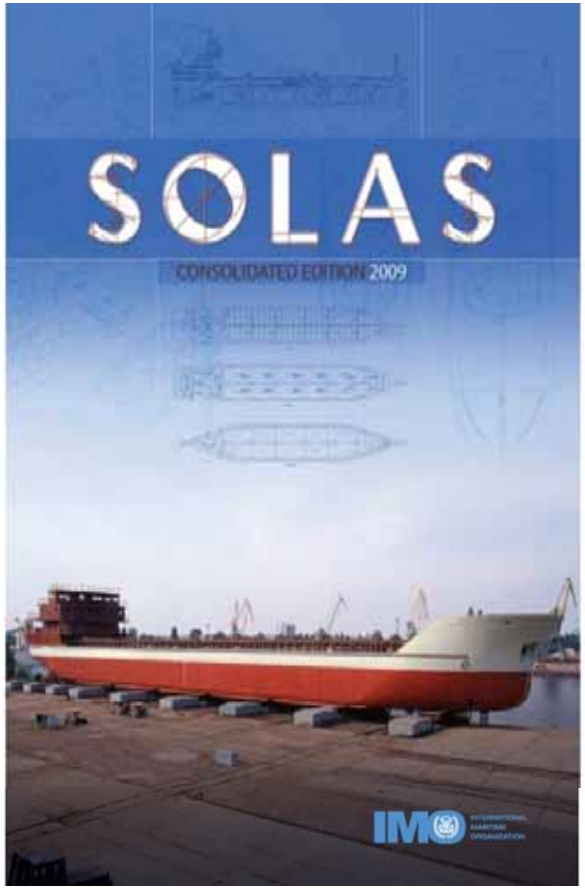
Efficient Risk Assessment for ships using Low Flash Point Fuel

Daniel Wesp | October 16, 2017

IMO IGF Code

- Resolution MSC.392(95) adopted SOLAS amendments to Chapter II-1 Regulations 2, 55 and new Part G to address low-flashpoint fuels together with amendments to SOLAS Chapter II-2 Regulation 4 and amended the form of ships safety certificates
- Apply to ships using low-flashpoint fuels:
  - for which the building contract is placed on or after 1 January 2017
  - in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 1 July 2017 or
  - the delivery of which is on or after 1 January 2021
- IGF Code applies to a ship which converts to using low-flashpoint fuels on or after 1 January 2017
- Governments to consider the voluntary application of the IGF Code to cargo ships of less than 500 gross tons
- Part 2 IGF Code looking at other low flashpoint fuels – methyl/ethyl, fuel cells, low flashpoint diesel fuels (<60C flashpoint)



Risk assessment required by the IGF Code

- Section 4.2.1:

  A risk assessment shall be conducted to ensure that risks arising from the use of low-flashpoint fuels affecting persons on board, the environment, the structural strength or the integrity of the ship are addressed. Consideration shall be given to the hazards associated with physical layout, operation and maintenance, following any reasonably foreseeable failure.

- Section 4.2.2:

  For ships using natural gas as fuel (part A-1 of the IGF Code) and complying with the detailed prescriptive requirements contained within the Code, a risk assessment need only be conducted where explicitly required by the prescriptive parts of the IGF Code.

IGF Code – Explicit Cites for RA

- 5.10.5 Capacity of Drip Trays
- 5.12.3 Separation of Spaces by Airlocks
- 6.4.1.1 Containment System – Integration to Overall Design
- 6.4.15.4.7.2 Design Load for Membrane Tanks – Accidental Scenarios
- 8.3.1.1 Closed or Semi-enclosed Bunkering Stations
- 13.4.1 Alternative Ventilation Capacity for tank connection spaces
- 13.7 Ventilation System for Bunkering Station not on Open Deck
- 15.8.1.10 Gas Detectors for Ventilation Inlets
- Annex, 4.4 Novel Containment Systems - Alternative Design Factor
- Annex, 6.8 Novel Containment Systems - Accidental Scenarios

Risk Based Approach

- Evaluating proposed designs that offer alternative means of compliance to prescriptive requirements, or
- Evaluate designs for compliance with the goal based approach of the IGF Code
- Offers advantages to ship owners/designers and other stakeholders, such that it provides as:
  - Increased ability to suggest innovative designs
  - Increased confidence that the proposed designs will provide an equivalent level of safety
  - Better understanding of hazards, mitigation measures, and risk posed by the proposed design

Items to be included within the scope

- Difference of opinion between Regulators on the scope
  - Case by case basis
  - Early discussions and planning with all stakeholders
- Items explicitly required by IGF Code section 4.2.2
- Others may need to be evaluated as per IGF section 4.1
  - Key terms, i.e. ‘normally’, ‘special consideration’ etc.
  - How the low flashpoint fuel impacts the vessel’s activities/systems
- Additional risks due to service or SIMOPS
- Integration issues (equipment control, connection compatibility etc.)

Risk assessment techniques

- Acceptable and recognized risk assessment techniques
  - Ensure proper identification of risks, and
  - Eliminating risks or mitigated As Low As Practicable (ALARP)
- IGF code does not require a quantitative measure of risk
  - Qualitative approach may be considered appropriate
  - Recommendations may lead to further analysis (when necessary)
- Qualitative Risk Assessment types;
  - HAZID
  - HAZOP

Risk Assessment Process

- The major activities in the risk assessment process are:

  Step 1 – Development of Risk Assessment Plan;

  Step 2 – Preparing for and conducting an Initial Risk Assessment; and

  Step 3 – Conduct an update to the Initial and/or perform additional Detailed Risk Assessment (if required)

- Increased communication during the development and execution of the risk assessment process will be necessary as the complexity of the risk assessment evaluation increases.
- The responsibility for developing the risk assessment plan, and then performing any analysis, rests with the organization proposing the design.

Step 1: Development of a Risk Assessment Plan

Also be referred to as the Terms of Reference (ToR)

- Well-defined and written
- Necessary to efficiently execute the risk assessment.
- Aspects addressed:
  - Scope of the risk assessment
  - Selection of suitable risk assessment technique(s)
  - Establishment of risk acceptance criteria
  - Identify how the specific cites in the IGF Code will be addressed
  - Identify the Risk Assessment Team

Scope of Risk assessment

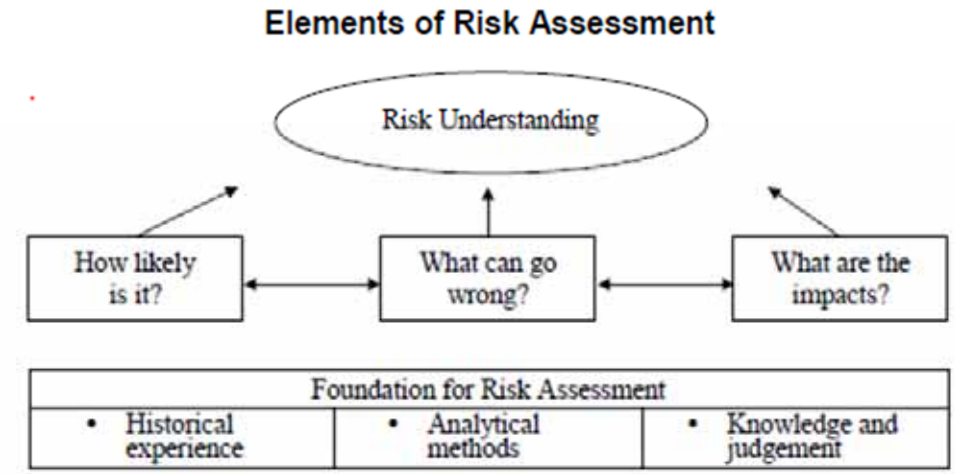
- Risk Assessment Plan or Terms of Reference
  - Agreed with the appropriate stakeholders (e.g. Class, Flag Administration, Owner, & Shipyard)
  - Clear understanding of the planned objective, system, and operations that are to be covered in the assessment.
- Cover the design and arrangement as installed on board
  - Where a proposed design has gone through a risk assessment in the concept stage, it may then require a later revision to ensure that the risks in the final design remain ‘mitigated as necessary’

Items to be considered within the RA scope

- IGF Code Section 4.2.2 explicitly requires specific items
- Other relevant items that should be evaluated may be triggered by key terms, such as:
  - ‘normally’
  - ‘special consideration’
  - ‘evaluated and approved’
- Service of vessel (e.g. FFV) or simultaneous operations (SIMOPS)
- Potential for systems integration/interface issues

Selection of Risk Assessment Technique

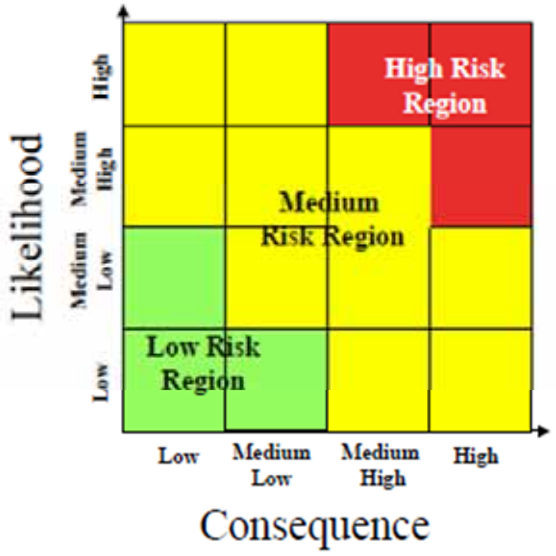
- Qualitative Vs Quantitative?
  - Common qualitative techniques
    - Hazard Identification (HAZID) study
    - Hazard & Operability (HAZOP) study
  - Common quantitative techniques
    - Computational Fluid Dynamic (CFD) analysis



Establishment of Acceptance Criteria

- Typically there are three regions of risk:
- 1. High Risk (Intolerable);
  - not accepted
  - must be further mitigated
- 2. Medium Risk (acceptable if ALARP)
  - If necessary, search for ways to minimize the risk
- 3. Low Risk (Tolerable)
  - risk is accepted,
  - important to make sure that the safeguards are in-place and working effectively.

FIGURE 1
Risk Matrix Concept

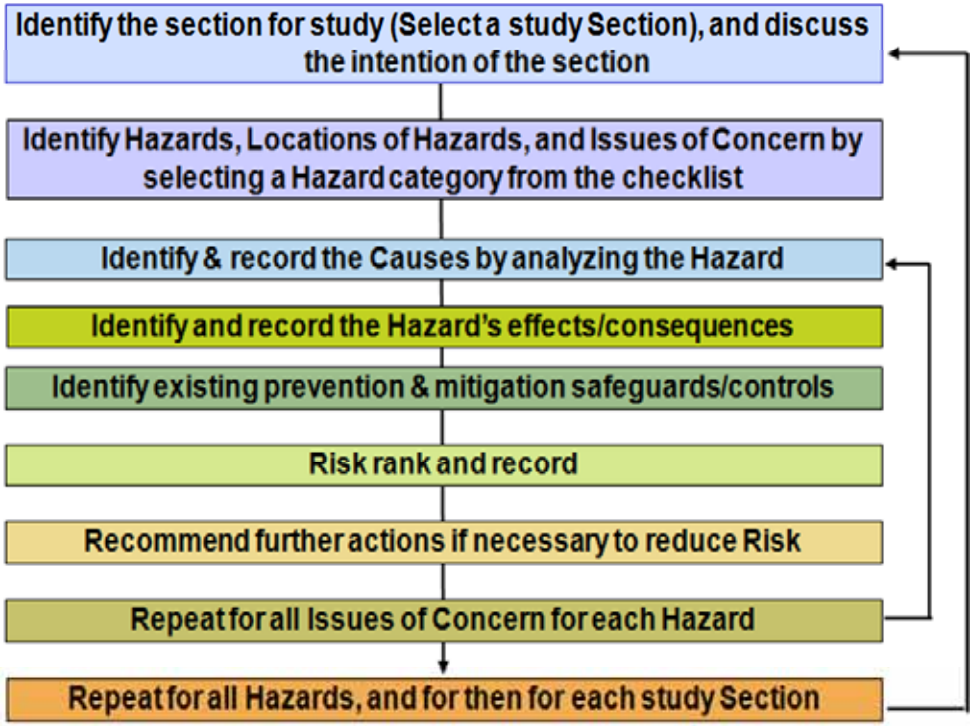


Risk Assessment Team

- Team Leader
- Scribe
- Subject Matter Experts
- Regulatory Participation

Step 2: Conducting the Initial RA worskshop

- Good practice;
  - Distribute relevant information as outlined by the risk assessment plan to the team, prior to the workshop



Document the Initial Risk Assessment

- The risk assessment needs to be documented in a formal report.
- No assessment be “documented by exception”
- The report for the risk assessment should ideally include the following sections:
  - Executive summary;
  - Introduction;
  - Scope and Objectives;
  - Methodology (including the risk matrix used);
  - List of attendees present and the documentation used;
  - Discussion section, with Results/Conclusions;
  - Appendices (covering: signed attendance sheet; the risk assessment worksheet]copy of any relevant documentation, where appropriate).

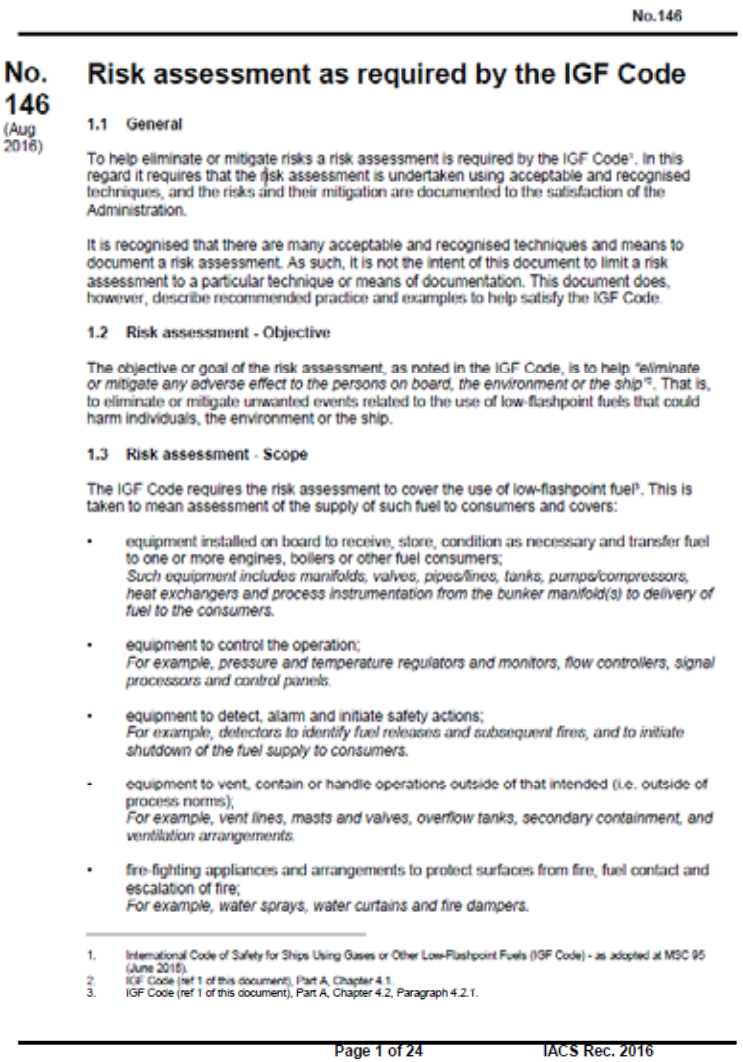
Step 3 Update and/or Detailed Risk Assessment

- A more refined risk assessment may be required if;
  - Initial risk assessment did not provide conclusive information; or
  - Specific risk issues were identified in the initial risk assessment; or
  - Basic initial assessment was done in the early design phase

USCG Existing Regulation

- CG-521 Policy Letter No. 01-12, CH-1 dated 12 July 2017: “Equivalency Determination – Design Criteria for Natural Gas Fuel Systems (Change-1)”
  - Plans received ahead of the risk assessment held in abeyance until after evaluation of the risk assessment has been completed.
  - Any mitigating safety measures imposed on the vessel based on review and approval of the risk assessment must be listed in the risk assessment’s approval letter.
  - Arrangements with natural gas fuel storage tanks located below or directly adjacent to accommodation spaces, service spaces, or control stations, must be specifically addressed in the risk assessment
  - Requests for a higher loading limit (LL) than as calculated in 6.8.1 of up to but not exceeding 95% will be evaluated within the context of the risk assessment required by 6.4.1.1.

IACS Risk Assessment Recommendations



No. 146 (Aug 2016)

Risk assessment as required by the IGF Code

1.1 General

To help eliminate or mitigate risks a risk assessment is required by the IGF Code[1]. In this regard it requires that the risk assessment is undertaken using acceptable and recognised techniques, and the risks and their mitigation are documented to the satisfaction of the Administration.

It is recognised that there are many acceptable and recognised techniques and means to document a risk assessment. As such, it is not the intent of this document to limit a risk assessment to a particular technique or means of documentation. This document does, however, describe recommended practice and examples to help satisfy the IGF Code.

1.2 Risk assessment - Objective

The objective or goal of the risk assessment, as noted in the IGF Code, is to help *"eliminate or mitigate any adverse effect to the persons on board, the environment or the ship"*[2]. That is, to eliminate or mitigate unwanted events related to the use of low-flashpoint fuels that could harm individuals, the environment or the ship.

1.3 Risk assessment - Scope

The IGF Code requires the risk assessment to cover the use of low-flashpoint fuel[3]. This is taken to mean assessment of the supply of such fuel to consumers and covers:

- equipment installed on board to receive, store, condition as necessary and transfer fuel to one or more engines, boilers or other fuel consumers;
  Such equipment includes manifolds, valves, pipes/lines, tanks, pumps/compressors, heat exchangers and process instrumentation from the bunker manifold(s) to delivery of fuel to the consumers.
- equipment to control the operation;
  For example, pressure and temperature regulators and monitors, flow controllers, signal processors and control panels.
- equipment to detect, alarm and initiate safety actions;
  For example, detectors to identify fuel releases and subsequent fires, and to initiate shutdown of the fuel supply to consumers.
- equipment to vent, contain or handle operations outside of that intended (i.e. outside of process norms);
  For example, vent lines, masts and valves, overflow tanks, secondary containment, and ventilation arrangements.
- fire-fighting appliances and arrangements to protect surfaces from fire, fuel contact and escalation of fire;
  For example, water sprays, water curtains and fire dampers.

1. International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels (IGF Code) - as adopted at MSC 95 (June 2015).
2. IGF Code (ref 1 of this document), Part A, Chapter 4.1.
3. IGF Code (ref 1 of this document), Part A, Chapter 4.2, Paragraph 4.2.1.

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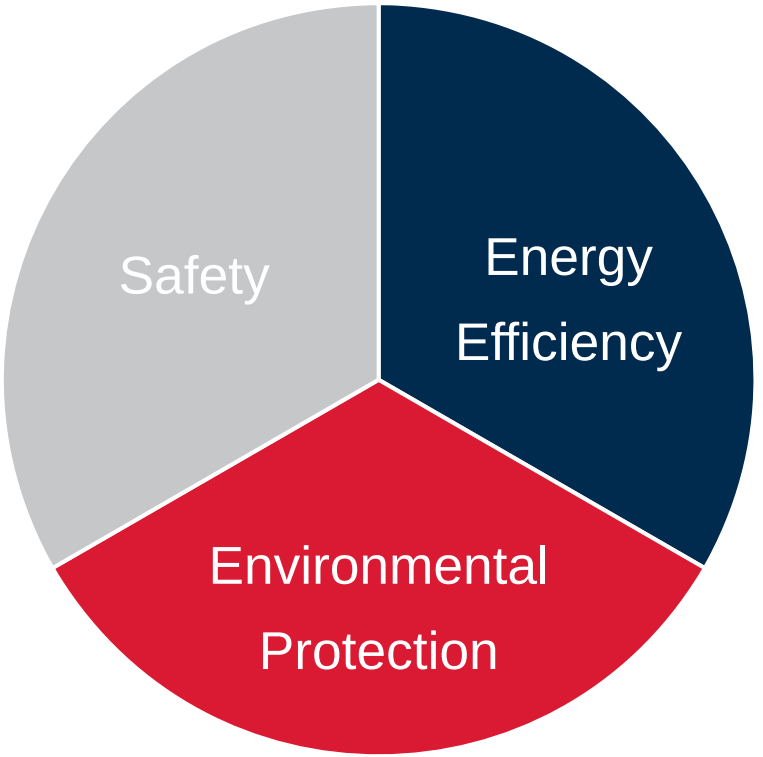

Thank You

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