16th Meeting of the International Committee on Global Navigation Satellite Systems (ICG-16)

WG-B, Application Subgroup (AppSG)

GNSS Application Case - NavIC-based Safety-of-Life Alerts for Fishermen

By ISRO, India

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International Committee on
Global Navigation Satellite Systems

Outline

- Role-sharing preferences

- Societal problem to be solved **"Safety-of-live alerts for Fishermen"**

- System configuration and NavIC Messaging Receiver

- Lessons learned and guidance to GNSS users

- Distress Alert Transmitter – Second Generation (DAT-SG)

- Technology transfer and product information

Role-Sharing Preferences

- Contribution to Sustainable Development Goals (SDGs)

  - C1 (zero hunger) and C2 (affordable energy, clean energy)

- Preferred study area:

  - **Fishery**, Aquaculture, Animal Farming & Agriculture

- Contribution to:

  - Land, Forest & **Disaster Management**

  - **Smart Mobility & Transportation**

Societal problems to be resolved

- Fishermen undertake deep-sea fishing expeditions with no means of emergency communication or receiving alerts

- NavIC-based safety-of-live alerts introduced to provide real-time alerts for fishermen

- Disseminate alerts on natural disasters: high-wave, cyclone and tsunami generated by authorized agency - Indian National Centre for Ocean Information Services (INCOIS)

- One-way broadcasting system providing alerts on Potential Fishing Zones (PFZ), improving productivity, efficient fuel consumption; thus reducing emissions and help mitigate global warming

System Configuration

- **NavIC Messaging Service (NMS)** - NavIC Satellites have a message "Type 18" in secondary navigation data for broadcasting text message

- NavIC 1A satellite has been dedicated to messaging service

- The signal is BPSK(1) modulated on L5(1176.45 MHz) and S(2492.028 MHz) bands. The navigation data rate is 50 sps (1/2 rate FEC encoded).

- NavIC 1A data is transmitted in a sub-frame which is tailored to support messaging

- It contains 6 bit message ID, so 64 different types of messages can be transmitted

NavIC Message Definition

TLM	TOWC	ALERT	RESERVED	RESERVED	RESERVED	MESSAGE ID	DATA	PRN ID	CRC	Tail
1	9	26	27	28	30	31	37	257	263	287
8 BITS	17BITS	1 BIT	1 BIT	2 BIT	1 BIT	6 BITS	220 BITS	6 BITS	24 BITS	6 BITS

Service ID	Seg.Count	Seg.ID	HWA1 Clear	HWA2 Clear	Spare	Port name 1	HWA message 1	Port name 2	HWA message 2
4 bits	4 bits	4 bits	1 bit	1 bit	34 bit	8 bits	78 bits	8 bits	78 bits

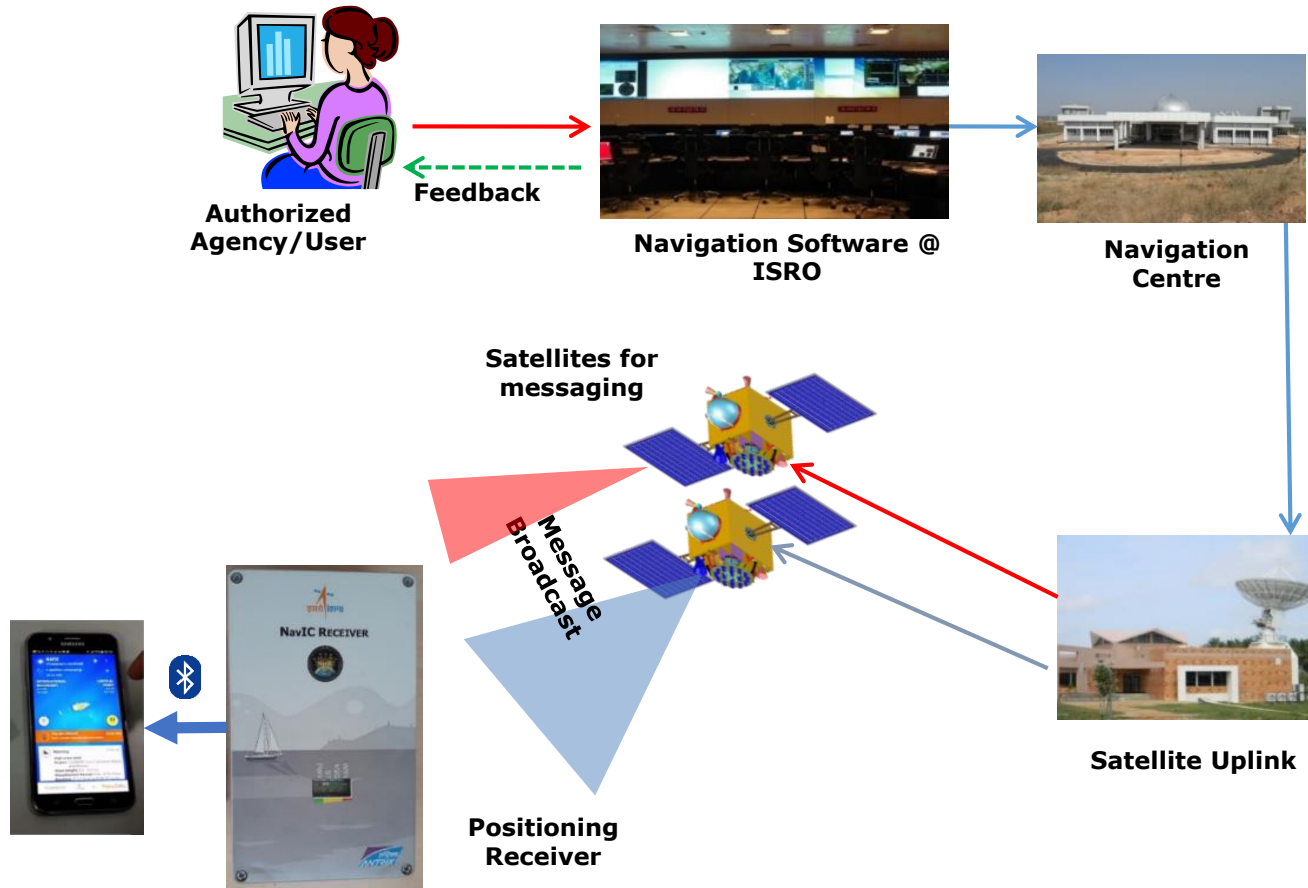**Example of a typical warning message with Message ID 21**

- Definition of 220 bits is left to user

- One such user is INCOIS

- Message Id 20 and 21 are allocated to INCOIS

  - Potential Fishing Zones (PFZ) – Msg 20

    - One sub frame can send 9 PFZs and will be repeated for more numbers

  - Emergency messages– Msg21 which further divided with service IDs

    - High Wave Alert   Service ID 0111

    - Cyclone Alert   Service ID 1111
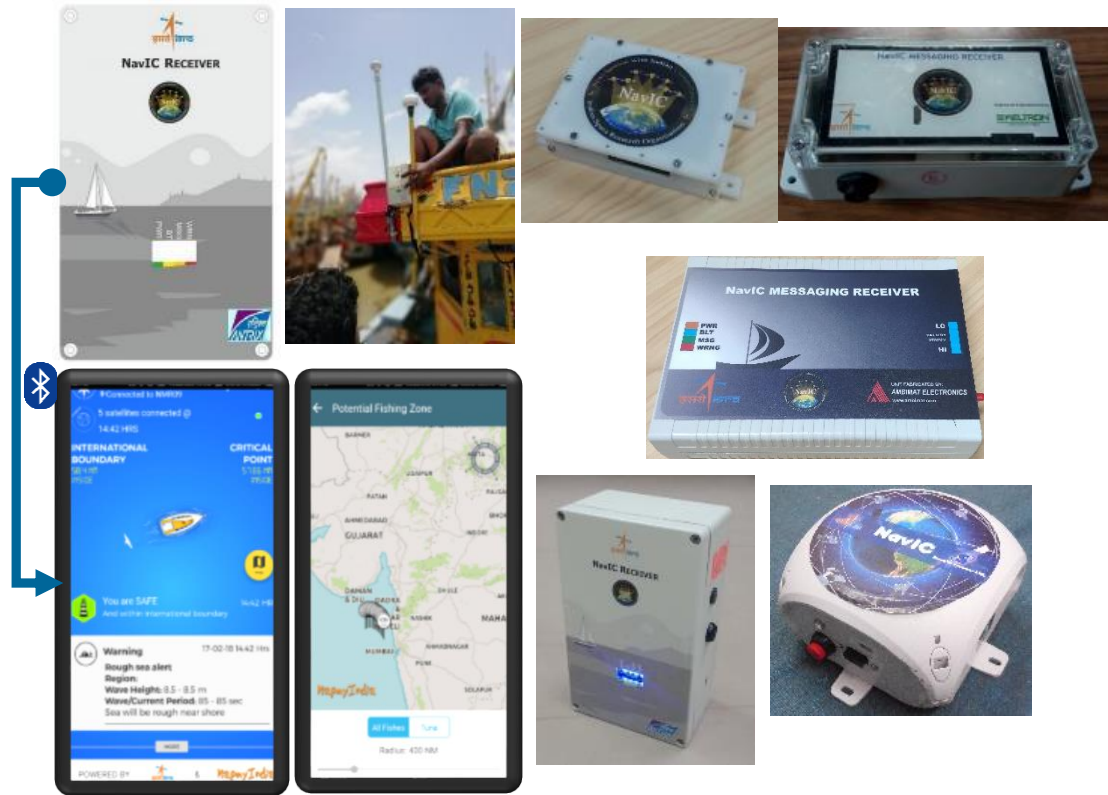
    - Tsunami Alert   Service ID 0011

ISRO-IRNSS-ICD-MSG-1.0

SIGNAL-IN-SPACE ICD FOR
MESSAGING SERVICE (IRNSS 1A)

VERSION 1.0

June 2018

SATELLITE NAVIGATION PROGRAMME

U.R.RAO SATELLITE CENTRE
INDIAN SPACE RESEARCH ORGANIZATION
BANGALORE

Functional Block Diagram
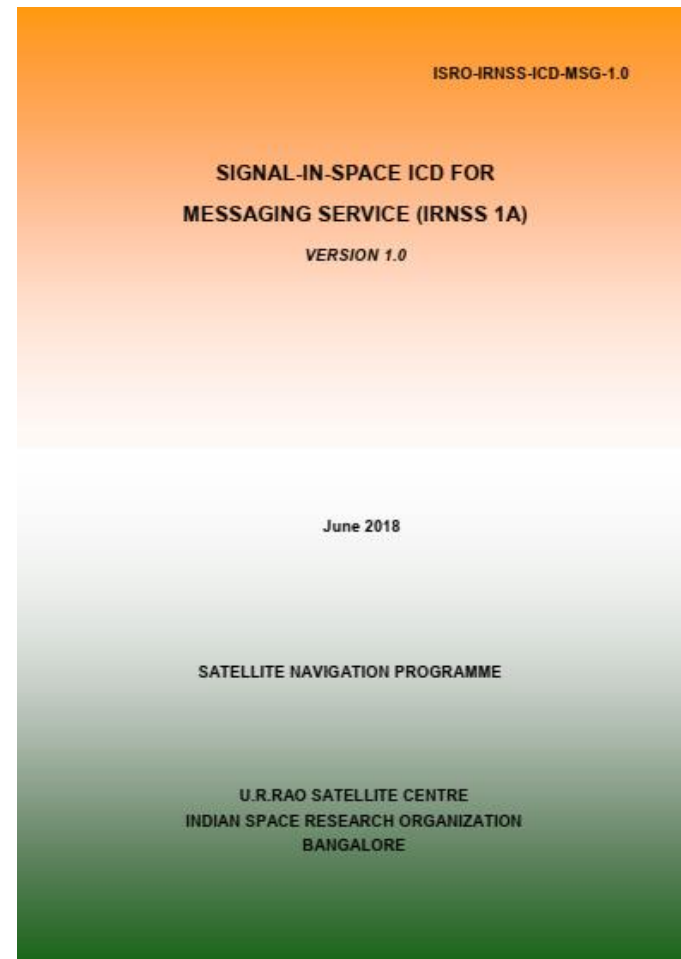
NavIC Messaging Service (NMS) – a one-way short messaging service

Authorized Agency/User

Feedback

Navigation Software @ ISRO

Navigation Centre

Satellites for messaging

Message Broadcast

Positioning Receiver

NavIC RECEIVER

Satellite Uplink

NavIC Messaging Receiver

- NavIC-based Messaging Receiver has been designed by ISRO

- Bluetooth connectivity with user cell phone and audio alarm with 5 days battery capacity

- Mobile app supporting audio/visuals alerts for fisherman in 13 different regional languages

- ISRO successfully developed receivers; technology transfer made to several Indian industries

- Field trials conducted; feedback received from fishermen

- Subsequently came up with 2-way messaging system

- Additionally provides acknowledgement of distress signals generated by fishermen

- Hub/server has been configured at ISRO for final commissioning

- Prototype terminals have been successfully tested

- Transceiver technology transferred to several Indian industries for mass production

**DAT-SG: Integrated Distress Alert Transmitter & NavIC Messaging Service
(2-way messaging system)**
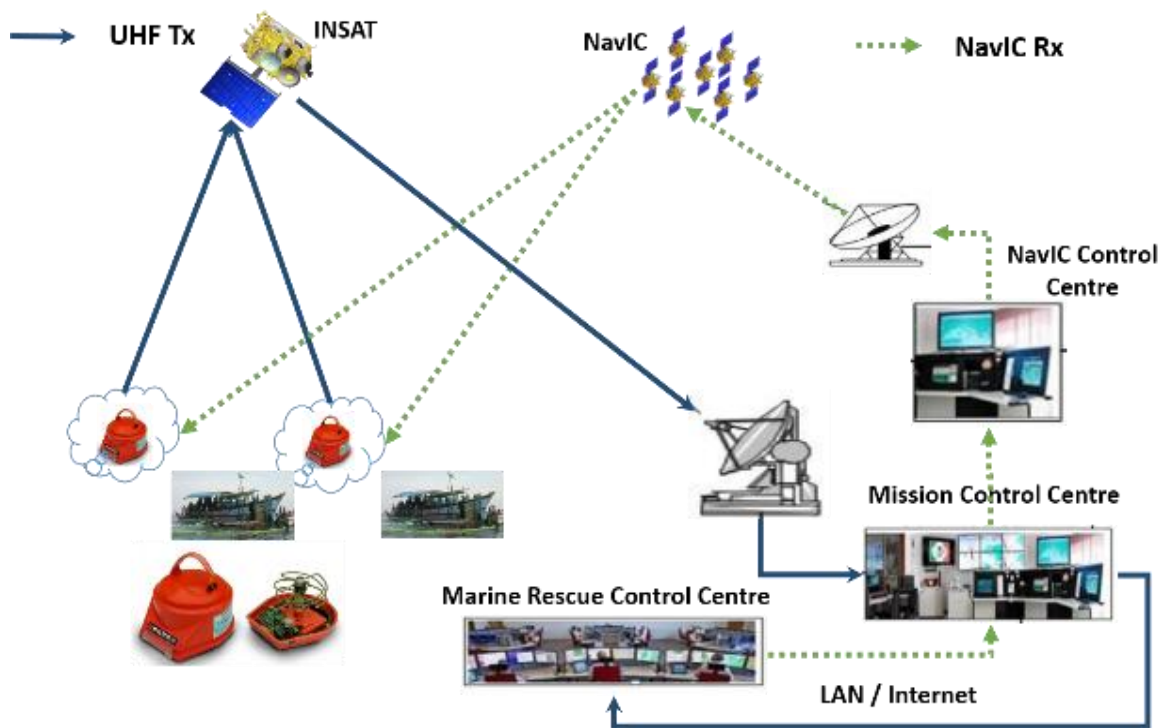
- Distress Alert Transmitter for emergency reporting by fishermen using DRT transponder of INSAT (402.65-402.67 MHz)

- Six types of messages based on manual activation

- Sends its position along with distress type

- PFZ, Cyclone, Tsunami Warning using NavIC Messaging Channel

- Low Cost battery operated terminal

- Limited Short Messaging possible from fisherman to HUB
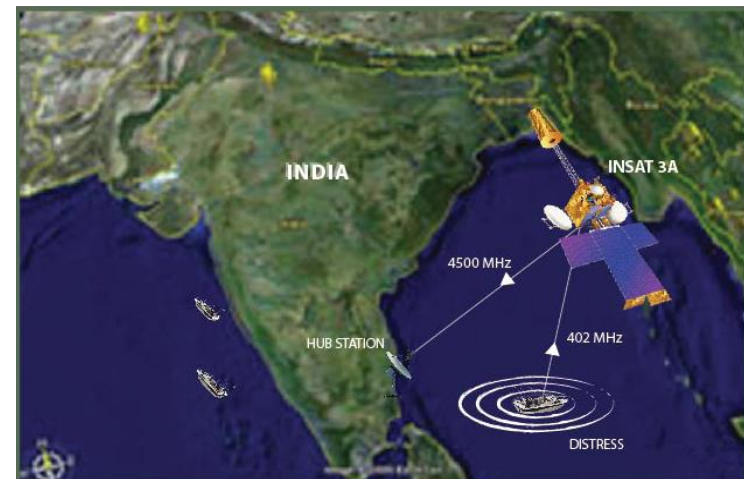
Technology Transfer

"SAC, ISRO, offers to transfer this technology of the NavIC Messaging Receiver developed by SAC to industries with adequate experience and facilities. The industry would be expected to fabricate the receiver PCB and design packaging including all the components mentioned above, and the package has to be IP67 compliant. The option of using power-bank or some rechargeable battery would be the discretion of the industry. Enterprises interested in obtained knowhow may write giving details of their present activities, infrastructure and facilities."

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Space Applications Centre (SAC), ISRO, Ambawadi Vistar,
Ahmedabad - 380 015
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Product Information

1. Application Area
   Fishery and Disaster Management
2. Product Name
   NavIC Messaging Receiver
3. Manufacturer (one among many)
   Alpha Design Technologies Ptv. Ltd.
   09, Service Road, HAL II Stage, Indiranagar, Bengaluru – 560 008, India
   Tel: +91 80-4255-6909, E-mail: alphacorp@adtl.co.on, www.adtl.co.in
4. Product Release
   Info not available on manufacturer website
5. Used GNSS Services
   NavIC Messaging Service
6. Price
   Contact manufacturer
7. References
   https://www.adtl.co.in/product-details/navic-messaging-receiver-nmr-

Thank You