INMARSAT'S ROLE IN RESPONSIBLE FISHING

by

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## 1.	BACKGROUND

The International Maritime Satellite Organization (Inmarsat) originally offered satellite communications services including voice, facsimile, telex and data to oil tankers, large transport vessels, and the offshore oil industry. Times have changed quite a bit since the early days 15 years ago! Now renamed the International Mobile Satellite Organization while still keeping the abbreviation most familiar to the maritime community, Inmarsat now offers an increasing array of telecommunication services to business travelers, landmobile, aeronautical, and more and more maritime users as well.

All of these services are offered via the same four geostationary satellites that provide communication services that cover nearly 99% of the inhabitants of the earth. Since Inmarsat maintains an extremely international ownership, any of the 79 member countries or signatories may offer any of these services through their own land earth stations or agreements with other countries which have decided to offer them.

## 2.	INMARSAT SERVICES

Inmarsat's high quality services continue to be available via the Inmarsat-A and Inmarsat-B equipment and services. Inmarsat-M offers similar service, but with a slightly slower speed at a more affordable cost. Inmarsat-E, offered for commercial service in early 1997, provides vessels owners with a second IMO-approved option for Emergency Position Indicating Radio Beacons (EPIRBs). And Inmarsat's Mini-M service has revolutionized global, mobile communications on land. In the second half of 1997, the hardware necessary for maritime operations will be available to potentially provide the lowest cost maritime voice service yet, with only some limits to coverage in the Southern hemisphere. Low speed facsimile and data service will also be available.

But the most significant Inmarsat service within the fisheries community has been Inmarsat-C, with a "key" role in responsible fishing. Inmarsat-C is certainly not exciting. It is simply a small, low-cost e-mail terminal with three particular features that have thus far served the fisheries industry quite well.

Firstly, the fisheries enforcement community has the ability to request **position reports** from any or all fishing vessels within their management control. These position reports may be requested manually, one-at-a-time at various times during a vessels' voyage. Or they may be requested to be sent automatically at some frequency, say once every two hours, until otherwise canceled. Critically important to fisheries authorities

has been the completely remote control over each Inmarsat-C equipped vessel. The Inmarsat-C sends these position reports without the need for any action on the part of the fishing vessel's crew. All commands issued by shore-side authorities are received by the Inmarsat-C and acted upon by the Inmarsat-C. For instance, commands to set-up automatic position reporting every two hours, to change the frequency to every four hours, to stop position reporting completely, or to request an ad hoc position report at any moment require no effort, acknowledgment or knowledge by the fishing vessel crew.

When authorities do wish to communicate with the fishing vessel, they may use Inmarsat-C's second feature of **messaging** to send and receive text and data messages at any time. Of course, anyone may communicate with the vessel in this manner, so the commercial benefits to the fishing vessel owner can be significant. (And if the owner so chooses, he may also receive each of his vessel's position reports, too.) Most significant with this service offering is the recent connectivity by many Inmarsat Land Earth Stations (LESs) to the internet for simple email messaging.

Finally, the fact that certain Inmarsat-C models are qualified to meet the rigorous requirements of IMO's Global Maritime Distress and Safety System (GMDSS) provides a powerful impetus to owners and authorities to provide the ideal communication device for safety reasons. One of the main features that make Inmarsat-C an ideal communicator for safety services is the **enhanced group call** service, which is fundamentally a broadcast service to groups of Inmarsat-C users. The SafetyNet service is a free broadcast to all users, and only sends safety messages, e.g., distress, meteorological, or navigation warnings, to those users in a geographic location to benefit or assist. FleetNet is the commercial equivalent broadcast service which allows fisheries authorities and commercial owners to send the same message to many vessels for one very low cost.

3.   SATELLITE VESSEL MONITORING

The position reports, which optionally may include course and speed, from one or more fishing vessels may be incorporated into a system comprised of hardware and software at a shore-side control station. Several considerations exist for the Inmarsat-C shipboard side of the system:

- which Inmarsat-C manufacturer to choose,

- whether to install laptop/PC for messaging capability (position reporting works without a laptop/PC),

- whether to choose GMDSS compliant model or not,

- whether to require "black box" solutions that offer battery back-up, additional tamper-proof features, and local storage of position reports for shore-side retrieval, for instance.

A second consideration that should be considered during research into Satellite Vessel Monitoring is the services offered by various Inmarsat land earth stations that might be used in the final system. Not all stations offer position (or data) reporting, and Internet connectivity, for instance. Also, retail prices may vary somewhat, and distance from the station to the satellite vessel monitoring shore-side control station could affect access costs.

Finally, the decision probably with the most variables revolves around the shore-side analysis of position reports and depends upon the exact requirements of the fisheries authorities. Naturally, a series of position reports from even a small number of fishing vessels on a regular basis requires some data processing for interpretation. Key issues to consider at this stage are:

- hardware processing and storage to handle an order of magnitude more data and activity than initially planned, for local expansion and possible future regional cooperation.

- management by exception, so that shore-side personnel are alerted when certain criteria are reached, for instance, low (fishing) speed operation in a prohibited fishing zone, two cycles of missed position reports indicating that the Inmarsat-C might be switched OFF, or no movement at sea for a minimum period of time indicating a possible illegal transshipment.

- post processing capability allowing one or more staff to review and analyze historical records without affecting current operations.

- convenient visual mapping tools to allow easy interpretation.

- user interface allowing point-and-click messaging, ad hoc position reporting and simple FleetNet broadcasting.

4.   ARCHITECTURE

The simplest system may offer a PC-based geographic information system for mapping all position reports received by the control station. Variations in architecture may be driven by post-processing requirements in a single country's control station or by the degree that countries and regions wish to cooperate with eachother for satellite vessel monitoring. Cooperation for a regional system has many benefits, such as:

- one single fishing vessel "position reporting" registration shared by all authorities,

- one shipboard system accepted by all authorities,

- no blind spots since regional satellite vessel monitoring could include international waters within region but between individual EEZs,

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-        economies in selection and operation of shore-side software and hardware.

Although integrated shore-side control stations offer the most utility amongst cooperating nations, political obstacles and differing priorities may prevent realistic progress in this direction. However, cooperation doesn't necessarily require the sharing of information, but could also include one or more of the following initiatives:

-        Selection of the same satellite network, such as Inmarsat, that provides a "level playing field", where security, integrity, privacy, and reliability are identical, and imbalances or "impressions" of imbalances are removed.

-        Requirement for vessels of the same size or tonnage operating in similar geographic and fishing situations to comply with satellite vessel monitoring.

-        Determination of position, and course/speed at the same frequency under similar circumstances.

If a higher degree of cooperation between countries and regions is realized, three basic architectures could be implemented:

-        Centralized regional control station with autonomy over all countries enforcement. All vessels send position reports to one central location (probably too ambitious at this stage),

-        Centralized regional control station that forwards flag data (own vessels) and coastal data (vessels in individual EEZ) to each participating authority for local enforcement. All vessels send position reports to one central location (the Forum Fisheries Agency [FFA] model),

-        Distributed control stations in each country (preferably, but not necessarily) running the same shore-based software, with identical forwarding rules that result in sharing of flag data with each coastal authority. Each vessel sends position reports to their own flag authority (the European Pilot Project model).

5.   GETTING STARTED

The Inmarsat-C system is loaded with powerful features, and offers a high degree of flexibility. However, rather than trying to pull a solution together alone, authorites may wish to access certain resources available in the marketplace:

-       One of the best places to begin is to request feedback and guidance from authorities already operating satellite vessel monitoring systems.

-       Discuss technical capabilities available to fisheries authorities with the software developers and integrators involved in satellite vessel monitoring for   the fisheries industry.

-       Consider discussions and contracts with fisheries consultants familiar with satellite vessel monitoring and systems analysis techniques that may illustrate the costs/benefits of certains ways forward.

Inmarsat is familiar with many of these resources and will be glad to provide contact information to individual authorities upon request. Please direct all queries to:
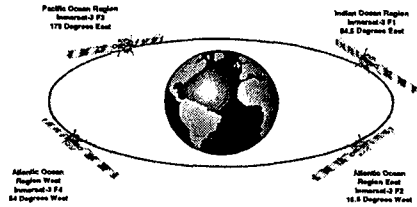
Satellite communications
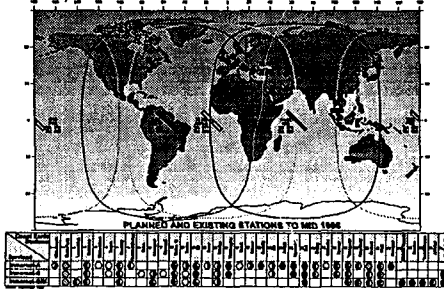
"an aid to responsible, sustainable fishing"

Frank August

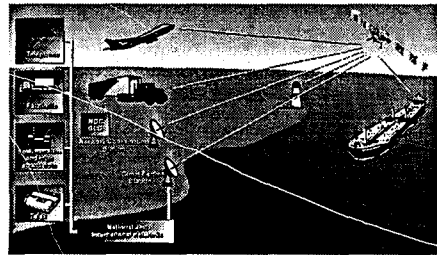**Maritime Market Mgr**

Inmarsat, London
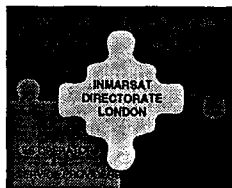

Spacecraft Status
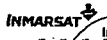
Inmarsat Mobile Satellite Communications

Inmarsat System Components

The Inmarsat Organization

THE INMARSAT PARTNERSHIP

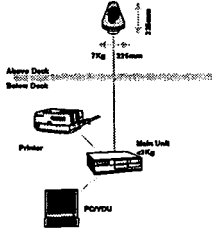**WORKING TOGETHER**

Inmarsat-A/B

Telephone, Telex,
Facsimile, Voice band data,
High Speed Data

Inmarsat-C

Messaging
Distress Alerting
Polling
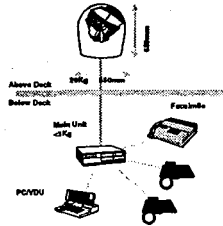EGC Broadcast
Position Reporting

Inmarsat-E

- Float-free Emergency Position Indicating Radio Beacon (EPIRB) operating through Inmarsat satellites

- Rapid alerting (real time coverage) direct to Rescue Co-ordination Centre (RCC)
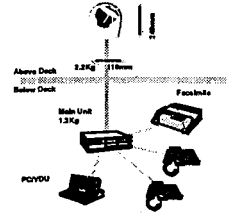
- Integral GPS for position

Inmarsat-M

Telephone
Facsimile
Data

Inmarsat Mini-M

Telephone
Facsimile
Data

Global & Spot-beam Coverage
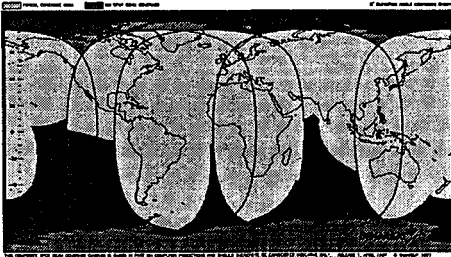
Inmarsat Products

Inmarsat	Voice	Fax	Data	Telex
A	✔	✔	✔	✔
B	✔	✔	✔	✔
C		✔	✔	✔
E			Epirb	
M	✔	✔	✔	
Mini-M	✔	✔	✔	

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INMARSAT **Inmarsat Features**

Inmarsat	Global	Position Reports	Real time	GMDSS
A	✔		✔	
B	✔		✔	
C	✔	✔		✔
E	✔	✔	✔	✔
M	✔		✔	
Mini-M	·		✔	

INMARSAT **Inmarsat Fittings**
(as of April 1997)

Inmarsat	Fishing	Maritime	All
A	2,126	17,936	25,487
B	345	2,435	4,286
C	3,083	21,069	32,399
E		240	240
M	383	2,489	13,975
Mini-M	0	0	3,825

INMARSAT

Inmarsat-C

The "key" role in Responsible Fishing
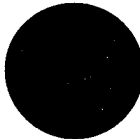
INMARSAT **THE FISHERIES ENVIRONMENT**

- Global Enforcement Issues . . . beyond the control of any one region
- Commercial efficiency . . . maximize the value of the product (and industry)
- Performance . . . today and in future
- Hazardous profession . . . increase level of safety to protect valuable resources

INMARSAT **THE FISHERIES ENVIRONMENT**

- Global Issues . . .
- Commercial efficiency . . .
- Demonstrated performance . . .
- Hazardous profession . . .

- ✔ Global coverage
- ✔ Two-way messaging
- ✔ Well-proven capabilities
- ✔ IMO GMDSS qualification, SafetyNet

INMARSAT **Inmarsat-C the role in fisheries**

fisheries protection and control

Inmarsat-C

commercial communications

distress and safety

INMARSAT   **Elements of System**
Inmarsat-C

- shipboard terminal
- Inmarsat satellite system
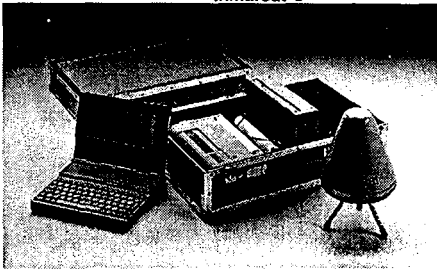- land-earth station (LES)

INMARSAT   **Shipboard terminal**
Inmarsat-C

- small and light weight equipment
- commercial off-the-shelf availability
- versions available for GMDSS compatibility

INMARSAT   **Shipboard Terminal**
Inmarsat-C

INMARSAT   **Shipboard terminal**
Inmarsat-C

- provides secure messaging with optional laptop
  o two-way communications
  o fish catch reports
- data reports for positioning
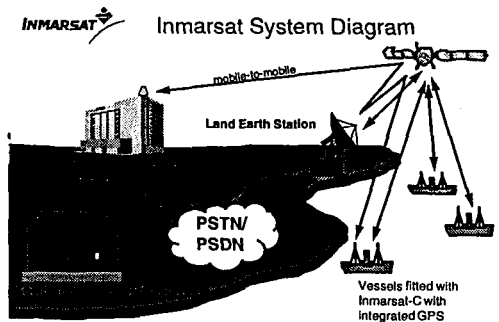 o position data from integrated GPS
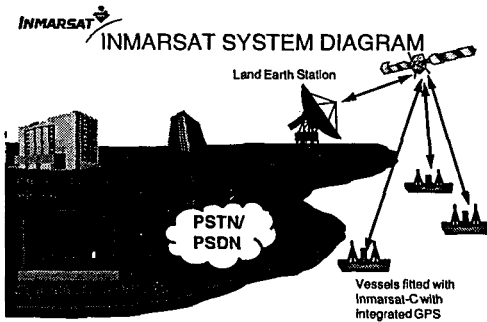
INMARSAT   **MESSAGING**
Inmarsat-C

- With other fishing vessels
- With Fisheries Enforcement Agencies
- With company/owner
- With agents/buyers/ auctions
- With family

INMARSAT   **MESSAGING**
Inmarsat-C

- Virtually unlimited message size in most operations (32Kb)
- Sent as telex, facsimile, e-mail, file transfers
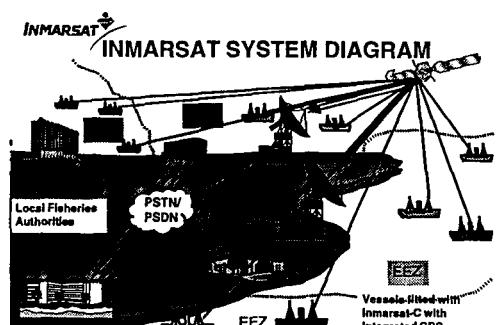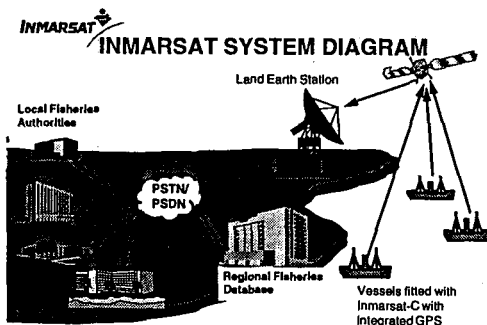- Sent over telex network, PSTN, PSDN (X.25), X.400, Internet

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INMARSAT SYSTEM DIAGRAM

Land Earth Station

PSTN/ PSDN

Vessels fitted with Inmarsat-C with integrated GPS

Inmarsat System Diagram

mobile-to-mobile

Land Earth Station

PSTN/ PSDN

Vessels fitted with Inmarsat-C with integrated GPS

POLLING & DATA REPORTING
Inmarsat-C

- Periodic position rpts with course/speed
- Parameters can be changed remotely with poll command
  o Position reporting ON / OFF
  o Frequency of position reporting
  o Vessels with Inmarsat-C added / deleted from VMS
- Random polls assure system integrity
- Course and speed are typical options

POLLING & DATA REPORTING
Inmarsat-C

- Fishing activity can be analysed by vessel movements, net sensors, turbocharger pressure, exhaust temperature
- Owner can monitor fleet activity in conjunction with enforcement agencies

INMARSAT SYSTEM DIAGRAM

Land Earth Station

Local Fisheries Authorities

PSTN/ PSDN

Regional Fisheries Database

Vessels fitted with Inmarsat-C with integrated GPS

INMARSAT SYSTEM DIAGRAM

Local Fisheries Authorities

PSTN/ PSDN

EEZ

Vessels fitted with Inmarsat-C with integrated GPS

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INMARSAT **Base station requirements**
Fisheries Enforcement

- central computer, usually UNIX or PC
- data link (usually X.25) and communications software. Inmarsat link is optional
- database and graphic (mapping) application
- - - - - Shipboard terminal
- Standard Inmarsat-C shipboard equipment, with optional laptop. "Black box" options for battery backup, data backup.

INMARSAT **BROADCAST SERVICES**
Inmarsat-C

- FleetNet broadcast of prices, closures, policy changes - to fleets or groups·
- SafetyNet broadcasts to geographic areas
- Subscribed news, weather, sea temperature, and sea color

INMARSAT **Observer advantages**
(Observer Programs)

- direct, on-board experience
- shipboard activity confirmed
- both quantitative and qualitative information

INMARSAT **Observer disadvantages**
(Observer Programs)

- Significant training, operating and management expense
- Integrity and consistancy issues
- Human limitations prevent monitoring 24 hour fishing activities

INMARSAT **Satcom advantages**
(Observer programs)

- position, speed & course always available
- unobtrusive on-board
- maximum value with sophisticated data processing/software, e.g., to indicate shipboard activity
- interconnection with patrol vessels & aircraft

INMARSAT **Satcom disadvantages**
(Observer Programs)

- data not directly useful in prosecution
- some activities go unobserved
- requires other focused resources to leverage the advantage of Satcom

NMARSAT

Which to choose?

- each has specific advantages
- a system which integrates both is inherently more solid
- a compromise might utilize random observer assignments within a satcom-fitted fishery

INMARSAT

International acceptance
Inmarsat-C

- Argentina
- Australia
- EU fishing pilot project
- Forum Fisheries
- Maldives

- NAFO
- New Zealand
- Norway
- South Africa

INMARSAT

Key Strengths
Inmarsat-C

- Global coverage
- Open network
- Stable, global ownership
  - 79 member countries
- Privacy
- Self-imposed competitive environment
  - Hardware
  - Software
  - Services

INMARSAT

Key Strengths
Inmarsat-C

- Global Maritime Distress & Safety System (GMDSS)
- F-I-R-S-T In Maritime market
- Numerous applications solutions