



**Program Executive Office
Command, Control, Communications,
Computers and Intelligence (PEO C4I)**

Submarine Commercial SATCOM Discussion

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Topics for Discussion



- Use of Commercial SHF Satellites to supplement WGS SHF Capability
- Use of IRIDIUM for Comms at Speed and Depth (CSD)

SHF- Super High Frequency

WGS – Wideband Global SATCOM



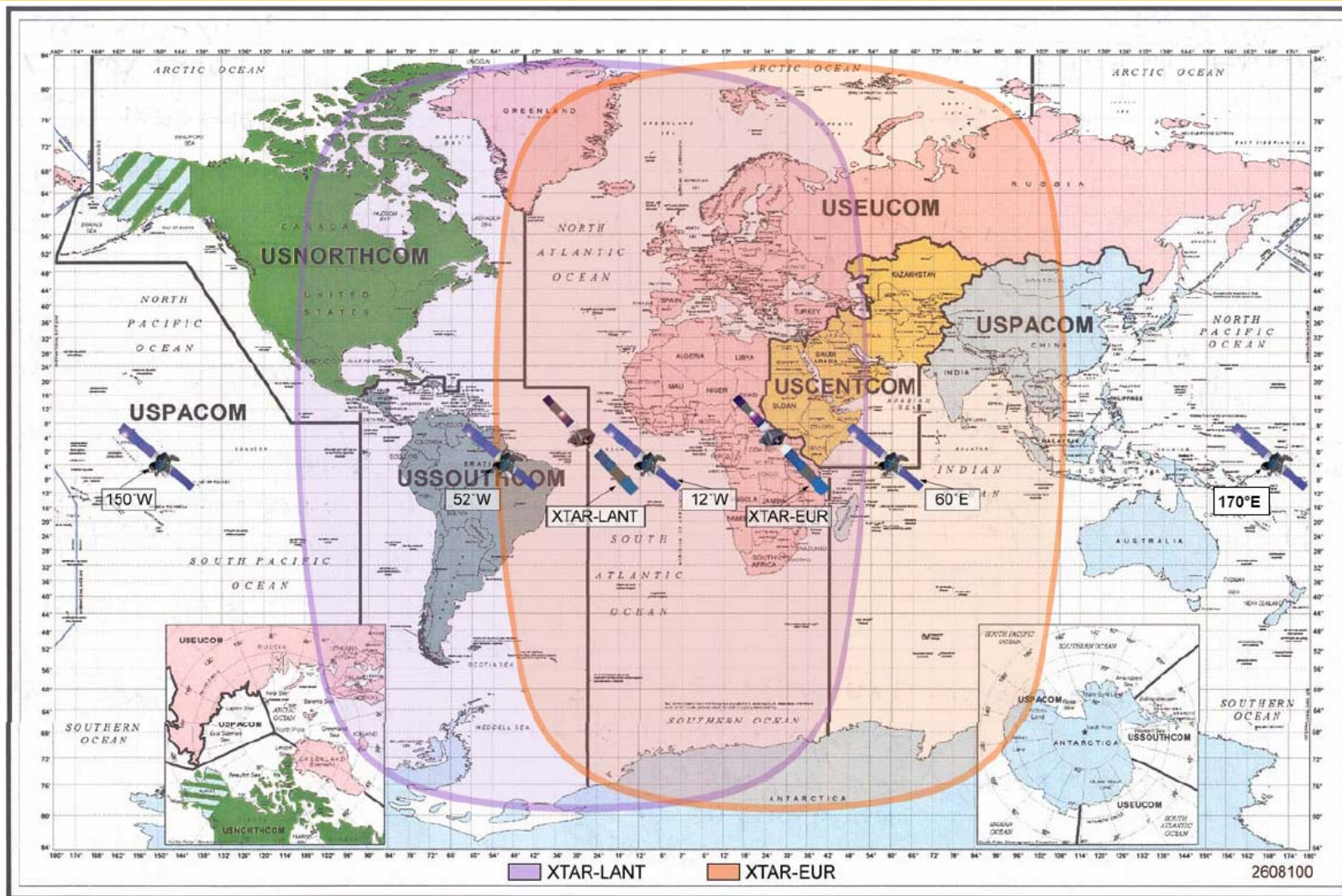
Submarine Operational Scenarios *with Commercial SATCOM*



- 4 simultaneous submarines operating dispersed in Med, CENTCOM, North Atlantic or other regions
- Looking for alternatives for the Pacific Region
- 24/7 coverage required
- Case 1:
 - Four 2-way 256 kbps
- Case 2:
 - Two 2-way 256 kbps
 - Two 2-way 512 kbps
- Case 3:
 - Four 2-way 512 kbps or Two 2-way 1024 kbps (SSGN)



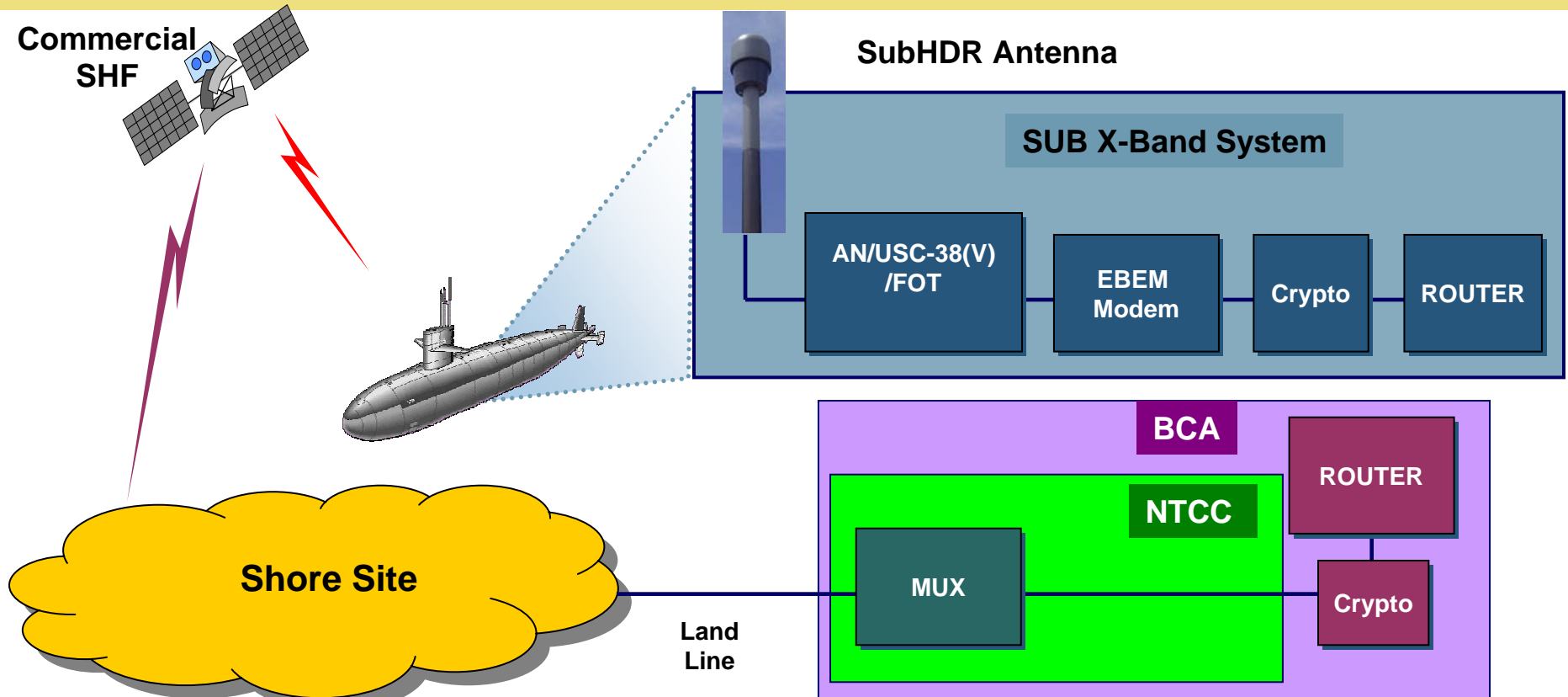
Notional WGS and Supplemental Commercial SHF Coverage



Note: WGS and XTAR satellites will provide global X-band coverage



Notional Submarine SHF Architecture



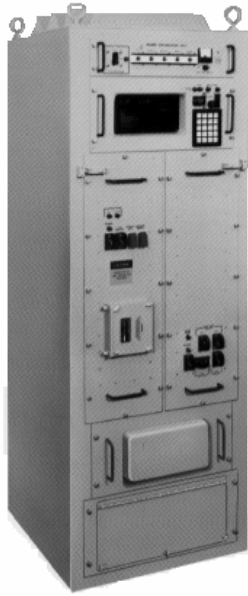
- Teleport shore antenna not currently available to point to commercial SHF
- PMW 170 investigating feasibility for Teleport to support commercial SHF mission

- Example: Site survey done Croughton UK
- 1-64kbps backhaul link currently available between Croughton and CSG8 via Northwood (Not X-Band)
 - PMW 770 investigating 4X512kbps backhaul direct between Croughton and CSG8

SHORE SITE BACKHAUL REQUIRES FURTHER INVESTIGATION



Submarine Current and Planned X-Band Equipment



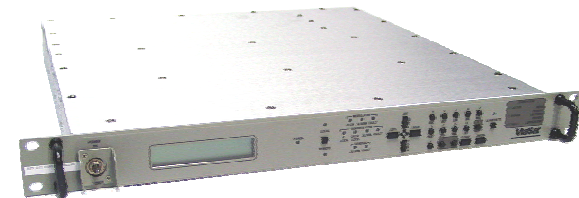
- Legacy Equipment supports up to 750kbps
 - Fielded on 5-688 class platforms
- FOT/EBEM supports > 64 to 750 kbps
 - OPEVAL completed on 688 class sub – Effective and Suitable
 - Fielding starting in FY09 on Los Angeles, Seawolf, Virginia, and Ohio (GN) class submarines
 - Congressional funding cut in FY08 for FOT SHF upgrade –reduced fielding numbers



**Legacy
Terminal and modem**



**FOT
Communications Group
(X-Band Upgrade in Progress)**



**FOT EBEM External Modem
(New)**

NO UNPLANNED INBOARD SUBMARINE MODS REQUIRED FOR COMMERCIAL SHF



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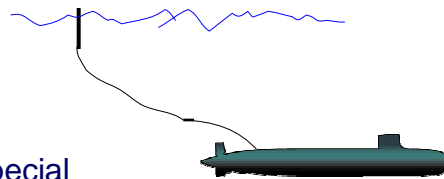
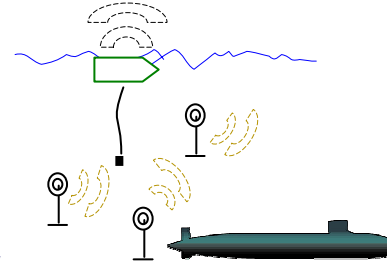
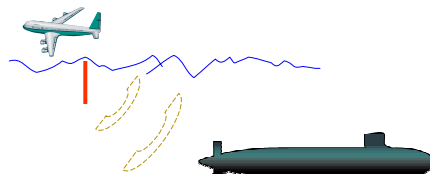


CSD's Incremental Capability



CSD Family of Systems:

- Structured to develop robust and sustained submarine communications while at speed and depth
- Connects the submarine to the operational commander (Strike Group or Theater)
- Provides IP, medium data rate, two-way communications throughout the full range of tactically relevant depths and speeds
- Supports multiple submarine missions
 - Anti-Submarine Warfare (ASW)
 - Intelligence, Surveillance, and Reconnaissance (ISR)
 - Land Attack/Strike Mission (STK)
 - Naval Special Warfare (NSW) / Special Operations Forces (SOF)
 - Strike Group Operations (SGO)
 - Anti-Surface Warfare (ASUW)
 - Mine Warfare Operations (MIW)
 - Strategic Deterrence (SD)



Increment 2: Follow-on Capability Improved SOF Mission Support, Enhanced World-wide Paging

- Recoverable Tethered Optical Fibre (RTOF) Buoy
- BCA w/HF Special Radio Variant
- BCA w/ Towed Buoy
- Distributed Undersea Communications Network (SeaWeb)
- Enhanced VLF (delivered with LBUCS)

Increment 1: **IOC FY12**

Fully integrated ASW Focused System with Two-way Messaging Capability and Improved Information Exchange Rate (IER)

- Tethered Expendable Communications Buoy (TECB) – Iridium
- Tethered Expendable Communications Buoy (TECB - UHF) (includes SSBN installations)
- Acoustic to RF Gateway (A2RF) System (air and sub variants)

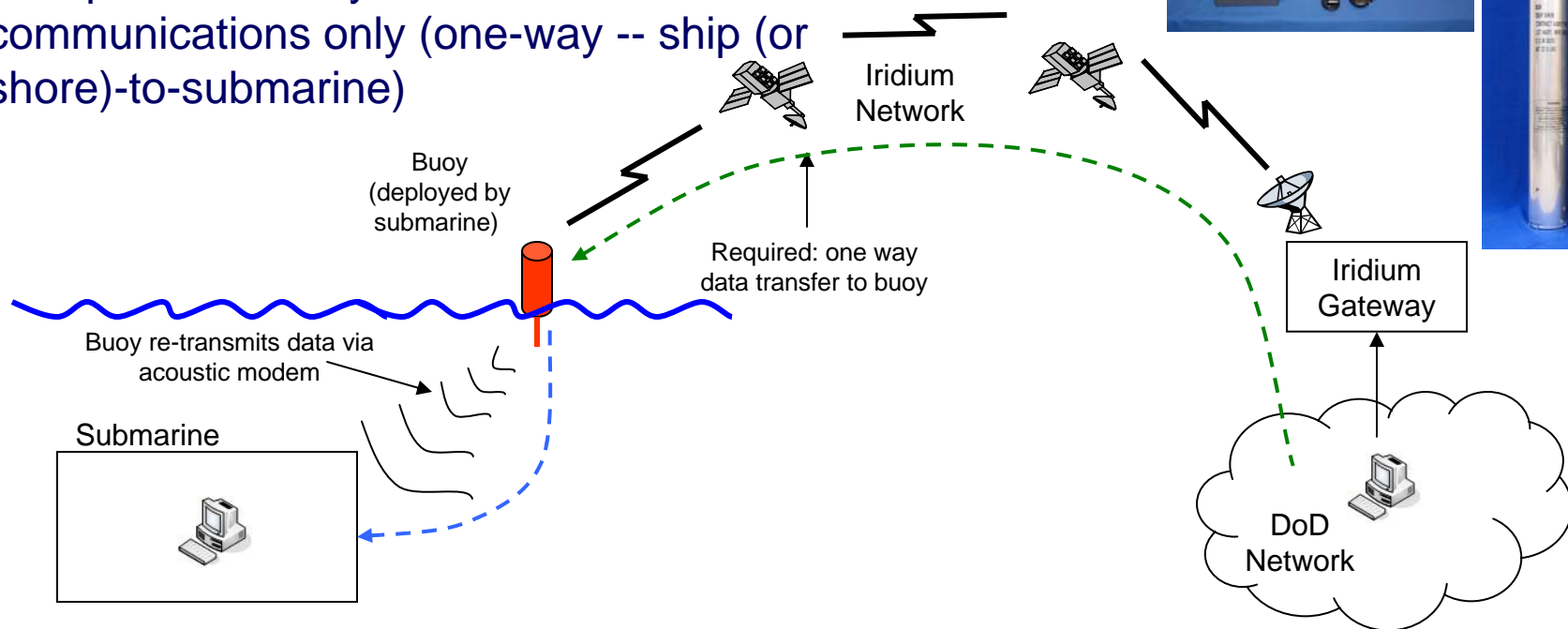
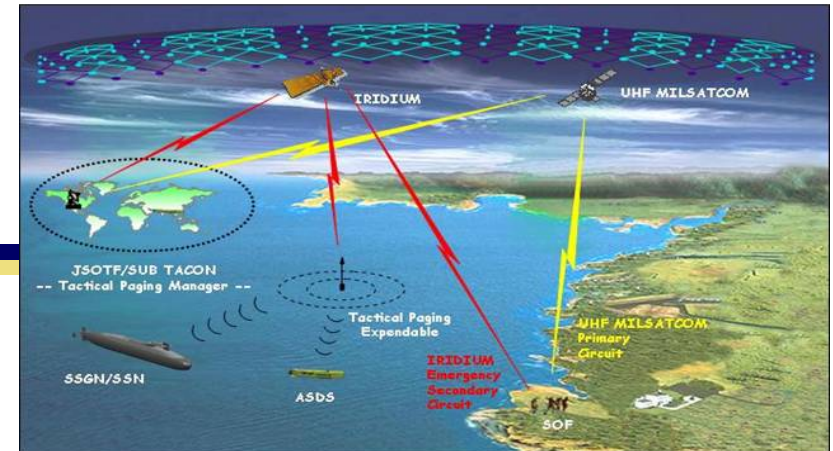
Increment 0: Non-Program of Record **IOC FY09** Near-term Capability Delivery

- Buoyant Cable Antenna (BCA) w/HF IP (PMW 170 RDC and PMW 770 Antenna Mods)
- Deep Siren Tactical Paging Buoy (RTT/FCT/ACTD process)



Tactical Paging Buoy (TPB)

- Buoy launched by a Submarine
- Buoy receives Iridium SATCOM broadcasts from shore site/ networks and converts signal to “Deep Siren” acoustic transmission, an acoustic coded pulse to relay information to submerged Sub
- TPB provides Buoy to Submarine communications only (one-way -- ship (or shore)-to-submarine)

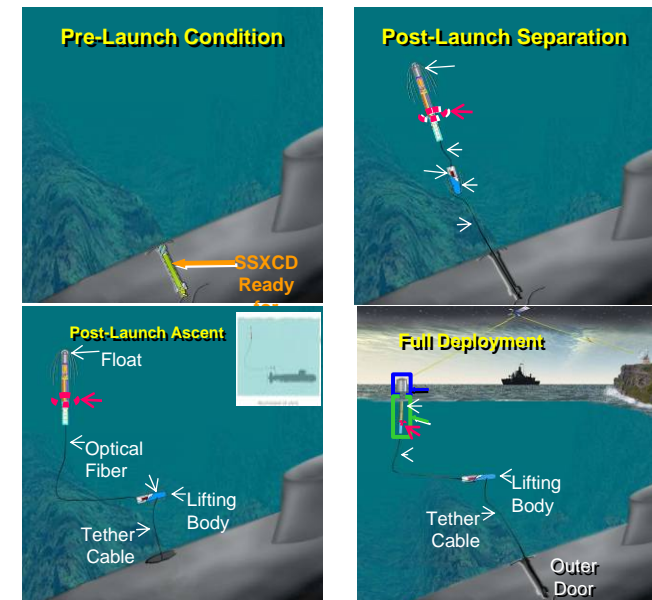
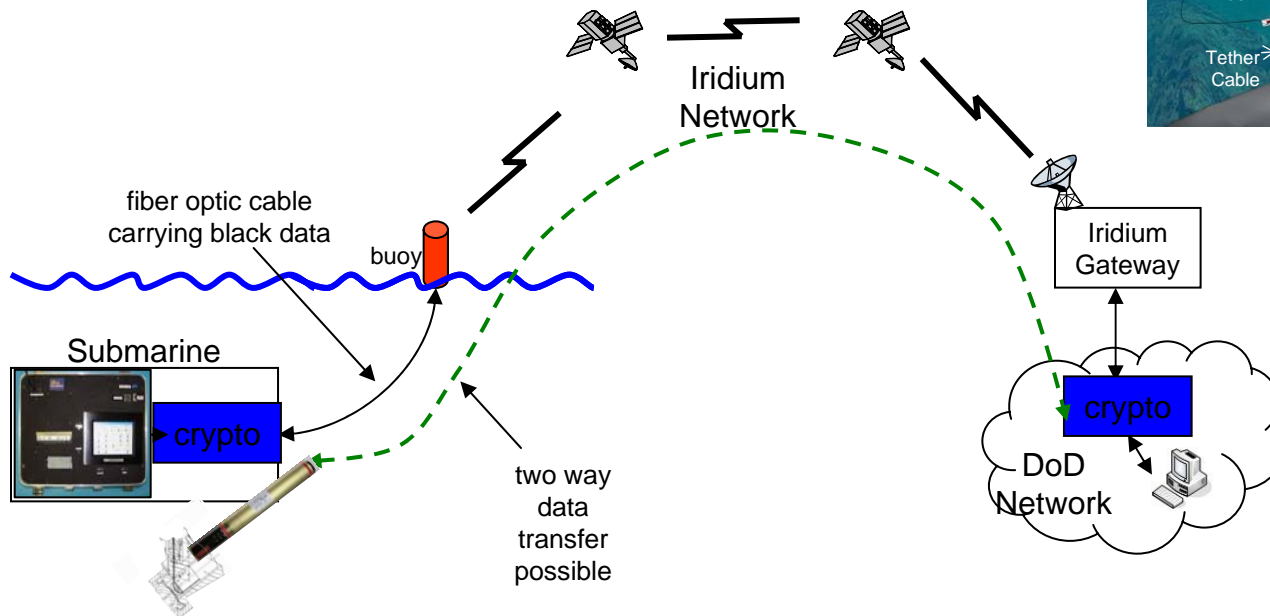




Tethered Expendable Communications Buoy (TECB)- Iridium



- Buoy is launched from Sub. using fiber optic cable to maintain connection with the Sub
- Buoy uses Iridium SATCOM to connect to shore network
- End to end link provides approximately 10 to 30 minutes of Circuit Switched Data Service
- System provides real-time, two-way chat, file transfer and email at a maximum of 2400 bps

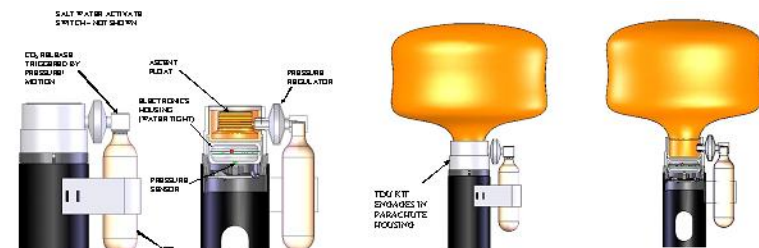
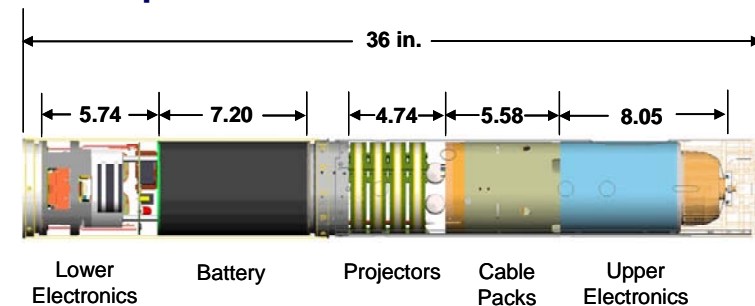
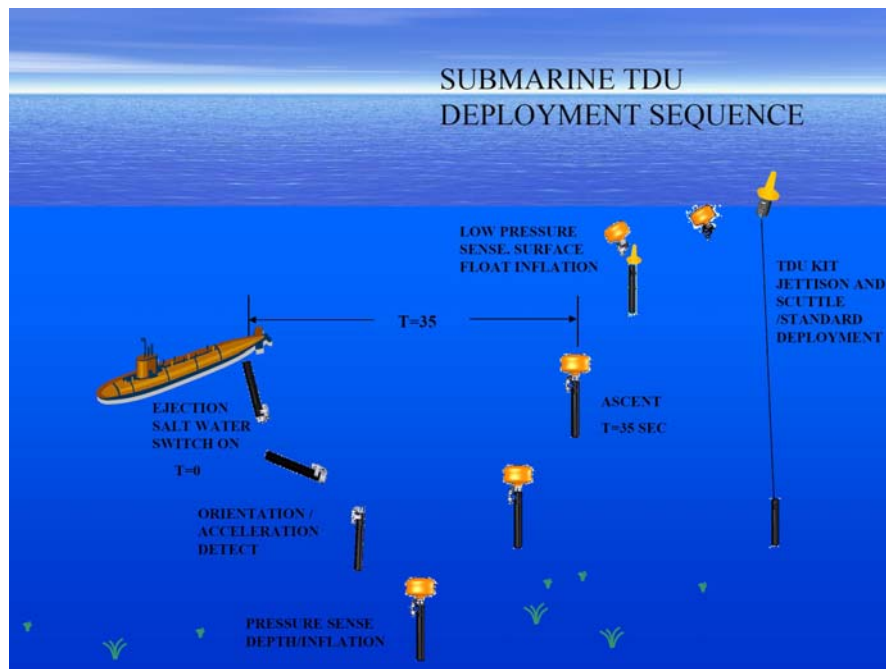




Acoustic to RF (A2RF) Gateway System



- Improvement on TPB system – provides two-way acoustic communications and improved system capabilities. Submarine and aircraft launched.
- Collaborative effort between PEO C4I, PEO SUB, PEO (A), PEO IWS5, and NUWC
- Built with standardized sonobuoy components for both submarine and aircraft deployed variants
 - Core Buoy
 - Submarine launch kit is attached prior to launch
- Leverages the Telemetry Buoy for Underwater Communications System (TBUCS) Foreign Comparative Test (FCT) effort to accelerate design and development





Summary



- Commercial SHF will to submarine MILSATCOM SHF and maybe funded in 2010 and later
- Shore site requires additional investigation
- No specific inboard or outboard submarine modifications required to access SHF
- IRIDIUM provides a unique capability with world wide coverage and on-demand service, CSD RFP issued
- Transition from IRIDIUM back to MILSATCOM (MUOS) if IRIDIUM is not replenished