

بِسْمِ تَعَالَى

وزارت راه و شهرسازی

سازمان بنادر و دریانوردی

تاریخ: ۱۳۹۷/۳/۲۱

شماره: ۹۷/۹۳۷۰/ص

پوست:

فورت:

شرکت ملی نفتکش ایران
شرکت کشتیرانی جمهوری اسلامی
شرکت کشتیرانی والفجر
شرکت کشتیرانی دریایی خزر

موضوع: تغییر نسل ماهواره های اینمارست و تاثیرات آن بر سیستم GMDSS

با سلام و احترام

به پیوست بخشنامه شماره 3845 مورخ ۹ مه ۱۸ + ۲۰ سازمان جهانی دریانوردی در خصوص تغییر نسل ماهواره های اینمارست از Inmarsat-3 به Inmarsat-4 و تاثیرات آن بر سیستم های GMDSS و راهکارهای مقابله و پیشگیری از عدم ایجاد اختلال در پیامهای مربوطه ارسال می گردد . خواهشمند است دستور فرمایید اقدام لازم معمول نمایند .

نادر پسنده

مدیر کل امور دریایی

رونوشت :

اتحادیه مالکین کشتیها جهت اطلاع و اطلاع رسانی به اعضا
انجمن کشتیرانی و خدمات وابسته جهت اطلاع و اطلاع رسانی به کشتیرانی های عضو
اتحادیه مرکزی تعاونی های حمل و نقل دریایی بار و مسافر کشور جهت اطلاع
اداره عملیات دریایی

آدرس: میدان ونک - بزرگراه حقانی - بعد از چهارراه جهان کوک - انتهای خیابان شهیدی

تلفن ۸۴۹۳۱ - ۲ - ۸۸۶۵۱۱۱۱ کد پستی: ۱۵۱۸۶۶۳۱۱۱ صندوق پستی ۱۱۱۱۵/۱۱۱۶۵/۱۱۱۶۵/۱۱۱۶۵ پست الکترونیکی info@pmo.ir

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Circular Letter No.3845
9 May 2018

To: All IMO Member States
Intergovernmental organizations
Non-governmental organizations in consultative status with IMO

Subject: **Information on the migration of the recognized GMDSS services for
Inmarsat satellites**

1 The Secretary-General of the International Maritime Organization has the honour to transmit herewith the text of a communication from the International Mobile Satellite Organization (IMSO).

2 The Secretary-General would be grateful if steps could be taken to bring this information to the attention of the appropriate authorities and other parties concerned.

ANNEX

IMSO



Mr Ki-Tack Lim
Secretary-General
International Maritime Organization
4 Albert Embankment
London SE1 7SR

IMSO/2018/GEN/009

9 May 2018

Dear Mr Secretary-General

MIGRATION OF THE RECOGNIZED GMDSS SERVICES FOR INMARSAT SATELLITES

I refer to the outcome of the 5th Session of the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR), inviting IMSO to provide further information to IMO, in a form suitable for circulation, on what will happen and what actions need to be taken by users of all types in respect of the major satellite migration plan being carried out by Inmarsat Global Ltd during 2018.

I should therefore be grateful, if your office could kindly circulate the annexed material on migration to all Member States.

Yours sincerely,



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ANNEX

**INFORMATION ON THE MIGRATION OF THE RECOGNIZED GMDSS SERVICES FROM
INMARSAT-3 TO INMARSAT-4 SATELLITES**

Inmarsat Global Limited (Inmarsat) provides Inmarsat C, SafetyNET and Fleet 77 services in the Global Maritime Distress and Safety System (GMDSS) over its mobile satellite communications network in accordance with decisions by the Maritime Safety Committee.

Inmarsat's public service obligations are overseen and reported on to the Maritime Safety Committee by the International Mobile Satellite Organization (IMSO) in accordance with the provisions of resolution A.1001(25) on *Criteria for the provision of mobile satellite communication systems in the Global Maritime Distress and Safety System*.

IMSO notified the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR), at its fifth session from 19 to 23 February 2018, that Inmarsat has developed a plan to migrate mobile satellite communication services, including the Inmarsat C, SafetyNET and Fleet 77 services, from the primary Inmarsat-3 satellites over to the Inmarsat-4 satellites, with the exception of the Inmarsat-3 F5 satellite, during 2018.

At the request of NCSR 5, the information contained in the annex on the Migration of the recognized GMDSS services from Inmarsat-3 to Inmarsat-4 satellites is brought to the attention of Member Governments and international organizations.

Annex

**MIGRATION OF THE RECOGNIZED GMDSS SERVICES
FROM INMARSAT-3 TO INMARSAT-4 SATELLITES**

1 Introduction

The Inmarsat-3 (I-3) satellite constellation will be approaching its end-of-life in the next few years. Inmarsat is committed to maintaining a number of services which currently are provided through the I-3 satellite constellation. These services must be migrated onto the Inmarsat-4 (I-4) satellites so as to ensure their continuity.

In order to perform an orderly migration of the recognized GMDSS services from I-3 satellites over to the I-4 satellites, while ensuring minimum or no interruption, the migration is programmed to take place during the course of 2018.

This document provides details on the migration of the current Inmarsat services provided for the GMDSS. It describes the impact of the migration and provides an overview on how to prepare for the migration.

Particular note should be taken of section 5, which describes the general consequences for terminals, and section 8 covering the actions required for terminals using data reporting and polling services.

Note: The term terminal or MES is used throughout the document to refer to Inmarsat C or Inmarsat mini-C mobile equipment.

2 Migration sequence and planning

The migration will take place in 4 steps, as listed below.

- Step 1: Move of AORW from the 3F5 satellite (54° W) to the 4F3 satellite (98° W).
- Step 2: Move of POR from the 3F3 satellite (78° E) to the 4F1 satellite (143.5° E).
- Step 3: Move of AORE from the 3F2 satellite (15.5° W) to the 3F5 satellite (54° W)
- Step 4: Move of IOR from the 3F1 satellite (64° E) to the AF1 satellite (25° E).

The resulting network configuration will consist of three I-4 satellites (4F1 (APAC), 4F3 (AMER) and AF1 (EMEA)) plus one I-3 satellite (3F5 (AORE)).

By the end of the migration, the coverage of the AORW, AORE, IOR and POR will have all moved in a westerly direction. In addition, the shape of the coverage area of the IOR will change, due to the non-standard coverage area of the I-4 AF1 (AlphaSat) satellite.

The figures below provide a graphical view on the changing coverage areas of the four ocean regions comprising the Inmarsat maritime services. The dashed contour is the coverage area before the migration and the solid contour is the coverage area after the migration. Appendix 3 shows the combined coverage of all ocean regions before and after migration.

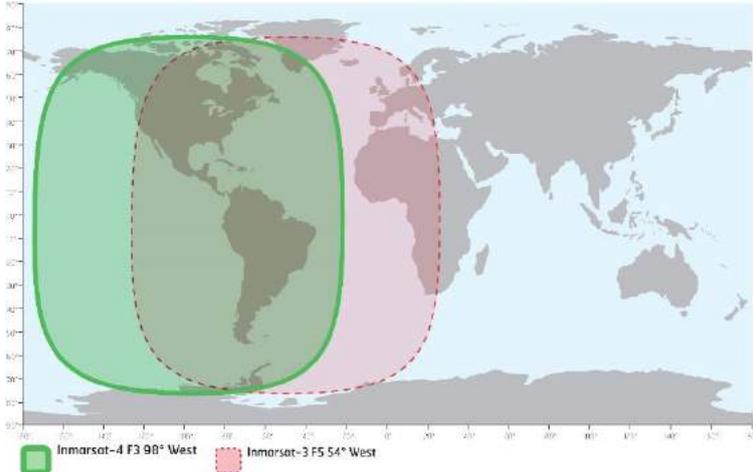


Figure 1: Step 1 – AORW migration

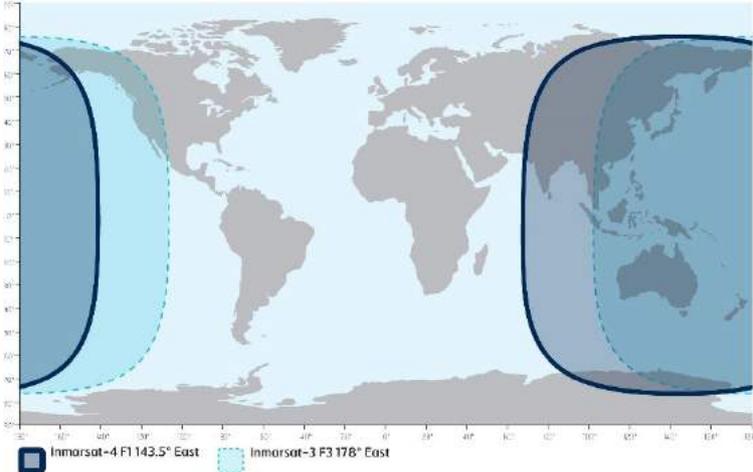


Figure 2: Step 2 – POR Migration

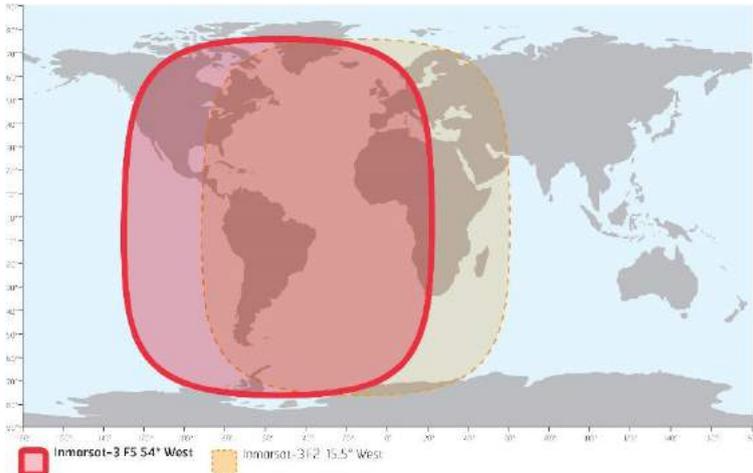


Figure 3: Step 3 – AORE Migration

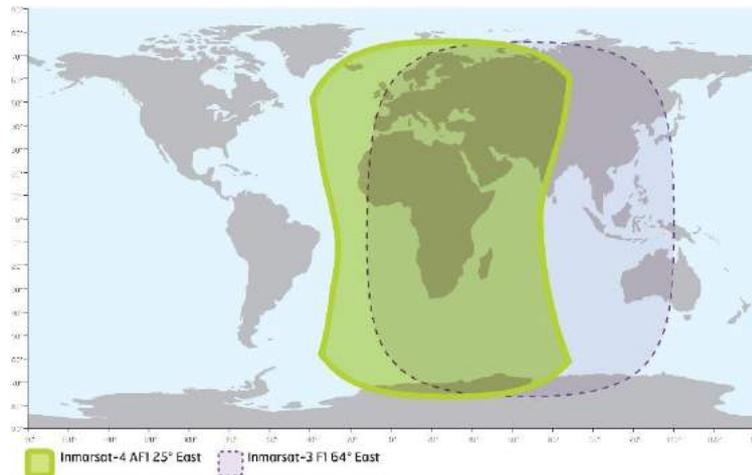


Figure 4: Step 4 - IOR Migration

2.1 Timetable

The figure below shows the planned timetable for the implementation of the migration. Each step is expected to require around three months in order to prepare, execute and verify.

Step 1 is scheduled to take place during May 2018, with the migration of Fleet 77, Swift 64 and Classic Aero services from the AORW I-3 satellite to the AMER I-4 satellite planned for **3 May at 17:30 UTC**, followed by the migration of Inmarsat C services on **9 May 2018 at 14:00 UTC**.

Dates for the additional steps will be confirmed and notified at least six weeks in advance by Inmarsat. Note that operational requirements may necessitate changes to this timetable.

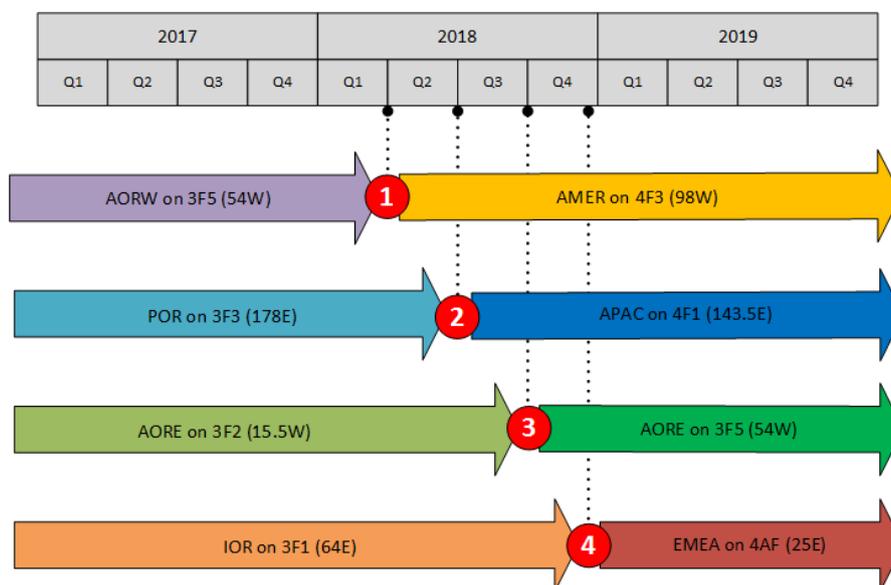


Figure 5: Migration timetable

3 Impact on Inmarsat C Land Earth Stations (LES)

As part of the migration preparation, Inmarsat and its partners have designed and implemented a new network architecture. The goal is to minimize the impact of the migration on the LES, its interface and the use of them by terrestrial users.

In the new optional network architecture, LES Operators (LESO) can share the radio equipment (e.g. antennas) located at the Inmarsat Network Coordination Station (NCS). The location (i.e. the LES) at which all the Inmarsat C messages are processed and where mailboxes reside does not change. The interface that users use to send messages to terminals or retrieve messages coming from terminals remains the same.

When using the shared radio resources, the ocean region associated with an LES will automatically move along with the migrating ocean region. The location of the LES and its terrestrial interfaces do not change. Figures 6 and 7 below depict how the current and the new shared network arrangements are organized. In the new situation, the LESOs will remotely access the shared radio equipment at the Inmarsat NCSs.

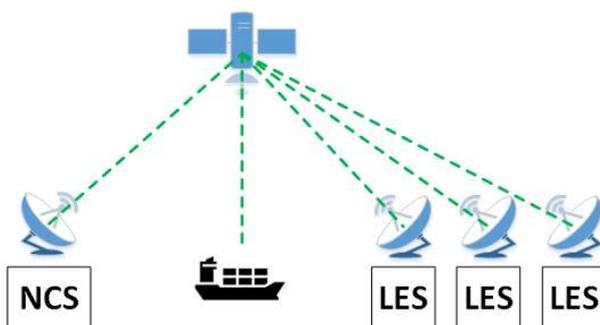


Figure 6: The current Inmarsat C network architecture

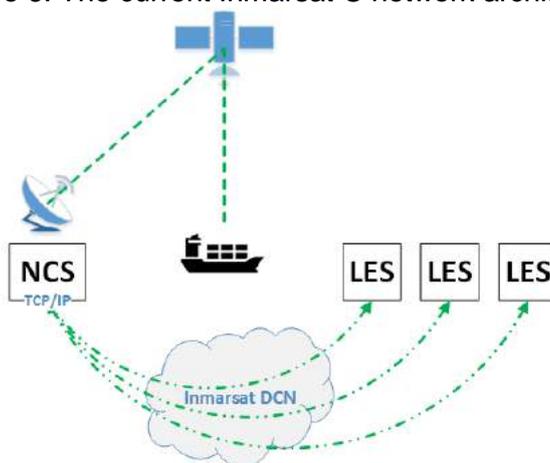


Figure 7: The new optional shared Inmarsat C network architecture

However, there will be some necessary changes to the network architecture, for instance, the NCS for the AORW will move from Burum in the Netherlands to Laurentides in Canada during the first step of the migration.

4 Impact on Inmarsat F Land Earth Stations (LESs)

During the migration of each ocean region, the geographical coverage will move westwards. As a consequence, some LESs may no longer be within the previously associated ocean region after migration, and will therefore no longer be able to exchange traffic directly with the terminals remaining in operation within the newly configured ocean region.

In many cases though, Inmarsat F LESOs have shared LES agreements that allow them to offer global service and, in this case, they will generally continue to offer service in all ocean regions during the migration. Users should confirm that their preferred LES will continue to offer service in the relevant ocean region during/after migration.

Inmarsat's LESs will continue to offer global Inmarsat F service throughout the migration. Inmarsat will also offer Shared LES facilities for Inmarsat F in any ocean region to any LESO who wishes to use them (subject to commercial agreement).

5 Migration impact on terminals

5.1 Inmarsat C and mini-C terminals

During normal operation, a terminal is "logged in" to an ocean region. When moving into the coverage of another ocean region, terminals may switch to this region automatically. GMDSS-approved terminals will provide an alarm when this occurs and require manual intervention to switch ocean regions (Log in).

As a result of the migration, ocean regions will shift westwards, and some terminals may then end up outside the previously selected ocean region, necessitating switching over and logging into a different ocean region appropriate to where the ship is located. GMDSS terminals will, in such cases, provide an alarm and require manual intervention.

Note: GMDSS certified terminals will always handle Distress Alerts, even if they are not logged in to an ocean region. See also section 7.

Mobile users operating in areas that will no longer be covered by the same ocean region after migration are encouraged to switch the terminal to another region before the migration occurs.

Figures 8 to 11 below provide a graphical overview of the areas that will no longer be covered by the "migrating ocean region".

For instance, in the case of the AORW migration, the crescent shaped area depicted in Figure 8 below (roughly between 24° East and 20° West on the lower latitudes) will no longer be part of the AORW ocean region. Mobile users about to be affected like this are advised to switch to the AORE ocean region before the migration takes place.

Note: Switching a terminal to another ocean region may have consequences for data reporting and polling. See section 8 for more information.

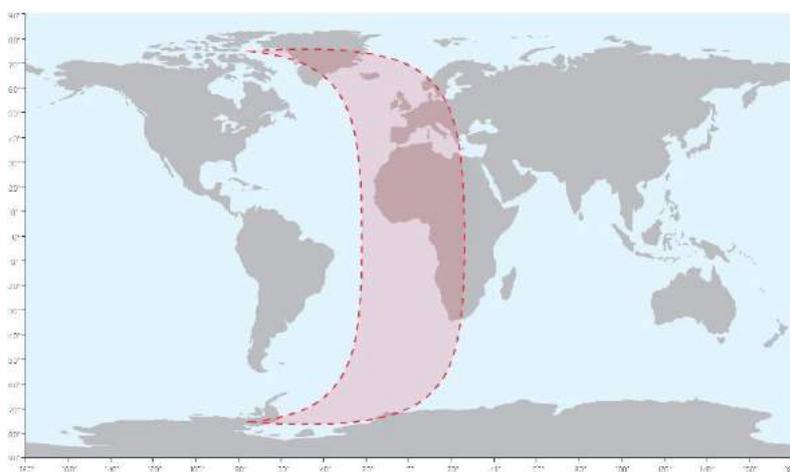


Figure 8: Area out of ocean region coverage after migration step 1

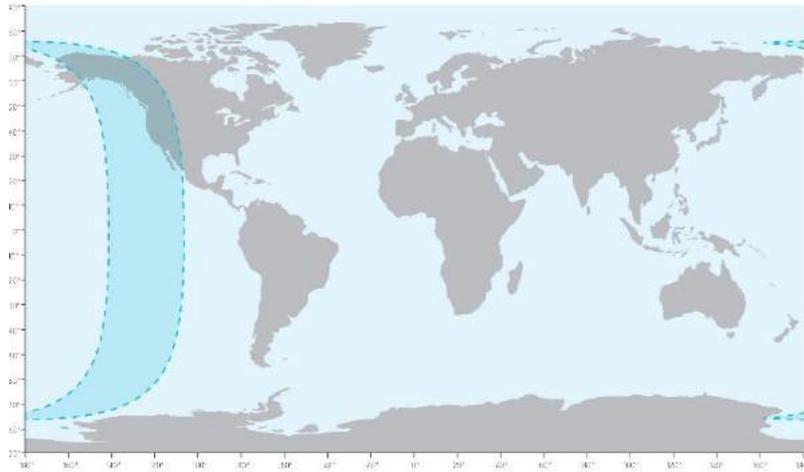


Figure 9: Area out of ocean region coverage after migration step 2

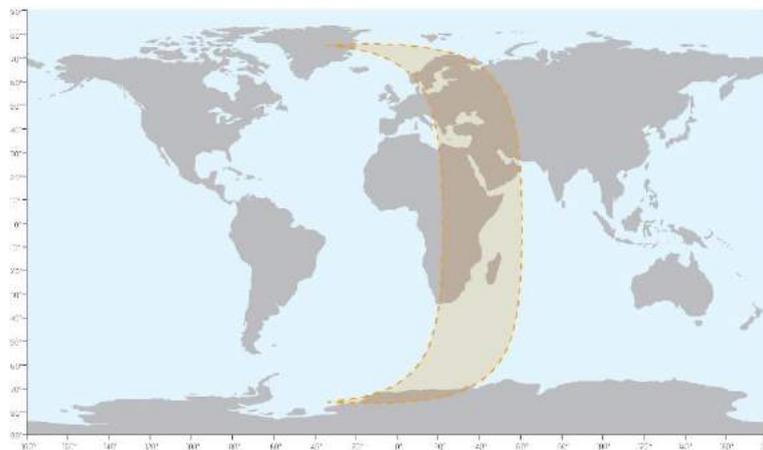


Figure 10: Area out of ocean region coverage after migration step 3

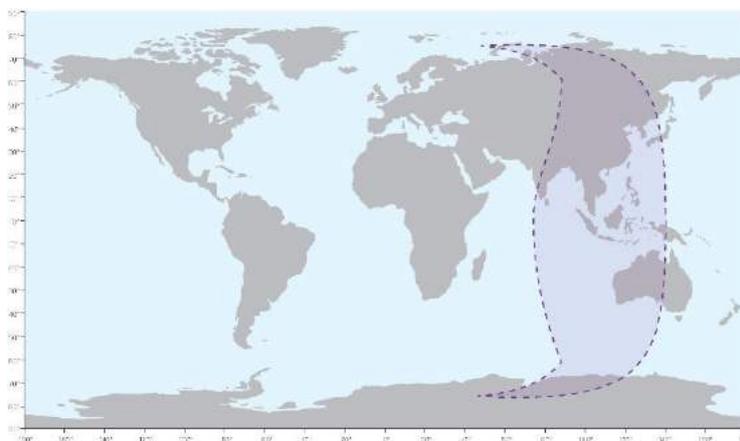


Figure 11: Area out of ocean region coverage after migration step 4

5.2 Inmarsat F terminal

Inmarsat F terminals currently operate in all ocean regions without limitation. During the migration, the satellite coverage area will change, but the network configuration will not change. In other words, the ocean region ID and signalling channels will remain the same.

During the migration, any Inmarsat F terminal that is located in an area that falls within the coverage of the relevant I-4 satellite will continue to operate normally (there will be a short period during the handover when the terminal will lose connection). As a result of the westward movement of the ocean regions during the migration, some terminals will end up outside their previously selected ocean region following a migration step. Terminals in this situation will lose their connection to the network and will need to select a different ocean region.

Mobile users should therefore be aware that they may need to select a new ocean region manually once the I-3 region is migrated onto the I-4 satellite. Some Inmarsat F terminals will select another region automatically; users should consult the terminal manual or the terminal manufacturer for more information.

In the worst case, if the location of the I-4 satellite is not known by the terminal, it may be necessary to perform a "sky search", where the terminal searches for the satellite – this can be a lengthy process. Where possible, users should select a different ocean region prior to the migration to avoid this situation and then switch to the appropriate ocean region configuration once the migration has been completed.

5.3 Terminals under Inmarsat Service Provider (ISP) arrangement

Special attention is needed where terminals are limited in their choice of LES. This is the case if terminals are locked-in by an "ISP arrangement". Terminal owners should review their commercial arrangements with their provider to determine if this is the case.

For the first step of the migration (AORW), all LESOs that currently provide services in that ocean region will continue to do so after migration. There will no impact on "Locked-in" terminals.

6 SafetyNET and SafetyNET II services

SafetyNET is the international service for the broadcasting and automatic reception of Maritime Safety Information (MSI), navigational and meteorological warnings, meteorological forecasts, Search and Rescue (SAR) information and other urgent safety-related messages via the Enhanced Group Call (EGC) system. The message-selection features of EGC receivers enable mariners to receive safety information broadcasts that are tailored to their particular needs.

SafetyNET services fulfil an integral role in the Global Maritime Distress and Safety System (GMDSS), developed by the International Maritime Organization (IMO) and incorporated into the 1988 amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. The capability to receive SafetyNET information is mandatory for ships to which the Convention applies.

The SafetyNET II system has been noted by NCSR 5 as an enhancement of the SafetyNET service, within the EGC system.

MSI or SAR information is promulgated by officially registered information providers, whose Certificates of Authorization to broadcast via the SafetyNET service are issued by IMO in accordance with the procedures in annex 2 of the International SafetyNET Manual, and which have an agreement with one or more LES(s) for providing SafetyNET services. Registered information providers include, for example:

- NAVAREA Coordinators: for NAVAREA warnings and other urgent safety-related information;
- National Coordinators: for coastal warnings and other urgent safety-related information;
- METAREA Coordinators: for meteorological warnings and forecasts; and
- Rescue Coordination Centres: for shore-to-ship distress alerts, SAR information and other urgent safety-related information.

Registered information providers are able to direct a message to a given geographical area. The area may be fixed, as in the case of a NAVAREA/METAREA, or to a coastal warning area; or it may be a user-defined area (circular or rectangular). The information collection process is different with SafetyNET II, where messages are submitted by registered information providers via a secure web interface to the Inmarsat network. Mariners will receive the MSI messages automatically on their Inmarsat C or mini-C terminals, and always free of charge.

6.1 What will change on the terminal side?

The migration will not affect mariners receiving MSI as the Inmarsat C and mini-C terminals will not be affected provided the terminal is logged in to the appropriate ocean region. Mariners can continue to select the NAVAREA and METAREA regions from which they want to receive MSI. Under strict supervision of the International Mobile Satellite Organization (IMSO), the Inmarsat Safety Team will closely monitor the migration ensuring that the required 99.9% service availability level is maintained.

Note: See section 5 for the general consequences for terminals.

6.2 What will change on the terrestrial side ?

EGC messages include instructions to the LES for processing MSI in the form of a special address header based on "C codes" that, among other things, will ensure that messages will be delivered correctly to the intended geographical area. During the migration, registered information providers that broadcast EGC messages over the SafetyNET system, may have to adjust C-codes to the applicable ocean region in order to ensure that all messages are broadcast over the correct satellites to their area of responsibility.

It is strongly recommended that all registered information providers that currently use SafetyNET for broadcasting EGC messages, contact their current LESO to request confirmation that they can continue to cover their NAV/METAREA or area of responsibility, during and after the migration process. For those cases where an LESO can no longer broadcast to all the required areas, a list of alternative LESOs is given in appendix 2.

Alternatively, any registered information provider for SafetyNET can request access to the SafetyNET II system from Inmarsat (via maritime.safety@inmarsat.com), which will then internally manage the migration process with no further intervention required. Otherwise, registration for SafetyNET II requires a "Certificate of Authorization to Participate in the International SafetyNET Service" from the International SafetyNET Coordinating Panel.

The International SafetyNET Co-ordinating Panel will provide advice as necessary on any further actions required on maintaining services as the migration steps proceed.

7 Distress Alerting

The Distress Alerting service for GMDSS **will not change** and is not impacted by the migration. Alerts will continue to be handled by the LESs in each region and automatically routed, with the highest priority, to the associated Maritime Rescue Coordination Centre (MRCC).

Please note that GMDSS certified terminals will always handle Distress alerts, even if they are not logged in to an ocean region.

7.1 Distress and Safety Services on Inmarsat F network

Distress and Safety services provided through the Inmarsat F network will continue to operate normally as the migration proceeds; however, to avoid a temporary interruption in service during a migration step, users should, if necessary, select an alternative ocean region prior to the start of a migration step affecting them.

After each step of the migration, users should review their terminal settings in order to ensure they are correct. In particular, users should check that they have entered the correct Distress Backup LES on their terminals – refer to the terminal instruction manual for more information.

Distress Backup LES settings on the Inmarsat F terminal should be as follows:

Step	OR 0 (AORW)	OR 1 (AORE)	OR 2 (POR)	OR 3 (IOR)
0	Southbury (001)	Southbury (001)	Santa Paula (001)	Burum (012)
1	Paumalu (012)	Southbury (001)	Santa Paula (001)	Burum (012)
2	Paumalu (012)	Southbury (001)	Perth (022)	Burum (012)
3	Paumalu (012)	Southbury (001)	Perth (022)	Burum (012)
4	Paumalu (012)	Southbury (001)	Perth (022)	Burum (012)

8 Data Reporting & Polling

8.1 Data Reporting

The Data Reporting service is an optional service of Inmarsat C. The terminal is enabled/set-up to send small amounts of information (from either the terminal itself or a peripheral item of equipment) to a predefined address.

In order to have the terminal provide Data Reports, a terminal must be part of a closed user group, identified by a Data Network Identifier or DNID. The closed user group is defined by the LES ID and the ocean region. As a member of the Closed User Group each terminal in that group is assigned a member number.

The most widely used form of Data Reporting is for position reporting. The Positioning Reporting Service uses the Data Reporting protocols to send information about the position (latitude-longitude) together with optional information, such as course, speed, time stamps and Macro Encoded Messages, on to a terrestrial address. The Position Reporting service is used for example by Vessel Monitoring Systems (VMS), Long Range Identification and Tracking (LRIT) and other applications.

The transmission of a Data Report can be the result of:

- a) a single (interrogation) command;
- b) the result of a program to send reports at regular intervals that is stored in the terminal memory; or
- c) the result of a particular trigger event.

In each of these cases the terminal will construct a Data Report and transmit it to the relevant LES. Depending on the configuration in the LES, the information is either forwarded immediately or at intervals to a pre-configured destination, or stored for retrieval.

To transmit a Data Report, the Inmarsat C terminal should have the Data Network ID (DNID), member number and ocean region downloaded using the polling command. All three are stored in the terminal's memory.

8.2 Polling

With the Polling service, commands and instructions can be sent by an authorized terrestrial user to an individual Inmarsat C terminal, an entire closed user group (identified by the DNID) or a group of DNID members that are in a given geographical area. Polling is generally used to:

- Include a terminal in a closed user group, by downloading a DNID and member number to a terminal in an ocean region (Multi Ocean Region Polling allows this action for all ocean regions supported for a DNID by the LES); support of this feature depends on terminal make/model and software version.
- Remove a terminal from a closed user group.
- Instruct a terminal or a group of terminals to send a position report immediately.
- Program a terminal or a group of terminals to regularly send reports with a defined interval.
- Instruct a terminal or a group of terminals to start reporting.
- Instruct a terminal or a group of terminals to stop reporting.

For many poll commands, the originator of the poll will have to indicate in which ocean region the poll needs to be transmitted.

8.3 What will change on the terminal side?

The DNIDs are stored in the terminals memory on a per ocean region basis. An active terminal is always "logged" into one of the four ocean regions. Its data reporting behaviour is based on the DNIDs and associated parameters configured for that ocean region. A particular DNID configuration may not be present in the terminals for all ocean regions and the data reporting behaviour may differ per ocean region.

Since the ocean regions will move in a westerly direction during the migration, a terminal logged into the migrating ocean region may find itself outside that ocean region after the migration step completes and must then log into an appropriate ocean region. Consequently, if a terminal is not configured correctly for the ocean region in which it has to operate after a migration step, the terminal may stop sending out reports or do so at incorrect times.

Note: See section 5 for the general consequences for terminals.

8.4 What will change on the terrestrial side?

On the shore side, nothing will change. Data Reports will continue to be delivered according to the DNID configuration of the ocean region in which the terminal resides (provided the terminal is logged in to the ocean region). Also, for sending polls to the terminals, no changes are expected.

If large amounts of polls from multiple LESOs need to be transmitted immediately after the migration, the polls will be queued by the NCS and handled in sequential order; this may cause some delay.

8.5 How to prepare?

The following measures can be taken to ensure that the data-reporting and polling function of a terminal will continue:

- If possible, change ocean region before migration. Make sure that the terminal is logged in to an ocean region after migration. See section 5 for details. If necessary, reboot or power-cycle the terminals after the migration.
- Check for all the terminals in the DNID user group that the terminal is configured with the DNID and associated parameters for all ocean regions. This can best be done before the first step in the migration.
- If required, download the DNID and its parameters for all ocean regions by using a Multi Ocean Region Poll (MORP) command. This can best be done before the first step in the migration.
- Older terminals, pre-2005, may not support the MORP. In this case the DNID programming needs to take place after the terminal has changed its ocean region.
- If necessary, DNID (re-)programming commands are best issued in sequence **stop reporting – program reporting – initiate reporting** individually or group-wise.
- A terminal's DNID configuration can be updated remotely using specified poll messages.
- Inmarsat's retail customers may use the DNID Management tool to download and manage DNID configuration. More information can be obtained from Inmarsat representatives.

8.6 What to do after migration?

Mobile users should ensure the terminal is working correctly. Users may want to check their terminal is logged in to an ocean region. As a precaution, terminal users can reboot their terminals after migration or enforce an ocean region log in.

Users of the data reporting and polling service should ensure that the terminals do indeed continue to send their Data Reports, and at the correct times. If recipients of the Data Reports detect that a terminal is no longer sending reports properly, it may need to be re-programmed with the DNID and its parameters.

9 Impact on LRIT, VMS and SSAS services

LRIT and VMS are applications that use data reporting and polling service to monitor the position and movement of terminals (on board vessels). As such all the implications discussed in section 8 are applicable.

The Ship Security Alert System (SSAS) is a covert alerting application that resides in terminals that support SSAS. It is based around a number of pre-configured destinations, to which an alert can be sent. The application uses Inmarsat C messaging with normal priority. To the Inmarsat C network SSAS messages appear as standard store-and-forward messages. The terminal needs to be logged in to an ocean region for sending SSAS messages.

Appendix 1

Acronyms

The acronyms shown below are used in this document.

Acronym	Meaning
AMER	Americas Ocean Region
AORE	Atlantic East Ocean Region
AORW	Atlantic West Ocean Region
APAC	Asia/Pacific Ocean Region
DNID	Data Network Identifier
EGC	Enhanced Group Call
EMEA	Europe/Middle East Ocean Region
GMDSS	Global Maritime Distress and Safety System
IMO	International Maritime Organization
IOR	Indian Ocean Region
LES	Land Earth Station
LESO	Land Earth Station Operator
LRIT	Long Range Identification and Tracking
MEAS	Middle East/Asia Ocean Region
MES	Mobile Earth Station (also commonly referred to as a "terminal")
METAREA	A geographical sea area established for coordinating the broadcast of marine meteorological information
MRCC	Maritime Rescue Coordination Centre
MSI	Maritime Safety Information
NAVAREA	A geographical sea area established for coordinating the broadcast of navigational warnings
NCS	Network Coordination Station
POR	Pacific Ocean Region
SAR	Search and Rescue
SSAS	Ship Security Alert System
VMS	Vessel Monitoring System

Appendix 2
LESO information

LESO pre-migration:

LES within 15.5W (AORE)	LES within 54W (AORW)	LES within 178E (POR)	LES within 64E (IOR)
Burum*	Burum*	Burum*	Burum*
Southbury *	Aussaguel*	Southbury *	Southbury *
Aussaguel*	Yamaguchi*	Aussaguel*	Aussaguel*
Yamaguchi *	Southbury*	Yamaguchi *	Yamaguchi *
Fucino*		Auckland	Fucino
Eik		Beijing	Hai Phong
		Nakhodka	Beijing
		Perth*	Nudol
		Santa Paula	Pune
			Eik

Table 1: LESO serving ocean regions pre migration

* LESOs marked with * are global and can broadcast over all 4 satellites

LESO post-migration:

LES within 54W (AORE)	LES within 98W (AORW)	LES within 143.5E (POR)	LES within 25E (IOR)
Burum*	Burum*	Burum*	Burum*
Southbury*	Southbury*	Southbury*	Southbury*
Aussaguel*	Aussaguel*	Aussaguel*	Aussaguel*
Yamaguchi *	Yamaguchi *	Yamaguchi *	Yamaguchi *
Fucino*	Fucino*	Fucino*	Fucino*
Perth*	Perth*	Perth*	Perth*
Eik	Santa Paula	Beijing	Beijing
		Hai Phong	Nudol
		Nakhodka	Eik
		Santa Paula	

Table 2: LESO serving ocean regions post migration

* LESOs marked with * are global and can broadcast over all four satellites

Appendix 3 Ocean region coverage areas

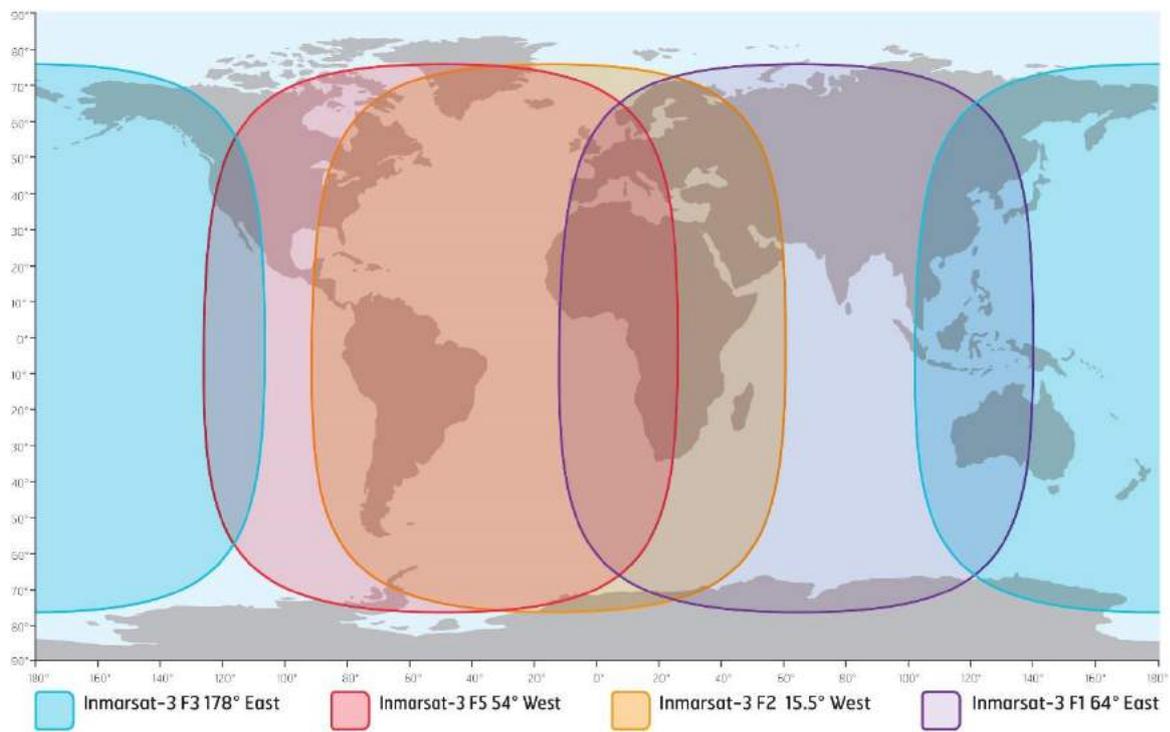


Figure 12: Ocean region coverage areas before migration

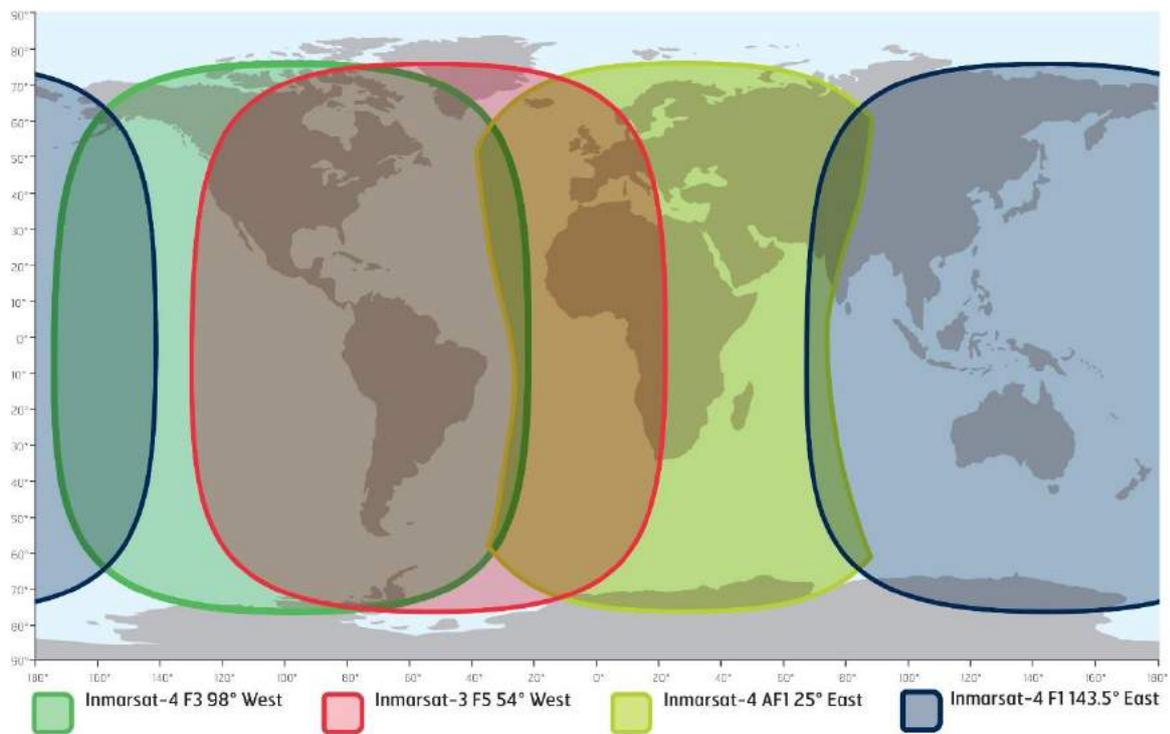


Figure 13: Ocean region coverage areas after complete migration

