Mag Fdir

Report

The Norwegian Trials - 1996 / 97

NAFO Satellite Pilot Project

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At their 1995 Annual Meeting, the parties to the Northwest Atlantic Fisheries Organisation (NAFO) agreed to carry out a Pilot Project on the use of satellite systems to improve compliance with the conservation measures within the NAFO Regulatory Area during 1996/ 1997. This is a report on the trials of the Norwegian party, covering the period from January 1996 up to and including August 1997. The report has been produced in time for the 1997 NAFO Annual Meeting.

A total of 23 vessels equipped with satellite tracking units had been commissioned by the Norwegian party by the end of 1996, of which 15 had by then participated in the fisheries for shrimp at Flemish Cap, within the Regulatory Area.

By the end of August only 2 Norwegian vessels have participated in the Flemish Cap shrimp fishery in 1997.

During the 1996 trials 42 782 position reports were received by the Directorate of Fisheries from within the NAFO Convention Area, and 1 984 from St. John's/Harbour Grace.

So far during the 1997 trials, the corresponding number of position reports are 4 198 and 95 respectively.

The NAFO Secretariat has acknowledged receipt of a total of 283 Hails from Norway generated from satellite tracking data for 1996. By the end of August, a total of 31 Hails have been generated in 1997.

Satellite units for the Inmarsat-C, ARGOS and EUTELTRACS/Canadian-OmniTRACS systems have been employed by the Norwegian party.

Reference is made to Fdir-SAT 96:1 "Progress Report, Norwegian Trials January - July 1996, NAFO Satellite Pilot Project"

The report concludes that the NAFO Secretariat is at present not equipped in such a way that the satellite tracking technology can be used to its full potential.

Topic Words
NAFO, Flemish Cap, tracking, satellites, ARGOS, Inmarsat-C, Euteltracs, OmniTRACS

Distribution

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1. INTRODUCTION

At their 17th annual meeting in September 1995, the contracting parties to the Northwest Atlantic Fisheries Organisation (NAFO), in order to improve compliance with their Conservation and Enforcement Measures, agreed to implement a Pilot Project for Satellite Tracking of fishing vessels (NAFO/FC Doc. 95/17). According to this agreement, the parties undertook to install satellite tracking devices on 35% of their respective vessels fishing in the NAFO Regulatory Area during the period from 1 January 1996 to 31 December 1997.

Further, each party would endeavour to test several systems of satellite tracking, and install at least one receiving station associated with their satellite tracking system. Contracting parties would transmit to the NAFO Executive Secretary messages of movement between NAFO divisions on a real time basis, for their vessels so equipped.

Each party would prepare a report on the results of the Pilot Project, to be submitted for consideration at the September 1997 Annual Meeting of NAFO.

This paper is the report from the Norwegian party, covering our activities from January 1996 up to and including August 1997.

A progress report [Fdir-SAT 96:1] covering the period from January to July 1996 was presented by the Norwegian party to the 1996 Annual Meeting. The present paper should be read as a supplement to the 1996 report, as a number of items which are dealt with in some detail in the 1996 report are not covered again in this report to the 1997 Annual Meeting.

2. THE TRIALS

2.1 Equipment on board vessels

Based on the agreed criteria, Norway has been in a position to allow 32 of her vessels to fish for shrimps at Flemish Cap in the NAFO subdivision 3M for a total of 2 206 fishing days in 1996. The same number of vessels were allowed 1 985 fishing days for 1997.

It was decided that all Norwegian vessels taking part in the Flemish Cap shrimp fisheries in 1996-97 should carry satellite tracking devices, and that the tracking equipment should be operational before a vessel could sail for the NAFO area.

A subsidy of NOK 20 000 (US$ 3 000) was provided by the Directorate of Fisheries for vessels buying their own tracking devices specifically to participate in the Flemish Cap fisheries. If the ship owner was not interested in buying such equipment, suitable tracking devices would be provided by the Directorate of Fisheries at no cost to the vessel, for the duration of the trials.

During the trial period, 6 ship owners have taken up the option to buy Inmarsat-C units for the NAFO trials. Including 10 vessels which had Inmarsat-C already installed at the start of 1996, this raised the number of Inmarsat-C units commissioned to 16. A total of 7 vessels had at any one time installed ARGOS units provided by the Directorate of Fisheries for tracking purposes, and 1 vessel had also installed EUTELTRACS equipment. One vessel first installed an ARGOS-GI unit, but later acquired Inmarsat-C equipment.

Some of the vessels commissioned eventually opted not to take part in the NAFO fisheries.

Figure 1 shows actual participation in the Flemish Cap fisheries by month and type of unit for 1996. It can for example be seen from the graph that the number of Norwegian satellite units active in the NAFO area was 12 by the end of July 1996, this being 3 ARGOS units and 9 Inmarsat-C units.

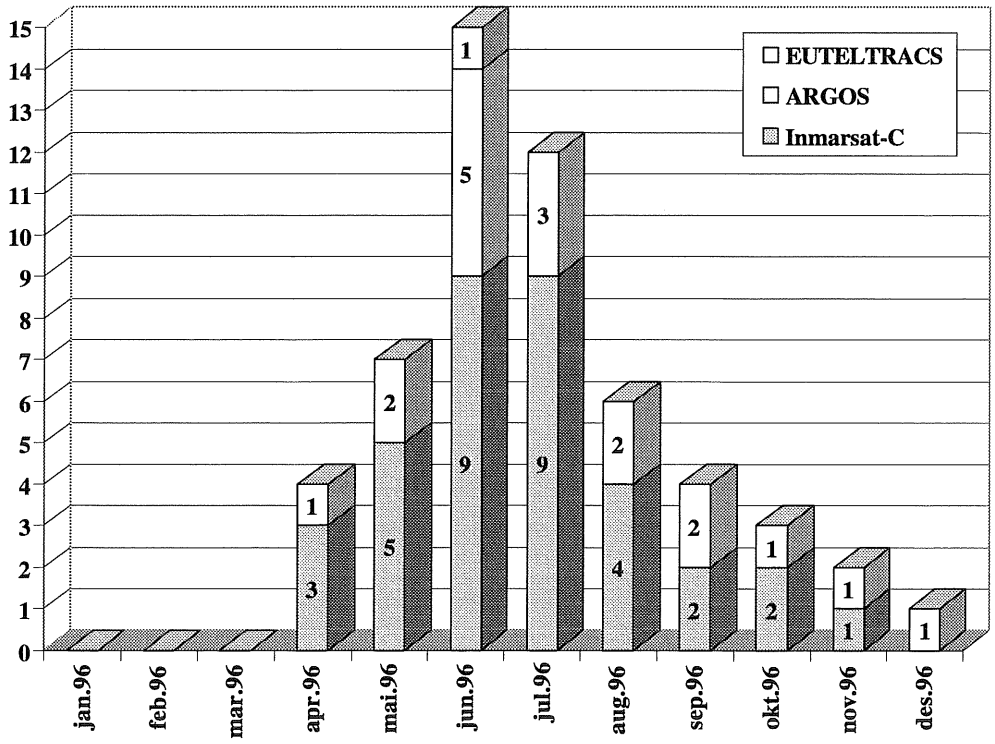

Figure 1) Participation by month and type of unit 1996

Note that the number of satellite units is not equivalent to the number of vessels. The reason for this is that one of the vessels in 1996 carried two sets of equipment. In the graph this affects only the month of June. The number of vessels active by the end of June was therefore 14.

A graph showing the corresponding distribution by month and type of unit for 1997 has not been produced, as only two Norwegian fishing vessels have been active in the area so far this year. The vessels entered the NAFO area at the end of March. One vessel left the area towards the end of June, while the other was still

fishing at the end of August, interrupted only by trips to harbour to deliver the catch. During the months with activity, both vessels were fishing simultaneously only for short periods of time.

2.2 *Equipment at the Directorate of Fisheries*

Figure 2 shows the schematics of the data system for tracking purposes at the Directorate of Fisheries.

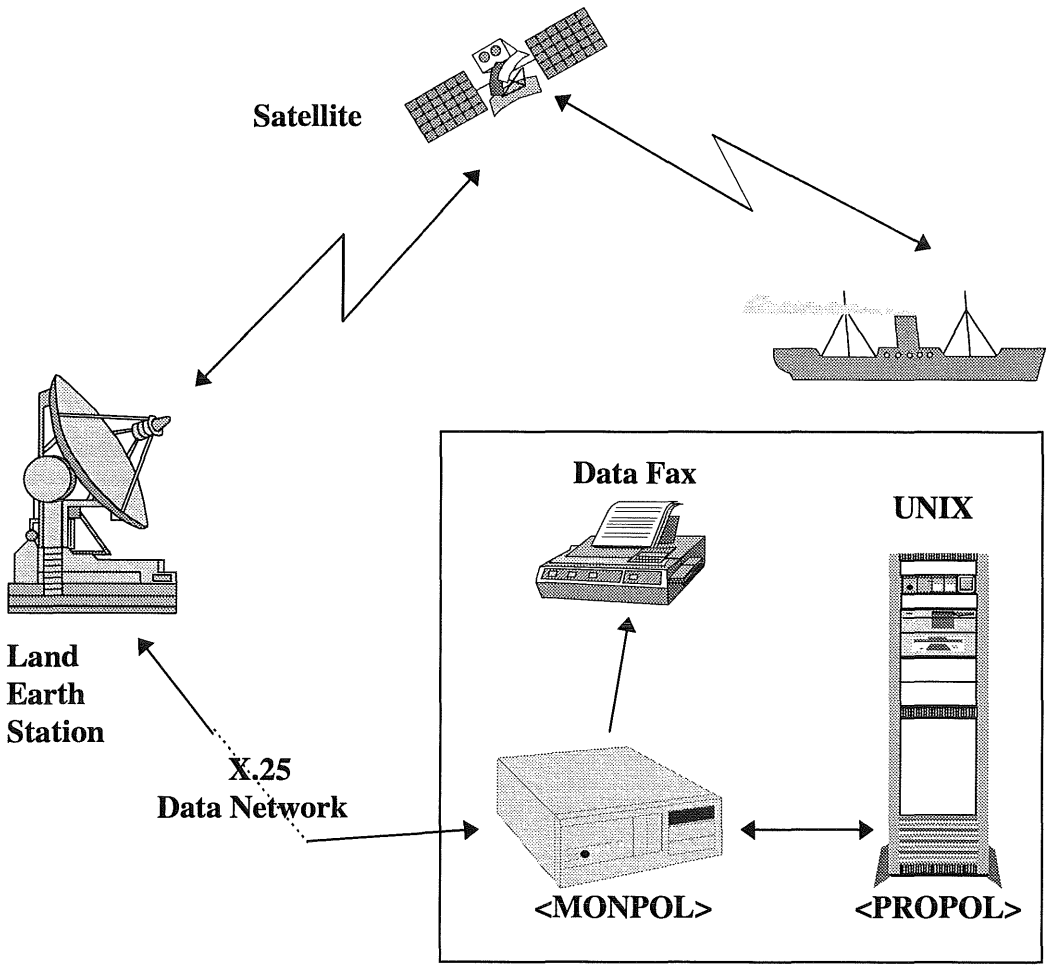

Figure 2) Data system for tracking purposes at the Directorate of Fisheries

The Norwegian system is set up in two parts. The first part <PROPOL> runs on a UNIX computer, and issues polls for position reports. Incoming position reports are also logged by this system, which then decides whether further action, such as the issuing of a Hail Report to a third party, must be initialised. With specific intervals, for the time being every 15 minutes, the system reads an operator-defined table to determine whether polls for position reports shall be issued over the Inmarsat-C system, and decides which satellite and *Land Earth Station (LES)* should be used. <PROPOL> can handle both ARGOS, EUTELTRACS and Inmarsat-C position reports.

The second part of the system <MONPOL> takes care off all actual data communication. <MONPOL> runs on one or more PCs. Basically X.25 is the preferred communication protocol. All Inmarsat-C traffic is handled via X.25, and all ARGOS data reports are submitted to the Directorate of Fisheries via X.25. A format for X.25 reporting was also agreed with EUTELTRACS, but no data on this format was received during 1996 (see also 3.3). The actual transmission of outbound Hails from <PROPOL>, in this trial the Hails to the NAFO Executive Secretary, is also handled by the <MONPOL> system. For the 1996-97 NAFO trials, such Hails have so far been submitted by facsimile.

As the <MONPOL> system reads all incoming position reports and transcribes them to a standard format before uploading to <PROPOL>, the <MONPOL> system has been equipped with a module to decide which geographical area a specific position refers to. This may be an *Exclusive Economic Zone (EEZ)* or international waters, and as in the case of the NAFO trials, in addition a statistical subdivision.

2.4 The Hailing System

NAFO FC/Doc. 95/24 made no specific recommendations as to the format and standards to be followed for the reporting of Hails. It did, however, in section 8, list *Universal Time Count (UTC)* and *World Grid System 84 (WGS-84)* as possible options. Further, it drew attention to the EU format developed by Denmark and Spain for use in data exchange.

The Norwegian party therefore decided to use those standards as a starting point. It was, however, apparent that the EU format did not cover all the data elements necessary for a NAFO hailing system. Two new data elements were therefore introduced from the start:

Field Code RC (new) - Radio Call Sign
Field Code RA (new) - Reporting Area (whether active or not)

Field Code XR would refer to Vessel Side Number

From 1997 on, an additional data element was included:

Field Code SQ (new) - Message Sequence Number

It was decided that for 1996 the satellite devices on board the Norwegian vessels should trigger an automatic Hail message every time a vessel crossed a subdivision line, whether this be between divisions or between divisions and outside the NAFO Convention Area. Although the system was also capable of generating e.g. EXIT Hails specifically, it was decided that for 1996 the Hail should in all cases be MOVE, to be reported in Field Code TM.

No effort was made in 1996 to Hail a crossing from the *Regulatory Area (RA)* into an EEZ. The reason for this was that sufficient data was not by then available on

machine readable form to enable us to include in our computer system the lines delimiting the relevant 200-mile zones bordering on the RA at that time.

Such data was not obtained until May 1997. From the start of June 1997, however, our hailing system was changed to cater also for the EEZs. From then on, our system has been generating an explicit ENTRY Hail to the Secretariat whenever a vessel moves from an EEZ and into the RA, whether fishing or not fishing. Vice versa, an EXIT Hail is now generated when crossing from the RA and into an EEZ. Explicit ENTRY and EXIT Hails are also generated when moving between the RA and other international waters. Moves between statistical subdivisions are hailed as before.

As character set, the international ISO 8859.1 standard has been used for Hails. In addition, longitude (LO) and latitude (LA) have been reported according to the universally accepted decimal format, as this is best suited for handling by computer.

An example of a Hail message submitted by fax is given in Appendix 1.

The Norwegian automatic hailing system is capable of submitting Hails either in the form of facsimile, or in machine readable form as E-mail or via X.25. If e-mail is chosen, we would prefer the use of X.400. The NAFO Secretariat is for the time being not equipped to read X.25 messages automatically, as the present set-up within the Secretariat only supports the use of X.25 for logging into a remote computer system for file retrieval. It was therefore decided to use facsimile as reporting medium for Hails.

This has created some problems, as for one reason or another it has not always been possible to connect to the fax machine at the Secretariat without delays. An automatic hailing system can only be of limited use if the processing of incoming messages at the receiving end is not also automated.

3. RESULTS

3.1 Framework

To allow for a proper analysis of the data from the Pilot Project, it was established in national Norwegian regulations for 1996 and 1997 that the fishing vessels proceeding to the NAFO area should report their positions by means of an automatic satellite system if inside an area delimited to the east of 37°W and to the north of 62°N, in addition to the whole of the NAFO Convention Area. This area, which is larger than both the Regulatory Area and the Convention Area, we shall in this report call the *Tracking Area (TAR).*

3.2 Position reports, Inmarsat-C and ARGOS

The total number of individual position reports received by us from the TAR in 1996 was 45 631, as compared to 42 782 from the NAFO Convention Area for the

same period. The corresponding figures for January - August 1997 are 4 473 and 4 198 respectively.

No effort has been made to single out the positions from within the RA. Identical positions reported several times for the same event, as with Mar-GI/GE, have been counted only once, and are stored as the earliest occurrence.

The positions from within the TAR distributed by subdivisions are given in tables 1 and 2.

Table 1 - TRACKING AREA POSITION REPORTS BY SUBDIVISION

1996

	0B	1D	1E	1F	2G	2H	2J	3L	3M	3K	St.J	Other	Sum
Number	3	133	10	219	7	12	61	1808	40242	287	1984	865	45631
Percent	0.0	0.3	0.0	0.5	0.0	0.0	0.1	4.0	88.2	0.6	4.3	1.9	100.0

During 1996, a total of 2 849 (6.2%) of the position reports came from outside the Convention Area, here also included 1 984 reports from St. John's/Harbour Grace. Position reports from subdivisions other than 3M were normally caused by harbour calls. One exception is a number of position reports from areas 2 and 0, which were generated by a vessel crossing from St. John's to fish a quota allocated within the EEZ of Greenland. This vessel also generated a number of Hails to the Secretariat by so doing. The tracking of this vessel was discontinued on her passing north of 62°N.

Of the position reports from table 1, a total number of 45 279 had time-stamps that enabled us to calculate the average time it takes for a position report to reach the Directorate of Fisheries, the *Reporting Delay (RD)*. This worked out to be 65 minutes. The average RD depends to a large extent on the relative number of the various units involved. Our Report Fdir-SAT 96:1 contains a detailed analysis of RDs by type of Unit for the month of July 1996.

The RD calculated for the 1997 data in table 2 is 76 minutes. See also table 4.

Table 2 - TRACKING AREA POSITION REPORTS BY SUBDIVISION

March - August 1997

	1F	2J	3K	3L	3M	St. John's	Other	Sum
Number	4	1	31	112	4 050	95	180	4 473
Percent	0.1	0.0	0.7	2.5	90.5	2.1	4.0	100.0

Tables 3 and 4 give TAR Position reports by type of unit for ARGOS and Inmarsat-C. EUTELTRACS position reports are dealt with separately.

Table 3 - TRACKING AREA POSITION REPORTS BY TYPE OF UNIT 1996					
	Mar-90	Mar-GE	Mar-GI	Sum ARGOS	Inmarsat-C
Number	1 701	4 446	10 569	16 716	28 915
Percent	3.7	9.7	23.2	36.6	63.4

Table 4 - TRACKING AREA POSITION REPORTS BY TYPE OF UNIT March - August 1997			
	Number	Percent	Reporting Delay
Mar-GI	2 428	54.3	134
Inmarsat-C	2 045	45.7	8

In 1996 the first Norwegian vessel did not enter the NAFO area until April. In 1997 the first vessels entered NAFO waters in March. Generally therefore, tables 1 through 4 have no relevant data for the early months. Tables 5 and 6 specify the position reports by month for 1996 and 1997 respectively.

Table 5 - TRACKING AREA POSITION REPORTS BY MONTH 1996									
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Number	2 194	4 513	9 249	11 214	9 296	3 685	2 922	1 751	807
Percent	4.8	9.9	20.3	24.6	20.4	8.1	6.4	3.8	1.8

Table 6 - TRACKING AREA POSITION REPORTS BY MONTH March - August 1997							
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sum
Number	572	1 601	1 095	704	109	392	4 473
Percent	12.8	35.8	24.5	15.7	2.4	8.8	100

So far during 1997, only two Norwegian fishing vessels have been operating within the NAFO area, one with Inmarsat-C and one with ARGOS-GI equipment. Unfortunately, by early May, the ARGOS-GI unit signalled a failure to operate in GPS mode. Thereafter, there have been only occasional GPS positioning for this unit, which means that for most of May and also during the months of June and August the unit has been operating in Mar-90 mode. The number of positions from this platform has therefore been much reduced, and four days during this period have seen no position reports from the vessel at all.

On discussing this problem with CLS/ARGOS, it was found that the standard procedure when a Mar-GI/GE transmitter reverts to Mar-90 mode will be for ARGOS to report the positions of Quality Class 3 only, as they are the most accurate. This accounts for the significant reduction in the number of positions reported for the faulty transmitter. It is, however possible for a customer to have ARGOS specify that Class 2 or even Class 1 positions should also be reported. It has therefore been decided that from September 1997 the Norwegian Mar-GI/GE units relevant to the NAFO trials shall report both Class 3 and Class 2 positions when in Mar-90 mode.

The faulty Mar-GI transmitter was eventually replaced during a harbour call on 27 August.

From the start of June 1997 onwards, CLS/ARGOS has been operating an instantaneous X.25 delivery service for the Directorate of Fisheries. It was anticipated that this could reduce the average ARGOS RD by perhaps 20 minutes. As the only Norwegian ARGOS unit in the NAFO area malfunctioned, it was not possible to establish whether this could actually be achieved. On the contrary we saw a considerable increase in the average ARGOS RD (table 4) because of the malfunction.

3.3 Position Reports, EUTELTRACS and the Canadian-OmniTRACS

BOATRACS has been our service provider for the EUTELTRACS/OmniTRACS systems. Only one vessel has been equipped with a BOATRACS unit. The vessel, which also carried an ARGOS unit, was active in the NAFO area during June 1996. A detailed performance analysis is given in [Fdir-SAT 96:1].

No BOATRACS unit has been commissioned on a Norwegian vessel in the NAFO Convention Area so far in 1997.

One problem during the 1996 trials, was that BOATRACS was unable to provide an automatic X.25 delivery service for their position reports. During 1997, the Directorate of Fisheries has carried out X.25 trials together with BOATRACS, based on data generated by a fishing vessel in Norwegian waters. Their X.25 delivery service is now much improved.

3.4 Hails

There are two variables of special interest in an analysis of hailing results. The first is the total time elapsed between the de facto crossing of a boundary between subdivisions, as subsequently reported by satellite, and the time when this position report was received by the Directorate of Fisheries. This we have termed the *Reporting Delay (RD).* The second variable is the time interval between the boundary crossing and the time when a Hail to this effect was successfully transmitted from the Directorate of Fisheries. This we have called the *Hailing Delay (HD).* A detailed analysis of such delays, based on data from 1 month in 1996 are given in [Fdir-SAT 96:1].

The Secretariat has acknowledged receipt of altogether 283 Hails from Norway generated from satellite tracking data for 1996. In September 1996, experiments with instantaneous X.25 delivery were carried out together with CLS/ARGOS, to attempt to determine whether this could reduce the RD. By that time, this was not successful, and faulty positions were generated which resulted in a total of 8 unwarranted Hails being forwarded to the Secretariat. The experiments were then discontinued for a time, but were resumed in June 1997 as mentioned in 3.2.

By the end of August, a total of 31 satellite tracking Hails have been generated for 1997. Appendix 2 shows the geographical distribution of 13 such Hails, which refers to the months June - August 1997. These Hails are generated with respect to the RA, and the boundary lines of the respective EEZs are also shown in the chart.

The HD turned out to be 197 minutes on average for the 30 Hails so far in 1997 where data allows such calculation, as compared to an average RD of 61 minutes. Closer inspection of the data reveals, however, that the distribution is rather skewed, as two Hails account for more than a third of the total HD. The distribution of Hails by HD is shown in Table 7. The first such Hail was generated on the evening of 11 May. This being a Sunday, the automatic hailing system tried repeatedly to connect to the fax machine at the NAFO Secretariat, but was unable to deliver until noon UTC on Monday 12 May, recording eventually a HD of about 17 hours for this delivery.

Also on 25 August an EXIT Hail generated at 17:01 UTC could not be delivered without a significant delay. Upon investigation it was found that the facsimile machine at the NAFO Secretariat was not operational and was being serviced. Consequently the Hail could not be delivered until 26 August 11:58 UTC, resulting in a HD of close to 19 hours.

If these two delays are disregarded, the HD for the other 28 Hails is 134 minutes on the average. This compares to an average RD of 61 minutes. Unfortunately the average *Processing Delay (PD)* of 73 minutes so far in 1997 is also adversely affected by some problems experienced when adapting our system to the new facsimile number after the NAFO Secretariat moved to their new premises at the end of August 1997.

But even if this is put on our account, it must be concluded that facsimile is not fully reliable as a medium for Hails.

Table 7 - DISTRIBUTION OF HAILS BY HAILING DELAY
1997

Minutes	0-9	10-19	20-29	30-59	60-111	120-239	240-479	480→
Number	4	5	2	6	3	3	3	4

The number of Hails with significant delays in 1997 is seen from Table 7 to be four.

On first inspection, the average RD of about one hour could be a surprise. But this is quite close to the July 1996 results, as fully 21 of the Hails have been generated for the ARGOS-GI platform, producing an average RD of 84 minutes as compared to 96 minutes recorded for ARGOS-GIs during July 1996. The 9 Hails generated for the Inmarsat-C platform actually appear to show an improvement, as the average RD is 7 minutes as compared to 13 minutes in 1996. But as the number of Inmarsat Hails is rather small, this improvement may not be very significant.

4. OTHER MATTERS

No requests for positioning information have been received from other parties with reference to NAFO/FC Doc. 95/17, Litra B, paragraph 1e by the end of August 1997.

Likewise, no reports from onboard observers concerning interference with satellite systems have been received with reference to NAFO/FC Doc. 95/17, Litra A, paragraph 4.

5. CONCLUSIONS

Based on our experience so far during the 1996-97 NAFO trials, it is possible for a flag state to operate a scheme for fishery control where enforcement measures may be enhanced by means of satellite tracking, in combination with a hailing system. Such a system could in conjunction with other enforcement schemes, e.g. the use of inspection vessels, increase the ability to monitor activity and thereby also enhance the possibility to improve fisheries control at sea.

A proper functioning of such a system does, however, also imply that the relevant parties must be equipped to handle the flow of information in a timely manner. The NAFO Secretariat is at present not equipped in such a way that the satellite tracking technology can be used to its full potential.

Criteria for the Hail System with relevance to the Satellite Tracking Pilot Project are outlined in Part III of The NAFO Conservation and Enforcement Measures [NAFO/FC Doc. 96/1] Litra E, paragraph 4. This paragraph states *inter alia* that:

> "In addition, each Contracting Party shall transmit, to the NAFO Executive Secretary, on a real time basis, messages indicating movements within the Regulatory Area for its vessels equipped with satellite devices. The Executive Secretary shall transmit as quickly as possible such information to Contracting Parties with an inspection vessel in the NAFO Convention Area."

There are two important requirements here. The first is the statement that the transmissions are to be "on a real time basis". This is generally understood to be "actual time in process analysed by computer" [The Concise Oxford Dictionary, Sixth Edition]. Consequently, this is an obligation by the Contracting Parties to use a computer system to analyse the incoming tracking data, and transmit (their Hails)

to the NAFO Secretary virtually without delay. By implication, the existing file retrieval system within the Secretariat can not be used for such purposes.

The second requirement is that the Executive Secretary shall take proper action "... as quickly as possible".

The reports presented to the 1996 and 1997 NAFO Annual Meetings by the Norwegian Party, contain detailed data on the performance of the Norwegian real time *Vessel Monitoring System (VMS).* The Reporting Delays as measured for the ARGOS and Inmarsat-C systems have so far been found to be in the regions of about 2 hours (ARGOS), or 10 minutes (Inmarsat-C), respectively. The internal Processing Delay inherent in our computer system has been less than 10 minutes if problems in connection with the facsimile delivery are disregarded.

In our experience, the total Hailing Delay has on a number of occasions been adversely affected by the facsimile machine at the Secretariat being busy, or being unavailable because of repairs, paper crash etc.

Further, for hailing purposes the facsimile has the same disadvantage as the computer assisted file retrieval system currently used by the Secretariat, i.e. the procedure for handling the Hails require manual intervention. For this reason, the system at the Secretariat can for the time being only handle incoming Hails during working hours.

The satellite tracking trials have therefore made it quite clear that it will be necessary to upgrade the computer system at the NAFO Secretariat to enable the Executive Secretary to handle incoming Hails from a satellite based VMS efficiently.

One way to do this, would be for the Secretariat to acquire an X.25 *Packet Assembler/Disassembler (PAD)* to attach to their X.25 connection. This would, for a start, allow the Secretariat to use the X.25 facility simultaneously for incoming and outbound Hails without interfering with the existing file retrieval facility.

With the proper software, a basic system for automatic handling of satellite tracking Hails can be set up with a few PCs at a moderate cost.

The efficiency would, however be much increased if one could at the same time install a Local Area Computer Network at the Secretariat, with an (X.400) e-mail facility.

Finally, we would like to draw the attention to the need for international standardisation of automatic messaging systems for fisheries purposes, and to the initiative of the North Atlantic Fisheries Ministers Conference in this regard.

APPENDIX 1: EXAMPLE OF HAIL MESSAGES

TELEFAX

From: The Norwegian Directorate of Fisheries, Bergen, Norway
To: NAFO Executive Secretary

Re. PILOT PROJECT FOR SATELLITE TRACKING (B.1.d)

Here are one or more HAILs regarding Norwegian fishing vessels,
as reported directly by computer.

This file has been generated 97-06-27 22:17:35 UTC

//SR//FR/NOR//AD/NAFO//SQ/68//RC/XXXX//XR/YYYY//NA/ZZZZ//FS/NOR/
/DA/970627//TI/220400//TM/ENTRY//RA/3M//LA/47.844//LO/-046.166//ER//

This is a copy of a real facsimile sent to the NAFO Executive Secretary in 1977. For reasons of anonymity, RC, XR and NA are given as XXXX, YYYY and ZZZZ respectively.

APPENDIX 2: HAILS FROM THE NAFO REGULATORY AREA

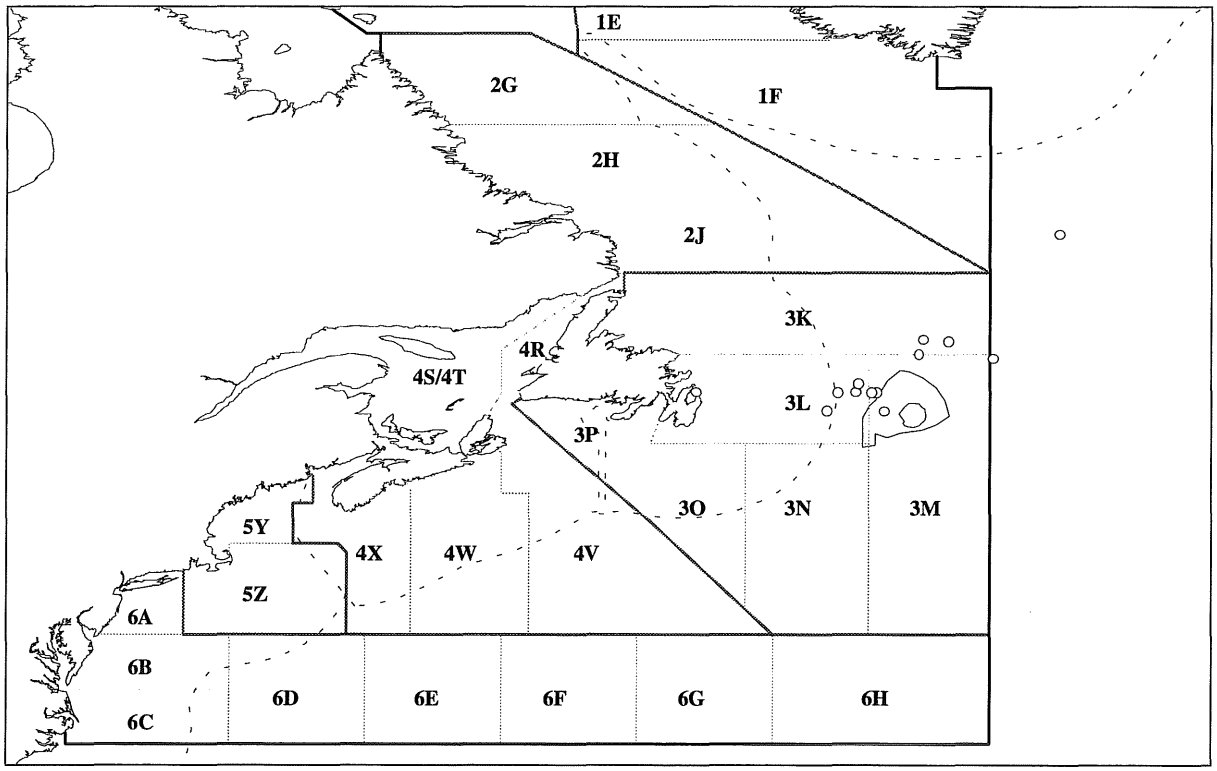

Figure 3) The NAFO Regulatory area, Hailing positions indicated

Figure 3 shows the positions of a total of 13 Hails generated between 1 June and 31 August 1997. These are Hails that have been generated based on information delimiting the respective EEZs from the NAFO Convention Area.

One vessel has caused an EXIT Hail from off St. John's. This vessel had already passed well inside the EEZ of Canada when our new hailing system was initiated.

As mentioned in paragraph 3.1, the actual Tracking Area is somewhat larger than the NAFO Convention Area. This is necessary to cater for proper handling of ENTRY and EXIT Hails. It can in this respect be seen from Figure 3 that one EXIT Hail has been generated from a position well into international waters. This happened because an ARGOS-GI transmitter had reverted to Mar-90 mode, ref. paragraph 3.2.

APPENDIX 3: ABBREVIATIONS

Abbreviations used in this report

EEZ	Exclusive Economic Zone
GPS	Global Positioning System
HD	Hailing Delay
PD	Processing Delay
RD	Reporting Delay
ISO 8859.1	ASCII extension 8-bit code set, often called 'ISO Latin'
LES	Land Earth Station (Inmarsat)
Mar-90	ARGOS Mar-90 transmitter, traditional unit
Mar-GI	ARGOS Mar-GI (GPS-type) transmitter
Mar-GE	ARGOS Mar-GE (GPS-type) compact transmitter
PAD	Packet Assembler/Disassembler
TAR	Tracking Area (here the NAFO Convention Area plus easterly bordering area)
UTC	Universal Time Count (ref. GMT)
VMS	Vessel Monitoring System
WGS-84	World Grid System (for latitude/longitude)
X.25	Data protocol for digital data interchange
X.400	Data protocol for e-mail interchange

Data exchange format abbreviations mentioned in report

LA - Latitude	(EU)	RA - Reporting Area	(new)
LO - Longitude	(EU)	RC - Radio Call sign	(new)
XR - External Reference	(EU)	SQ - Sequence number	(new)

References

Fdir-SAT 96:1 "Progress Report, The Norwegian Trials January - July 1996, NAFO Satellite Pilot Project"

Bergen, 2 September 1996