In the Matter of	)	
	)	
Telecommunications Assessment of the Arctic Region	)	Docket No. 140925800–4800–01
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	)	
	)	

JOINT COMMENTS OF THE
NATIONAL GLOBAL MARITIME DISTRESS & SAFETY SYSTEM (GMDSS) TASK FORCE
AND THE
RADIO TECHNICAL COMMISSION FOR MARITIME SERVICES (RTCM)

Introduction

The GMDSS Task Force was chartered by the U.S. Coast Guard to supplement government functions through outreach to the private sector and recommendation to regulatory authorities. The Task Force membership is broad based including over 4500 representatives of commercial vessel operations, recreational boating interests, training institutions, service agents, manufacturers, and government authorities. The Task force maintains a website[1] which contains numerous GMDSS Information Bulletins, records of Task Force meetings, various letters and petitions seeking regulatory action, and comments to regulatory proceedings.

The Radio Technical Commission for Maritime Services (RTCM) currently operates the GMDSS Task Force for the U.S. Coast Guard. Originally a Federal Advisory Committee established in 1947, RTCM is now a non-profit organization supported by members whose objectives include studying and preparing reports on maritime electronic navigation and telecommunications practices. RTCM standards are incorporated by reference into regulations of the U.S. Coast Guard and Federal Communications Commission.

The GMDSS Task Force was formed to improve maritime distress and safety communications particularly through but not limited by the GMDSS, with emphasis in and near US waters. The Task Force and RTCM stand ready to assist NTIA and other agencies in planning and preparing for adequate and reliable maritime communications, particularly communications in support of safe navigation and safety of life at sea, in the Alaskan and Arctic waters described by your Notice.

[1] See http://www.navcen.uscg.gov/?pageName=gmdssTaskForce

Comments

GMDSS

The Amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974 concerning Radiocommunications for the Global Maritime Distress and Safety System, adopted on 9 November 1988, as amended, specify the radiocommunications systems carriage requirements for vessels subject to the Convention. This Convention applies to all ships on international voyages except ships of war and troopships, cargo ships of less than 300 gross tons, ships not propelled by mechanical means, wooden ships of primitive build, pleasure yachts not engaged in trade, and fishing vessels. Nevertheless, ships not subject to the Convention rely on elements of the GMDSS for their distress and safety needs. Title 47 U.S. Code[2] applies these SOLAS GMDSS requirements to U.S. vessels on all voyages except on inland and protected waters and the Great Lakes, and included fishing vessels over 300 tons, pleasure vessels over 500 tons and primitive & wooden vessels[3]. These GMDSS ships increasingly operate in Alaskan and Arctic waters described in this Notice.

The GMDSS provides capability for meeting nine functional safety communications requirements. Every ship, while at sea, must be capable of:

1. Transmitting ship-to-shore distress alerts by at least two separate and independent means,
2. Receiving shore-to-ship distress alert relays,
3. Transmitting and receiving ship-to-ship distress alerts,
4. Transmitting and receiving search and rescue coordinating communications,
5. Transmitting and receiving on-scene communications,
6. Transmitting and receiving signals for locating,
7. Transmitting and receiving maritime safety information,
8. Transmitting and receiving general radiocommunications to and from shore-based networks, and
9. Transmitting and receiving bridge-to-bridge communications.

To meet these functional requirements, most ships are required to carry the following equipment[4]:

- VHF radiotelephone capable of digital selective calling (DSC)
- An X-band search and rescue radar transponder (radar SART) or a VHF automatic identification system search and rescue transmitter (AIS SART).

[2] 47 U.S. Code, Chapter 5, Subchapter III, Part II - Radio Equipment and Radio Operators On Board Ship
[3] 47 U.S. Code § 352 – Exemptions
[4] Specific carriage requirements can be found at http://www.rtcm.org/gmdssguide.php

- A 518 kHz NAVTEX receiver for reception of coastal maritime safety information navigational warnings and meteorological forecasts and warnings.
- A SafetyNET-equipped Inmarsat C satellite terminal for reception of high seas maritime safety information navigational warnings and meteorological forecasts and warnings[5]
- A 406 MHz satellite emergency position-indicating radiobeacon (EPIRB). This vital maritime distress alerting device has counterparts in the Personal Locating Beacon (PLB) widely carried by land parties in Alaska and the Emergency Locating Transmitter (ELT) widely carried by aircraft in Alaska.
- Passenger ships must additionally carry a VHF-AM transceiver for limited air-ground communications.

The SOLAS Conventions requires additional telecommunications and radionavigation systems that are not part of the GMDSS, including:

--Ship Security Alert System (SSAS); this is a covert alert system for reporting security threats.

--Long Range Identification and Tracking (LRIT); position, identification and time of position must be reported at least four times each day.

--Automatic Identification System (AIS); automatically reports position, identification and navigation information; also provides safety-related messaging capability and for the exchange of other information relative to navigation safety.

GMDSS prescribes four Sea Areas which define further equipment requirements depending on the ships operating area. Because the first two sea areas have not been and are not likely to be declared in the regions specified by this notice, they won't be further described. The remaining two areas are: Sea Area A3, which consists of the area covered by the Inmarsat I-3[6], roughly between 70º N and 70º S latitude; and Sea Area A4, which consists of the Polar areas outside of 70º S to 70º N, including the Northwest and Northeast passages. Area A4 also includes Antarctic Regions, but they will not be discussed here.

Ships operating in Sea Area A3 must additionally carry an Inmarsat C satellite terminal or an MF/HF radio equipped with telephony, DSC and radiotelex (narrow-band direct printing). Ships operating in Sea Area A4 must additionally carry an MF/HF radio equipped with telephony, DSC and radiotelex.

IMO is developing a mandatory International Code of safety for ships operating in polar waters (Polar Code), to cover the design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating particularly in Arctic

[5] Reception of HF radiotelex is allowed as an alternative, but it is little-used and NAVAREA warnings broadcast are incomplete.
[6] See http://www.inmarsat.com/about-us/our-satellites/our-coverage/

waters[7]. The Code would require VHF DSC radios and 121.5/123.1 MHz aeronautical radios on all lifeboats and EPIRBs and SARTs on all survival craft. The Polar Code currently contains no provisions for additional communications outside of that discussed above.

Telecommunications issues affecting ships operating in areas described by this notice

While the GMDSS came into legal effect in the 1990s, the technology which formed the basis of GMDSS was largely developed in the preceding three decades. Much of the infrastructure upon which system operation depended has disappeared or is disappearing around the world. The most significant problems include:

- The 1200 baud Inmarsat C terminal is the only satellite communication system now recognized by the GMDSS. While this terminal adequately meets the functional requirements No. 1 (distress alerting), 2 (distress notification) and 7 (safety information broadcasts), it provides little utility in meeting other requirements.
- Except for the Coast Guard's Rescue 21 network, the VHF and MF/HF coast station network upon which the GMDSS depends has largely disappeared worldwide. Stations open for public correspondence, upon which the GMDSS general communication requirements (Functional requirement #7) depend, have largely disappeared.
- GMDSS general communications functions, which include such safety communications as the ship movement and navigational communications as well as other safety-related communications, can no longer be provided effectively by the GMDSS.
- Sea Area A4 designed to cover maritime communications in the Polar Regions above 70º is largely dysfunctional. Ship operators are generally unfamiliar with and do not use the MF/HF equipment installed to meet this regulatory requirement. The only US known coast station interoperable with the radiotelephone and DSC requirements of Sea Area A4 is in Kodiak AK. Maritime HF radiotelex coast stations have now largely closed.
- GMDSS's effective telecommunications data transmission capacity is currently limited to 600 baud.

GMDSS modernization and Iridium's GMDSS application

The International Maritime Organization (IMO) has included on its work plan a review and modernization of the GMDSS. That review includes a study of the problems described above. Nevertheless the pace of this work is slow and expected results inconclusive in the near term, so

[7] See http://www.imo.org/MediaCentre/HotTopics/polar/Pages/default.aspx

the impact of this work on information requested in this Notice is expected to be negligible. More fruitful at least in the short term is Iridium Communications Inc. application to the IMO to provide mobile satellite services in the GMDSS[8]. A detailed evaluation of its suitability is expected in 2015. While Iridium is not yet capable of providing broadband data communications to ships, its systems are expected to overcome the limitations described above. Iridium provides full global coverage including all Alaskan and Arctic waters. Some other Low Earth Orbit satellite systems provide some coverage in Polar Regions depending upon the inclination of their orbits, but none now are candidates for GMDSS recognition.

As noted IMO's review and ultimate recognition of Iridium's application will take some time and acceptance if provided is unlikely before 2016 at the earliest. However, there are domestic actions that can be taken by the FCC, Coast Guard and perhaps others in the meantime to validate their satisfaction of some requirements.

Questions about Telecommunications Services and Technologies in Arctic Alaskan Communities and the Pan-Arctic Region

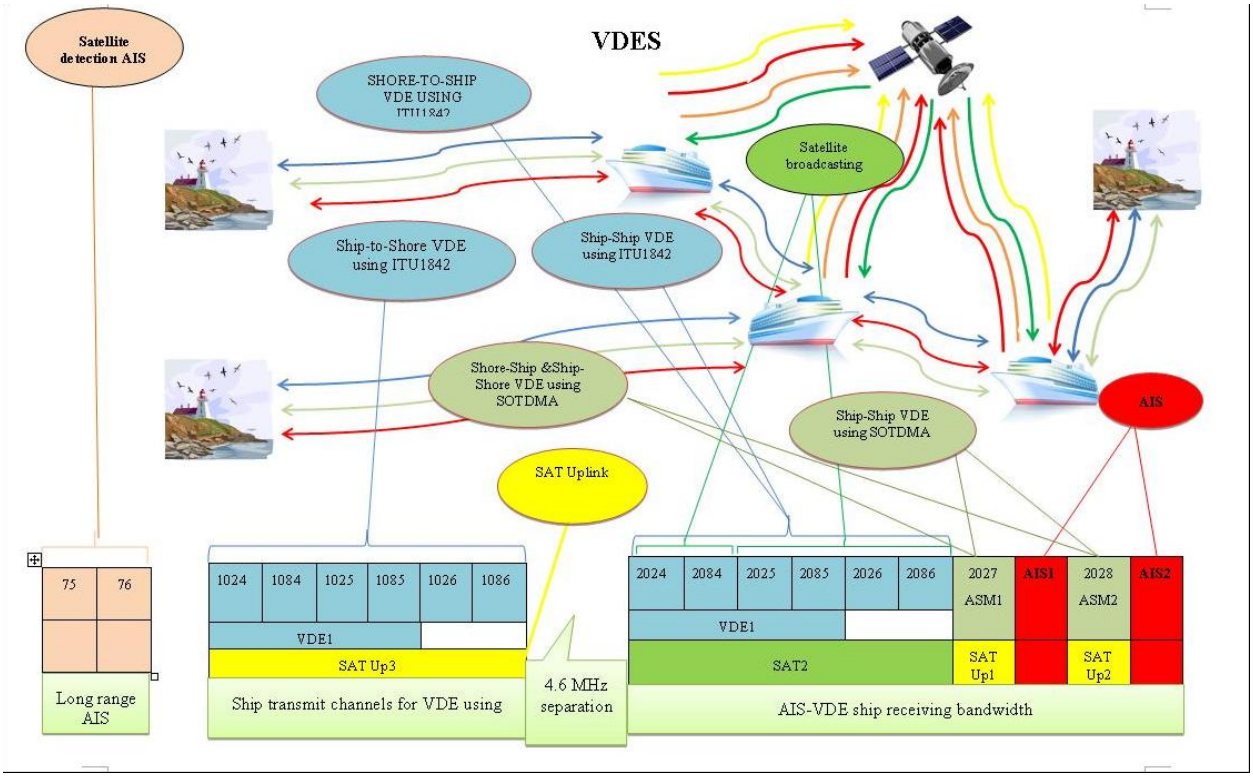
***(10) Aeronautical and Maritime Communications**: What communications systems and technologies support aircraft and maritime voice and data communications? What are the key strengths and limitations of these networks? What new systems are being planned to address aviation and maritime user needs?*

GMDSS communications in the areas described by the Notice rely primarily on Inmarsat C up to approximately 70º North, and HF communications when above that latitude. Coast Guard Rescue 21 VHF GMDSS-capable services are being planned in certain areas but are not available in most Alaskan waters. USCG Communication Station Kodiak provides GMDSS HF DSC and voice services as well as NAVTEX broadcasts of navigational and meteorological safety information, but coverage from those services are also limited[9]. The Coast Guard had operated a NAVTEX station in Adak AK, but that service was discontinued in December 1996 due to closure of the Navy facility there. The primary system used for distress and safety communications in Alaskan waters particularly by the commercial fishing industry is the HF single sideband radiotelephone on 4125 kHz. 4125 kHz coverage is subject to fading and is not reliable, especially at night. Once Iridium is accepted into the GMDSS, it would provide full and reliable distress and safety coverage for the whole of the Alaskan and Arctic area. As noted above, some forms of domestic acceptance could occur in the meantime.

[8] See http://investor.iridium.com/releasedetail.cfm?releaseid=842239.
[9] NAVTEX coverage from Kodiak, identifier J, is posted at USCG NACVEN http://www.navcen.uscg.gov/images/marcomms/navtex-p.gif.

Although not recognized by the GMDSS, several shipboard very small aperture terminal (VSAT) mobile satellite systems operating C-band and Ku-band provide reliable broadband service throughout the area up to 70º north[10]. Inmarsat's Fleet Broadband system provides distress and safety broadband communications capability as far north as the Bering Strait[11].

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) in cooperation with the International Telecommunications Union are developing a broadband communications "front end" called the VHF Data Exchange System (VDES), which would include the shipborne automatic identification system (AIS) used for inter-ship navigation. VDES would use the old VHF marine operator (maritime public correspondence) duplex frequencies providing an available ship-shore data capacity between terrestrial stations at 307.2 kbps. VDES is designed for installation on low or medium earth orbit satellites where it would provide an uplink and downlink data capacity of about 240 kbps. VDES's satellite communications capability would be especially useful in areas without an installed shore-based infrastructure such as the Artic.



While spectrum used by VDES is allocated to the maritime service, it will require approval by the ITU 2015 World Radio Conference (WRC) (in satisfaction of WRC-15 Agenda Item 1.16) as well as by the FCC and NTIA before VDES service can begin. For that reason, we respectfully

[10] See for example http://www.kvh.com/Pages/Satellite-Coverage-Maps/Satellite-Coverage-Maps/TracPhone-Maps.aspx.
[11] Ibid (above)

ask NTIA for their assistance in supporting VDES at the WRC and in enabling its use within the U.S.

(11) Aeronautical and Maritime Radionavigation*: What radionavigation systems are currently used by commercial ships and aircrafts in the Arctic region? What are the key strengths and limitations of these systems, especially with regard to location reliability? What new satellite-based navigation systems are being planned, and what are their comparative advantages relative to current systems? What key dependencies and factors impact the likelihood of these systems being launched in a timely manner?*

Many commercial ships on domestic or international voyages[12] carry a VHF shipborne AIS system used to identify ships and their reported positions for navigation purposes. Orbcomm and ExactEarth operate satellite systems capable of tracking AIS-equipped ships worldwide including in Alaskan and Arctic waters. The Coast Guard is installing a network[13] of AIS coast stations capable not only of receiving vessel transmissions but also capable of transmitting such navigational information as aids to navigation data including buoy type and location, differential global navigation satellite system corrections, and navigational, meteorological, hydrological and environmental information and data to ships. The Marine Exchange of Alaska is partnering with the Coast Guard to extend this service throughout Alaska[14]. AIS shore stations can broadcast navigational information directly to shipboard navigational displays using existing interfaces already specified in the shipboard radar or electronic chart display[15]. The VDES system described in (10) above increases the communications capacity providing this information to ships, allowing data to be transmitted to and from satellites as well as by terrestrial coast stations directly to ship's existing navigation displays.

(12) Weather and Other Information Services*: How effectively do broadcast and other networks support the delivery of weather monitoring alerts (including warnings, watches, and forecasts) and non-weather hazard alerts across Arctic Alaska and the pan-Arctic region, especially with regard to speed of delivery and service reliability? How do Arctic broadcasts and other information reports for weather monitoring compare to those services in other parts of Alaska? What initiatives are underway, or can be recommended, to improve the delivery and receipt of weather information and other critical alerts, including system upgrades and/or new infrastructure deployments? What innovations across satellite imaging and other technology developments offer the greatest potential?*

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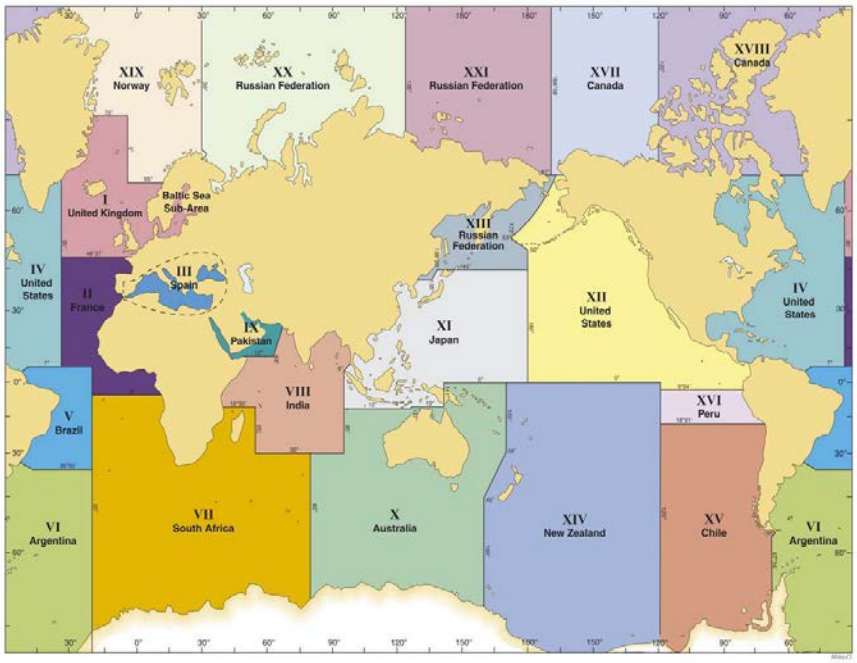
[12] See http://www.navcen.uscg.gov/?pageName=AISCarriageReqmts. Commercial fishing vessels are presently exempted, although regulations extending this carriage requirement are pending at OMB.

[13] Nationwide Automatic Identification System (NAIS). See http://www.navcen.uscg.gov/?pageName=NAISmain

[14] See http://www.dvidshub.net/news/139326/coast-guard-marine-exchange-alaska-partner-build-next-generation-arctic-navigation-and-safety-information-system.

[15] As mandated by the International Electrotechnical Commission (IEC) navigation presentation certification standard 62288 Ed.2

In 2011 the International Maritime Organization, the International Meteorological Organization and the International Hydrological Organization expanded the World-Wide Navigational Warning System into arctic waters[16]. The US Coast Guard broadcasts NAV/METAREA XII



World-Wide Navigational Warning System Navigational/Meteorological Areas (NAV/METAREAs)

to ships using Inmarsat C SafetyNET and HF radiotelex. There are currently no broadcasts of NAV/METAREA XVII warnings. Iridium could become available to broadcast safety warnings to all five new Arctic NAV/METAREAs including NAV/METAREA XVII. NOAA National Weather Service weather forecasts and warnings are additionally broadcast[17] to ships in Alaskan waters over NOAA Weather Radio and Coast Guard HF single sideband radiofax and NAVTEX. AIS can also be used to broadcast weather information to ship navigational displays. The National Geospatial-Intelligence Agency, the agency responsible for providing NAVAREA XII and IV navigational warnings, also provides Arctic navigational warnings as HYDROARC product[18]. However, unlike NAVAREA reports, HYDROARC reports are not broadcasts to ships.

***(13) High Frequency Radio Communications (3–30 MHz)**: How do high frequency (HF) radio systems serve Arctic Alaskan end-users and to what degree are they used especially for emergency and search and rescue communications? What are the comparative advantages and*

[16] See http://www.imo.org/MediaCentre/PressBriefings/Pages/11-arctic.aspx
[17] See http://www.nws.noaa.gov/om/marine/home.htm
[18] See http://msi.nga.mil/NGAPortal/MSI.portal?

limitations of HF radio relative to other technologies, especially with regard to reliability, privacy, and degree of availability after considering seasonal and temporal variances? Which frequencies are currently used and which ones offer the highest quality of service? What improvements have been made, or are planned, on HF radios to improve communications?

4125 kHz single sideband has been a primary means for distress and safety communications and broadcasts of weather warnings in Alaskan waters for many years. The Coast Guard maintains voice distress watch keeping on HF voice channels in addition to 4125 kHz, and on GMDSS DSC channels[19]. GMDSS Sea Area A4 applicable to Arctic waters relies exclusively upon HF. Nevertheless use and knowledge of HF aboard ships has declined significantly, most HF public coast stations have now closed and Coast Guard maritime HF services has declined over the years and is expected to decline further.

***(14) Very High Frequency Radio Communications (30–300 MHz)**: How do Arctic Alaskan residents use VHF radios to communicate?*

VHF is the mainstay of maritime communications and the Coast Guard's investment in the newly-implemented Rescue 21 shore-based system will ensure that maritime VHF remains operational for many years to come. When operational, VDES will provide high capacity data communications between ship and shore where terrestrial stations exist and through satellite where shore infrastructure does not exist.

Conclusion

This is an exciting and vitally needed initiative. It is also exceptionally complex, and it will require broad expertise to complete successfully. This kind of expertise is available within the RTCM's and Task Force's membership, and we stand ready to assist.

Here is a partial listing of initiatives already announced or in progress to evaluate communications capabilities in the Arctic. These and other initiatives should be conducted against your evaluations to assist with determining requirements and their satisfaction by existing or planned systems.

A. The Coast Guard Research & Development Center (RDC) is bringing a team of 52 scientists onboard the Coast Guard's premier research vessel, USCGC HEALY, from August 8th through 30th for a technology evaluation to improve Coast Guard capabilities in the Arctic. The team will embark the ship in Seward, Alaska and transit north into the ice[20].

Four RDC projects will be the focus of the exercise: Arctic Craft Improvements, Arctic Communications Testing, Arctic Navigation Improvements, and Oil in Ice Interaction projects.

[19] See http://www.navcen.uscg.gov/?pageName=cgcommsCall.
[20] According to:http://www.uscg.mil/hq/cg9/rdc/pdf/ATE14%20Pub_FINAL_23Jul14.pdf

Reliable communications are becoming increasingly important in the Arctic region as activity increases. The vast distances, lack of communications infrastructure, harsh weather conditions, and high latitude ionic disturbances combine to make communications in the Arctic difficult. Reliable communications is required for positive tactical control of operational units and for emergency communications with mariners operating in the area. To help improve communications in the Arctic, this project will assess High Frequency (HF), Very-High Frequency (VHF), Ultra-High Frequency (UHF) and satellite communications signal strength to evaluate system coverage and improve signal modeling.

B. We expect that in 2015, the IMO will conduct a thorough evaluation of the Iridium System's ability to meet all relevant GMDSS requirements. This should include extensive data collection and evaluation in areas including the Arctic.

C. The RTCM Annual Assembly will be held in the Annapolis area during a week in May of 2015; we are willing to work with you to formulate a session discussing Arctic Navigation and Communications Programs. For example at least two companies have made presentations in the past about collection of AIS data from ships via their satellites with some coverage in the Arctic Regions.

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Captain John C. Fuechsel date
Director, GMDSS Task Force

_____ _____

R.L. Markle date
President, RTCM