



# Corrupt Beacon IDs

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# Alerts with “Unknown Beacon Type”

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- “Unknown Beacon Type” identifies alerts with a corrupt beacon ID
- Are only sent when there is a Doppler location
- Occurs when the beacon ID fails validation checks for:
  - Country Code
  - BCH (Uncorrectable bit errors)
  - Fixed Bits
  - Invalid Radio call signs
  - Invalid Ship Station Id
  - Aircraft ID
- Until recently they were considered an artifact of:
  - Beacon transmission
  - Beacon miscoding
  - LUT processing



# Unknown Beacon Type

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- Recently we discovered it is also an artifact of satellite processing. The discovery was due to:
  - Good work and persistence by the Coast Guard RCCs
  - A beacon with “Unknown Beacon Type” that transmitted for a long time
  - MCC analyst observed that the beacon was only reported by certain satellites
    - S11
    - S12



# Further Investigation (1 of 2)

## Unreliable Beacon IDs that Match to a Registered Beacon

Year	S11/SARP3 Alert site Solutions	S12/SARP3 Alert site Solutions	S7 - S10 SARP2 Solutions	S7 - S12 SARR & SARR/SARP Combined Solutions	Alert Sites from Solutions	Additional Information
2011	270	234	0	0	31	
2010	148	575	0	0	33	
2009	207	370	0	0	36	S12 Ops as of 3/25/2009
2008	450	Not Ops			30	
2007	255	Not Ops	0	0	16	S11 Ops as of Jan 2007
2006	Not Ops	Not Ops	0	0	0	

The table above shows unreliable beacon IDs that were linked to a USA registered beacon only came from SARP3 satellites.

Note: There probably are beacon s with other than USA country codes that are not included here.



# Further Investigation (2 of 2)

## Total Alert Sites with Unreliable Beacon IDs

	2011	2010	2009	2008	2007	Average per Year	Launch Date
<b>Total with Bad IDs</b>	1403	964	1250	1115	791		
<b>Total Sites</b>	26403	26771	24610	20056	17389		
<b>% Sites with Corrupt IDs by satellite</b>	5.31%	3.60%	5.08%	5.56%	4.55%		
G11	345	256	352	271	123		
G12	0	161	463	397	240		
G13	541	166	0	94	0		
I3	0	0	1		1		
M2/M1	0	0	1		11		
S10	121	93	146	136	127	124.6	May-05
S11	361	192	237	283	234	261.4	Oct-06
S12	259	224	149			*241.5	Feb-09
S7	131	82	136	152	88	117.8	May-98
S8	130	82	123	160	86	116.2	Sep-00
S9	137	97	142	179	102	131.4	Jun-02

The table above shows the distribution of solutions with unreliable Beacon IDs by year and satellite since 2007.

Note: The number of solutions with unreliable beacon IDs from S11 & S12 are approximately double those from S7 – S10.



# What We Learned

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- Corrupt beacon IDs are also caused by the Search and Rescue Processor (SARP) on S11 and S12 (SARP-3)
- The method of identifying the start (first bit) of the beacon message was changed on SARP-3
- The problem occurs when:
  - A beacon transmits rapidly (transmission every 10 seconds instead of the expected every 50 seconds)
  - A beacon transmits in an area of high interference
- SARP-3 incorrectly identifies the start of the beacon message at a bit downstream of the correct bit





# Mitigation - Suggested RCC Actions

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- Gather Information
  - Beacon location
  - Attempt to get registration information
    - Search RGDB using ADCD0 + the first ten of the ID on the alert
    - Search RGDB using an \* + the first 14, 13, 12, 13, and 10 of the ID on the alert
    - Look for other beacon IDs in the general vicinity
    - Suggestions from audience?





# Mitigation - Cautions

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- Do not consider any information gained from decoding the beacon to be reliable, therefore
  - You are not given any information in the Beacon Decode section of the alert message
  - You cannot consider the decode on the Cospas-Sarsat Website reliable
    - You will not have the additional bits that are used for error checking
  - Registration information is included in the alert message if the corrupt beacon ID matches a beacon that is registered in the US RGDB
    - Don't rely on the registration information being for that beacon
  - The beacon may not be a US coded beacon and not be in the RGDB

# Actions when corrupt beacons are identified

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- Request owner to contact beacon manufacturer
  - Probably requires a battery change
  - Beacon probably malfunctioned:
    - Transmitted continuously in self-test mode
    - Transmitted at short intervals
    - Bracket design may have caused rapid transmission in self-test mode
- Contact Chief USMCC by email so further investigation is performed.
  - (sam.baker@noaa.gov)



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Questions?