



# UC San Diego



**UNOLS Annual Meeting 2021**  
**HiSeasNet US Academic Research Fleet Updates**  
**2021-10-25**

Jon C. Meyer, Information Systems Manager, Shipboard Technical Support, Scripps Institution of Oceanography

# HiSeasNet website updates

1. [hiseasnet.ucsd.edu](https://hiseasnet.ucsd.edu) has been updated with information mostly about:
  1. The vessels we are supporting
  2. The equipment we use/will use
  3. The service plans we are/will purchase
2. We have a FAQ section to address some repeated questions we are getting
3. We are in the process of creating a login-required section where reports and private URLs can be shared
4. Feedback welcome via our web form at the site

The image displays three overlapping screenshots of the HiSeasNet website. The top screenshot shows the 'About' page, which describes the network's purpose and lists services for ships. The middle screenshot shows a table of service plans with columns for ship-to-shore types and bandwidth. The bottom screenshot shows the 'Internet and Voice systems' section, featuring an image of a research vessel and a list of system options.

**Table of Service Plans (from middle screenshot):**

CIR shore-to-ship	CIR ship-to-shore	MIR shore-to-ship	MIR ship-to-shore	Blockage (%)							
best effort	best effort	432	432								
512	256	4096	2048								
512	256	1024	512								
best effort	best effort	432	432								
1024	512	8192	4096	0							
-	-	Sealink Plus	Inridium CERTUS	Out-of-band Management	Sailor 4300	L-band	120 W	best effort	best effort	176	176
-	-	Sealink	Internet & v240M	Ku-band	200	1024	512	4096	1024	0	

**Internet and Voice systems (from bottom screenshot):**

- Automatic Identifi...
- Operator Informati...
- Wikipedia

Internet and Voice systems

All Committed Information Rate (CIR) and Maximum Information Rate (MIR) units are in Kilobits Per Second (kbps). When planning, one should plan for the



## HiSeasNet US Academic Research Fleet Update

### Topics:

1. Personnel
2. State of fleet radomes
3. COVID-19 and telepresence
4. 2021
  - By the numbers
  - Changes
  - High Availability
  - Challenges
5. 2022 Plans at-a-glance

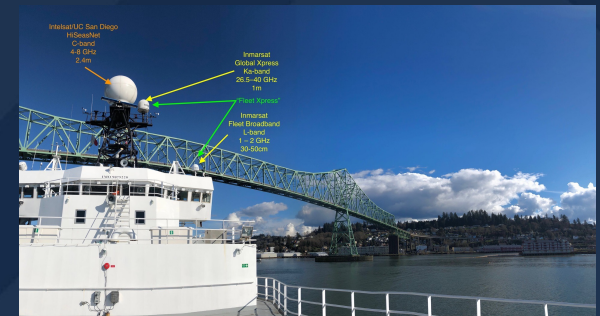
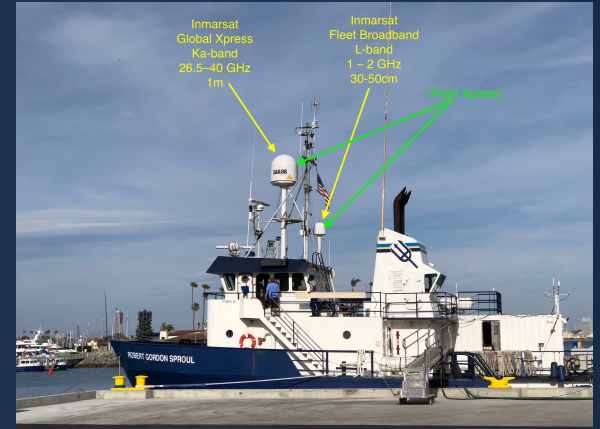
# HiSeasNet Personnel

1. Kevin Walsh has retired, but remains as busy as ever; we wish him well!
2. Thomas Lockwood has been working HiSeasNet for ~2 years and has taken on the role of primary technical POC. Thanks Thomas!
3. Lee Ellett, Jon Meyer, Kenny Olsen and Mark Pumphrey remain active project participants



# State of fleet radomes

1. 2 multi-system systems are in use
  1. Sealink Plus (bigger ships), a combination of Sealink and (out-of-band) Iridium CERTUS
  2. Fleet Xpress (all ships), a combination of Global Xpress and FleetBroadband
2. Each system has a high-performance component
  1. Sealink (C/Ku-band)
  2. Global Xpress (Ka-band)
3. Bigger dome = ~ more performance



# C/Ku-band (Sealink) radomes

1. ~3 models in fleet
  1. Intellian v240M (2.4m C/Ku-band)
    1. Gen 1 2020-present
    2. Gen 2 2020-present
  2. Cobham 9711 (2.4m C/Ku-band), <=2015-2018
  3. Cobham 6000 series (Ku-band)
2. 2.4m radomes have the biggest contract
3. 2 vessels in ARF have Ku-only setups



# Ka-band (Global Xpress) radomes

1. 3 models in fleet
  1. Cobham Sailor 100 GX ( $\leq 2019$ )
  2. Intellian GX100 HP (2020)
  3. Intellian GX100NX HP (2021-)
2. The "NX" series of radomes has Low Earth Orbit (LEO) capability
3. LEO function requires 2+ radomes, since two distinct satellites often need to be tracked at the same time





## COVID-19 and telepresence

- 2021 saw the fleet fully return to sailing after COVID lock downs and limited cruises during the prior year.
- More reliance on satellite communications and increased bandwidth requirements to support remote learning and remote collaboration with off ship parties unable to sail.
- Providers typically need 90 days or more preparation time to ensure capacity and change link performance. We are committed to trying our best to make shorter timeframes, as a best effort.
- HiSeasNet processed the most bandwidth expansions ever 2021. Most of the increased expansions were at a 4 Mbps shore-to-ship, 2 Mbps shore-to-shore committed information rate (CIR), the minimum recommended baseline for Zoom and similar telepresence applications.
- Where you go in the world matters for our planning; the sooner that is defined, the better the outcome
- Fleet Xpress can be used too; we recommend you consider both when high availability Internet is needed



## 2021: by the numbers

- High-performance radomes installed or relocated: 17
  - Second only to 2020 for most radomes installed
- Expansion requests fulfilled: 30 (and still growing!)
  - By June 2021, HiSeasNet had fulfilled the most bandwidth requests since the project's beginnings in 2002
  - "Normal" expansions have previously been on the order < 10 per year
  - Commercial service and scale has allowed this (but there are downsides)



## 2021: continuing change for satcoms

- Sealink/HiSeasnet: all remaining vessels are migrated from HiSeasNet's C/Ku private ground station to Marlink Sealink Plus service
  - Thompson (Dec 2020-Jan 2021)
  - Sikuliaq (February 2021)
  - Sally Ride (March 2021)
  - Atlantis (June/July 2021)
- Fleet Xpress progress
  - Oceanus migrated to Fleet Xpress, eschewing Sealink, due to hardware change
  - Atlantis converted to Marlink Fleet Xpress plan, following midlife refit
  - Rachel Carson still to add their Global Xpress radome

# 2021: high availability for satcoms

- Equipment installations and modifications mostly focused on achieving full sky view (high availability) for high performance capable equipment (C/Ku-band and Ka-band)
- **Global Xpress (Fleet Xpress Ka-band)**
  - New Intellian GX100NX HP domes . . . LEO capable when you install 2+ domes
    - Oceanus (March 2021)
    - Sikuliaq (March 2021)
    - Atlantis (June/July 2021)
    - Reville (August 2021)
    - Thompson (October 2021)
    - Kilo Moana (December 2021)
  - R.G. Sproul (November 2021) & Hugh R. Sharp (January 2022) dual GX domes
  - Sally Ride – Existing GX100 HP moved top-of-mast (May 2021)
- **Sealink C/Ku-band 2.4m radome installations**
  - Sikuliaq (May 2021) dual LEO Capable V240M Generation 2
  - Atlantis (June/July 2021)

# 2021: challenges for satcoms

- COVID-19 logistics dramatically increased the need for reliable Internet at sea
- COVID-19 also made travel and shipping more challenging, impacting our aggressive overhaul plans
- **Marlink/Sealink Plus/Newtec platform performance and coverage issues**
  - Thompson – coverage issues around East Pacific Rise, poor performance on video streaming for JASON cruise.
  - Sikuliaq - limited C-Band options at high latitude due to fishing fleets remaining on older iDirect platform and performance issues with NSS9.
  - Newtec on Marlink is growing, so problems like this will repeat less, going forward
  - Sally Ride – Hardware issues with both 2.4m radomes throughout the year
  - Revelle – Surprising 2.4m hardware failure. Caused ship to return to port. Quick turnaround for repair
- **Fleet Xpress**
  - Oceanus – issues with failover on dual GX domes
  - Revelle – Poor GX coverage (less than 50% availability) before dual GX dome install
  - Sproul – lack of dual GX domes caused problems during a survey cruise

# Future: 2022 Plans at-a-glance

1. ~4x bandwidth increase planning underway!!
  - Sealink 2.4m: 4x2 Mbps CIR
  - FX: 2x2 Mbps CIR
  - Rates satisfy minimum Zoom requirements
  - Timeline TBD, but as soon as feasible is desired
  - No Day Rate changes are planned for 2022
  - NSF and ONR are cost-sharing the additional expenses
  - Highest feasible ~worldwide for systems in use
2. Leased equipment projects will continue for Ocean class and bigger. Cycling hardware at ~5 years is in the plans for all ships
3. Dual radomes will continue where needed/possible
  - We are interested in pursuing class-specific solutions for multiple vessels where feasible
4. Continued lifecycle replacement of aging equipment not yet addressed in 2020-2021
5. Possible at-sea LEO tests in late 2022 (stay tuned)
6. Investigating addition of cellular WAN support for ARF
7. Investigating additional, specialized use of Iridium CERTUS





# UC San Diego



**Thank you! Questions?**