further Study Recommendations*.		
	• International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) • USCG and other Flag State Regulations • Industry Standards, such as the American Red Cross • IMO Resolution A.1079(28) recommendations for the Training and Certification of Personnel on Mobile Offshore Units (MOUs), paying particular attention to the categories of offshore personnel in Section 5. • IMO Model Courses • State and Federal Maritime Academy Courses • Class Societies • Previous NOSAC and Federal Advisory Committee reports on this subject. Applicability: All types of vessels. {Reference National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022*; Section 1 (*Factual Information*); Subsection 1.2 (*Response*) Sub-subsection 1.2.3 (*Rescue Operations*) (Page 20)}	
TS 01-23(1) R2.3	The NOSAC recommends that the USCG have owners or operators of U.S. inspected vessels verify that their EPIRB meets the requirements of 47 CFR Part 80.1061(a) (*Special requirements for 406.0–406.1 MHz EPIRB stations*) which includes the technical and performance standards contained in Radio Technical Commission for Maritime Services (RTCM) RTCM 11000 (*406 MHz Satellite Emergency Position Radiobeacons (EPIRBs)*) beginning January 17, 2023. In particular, the USCG should focus on confirming that EPIRBs are Global Navigation Satellite System (GNSS) equipped. [*Refer to USCG ROI 9 and 10.*] Applicability: All types of vessels. {Reference: 47 CFR Part 80.1061(a) (*Special requirements for 406.0–406.1 MHz EPIRB stations*)}	Medium
TS 01-23(1) R2.8	The NOSAC recommends that the USCG address the new NTSB recommendations M-22-6, M-22-7, and M-22-8 related to NAVTEX, Stability, and Mass Rescue Operations Plans, respectively. M-22-6 Develop procedures to inform mariners in affected areas whenever there is an outage at a navigational telex broadcasting site. M-22-7 Modify restricted-service liftboat stability regulations to require greater stability for newly constructed restricted-service liftboats. M-22-8 Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate. Applicability: All types of vessels. {Reference: National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022*. Recommendations M-22-6, M-22-7, and M-22-8.}	High

Table 12.3 *Further Study Recommendations*.		
TS 01-23(1) R2.9	The NOSAC recommends that the USCG **DOES NOT** pursue the NTSB previous recommendation (M-17-45) regarding personal locator beacons for all personnel on vessels in coastal, Great Lakes, and ocean service. The NOSAC does not believe that the USCG infrastructure is sufficiently equipped to handle additional monitoring at this time. [*Refer to NTSB M-17-45; 47 CFR 95, Subpart K (Personal Locator Beacons and Maritime Survivor Locating Devices); USCG BP 11.2.4 (#4); and NOSAC 2.1*.] M-17-45 "To the United States Coast Guard: Require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival." Applicability: All types of vessels. {Reference: National Transportation Safety Board (NTSB) *Capsizing of Liftboat SEACOR POWER, MIR-22/26, Adopted 18 October 2022*. Previous Recommendation M-17-45.}	Low
TS 01-23(1) R3.6	The NOSAC recommends that the USCG conduct a study to evaluate the use of radar Search and Rescue Transponders (SARTs). The Seacor Power investigation revealed that SARTs were not detected on a radar unless the radar was set to a specific range and gain. If the crew on a nearby vessel crew did not know they are looking for a SART, then they would probably not adjust their radar settings and would not detect the SART. The USCG should determine whether there is a more efficacious system that could serve as a viable replacement for radar SARTs and adjust the requirements as appropriate. [*Refer to USCG ROI 20 and 21*.] Applicability: All types of vessels. {Reference: International Maritime Organization, Subcommittee on Safety of Navigation (NAV), SN/Circ. 197, Ref T2/6.03, *Operation of Marine Radar for SART Detection*, Annex: *Operation of Marine Radar for SART Detection*, 1 November 1997.}	High
TS 01-23(1) R4.8	The NOSAC recommends that the USCG conduct a study to determine whether dynamic stability analysis is a viable tool for calculating liftboat stability, and whether this would increase the safety of liftboats. The study could also include other types of vessels, and Best Available and Safest Technologies (BAST) principles as appropriate. Based on the results of the study, the USCG should determine whether there is a need to update existing regulations or policies such as 46 CFR 170 (*Stability Requirements for All Inspected Vessels*), NVIC 3-89 (*Guidance for the Presentation of Stability Instructions for Operating Personnel*), and NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*). Applicability: Liftboats only {Reference USCG: Exhibit 7: USCG Response to NOSAC SC Stability Questions from MSC *Post-Casualty Stability Analysis of Liftboat Seacor Power*; MSC Q. 18 (12,4a), Page 12: Section 4. Operating Requirements for Afloat Stability. QUESTION FROM NOSAC: Should stability in waves be included in stability analyses? *Response: Dynamic stability analysis of liftboats in waves is difficult. Likewise, the ability to perform such analysis – to the extent possible -- and to develop regulations that incorporate such analyses would be very difficult.*"}	Medium
TS 01-23(1) R4.9	The NOSAC recommends that the USCG conduct a study to evaluate alternative forms of tracking vessels, other than Automatic Identification System (AIS) or Long-Range Tracking	Medium

Table 12.3 *Further Study Recommendations*.		
	and Identification (LRIT). Additional forms of tracking vessels could provide the USCG with information that allows quicker response to emergencies. Alternative forms of tracking vessels could include, but are not limited to, port cameras, Vessel Traffic Services (VTS), AIS-SART, and AIS cessation transmission triggering. [*Refer to USCG ROI 17 and USCG BP 11.2.5 (#5)*.] Applicability: All types of vessels. {Reference: USCG: *Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290)*: USCG Recommendation 17: "The Commandant should consider whether there is a need to provide District and Sector Command Centers with additional means of tracking commercial vessel locations, in order to allow Command Centers to quickly and easily correlate distress alerts with vessel locations." Action: I do not concur with this recommendation.}	
TS 01-23(1) R4.11	The NOSAC recommends that the USCG augment its *Unmanned Systems Strategic Plan*, dated March 2023, to include studies of the following. [*Refer to USCG ROI 25*.] 4.11A Integrating private training organizations into the *Plan*. 4.11B Identifying risks and precautions associated with the use of Unmanned Systems during search and rescue. 4.11C Incorporating Artificial Intelligence capabilities at USCG Rescue Coordination Centers to filter out false EPIRB transmissions. [*Refer to NOSAC 2.1*.] 4.11D Placing Unmanned Systems on offshore facilities. Applicability: All types of vessels. {Reference: United States Coast Guard, *Unmanned Systems Strategic Plan*, from March 2023.}	Medium
TS 01-23(1) R5.1	The NOSAC recommends that the USCG review their Contingency Preparedness System (CPS) to determine if the database contains any lessons learned that can be correlated with the Seacor Power recommendations from the NTSB and the USCG Reports of Investigation. Any relevant information found in the CPS should be used to update the appropriate USCG policy or guidance, including, but not limited to, the *USCG Addendum to the National Search and Rescue Supplement (NSS)*. In particular, the NOSAC recommends that the USCG search the CPS for lessons learned related to the following: [*Refer to USCG ROI 1, 11, 14, 22, and 27; NTSB M-22-8; and USCG BP 11.2.7 (#7)*.] USCG Recommendation 1: Commandant Instructions 3140.2D (*Commandant Instruction: Marine Weather Reporting*) and 3140.3D (*Commandant Instruction: Coastal Weather Program*) regarding weather observations and reporting. USCG Recommendation 11: U.S. Search and Rescue Satellite Aided Tracking (SARSAT) system. USCG Recommendation 14: phone infrastructure and communications capabilities.	Medium

Table 12.3 *Further Study Recommendations*.		
	USCG Recommendation 22: NAVTEX. USCG Recommendation 27: SAR cases and underwater rescue. [*Refer to NTSB M-22-6*.] NTSB New Recommendation M-22-8: "Develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate." USCG BP 11.2.7 "Vessel owners and operators should provide additional weather training to their Masters and licensed crew members. Training could include items such as options for checking weather underway, minimum intervals to check weather while underway, emergency procedures for unexpected weather changes, and providing voluntary weather reports to the National Weather Service." Applicability: All types of vessels. {References: as noted above}	
TS 01-23(1) R5.2	The NOSAC recommends that the USCG coordinate with the National Weather Service (NWS) to request an increase in the frequency of Marine Weather Messages to at least every two (2) hours, particularly for the benefit of small craft, liftboats, and other vessels that are particularly vulnerable to rapid changes in weather and sea conditions and potential loss of stability. Applicability: All types of vessels. {Reference: National Weather Service Instruction 10-315, February 11, 2020, Operations and Services; Marine and Coastal Weather Services, NWSPD 10-3: *Marine Weather Message*.}	High
TS 01-23(1) R5.4	The NOSAC recommends that the USCG continue further study in the areas of wind force estimation, wave dynamics, and righting arm analysis refinement for liftboats and other non-traditional vessel stability characteristics. Use Best Available and Safest Technology (BAST) principles, as appropriate. Applicability: Liftboats and other non-traditionally shaped vessels. {Reference: Acquisition Directorate, Research & Development Center (RDC), *Non-Traditionally Shaped Vessel Stability Standards, Project Summary*; Project No. 1024, Final, Contract #GS00Q14OADU420; February 2024. Pages 77-79, 6. Also: USCG: Report of the Investigation into the Circumstances Surrounding the Capsize of the Liftboat SEACOR POWER (O.N. 115290) Approximately 7 Nautical Miles South of Port Fourchon, LA in the Gulf of Mexico Resulting in the loss of 13 Lives on April 13, 2021. MSLE Activity Number: 7175076, MISLE Case Number 1256196: Recommendation 2: "The Commandant should expedite their current study of liftboat stability, and then immediately use the results of that study to revise liftboat stability regulations."}	High
TS 01-23(1) R5.5	The NOSAC recommends that the Society of Naval Architects and Marine Engineers (SNAME) request its Technical and Research OC-8 Wind Technologies Panel to follow-up its Comparative Wind Load Study to prepare a guideline of the Best Practice for Use of the empirical building block method for estimation of wind loads on offshore structures and to	High

Table 12.3 *Further Study Recommendations*.		
	recommend whether the regulations for calculation of wind loads (e.g., 46 CFR Section 174.055) should be updated and/or amended to include state-of-the-art processes for wind load estimation, such as wind tunnel testing or Computational Fluid Dynamics (CFD). The Panel should endeavor to include representation from the US Coast Guard, classification societies, operators, engineering companies, research institutions, and academia. Applicability: All MODUS, liftboats, and other non-traditionally shaped vessels. {Reference: *OTC-29289-MS; A Detailed Look into the 2017 SNAME OC-8 Comparative Wind Load Study*; Kevin Berto, Texas A&M University; David Hodapp, Chevron Energy Technology Company; Jeffrey Falzarano, Texas A&M University; for Offshore Technology Conference (OTC) 6-9 May 2019; © 2019. Also: SNAME Bulletins 5-04: *Guidelines for Wind Tunnel Testing of Offshore Units (2020)*" and "5-04A: *Guidelines for The Reproducible CFD Wind Load Estimations on Offshore Structures (2021)*"}	

End of Exhibit 12.

Exhibit 13: NOSAC Suggested Solutions to Selected Recommendations

The purpose of this Exhibit is to provide the US Coast Guard with a first draft solution to selected recommendations identified in Exhibit 12 and within the report. These proposed first drafts offer industry's ideas on what information should be disseminated either to the industry, within the US Coast Guard, or elsewhere. The NOSAC thanks the US Coast Guard for their consideration of these first drafts.

Shortened versions of the identification of recommendations numbers are used in this Exhibit. For example, the full recommendation number for "1.4" is "TS 01-23(1) R1.4".

Recommendation 1.1A: Draft Definition for "Offshore"

[TS 01-23(1) R1.1A]
The NOSAC recommends that the USCG review and update NVIC 8-91 (*Initial and Subsequent Inspection of Existing, Uncertificated Offshore Supply Vessels, Including Liftboats*) to account for technological advances, changes to the regulations referenced within these NVICs, and lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update the following regarding NVIC 8-91.

> Develop a statutory or regulatory definition for the word "offshore", which is found in the cover letter, Background, 3b.

The NOSAC identified the term "offshore area" in Vessel Response Plan regulations that may be useful in defining "offshore".

Vessel response plan regulations for oil spill response define certain areas from the shoreline to 200 nautical miles (Exclusive Economic Zone [EEZ] boundary line) - nearshore, ocean, offshore, open ocean. Refer to 33 CFR 155.1020 (*Definitions*).

Nearshore area means the area extending seaward 12 miles from the boundary lines defined in 46 CFR part 7, except in the Gulf of Mexico. In the Gulf of Mexico, a nearshore area is one extending seaward 12 miles from the line of demarcation (COLREG lines) as defined in §§ 80.740 through 80.850 of this chapter.

Ocean means the open ocean, offshore area, and nearshore area as defined in this subpart.

Offshore area means the area up to 38 nautical miles seaward of the outer boundary of the nearshore area.

Open ocean means the area from 38 nautical miles seaward of the outer boundary of the nearshore area, to the seaward boundary of the exclusive economic zone.

Recommendations 1.4 and 2.5: OSV Inspector Job Aid and Vessel Name Change

[TS 01-23(1) R1.4]

1.4 The NOSAC recommends that the USCG review and update the *Offshore Supply Vessel Inspector Job Aid*, to account for lessons learned from the capsizing of the Seacor Power. In particular, the NOSAC recommends that the USCG update item 7 in the *Certificates & Documents* section to include a check that if the stability letter or book is amended, then a corresponding check is made to determine if the Operating Manual should be amended as well.

[TS 01-23(1) R2.5]

2.5 The NOSAC recommends that the USCG create a new regulation or policy for liftboats that uses stability computers or other computer programs for stability related purposes. The new regulation or policy should establish a requirement to validate or affirm that the stability computer or program compared with the stability book, Operating Manual, Stability Letter, and / or the Certificate of Inspection, as applicable, whenever there is a name change, or a major modification to the vessel is correct. This action is an administrative review function rather than a call for conducting deadweight surveys or complete stability analyses.

The NOSAC suggests the following draft language to place in the OSV Inspector Job Aid. Refer to Page 10 of the *Offshore Supply Vessel Inspector Job Aid*, item Number 7 (Certificates and Documents) and add the following draft bullet item after the third bullet in the *Job Aid*.

- Verify amendments to Operations Manual are current with related stability documentation. 46 CFR 134.170 (15)
- Verify that vessel name changes are reflected in stability documents, Operations Manual, and computer stability programs, as applicable. 46 CFR 126.150; 46 CFR 134.170 (a)

Recommendation 1.7: Marine Safety Alert 8-17 update

[TS 01-23(1) R1.7]

1.7 The NOSAC recommends that the USCG review and update Safety Alert 08-17, Know your high seas comms equipment and how to use them. You just might save your own life when in trouble offshore! to account for lessons learned from the capsizing of Seacor Power. In particular, “This Safety Alert reminds all mariners of the appropriate use of Single Side Band High Frequency (SSB-HF) radios when attempting to contact the Coast Guard outside the normal range of Very High Frequency-Frequency Modulation (VHF-FM) marine radios.”

Following is the updated MSA. This MSA should be reissued with the first paragraph broken into three parts such that the reminder message (highlighted in yellow) is its own separate paragraph and thus more visible to the reader.

Know your high seas comms equipment and how to use them. ***You just might save your own life when in trouble offshore!***

Recent inquiries by Coast Guard Marine Inspectors indicate that a large number of vessel operators and ship masters continue to rely on outdated high seas communications frequencies when communicating with the United States Coast Guard.

This Safety Alert reminds all mariners of the appropriate use of Single Side Band High Frequency (SSB-HF) radios when attempting to contact the Coast Guard outside the normal range of Very High Frequency-Frequency Modulation (VHF-FM) marine radios.

It is important to note that the Coast Guard discontinued monitoring the SSB-HF frequency of 2182 KHz over four years ago; nevertheless, many mariners continue to attempt to contact the Coast Guard using this frequency. Also, many mariners attempt to contact the Coast Guard using their EPIRBs, cell phones, SAT phones, and even NOAA weather electronics. Each of these communications devices has its own limitations and specific functional capabilities. Above: *Example of Single Side Band High Frequency Radio.*

SSB-HF communications offer a greater transmission range when other options are not available. SSB-HF radios equipped with digital selective calling (DSC) are capable of triggering an alert at Coast Guard Communications Command and are an especially reliable means for initiating communications with the Coast Guard during distress situations.

The Coast Guard keeps watch on the Global Maritime Distress and Safety System (GMDSS) SSB-HF frequencies 4125, 6215, 8291 and 12,290 kHz in place of the old international radiotelephone distress frequency 2182 kHz. More detailed information on the SSB-HF and HF DSC frequencies on which the Coast Guard keeps watch for distress and safety purposes are listed here: https://www.navcen.uscg.gov/?pageName=cgcommsCall. Questions or comments concerning Coast Guard HF distress, safety and broadcast services may be sent to the Coast Guard Communications Command at COM-DG-M-CWOWatchstanders@uscg.mil.

This safety alert is provided for informational purpose only and does not relieve any domestic or international safety, operational, or material requirements. Developed by Marine Inspection SME Sector Mobile and the Office of Investigations and Casualty Analysis. Questions or comments regarding this Safety Alert may be sent to HQS-PF-fldr-CG-INV@uscg.mil.

Recommendations 1.8 and 1.10: MSIB Emergency Escape Windows and Safety Orientation

[TS 01-23(1) R1.8]

1.8 The NOSAC recommends that the USCG issue a Marine Safety Information Bulletin (MSIB) regarding the means of escape that are required by 46 CFR 127.240 (*Means of escape*), and how those provisions apply to liftboat accommodations. The capsizing of Seacor Power revealed that many liftboat crew members believed their cabin windows were a means of escape. Additional options include the following. {Reference Code of Federal Regulations (CFR), Title 46, Shipping; Chapter I, Coast Guard, Department of Homeland Security; Subchapter L, Offshore Supply Vessels; Part 127, Construction and Arrangements.}

a) Annotating the location of emergency escape windows on the vessel's Safety Plan.
b) Affixing decals or other effective means to cabin windows not installed as escape emergency windows stating to the effect: "This window is not for emergency escape".
c) Affixing decals or other effective means to cabin windows which are designated as emergency escape windows.
d) Including discussion regarding emergency escape windows in vessel safety and orientation meetings.

[TS 01-23(1) R1.10]

1.10 The NOSAC recommends that the USCG remind liftboat owners, operators, and Masters to ensure safety orientations are conducted for offshore workers, as required by 46 CFR 131.320 (*Safety orientation for offshore workers*) in a Marine Safety Information Bulletin (MSIB) or other appropriate communications vehicle.

NOSAC has developed a draft Marine Safety Information Bulletin (MSIB) to cover both of these related recommendations.

"In 2021, a liftboat capsized off the coast of Louisiana. The vessel was certificated as an offshore supply vessel, and it was working in the oil and gas industry at the time of the accident. Tragically, 13 individuals lost their lives. The investigation revealed that some of the survivors (both crew members and offshore workers) believed that their stateroom windows were designed to serve as emergency escapes. After the vessel capsized, the individuals spent a long time in the dark trying to break open a window, and they narrowly escaped before their stateroom filled with water. We will never know if there were other individuals who unsuccessfully tried to escape through their windows. This incident demonstrates how critical it is for vessel owners and operators to ensure that emergency escapes are clearly marked, and to ensure emergency escape routes are clearly and comprehensively addressed during the safety orientation.

As a result of this investigation, the owners and operators of all offshore supply vessels and other types of vessels should consider the following safety measures related to emergency escape:

- Clearly mark all emergency escape routes and exits using glow in the dark lettering, paint or tape.

- Consider adding window breakers near emergency escape windows in order to make it easier for an individual to escape when the window is submerged.

- Annotate the location of emergency escape windows on the vessel's fire and safety plan.

- Consider marking other large openings to indicate they are not emergency escape routes, especially if an opening falsely appears to lead to the exterior or an opening does not provide a quick and easy path out.

- Ensure that the vessel's master understands how critical it is to cover the topic of emergency escapes during the safety orientation.

- Ensure that the master of an offshore supply vessel understands how critical it is to confirm that offshore workers know the layout of the vessel and the locations of emergency escapes.

- Ensure that the master of a liftboat will take immediate action to prepare the crew when heavy weather is encountered. This action could involve waking and alerting the crew and offshore workers, or it could involve mustering the crew and offshore workers at an accessible emergency egress point.

- Ensure that the master of an offshore supply vessel understands how critical it is to confirm that all offshore workers are present for the safety orientation, regardless of how or when they came aboard the vessel.

For questions regarding this bulletin, please contact xxxxx."

Recommendation 2.4: Weather Broadcast Monitoring

[TS 01-23(1) R2.4]

2.4 The NOSAC recommends that the USCG create a new regulation or policy for liftboats that requires the crew to monitor National Oceanic and Atmospheric Administration (NOAA) Weather Radio broadcasts and requires minimum intervals for monitoring, such as prior to departure, while underway, while on position, and so forth.

Following is draft language that could be used in a US Coast Guard policy, a Marine Safety Information Bulletin (MSIB), or Navigation and Vessel Inspection Circular (NVIC) as appropriate.

The chance of sudden storms with high winds, rain, and reduced visibility occurs from time to time in the marine environment. Radio watchkeeping is important to make decisions prior to getting underway with the possibility that weather conditions may exceed the operational stability criteria of vessels.

Three U.S. government agencies, the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), and the US Coast Guard; plus two international organizations, the International Telecommunications Union (ITU) and the International Maritime Organization (IMO); have each established marine radio watchkeeping regulations. Regulations on radio watch keeping exist for all boats and ships --commercial, recreational, government and military, domestic and foreign--carrying marine radios.

The ITU regulates all use of radio spectrum by any person or vessel outside US waters. ITU rules affecting radio, which have treaty status in the US and most other nations, are published in the ITU Radio Regulations. The ITU has established three VHF marine radio channels recognized worldwide for safety purposes:

Channel 16 (156.800 MHz) - Distress, safety and calling
Channel 13 (156.650 MHz) - Intership navigation (bridge-to-bridge)
Channel 70 (156.525 MHz) - Digital Selective Calling

The US Coast Guard regulates carriage of radios on most commercial vessels, foreign vessels in US waters, survival craft, and vessels subject to the *Vessel Bridge-to-Bridge Radiotelephone Act* (generally all vessels over 20m length) [33 USC 1201-1208 and 33 CFR 26] and operating in a Vessel Traffic Service (VTS) area.

In general, any vessel equipped with a VHF marine radiotelephone (whether voluntarily or required) must maintain a watch on channel 16 (156.800 MHz) whenever the radiotelephone is not being used to communicate. Source: FCC 47 CFR §§ 80.148 and 80.310; NTIA *Manual of Regulations and Procedures for Federal Radio Frequency Management*, 8.2.29.6.c(2)(e); and ITU RR [*Radio Regulations*] 31.18 and 52.244.

The US Coast Guard recommends the following weather monitoring conditions for liftboats and other non-traditionally shaped vessels.

Prior to getting underway, check weather and sea conditions along the intended route of travel.
After getting underway, monitor weather and sea conditions every two hours until reaching location.

On location, monitor weather and sea conditions every six hours.

The Master should log times of weather and sea condition monitoring in the logbook.

Recommendation 2.7: Maneuvering Guidance in Liftboat Operating Manual

[TS 01-23(1) R2.7]

2.7 The NOSAC recommends that the USCG create a methodology which assists liftboat owners and operators providing the vessel's Master and crew with specific guidance for maneuvering and operational characteristics during heavy weather. Due to the unique features of liftboats, these vessels may have relative wind directions that risk less destabilization than other relative wind directions. As a result, there could be a preferred direction of turn for a liftboat maneuvering in heavy weather. In addition, lowering of the legs should be included in this guidance to the vessel's Master. This guidance must be very clear to the Master and crew.

Draft methodology criteria.

A. Wind forces about the vessel create different heeling moments. Some relative wind directions create greater heeling moments than other relative wind directions. The liftboat owner/operator should provide the Master with vessel specific information regarding which direction (port or starboard) to turn during severe weather to create the least destabilizing condition, i.e., the least heeling moment. The liftboat owner/operator should also specify if there are any relative wind directions that must be avoided for that particular vessel.

B. Lowering the legs during severe weather could create a more stable situation for the liftboat. However, if the legs or pads are buoyant, the first several feet of lowering may create a less stable situation. Lowering the legs will also reduce the vessel's maneuverability and may use power from the main engines. The liftboat owner/operator should provide the Master with vessel specific information regarding the change in stability when lowering the legs and what is expected to be the safest course of action for the vessel in different weather conditions. This information should describe when to lower the legs (before, during, or after turning the vessel) and how much to lower the legs.

C. The liftboat owner/operator should provide the Master with guidance regarding the speed of the vessel, if controllable, in heavy weather conditions.

D. The Master has the overriding authority to do whatever is necessary in cases of emergency or similar situations to prevent further harm to personnel, the vessel, or the environment regardless of guidance or procedure in a Company's management system.

Recommendation 3.4: Stability Definitions

[TS 01-23(1) R3.4]

3.4 The NOSAC recommends that the USCG review the International Maritime Organization International Code on Intact Stability, 2008, and use the information found in the Code to update Title 46 (Shipping), Chapter I (Coast Guard, Department of Homeland Security), Subchapter S (Subdivision and Stability), § 170.170 (Weather Criteria). In particular, the NOSAC recommends the USCG review the definitions of "P" and "GM" found in Part A (Mandatory Criteria), Chapter 2 (General Criteria), Section 2.3 (Severe wind and rolling criterion (weather criterion)).

The following draft language to be added to 46 CFR 170.170(a) after the text "Where-"

P = wind pressure of 504Pa. The value of P used for ships in restricted service may be reduced, subject to the approval of the US Coast Guard.

GM = metacentric height corrected for free surface effect.

The reference for "P" is the *International Code on Intact Stability, 2008*; Chapter 2 – General Criteria; Section 2.3 Severe wind and rolling criterion (weather criterion); Subsection 2.3.2.

The reference for "GM" is the *International Code on Intact Stability, 2008*; Chapter 2 – General Criteria; Section 2.3 Severe wind and rolling criterion (weather criterion); Subsection 2.3.4.

Recommendation 3.7: Cancelling False Distress Alerts

[TS 01-23(1) R3.7]

3.7 The NOSAC recommends that the US Coast Guard develop a Marine Safety Information Bulletin (MSIB) or other appropriate communication vehicle to provide guidance to mariners regarding cancelling false distress alerts.

The NOSAC suggests the following draft MSIB regarding false alert reporting.

[**Note to Reader**: this draft recommendation is in coordination with the CEPT Handling of EPIRBs to Prevent False Alerts in Specific Task Number 5.]

"Subject: How to Cancel Distress Emergency Alerts

The National Oceanic and Atmospheric Administration (NOAA) currently reports that 98% of all Emergency Position Indicating Radio Beacon (EPIRB), Emergency Locator Transmitter (ELT) and Personal Locator Beacon (PLB) activations are false alerts. False alerts waste valuable resources, and they increase the risks for Search and Rescue (SAR) crews that put their lives on the line every time they go out on a mission.

The main reasons for false alerts include beacon mishandling or malfunction, mounting failures, environmental conditions, and improper disposal. While not all false alerts can be prevented, it is critically important to cancel an alert if you know it is accidental or unintentional. The procedures for canceling false distress alerts are found in the Federal Communications Commission regulations (Title 47 Code of Federal Regulations 80.335). For ease of reference, the procedures for canceling false distress alerts on EPIRBs and other types of equipment are summarized in this bulletin.

Cancelling of false distress alerts

If a distress alert is inadvertently transmitted, the following steps shall be taken to cancel the distress alert.

1 VHF Digital Selective Calling

1) Reset the equipment immediately;
2) Immediately cancel the distress alert orally over the telephony distress traffic channel associated with each DSC channel on which the distress alert was transmitted;
3) Set to channel 16; and
4) Transmit a broadcast message to “All Stations” giving the ship’s name, call sign or registration number, and maritime mobile service identity (MMSI), and cancel the false distress alert.

2 MF Digital Selective Calling

1) Reset the equipment immediately;
2) Immediately cancel the distress alert orally over the telephony distress traffic channel associated with each DSC channel on which the distress alert was transmitted;
3) Tune for radiotelephony transmission on 2182 kHz; and
4) Transmit a broadcast message to “All Stations” giving the ship’s name, call sign or registration number, and MMSI, and cancel the false alert.

3 HF Digital Selective Calling

1) Reset the equipment immediately;

2) Immediately cancel the distress alert orally over the telephony distress traffic channel associated with each DSC channel on which the distress alert was transmitted;
3) Tune for radiotelephony on the distress and safety frequency in each band in which a false distress alert was transmitted; and
4) Transmit a broadcast message to "All Stations" giving the ship's name, call sign or registration number, and MMSI, and cancel the false alert on the distress and safety frequency in each band in which the false distress alert was transmitted.

4 Inmarsat ship earth station

Immediately notify the appropriate rescue co-ordination center that the alert is cancelled by sending a distress priority message by way of the same land earth station through which the false distress alert was sent. Provide ship name, call sign or registration number, and Inmarsat identity with the cancelled alert message.

5 Emergency position indicating radio-beacon (EPIRB)

If for any reason an EPIRB is activated inadvertently, immediately contact the nearest U.S. Coast Guard unit or appropriate rescue co-ordination center by telephone, radio or ship earth station and cancel the distress alert. If the nearest unit is unknown, contact the National Command Center at 1-855-406-USCG (8724).

6 General

Notwithstanding the above, ships may use additional appropriate means available to them to inform the nearest appropriate U.S. Coast Guard rescue coordination center authorities that a false distress alert has been transmitted and should be cancelled.

Recommendation 5.8: Draft update to NVIC 3-97

TS 01-23(1) R5.8

5.8 The NOSAC recommends NVIC 3-97 be updated to hold ABS more accountable for their stability reviews on behalf of the Coast Guard and to clearly outline the selection process for oversight of vessel types.

The NOSAC suggests the following amendments and additions to NVIC 3-97, *Stability Related Review Performed by the American Bureau of Shipping for U.S. Flag Vessels*.

Enclosure 1, "Instructions for Implementation", Paragraph 1.a.(1):

Change the following sentence:

"The number and type of independent reviews will be determined by the MSC…"

TO:

"The number and type of independent reviews will be determined by the MSC with no less than the first vessel of each vessel type each year up to 10% of each vessel type each year if there are more than 10 vessels of that type during the year. Liftboats shall be a separate vessel type regardless of the CFR subchapter they fall under."

Enclosure 2, "Application of Coast Guard Requirements for…", Paragraph 1:

Add the following subparagraphs:

m. Approval of draft mark locations and numbering on the hull with verification against actual draft marks.

n. Approval of example draft calculation for a single draft location applicable to the vessel hydrostatics and approved VCG curves.

o. Approval of VCG curves for the range of actual vessel trims.

Add the following paragraph:

5. USE OF STAMPS. (USCG to provide guidance and definitions for when "Approved", "Reviewed", and "Returned for Revision" stamps shall be used in this paragraph)

Recommendation 5.10A.2: Definitions of Stability Terms

[TS 01-23(1) R5.10A.2]

5.10A.2 The NOSAC recommends that the USCG review and update Title 46 (*Shipping*); Chapter I (*Coast Guard, Department of Homeland Security*); Subchapter S (*Subdivision and Stability*); Part 174 (*Special Rules Pertaining to Specific Vessel Types*) to account for lessons learned from the capsizing of Seacor Power. In particular, the NOSAC recommends that the USCG update 46 CFR 174.255 to include the following:

4.2.2 A definition of "*Heel*" for a liftboat.

4.2.3 A definition of "*heeling moment*" for a liftboat.

The NOSAC suggests the following language to 46 CFR 174.255.

(c) Definitions

(1) Heel is defined as the inclination of the boat in the water when viewed from ahead or astern or the lowest part of the keel, frame or bulkhead. [NOTE: this definition source is from *Modern Shipbuilding Terms*, F. Forrest Pease, J. B. Lippincott Company]

(2a) The wind heeling moment (Hm) of a unit in a given normal operating condition or severe storm condition is the sum of the individual wind heeling moments (H) calculated for each of the exposed surfaces on the unit; i.e., Hm=ΣH. Each wind heeling moment (H) must be calculated using the equation: $H = k(v)^2(Ch)(Cs)(A)(h)$ where:

(1) H = wind heeling moment for an exposed surface on the unit in foot-pounds (kilogram-meters);

(2) k = 0.00338 lb./(ft. 2-knots 2) (0.0623 (kg-sec 2)/m^4);

(3) v = wind velocity of—

(i) 70 knots (36 meters per second) for normal operating conditions.

(ii) 100 knots (51.5 meters per second) for severe storm conditions.

(iii) 50 knots (25.8 meters per second) for damage conditions.

(4) A = projected area in square feet (square meters) of an exposed surface on the unit;

(5) Ch = height coefficient for "A" from Table 174.055(a);

(6) Cs = shape coefficient for "A" from Table 174.055(b); and

(7) h = the vertical distance in feet (meters) from the center of lateral resistance of the underwater hull to the center of wind pressure on "A".

[Note: the source of this definition is 46 CFR 174.055, *Calculation of wind heeling moment (Hm)*. Perhaps this definition can resolve the comment in section 3.2.2 of the USCG Marine Safety Center (MSC) *Post-Casualty Stability Analysis of Liftboat Seacor Power, Revision 4, July 28, 2022*; Enclosure (1) to MSC Memo, Serial # A0-2201141.]

(2b) Heeling moment (on account of turning) is $M_R=0.200 \times V_0^2/L_{wl} \times \Delta \times (KG-d/2)$ where:

M_R = heeling moment (kNm)
V_0 = service speed (m/s)
L_{wl} = length of ship at waterline (m)
Δ = displacement (t)
D = mean draught (m)
KG – height of center of gravity above baseline (m)

[NOTE: source IMO *International Code on Intact Stability, 2008*; 2009 Edition, page 25, section 3.1.2; Chapter 3, Special Criteria for certain types of ships, section 3.1, Passenger ships]

(2c) Heeling moment (wind), Mw is defined as $\frac{1}{2}\rho C_D A H_0 (H/H_0) V_W^2$ where:

ρ = air density
C_D = drag coefficient
A = lateral windage area above water surface
H = heeling lever
H_0 = vertical distance from center of lateral windage area to a point at one half the mean draft
*V*w = wind velocity

[NOTE: source IMO *International Code on Intact Stability, 2008*; 2009 Edition, page 150, section 3.5.3.1 (Explanatory Notes to the International Code on Intact Stability, 2008: 3.5 (Background of the sever wind and rolling criterion (weather criterion)).]

Commandant's Request, Recommendation 5 from the USCG ROI

Exhibit 9 provides the *USCG Commandant's Responses to the USCG Seacor Power Final Report Recommendations*. Within the action response from the Commandant for Recommendation 5 is a request that NOSAC "develop standardized quick reference card templates for liftboats that can be used by the industry". The full recommendation and action are as follows.

"Recommendation 5: The Commandant should consider a new regulation or policy requiring liftboat owners and operators to create a quick reference guide for each vessel. The quick reference guide would establish clear and simple operating information, and could include topics such as wave limits, wind limits, draft restrictions, trim conditions, and emergency procedures for sudden changes in weather or weather that exceeds the vessel's operating limits.

Action: I concur with the intent of this recommendation. A Finding of Concern will be published recommending that owners and operators of liftboats review their operations manuals to ensure they are easily accessible and understood by the crew when making time-sensitive decisions. The Coast Guard will share this recommendation with the National Offshore Advisory Committee (NOSAC) for their consideration and direct them to develop standardized quick reference card templates for liftboats that can be used by the industry. NOSAC has been tasked to consider the SEACOR POWER National Transportation Safety Board (NTSB) report and any available public-facing reports, which will include this ROI once released, and propose recommendations. The Coast Guard will reevaluate this

recommendation pending a response from NOSAC regarding any necessary regulatory or policy changes."

The following is NOSAC's response.

Quick Reference Guide Template for Liftboats

The information below provides a sample template for liftboat Owners and Operators to create a quick reference guide(s) for their vessels. This template is not an all-inclusive list; there may be additional vessel specific information that should be included for quick reference by the vessel's master and crew. The information can be placed in any sequential order that the Owners/Operators prefer. [Text that is contained within brackets is suggested guidance which may be deleted or amended by liftboat Owners or Operators with input from the vessel's Master and crew.]

VESSEL NAME QUICK REFERENCE GUIDE

NOTE: The Master has the overriding authority to do whatever is necessary in cases of emergency or similar situations to prevent further harm to personnel, the vessel, or the environment regardless of guidance or procedure in a Company's management system.

AFLOAT LIMITATIONS

Wave Limitations [height]	_____ Feet
Wind Limit: [This wind speed should be the regulatory limit, usually 70 or 100 knots, minus a safety factor, since the regulatory wind speed does not account for waves.]	_____ Knots
Critical relative wind direction [the wind direction that results in the least stable vessel condition.]	_____ Degrees
Maximum Operating Water Depth	_____ Feet
Maximum Allowable List	_____ Degrees
Maximum Average Draft: [or fore and aft if notably different]	Fore ____ Feet ____ Inches Aft ____ Feet ____ Inches
Maximum Allowable Trim by the Bow	____ Feet ____ Inches
Maximum Allowable Trim by the Stern	____ Feet ____ Inches
	_____ Knots

Critical wind speed: [Critical wind speed is the wind speed at which the vessel should immediately start lowering their legs in case the wind speeds get higher. It could be the wind speed at which the vessel can no longer make way in a forward direction, or it could be a wind speed that provides a safety margin prior to capsize.]	
Critical wave period: [If the vessel has a critical wave period which causes excessive roll or pitching, or causes the legs to resonate or whip, then Critical wave period should be listed, along with instructions on what to do in the case of waves matching the critical wave period.]	_____ Seconds
Rate of turn (legs up, all engines.)	_____ degrees/second
Rate of turn (legs up, __ engines): [Use this line if the vessel may operate without all of the engines or if some of the engines are used to lift/lower the legs]	_____ degrees/second
Rate of turn (legs at __ depth, __ engines)	_____ degrees/second
Rate of turn (legs at depth, all engines)	_____ degrees/second
Rate of lowering the legs	_____ feet/minute

STABILITY INFORMATION

Maximum Deck Load Weight [Tons or Pounds, circle units]	_____ Tons/Pounds
Max deck load height [or Maximum deck load Vertical Center of Gravity]	____ Feet ____ Inches
Down flooding Angle	____ degrees (Port or Stbd)
Shortest safe Rolling Period [full roll from port to starboard and back to port]	_____ Seconds

ELEVATED (JACKED-UP) LIMITATIONS

_____ Feet

Maximum water depth for jacking up in normal weather conditions [specify with or without tides]	
Minimum air gap [above high tide]	_____ Feet
Maximum total elevated weight [Tons or Pounds, circle units]	_____ Tons/Pounds
Maximum total weight for pre-loading [Tons or Pounds, circle units]	_____ Tons/Pounds

HEAVY WEATHER ACTION
(in case of unexpected heavy weather that exceeds wave limits or critical wind speed)

1. Announce that all Person on Board should muster at/in a designated location. [The chosen location should typically be outside the superstructure, but above the main deck. Alternatively, the location could be inside at a point with quick access to the exterior. Preferably, the location would be on the same side as the turn direction in the event of severe weather.]

2. If heading changes are contemplated, reduce speed or stop and maintain station as much as possible.

3. If possible, turn into the prevailing wind/wave conditions. If the wind speed exceeds _____ knots, or it will take longer than a minute or two due to the weather conditions and the vessel's maneuverability, then skip this step and move onto the next.

4. Begin lowering the legs to at least a depth of _____ feet. [This step may initially decrease stability due to leg or pad buoyancy, so it is important to lower the legs to a depth that produces a significant improvement in vessel stability.]

5. Issue a call out on VHF Channel 16 stating the vessel has encountered heavy weather and is lowering legs and other information the Master determines is relevant, i.e., location, Persons on Board, etc.

6. Prepare evacuation safety equipment: life rings, life preservers, liferafts, lifeboats, rescue boats, etc.

7. Ensure watertight and weathertight doors are secured to vessel spaces and living quarters.

8. Other Guidance: _____

 [1]

[1] Figure 8. SEACOR Power capsized on its starboard side on the evening of the casualty, with a Coast Guard RB-M in the foreground and the liftboat Rockfish in the background. (Source: Coast Guard; page 19 of the NTSB Report.)

END OF REPORT