

Ad Hoc LRIT Group  
8th session  
Agenda item 4

MSC/Ad Hoc LRIT 8/4  
8 February 2010  
ENGLISH ONLY

**CONSIDERATION OF ISSUES RELATING TO  
THE SURVEY AND CERTIFICATION OF SHIPS,  
INCLUDING MATTERS RELATING TO THE TESTING  
AND FUNCTIONING OF SHIPBORNE EQUIPMENT**

**Information on Arctic LRIT Trials conducted by Canada**

**Submitted by Canada**

**SUMMARY**

<b><i>Executive summary:</i></b>	This document provides information on trials conducted by Canada on Canadian ice patrol vessels to compare the relative performance of the Inmarsat Geostationary satellite technology with that of Iridium Low Earth Orbit at high latitudes
<b><i>Strategic direction:</i></b>	No related provisions
<b><i>High-level action:</i></b>	No related provisions
<b><i>Planned output:</i></b>	No related provisions
<b><i>Action to be taken:</i></b>	Paragraph 8
<b><i>Related documents:</i></b>	MSC.1/Circ.1307

**Introduction**

1 Canada conducted a trial between the end of July 2009 and the beginning of November 2009 using three Government of Canada vessels to compare the relative performance of the Inmarsat Geostationary satellite technology with that of Iridium Low Earth Orbit at high latitudes. The objective of the trial was to determine the preferred terminal solution for vessels that travel in the high Arctic.

**Background**

2 For the purposes of the trial, three Canadian Coast Guard ice patrol vessels were fitted with Inmarsat SkyWave IsatM2M DMR-800LRIT transceivers and Iridium EMA BlueTraker LRIT transceivers. In addition, the existing Inmarsat C Thrane & Thrane transceivers already installed on the vessels were tested in a similar manner. It should be noted that the existing transceiver installed on all three vessels (TT H2095B) is relatively old and is not recommended by the manufacturer for applications where reliable position reporting is a requirement. It is not envisaged that the issues experienced with these transceivers would be experienced with more modern equipment.

3 Being geostationary there is a physical limit to the northerly satellite view of the Inmarsat constellation (~76 degrees) while the Iridium constellation being of a Low Earth Orbit nature suffers no such limitation. The latitudes covered by the vessels during the course of the trial ranged between 44°N to over 84°N. During the course of the trial all transceivers were configured to report every 60 minutes (24 x per day).

4 As expected, at lower latitudes all three types of transceiver performed consistently well, occasionally under or over reporting within expected tolerances.

5 At higher latitudes the Inmarsat transceivers, while still reporting periodically, showed significant degradation in their reporting frequency, while the Iridium transceivers exhibited similar performance to that shown at lower latitudes. While the IsatM2M transceiver continued to report at higher latitudes, the number of position reports received per day was far less consistent than the Iridium transceiver.

6 In general the transceivers performed in line with expectations. The IsatM2M transceivers did report at surprisingly high latitudes with one vessel reporting reasonably reliably at between 80°N and 81°N during the period 11 August 2009 to 22 August 2009 and another sending a position report from 84°N on the 28 August 2009. However, as has been demonstrated, the IsatM2M transceivers were consistently less reliable than the Iridium transceivers at latitudes above 76°N.

7 The general conclusion is that at latitudes above 76°N, Iridium would be the preferred solution.

#### **Action requested of the Group**

8 The Group is invited to note the above information.

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## ANNEX

## CANADIAN COAST GUARD LRIT ARCTIC TRIAL REPORT

**Introduction**Objective

The objective of the trial was to compare the relative performance of the Inmarsat Geostationary (GEOS) satellite technology with that of Iridium Low Earth Orbit (LEO) at high latitudes. For the purposes of the trial three Canadian Coast Guard ice patrol vessels were fitted with Inmarsat SkyWave IsatM2M DMR-800LRIT transceivers and Iridium EMA BlueTraker LRIT transceivers. In addition the existing Inmarsat C Thrane & Thrane transceivers already installed on the vessels were tested in a similar manner.

**Scope**Equipment used for trial

The equipment trialled on the three vessels (*CCGS Henry Larsen*, *CCGS Louis St Laurent* and *CCGS Terry Fox*) was as follows:

***CCGS Henry Larsen***

Inmarsat-C – Thrane & Thrane TT-H2095B s/n 431601330  
IsatM2M – SkyWave DMR-800LRIT s/n DCC00120EEAF9  
Iridium – EMA BlueTraker LRIT s/n 12066810

***CCGS Louis St Laurent***

Inmarsat-C – Thrane & Thrane TT-H2095B s/n 4431616510  
IsatM2M – SkyWave DMR-800LRIT s/n DCC01243C7D6  
Iridium – EMA BlueTraker LRIT s/n 12740660

***CCGS Terry Fox***

Inmarsat-C – Thrane & Thrane TT-H2095B s/n 431612220  
IsatM2M – SkyWave DMR-800LRIT s/n DCC01284753A  
Iridium – EMA BlueTraker LRIT s/n 12062810

Trial period

The trial took place between the end of July 2009 and the beginning of November 2009.

**General comments regarding the equipment performance**Inmarsat-C

All three Inmarsat-C transceivers experienced occasional issues with reporting which resulted in the transceivers having to be re-started. However the equipment installed on all three vessels (TT H2095B) is relatively old and is not recommended by the manufacturer for applications where reliable position reporting is a requirement. It is not envisaged that such issues would be experienced with more modern equipment.

## IsatM2M

All three IsatM2M transceivers performed reliably throughout the course of the trial.

## Iridium

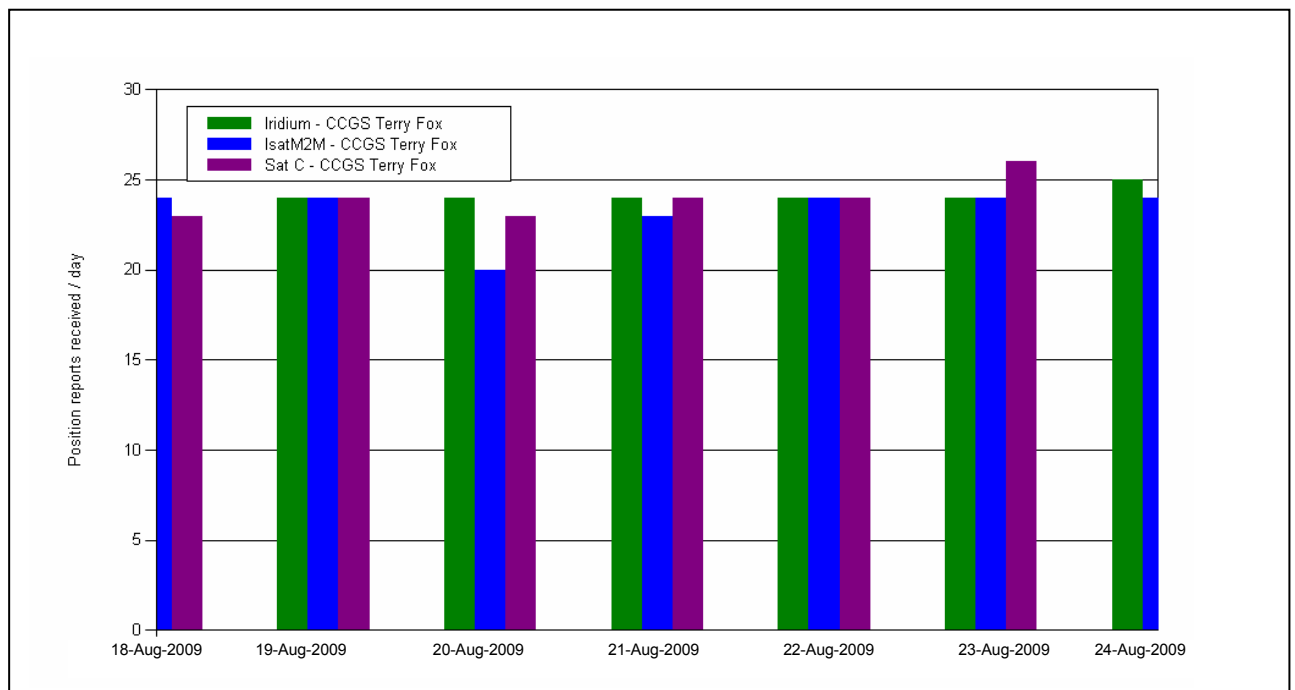
The Iridium transceivers installed on the *CCGS Louis St Laurent* and the *CCGS Terry Fox* performed reliably throughout the course of the trial. However several problems were encountered on the *CCGS Henry Larsen* which resulted in the equipment having to be replaced on two occasions. As a result Iridium data from the *CCGS Henry Larsen* has not been considered as part of this analysis.

## Expected performance during the course of the trial

Being geostationary there is a physical limit to the northerly satellite view of the Inmarsat constellation (~76 degrees) while the Iridium constellation being of a Low Earth Orbit nature suffers no such limitation. The latitudes covered by the vessels during the course of the trial ranged between 44°N to over 84°N. During the course of the trial all transceivers were configured to report every 60 minutes (24 x per day).

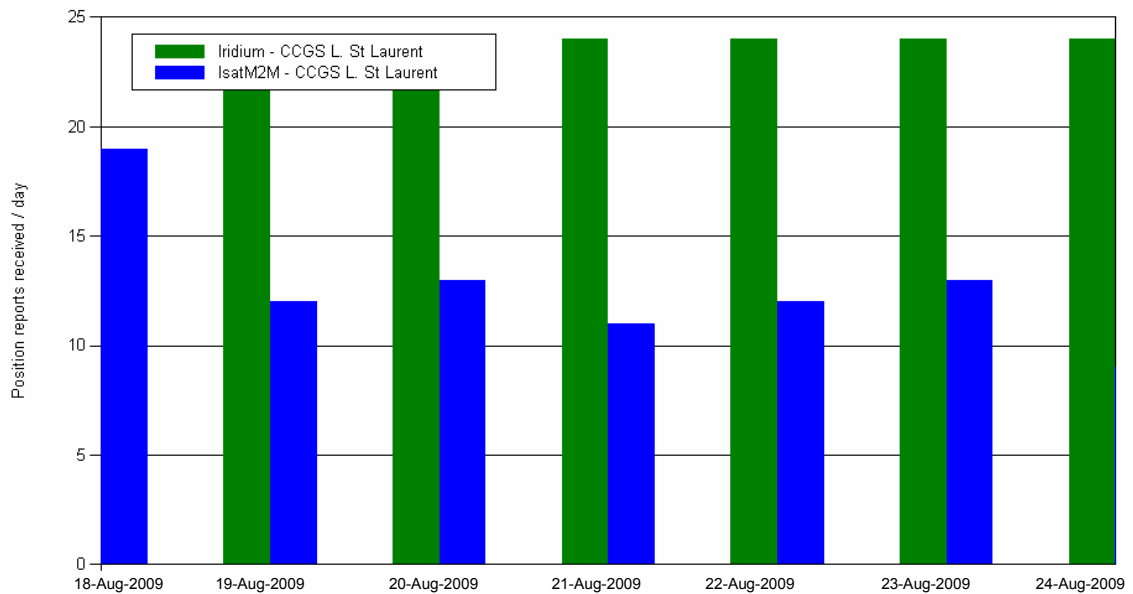
## **Comparative performance at lower latitudes**

At lower latitudes all three types of transceiver performed consistently well, occasionally under or over reporting within expected tolerances. The following chart shows the number of position reports received from the *CCGS Terry Fox* during the period 18 August 2009 to 24 August 2009, during which the vessel was operating at around 74°N.

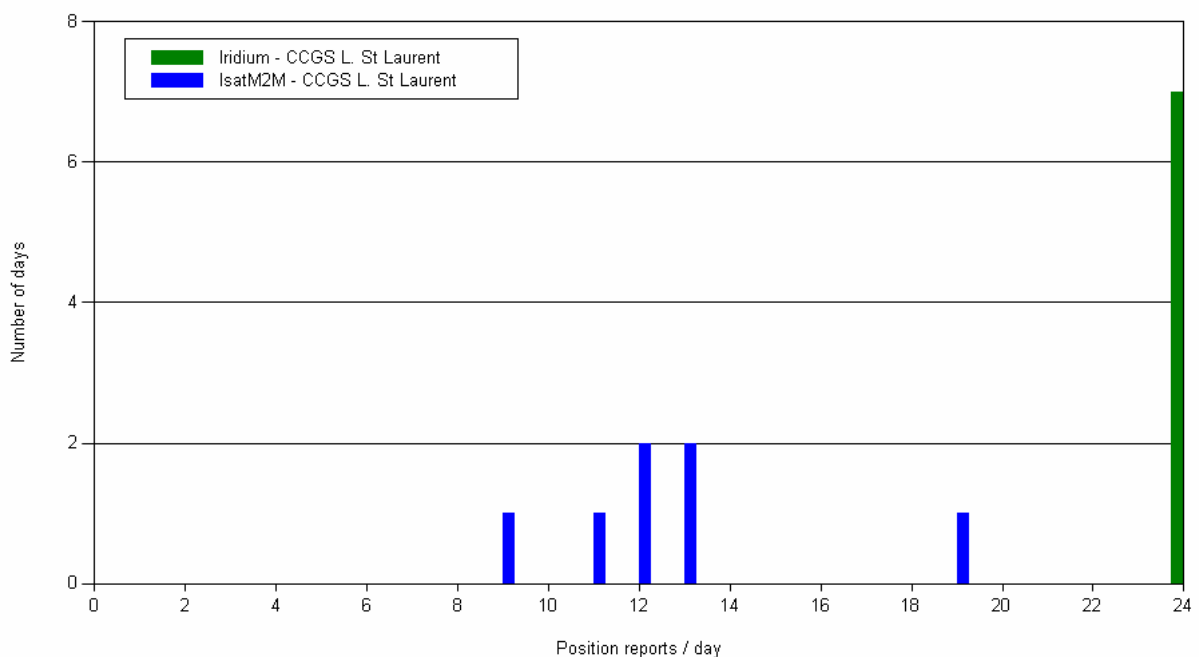


### Comparative performance at higher latitudes

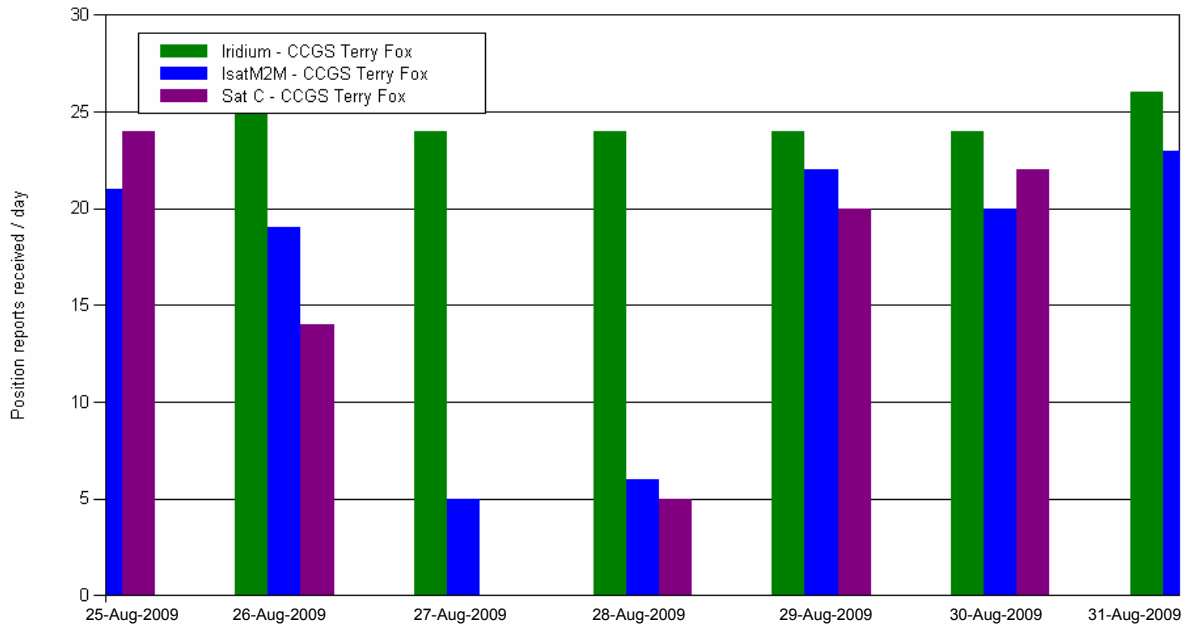
At higher latitudes the Inmarsat transceivers, while still reporting periodically, showed significant degradation in their reporting frequency, while the Iridium transceivers exhibited similar performance to that shown at lower latitudes. The following chart shows the number of position reports received from the *CCGS Louis St Laurent* during the period 19 August 2009 to 25 August 2009, during which the vessel was operating at between 80°N and 81°N.



The following chart further illustrates the fact that while the IsatM2M transceiver continued to report at these latitudes, the number of position reports received per day was far less consistent than the Iridium transceiver.



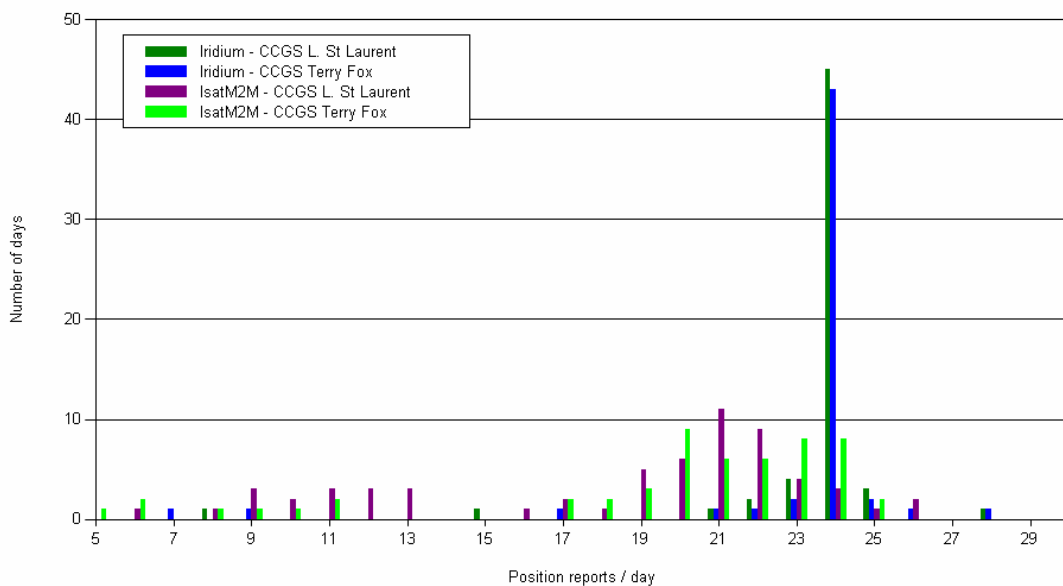
Similar behaviour can be observed from the three transceivers on board the *CCGS Terry Fox*. The following chart shows the number of position reports received from the *CCGS Terry Fox* during the period 25 August 2009 to 31 August 2009, during which the vessel travelled from 76°N on the 25 August 2009 up to a latitude of almost 80°N on the 27 August 2009, returning to 73°N on the 31 August 2009.



This chart demonstrates the reduction in reporting frequency of the Inmarsat transceivers at latitudes above 76°N.

**Overall performance of units throughout the period of the test**

The following chart shows the overall performance of the Iridium and IsatM2M transceivers on the *CCGS Louis St Laurent* and the *CCGS Terry Fox* during the months of August and September. During this period the *CCGS Louis St Laurent* spent around 50% of the time above 76°N while the *CCGS Terry Fox* spent around 10% of the time above this latitude.



This chart gives a good overview of the trial with the Iridium transceivers clearly demonstrating greater consistency of reporting. The fact that the IsatM2M transceiver on the *CCGS Terry Fox* sent proportionally more reports in the 20-24 per day range than the IsatM2M unit on the *CCGS Louis St Laurent* is indicative of the fact that this vessel spent a greater proportion of the trial at lower latitudes.

### Controlled tests

Towards the end of the trial period further tests were conducted to check the responsiveness of the transceivers to various changes of state commands – Poll, Stop and Change of Reporting Frequency. These tests are summarized in the following table.

Network	Vessel	Poll	Y/N	15 Minute Int.	Y/N	Stop	Y/N	120 Minute Interval	Y/N
Iridium	L. St. Laurent	08/10/2009 09:28	Y	08/10/2009 10:00	Y	09/10/2009 09:14	Y	15/10/2009 10:14	Y
	Terry Fox	08/10/2009 09:32	Y	08/10/2009 10:04	Y	09/10/2009 09:16	Y	13/10/2009 12:04	Y
IsatM2M	Henry Larsen	08/10/2009 10:08	Y	08/10/2009 13:10	Y	09/10/2009 10:22	Y	13/10/2009 17:08	Y
	L. St. Laurent	08/10/2009 09:33	Y	08/10/2009 11:52	Y	09/10/2009 10:22	Y	12/10/2009 13:24	Y
	Terry Fox	08/10/2009 09:59	Y	08/10/2009 12:36	Y	09/10/2009 10:22	Y	12/10/2009 13:24	Y
Inmarsat C	Henry Larsen	08/10/2009 10:59	Y	08/10/2009 11:19	Y	09/10/2009 09:02	Y	12/10/2009 12:12	Y
	L. St. Laurent	08/10/2009 10:24	Y	08/10/2009 14:02	Y	09/10/2009 09:00	Y	12/10/2009 12:14	Y
	Terry Fox	08/10/2009 10:26	Y	08/10/2009 12:38	Y	09/10/2009 09:14	Y	12/10/2009 12:14	Y

Network	Vessel	Poll	Y/N	15 Minute Int.	Y/N	Stop	Y/N	60 Minute Interval	Y/N
Iridium	L. St. Laurent	15/10/2009 08:44	Y	16/10/2009 17:00	Y	19/10/2009 12:58	Y	22/10/2009 14:14	Y
	Terry Fox	15/10/2009 15:00	Y	16/10/2009 17:20	Y	19/10/2009 12:58	Y	21/10/2009 19:04	Y
IsatM2M	Henry Larsen	15/10/2009 09:21	Y	16/10/2009 17:02	Y	20/10/2009 08:53	Y	21/10/2009 15:42	Y
	L. St. Laurent	14/10/2009 15:48	Y	16/10/2009 17:03	Y	20/10/2009 08:58	Y	21/10/2009 15:43	Y
	Terry Fox	14/10/2009 15:49	Y	16/10/2009 17:02	Y	20/10/2009 08:58	Y	21/10/2009 15:44	Y
Inmarsat C	Henry Larsen	14/10/2009 14:38	Y	16/10/2009 09:50	Y	19/10/2009 14:08	Y	21/10/2009 12:46	N*
	L. St. Laurent	14/10/2009 14:34	Y	16/10/2009 15:38	Y	19/10/2009 14:10	Y	21/10/2009 12:47	Y
	Terry Fox	14/10/2009 14:34	Y	16/10/2009 15:38	Y	19/10/2009 12:16	Y	21/10/2009 12:47	N*

N\* – The Inmarsat C transceivers on board the Henry Larsen and Terry Fox did not respond towards the end of the controlled tests due to the vessels having returned to port and the transceivers either suffering from blockage or being switched off.

During the course of these tests the location of the vessels was as follows:

*CCGS Henry Larsen*: Operating between 68°N and 77°N.

*CCGS Louis St Laurent*: Operating between 48°N and 72°N.

*CCGS Terry Fox*: In port at 76°33'N.

During the course of the controlled tests the vessels reported within the parameters that would be expected. As these tests were conducted towards the end of the trial period the vessels were generally operating below 76°N. While a degree of consistency was attempted to be maintained this proved difficult on occasions due to the disparate nature of the networks and communication protocols employed. It is reasonable to conclude that had the vessels been operating north of 76°N the Inmarsat equipment would have suffered forward packet loss in line with the periodic reporting observed at these latitudes during the course of the trial.

### Summary and Conclusions

In general the transceivers performed in line with expectations. The IsatM2M transceivers did report at surprisingly high latitudes with the *CCGS Henry Larsen* reporting reasonably reliably at between 80°N and 81°N during the period 11 August 2009 to 22 August 2009 and the *CCGS Louis St Laurent* sending a position report from 84°N on the 28 August 2009. However, as has been demonstrated, the IsatM2M transceivers were consistently less reliable than the Iridium transceivers at latitudes above 76°N.

The general conclusion is that at latitudes above 76°N, Iridium would be the preferred solution.



Track of the *CCGS Louis St. Laurent* up to 84°N using Iridium