
HF in the US Navy
Latest Status
HFIA
1 Feb 2007

Ongoing Initiatives

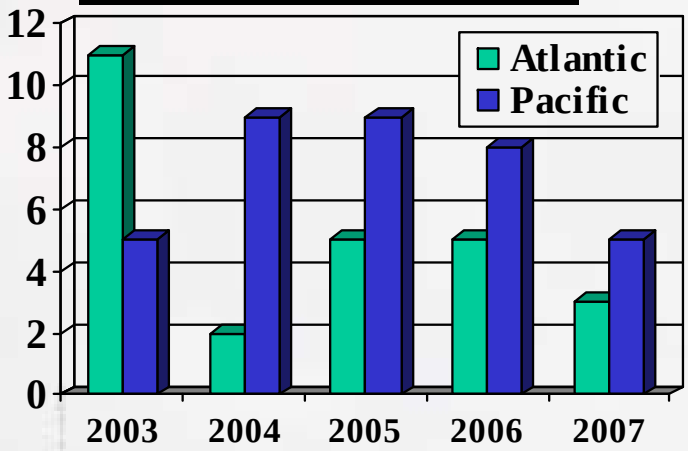
- ***High Frequency Data System***
  - **BFEM66**
  - **HFIP**
- ***Airborne Networking***
- ***Shore Infrastructure Upgrade***
- ***Mast Clamp Current Probe***
- ***JTRS***

HFDS Relies on BFEM66 Today

- ***FY'04 – FY'06***
  - **BFEM66 point to point system –currently 195 ships fielded**
    - **Still growing in number of Allied/Coalition partners who use BFEM66 for communication with US Navy afloat**
    - **Larger and larger use for serial chat as well as e-mail**
    - **Tied to CENTRIXS enclaves when necessary**
  - **Technology obsolescence exacerbated by electronic design changes and increasing demand for ad hoc connectivity**
    - **Marketplace influences are changing the way users view HFDS**
    - **Connectivity changes are necessary in order to maintain Allied/Coalition interoperability the US Navy afloat has today**
  - **Overlapping technology lifecycles across two (2) upgrade increments**
    - **Increment I: SMTP over HF (Battle Force E-Mail66)**
    - **Increment II: IPv6 over HF (S-5066 Edition 2)**

BFEM 66 Performance: Service to the Fleet

Down Time Reports



Average Data Rates

	Pre-Set Modem Speeds for Shipboard Systems			
If Modem SNR =	<12 SNR*	12-18 SNR*	18-24 SNR*	>24 SNR*
With Function =	MIL110B	MIL110B	MIL110B-F	MIL110B-F
At Datarate =	4.8 Kbps	9.6Kbps	12.8Kbps	19.2Kbps
253K Word document	12.2 minutes	10.9 Minutes	7.0 Minutes	3.0 minutes
Rec. Distance	<100 Miles	<125 Miles	<200 Miles	<400 Miles

* SNR = Signal to Noise Rating on modem front panel

Interoperability Level:

Int'l Partner	NATO	Coalition	FMS/Direct	Verified
Bahr		4	FMS	Yes
Belg	3		FMS	Yes
Can	16		Direct	Yes
Fra	77		Direct	
Ger	24		FMS	Yes
Ital	58		Direct	
Kor		2	FMS	Yes
Jap		22	FMS	Yes
Neth	6		Direct	Yes via NATO
Oman		15	Direct	Yes via UK
Peru		1	FMS	Yes
Spn	1		Direct	
UK	60		Direct	Yes
US	182			

Requirements

Information Characteristics	Sending Node	Receiving Node	Format	Time lines
Operational and administrative traffic to include emails and attachments	Afloat platforms, shore sites both U.S. and Allied/ Coalition. Joint aircraft/land based vehicles as appropriate.	Afloat platforms, shore sites both U.S. and Allied/ Coalition. Joint aircraft/land based vehicles as appropriate	Data packets, formatted in accordance with STANAG 5066 in a modulated waveform complying with STANAG 4539/MIL-STD 188-110B	Variable. In two station net, 100KB message in less than 5 mins.

Internet Protocol over HF (HFIP)

- ***Effort endorsed by CNO in April 2001***
- ***Developed by US Navy and NC3A in Linux OS - based on draft STANAG 5066 Edition 2***
  - **Edition 2 release awaiting promulgation of Edition 1 by member nations**
- ***Plan to upgrade BFEM66 from ship to ship comms to multi-ship HF comms***
  - **Backbone carrier support to latency tolerant IP-based apps**
- ***SSB or ISB up to 19.2 KBPS***
  - **MIL-STD-110B, STANAG 4539 & 5066 App. G waveforms**
- ***Interconnection with other afloat and airborne forces involved in specified ConOps***

HFIP Experience

- *Dec 02 – Three ship at sea trial*
- *Aug 03 to Aug 05 – E2C Compatibility tests and trial deployment*
- *May 04 to Dec 04 – Various demonstrations and exercises with ships and shore sites*
- *Dec 05 – Trident Warrior 05. Demonstration involving 3 ships, 2 aircraft and shore site*
- *Jun 06 – Trident Warrior 06. Demonstration involving 3 USN ships and 2 RAN ships*
- *Jul 06 – LOE tests with P-3 Aircraft and other surface platforms*
- *Dec 06 – Connectivity and data transport tests validate use with SSN*

Battle Force Email 66 Capabilities Growth Plan in HFDS

- FY07
  - Integrate HF-IP Design and connect to secure LAN infrastructures
    - Advances HF pathway capability toward lights-out operation as a network appliance
      - E-Mail
      - Internet Relay Chat Environment
      - Secure FTP transfers
    - Implement in air, ground and afloat environments
      - Diverse topologies and extended range connection
      - Multiple platform connections and bridging across nodes
  - Broaden scope of HFDS to include shore and aircraft
    - Successful demonstration in theatre and in more multi-platform ad hoc test environments continues

HFIP is listed as #1 Interoperability "Need" in US Navy

FY08 - FY09

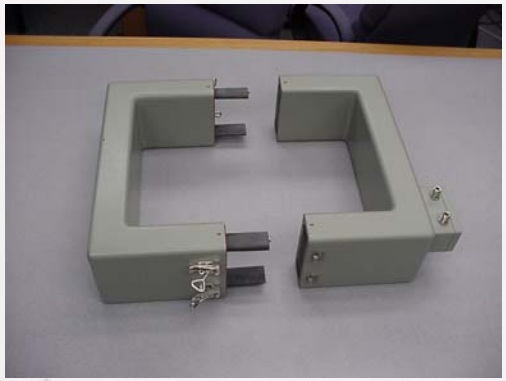
- Developing the integration and operation underpinnings necessary for afloat, aircraft, shore comms interoperability
  - Secure network infrastructure, ConOps for link positioning
- Shrink form factor
  - Co-host within existing accredited/hardened Common Computing Environment (makes achieving interoperability easier)
  - Add HF-IP into more afloat platforms
- Converge HFIP with non-HF systems to improve information transfer among ships in LOS/ELOS proximity
  - Extended Line of Sight – Wide Area Networks (ELOS-WAN)

Move toward IP over HF in a Joint/Allied Interoperability environment will set the rate of authorized improvements in the U.S. Navy

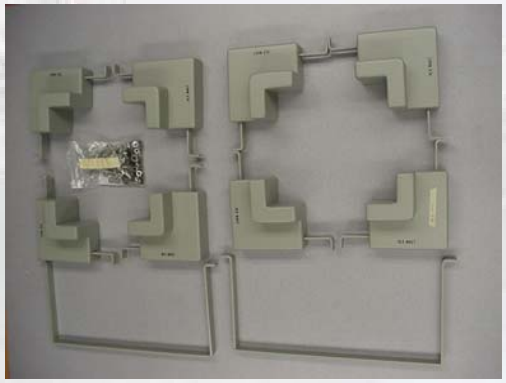
Mast Clamp Current Probe (MCCP)

- ***The MCCP replaces two DDG-51 Antenna Tilt Groups and HF receive antennas***
  - **Requires no power/No moving parts**
- ***HF Antennas are the number one fault / failure mode aboard US Navy ships today***
  - **MCCP offer significant acquisition and maintenance cost savings**
  - **Topside weight savings of 840 lbs**
  - **Reduced radar cross section**
  - **Eliminates antenna hazard to helicopter flight operations**
- ***The MCCP provides equal or superior HF receive performance to existing antenna***

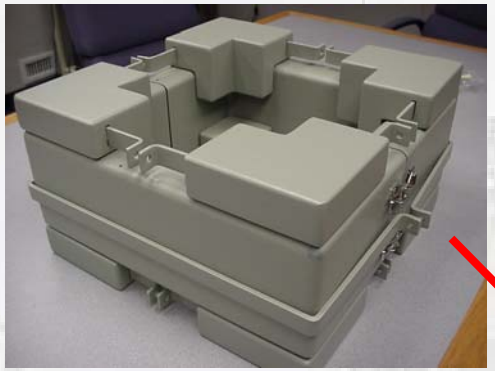
Mast Clamp Current Probe



17.5”x17.5”x6.5” (100 Lbs.)



Mounting kit and belly band



17.5”x17.5”x10.5” (110 LBs)

USS Roosevelt Stub Mast

Mast Clamp Current Probe

- ***Status***
  - **CONOPS successfully demonstrated in 1998 and 2000**
  - **New construction DDGs 104 & beyond being outfitted**
  - **Fleet modernization requirements being addressed**

Shore Infrastructure Upgrade

- ***Shore HF requirements being upgraded for HFIP***
  - **Primarily support to extended range comms to US Navy aircraft**
- ***Ship to shore comms still pretty much restricted to MPA support***
  - **Most shore sites being upgraded to USAF Scope Command standards pending turn over to USAF for O&M**
  - **Some dual use sites will remain**

HF Transition to JTRS

- ***FY'10 - Beyond***
  - **Assessing business case offered by ALE in HF-IP token ring environment over legacy SSB capability**
    - **With ALE controller or new ALE radio functions**
  - **Continue to measure and accomplish dove-tailing with JTRS requirements**
    - **JTRS will support all HF waveforms/protocols used in the US Navy today.**
      - **Mil-Std-188-110B appendix F**
      - **STANAGs 5066 and 4529**
      - **HF ALE Mil-Std-188-141B**
      - **ATC HF Data Links**

Summary

- ☑ *HF Data (IP Based) use for allied/coalition naval interoperability is proving reliable and efficient*
- ☑ *US Navy continues to evaluate higher speed modems for increasing HF medium operational utility*
- ☑ *HFDS used with Military IT architectures is addressing the U.S. Navy's needs for data speed, hands-free utility and HF networking*
- ☑ *Goals within the Navy's HF programs are compatible with JTRS implementation*

Backup

Definitions

- ***A Token Ring network is a local area network (LAN) in which all computers are connected in a ring, mesh or star topology and a bit- or token-passing scheme is used in order to prevent the collision of data between two computers that want to send messages at the same time***
  - **Very briefly, here is how it works:**
    - **When a computer has a message to send, it inserts a token in an empty frame (this may consist of simply changing a 0 to a 1 in the token bit part of the frame) and inserts a message and a destination identifier in the frame.**
    - **The frame is then examined by each successive workstation. If the workstation sees that it is the destination for the message, it copies the message from the frame and changes the token back to 0.**
    - **When the frame gets back to the originator, it sees that the token has been changed to 0 and that the message has been copied and received. It removes the message from the frame.**
    - **The frame continues to circulate as an "empty" frame, ready to be taken by a workstation when it has a message to send.**
  - **The Token Ring protocol (IEEE 802.5) is the second most widely-used protocol on local area networks after Ethernet.**
- ***The HF-IP Token scheme is used within a wireless "Bus" network topology and "Multi-cast" connection state.***
  - **In the bus network topology, every HF-IP workstation is connected to a single frequency channel called "the bus". Multicast(1) communication is systematically handed off between a single sender and multiple receivers on the HF-IP network.**
    - **Therefore, in effect, each workstation is directly connected to every other workstation in the network.**

(1) *Together with anycast and unicast, multicast is one of the packet types in the Internet Protocol Version 6 (IPv6). Multicast is supported through wireless data networks technology.*