

NAVAL SURFACE WARFARE CENTER - DAHLGREN DIVISION



Q Electromagnetic & Sensor Systems Department



SATELLITE COMMUNICATIONS AND THE AFLOAT ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM (AESOP)

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Report Documentation Page

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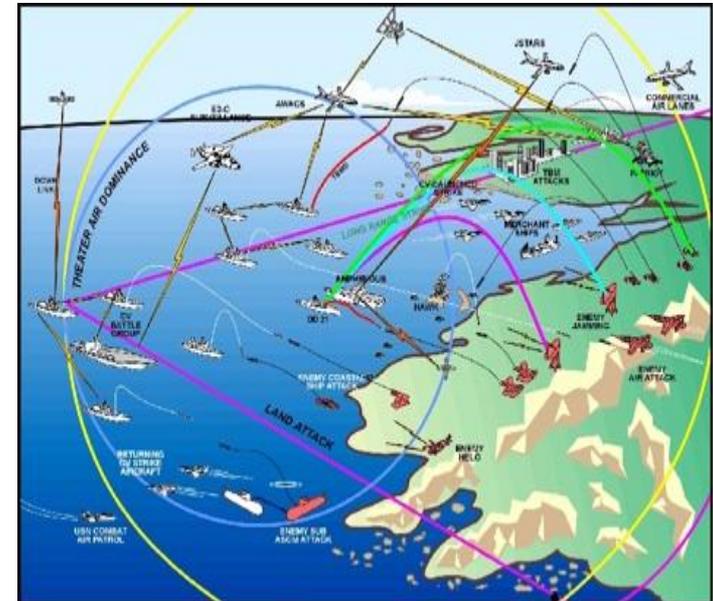
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Outline

- **Satellite Registration**
- **Satellite Frequencies and the Operational Tasking Communication (OPTASK COMM)**
- **Satellite Frequencies and Radar Assignments**
- **Afloat Electromagnetic Spectrum Operations Program (AESOP) Demonstration**

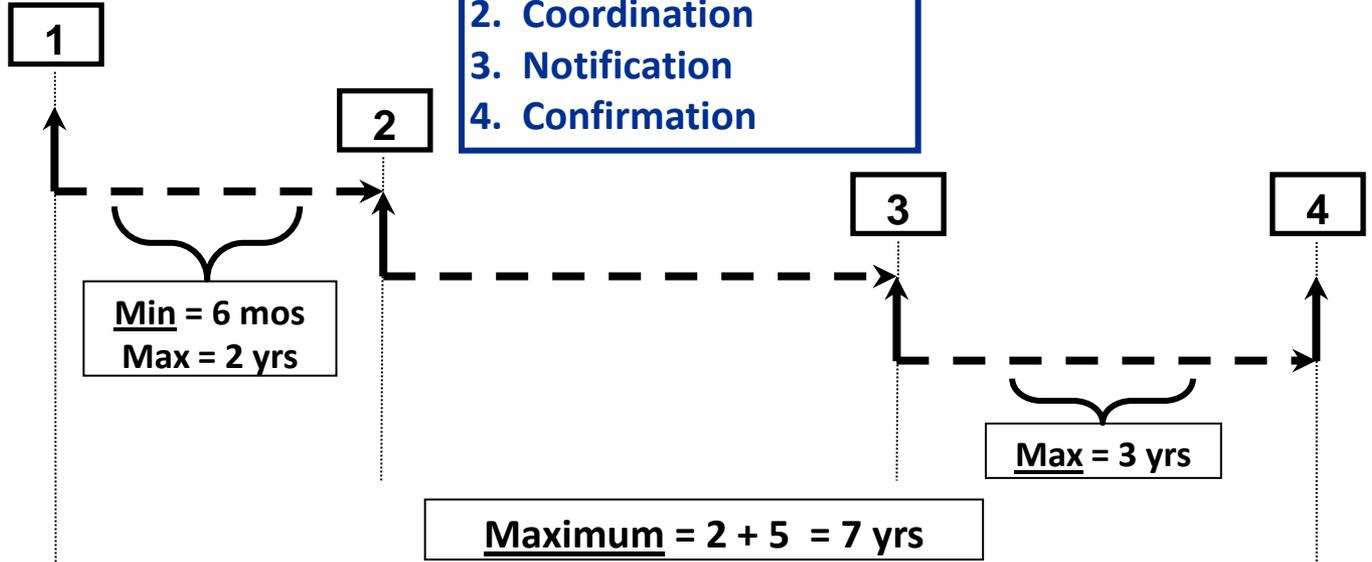




Satellite Registration Process 4 Phases / 7 Years

ITU Registration Process

1. Advance Publication
2. Coordination
3. Notification
4. Confirmation



Satellite Program Decision

Requirements

Launch

DoD Acquisition Process

CDD

Specs

SOW

PPBS

Contract

PDR

CDR

Test

Acronyms:

CDD: Capability Description Document

SOW: Statement of Work

PPBS: Plans, Programs, Budget System

PDR: Preliminary Design Review

CDR: Critical Design Review





Satellite Frequencies and the OPTASK COMM

- **Satellite Access Requests (SAR)**
 - Request to obtain uplink/downlink frequencies for Defense Satellite Communication System (DSCS), Commercial Wideband Satellite Program (CWSP), Commercial Broadband Satellite Program (CBSP), Extremely High Frequency (EHF)
- **Satellite Access Assignment (SAA)**
 - Provides satellite uplink/downlink frequencies for DSCS, CWSP, CBSP, EHF
- **SATCOM Frequencies in the OPTASK COMM**
 - UHF SATCOM frequencies are provided by the NCTAMS in the daily status message (2301Z)
 - SHF/EHF frequencies are provided to the ship(s) directly from the Regional Satellite Support Center (RSSC) via SAA.
 - OPTASK COMM Satellite Line Numbers are used to account for satellite frequencies.
 - Satellite frequencies documented in the OPTASK COMM will be analyzed by AESOP software for Electromagnetic Interference (EMI).



Satellite Frequencies and Radar Assignments

- **Radar Planner and Communications Planners work together**
 - **Must share information to support Information Warfare (IW) and Command, Control, Communications and Computers (C4)**
 - **Supports IW requirements, deny spectrum from our enemies while providing rapid and reliable communications**
- **Communications planner distributes OPTASK COMM to Radar Planner**
 - **Radar Planner imports OPTASK COMM into AESOP prior to generating Radar Assignments**
 - **AESOP generates Radar assignments to minimize EMI to communications systems from Radar & Electronic Warfare (EW) systems**



Satellite Frequencies and AESOP EMI Analysis

RONALD REAGAN EMI Victims

Select an EMI Victim

Victim	Priority	Frequency MHz	JRFL
SPS-48E(V)10	Neutral	2939.00 - 3058.00	
SPS-49A(V)1	Neutral	881.33 - 910.22	
SPS-67(V)1	Neutral	5781.00	
SPS-73(V)17	Neutral	9405.00	
UPX-27 INTERROGATOR	Neutral	1090.00	
UPX-27 TRANSPONDER	Neutral	1030.00	
USC-38 NO. 1 (ST802B)	Neutral	20700.00	
VHF BRIDGE-TO-BRIDGE NO. 1 (LP158)	Neutral	156.80	
WSC-6 NO. 1 (ST800B)	Neutral	7710.00	
WSC-8 NO. 1 (ST801B)	Neutral	3744.00	

Sources of EMI to Selected Victim

Platform	Source	EMI Level	Frequency (MHz)
No EMI Predicted.			

OK
Report
Help

Cumulative EMI Level:
Severe
Moderate
Mild
Score: 0

Example EMI Victims Dialog



Satellite Recap

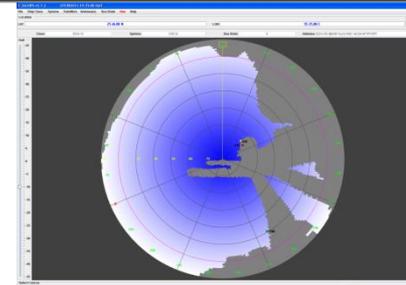
- **Satellite Frequencies and the OPTASK COMM**
 - **Add SATCOM frequencies to the OPTASK COMM to avoid EMI from high powered radar systems to co-located satellite systems operating in the same bands**
 - **Improve reliability to critical satellite links such as DSCS, CWSP**
- **Satellite Frequencies and Radar Assignment Generation**
 - **Consider OPTASK COMM frequencies during AESOP's EMI analysis**
 - **Provide radar frequency plan that minimizes EMI to satellite and terrestrial communications nets and links**
- **AESOP Software Demo**



AESOP Core Elements

➤ Build/Gather/Input Deployment Data

- Phases/Areas of Operations
- Participants
- Net Plans



➤ Request Spectrum Management Data

- Equipment Inventory
- Frequencies

➤ Receive/Input Spectrum Management Data

- Import of Equipment Inventory
- Import of Frequency Assignments

➤ Create/Distribute Frequency Plan

- OPTASK COMM, Radar Assignments, SFAF

➤ Monitor Spectrum Usage

- Identify EMI/Connectivity Issues





DEMO

- **Demo is built using the Instructional Use Unclassified database with default FY2011 Reagan Strike Group (SG)**
- **Sample Local Area Frequency Assignment is included**
- **Demonstration will show that by including SATCOM uplinks and downlinks in the Net Plan, potential EMI issues from shipboard radar systems can quickly be identified and mitigated**
- **AESOP strives to avoid EMI to any terrestrial and/or SATCOM frequencies in Net Plan when regenerating new Radar Assignments**



Questions?

Comments?



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BACKUP SLIDES

- Phases of Satellite Registration Process:
 - API
 - CRC
 - Notification
 - Confirmation



Phase 1: Advance Public Information (API)

- Administration Submits API to International Telecommunications Union (ITU)
 - 2 to 7 Years Prior Planned Launch/Operational
 - General Information / Identity of the Network
- ITU
 - Reviews API for Completeness
 - Distributes to Its Members
- ITU Members
 - Review API; Identify and Provide Initial (Interference) Concern/s to Filing/Registration Administration



Phase 2: Satellite Coordination Request (CRC)

- Administration Submits CRC to ITU
 - Between 6 Months to 2 Years after submitting API
 - Detail Identity of the Network
 - Specific Frequency Band(s) , Orbital Slot, Planned Operational Date,
 - Transponder RF Characteristics (Power, Bandwidth, Antenna Gain/Pattern)
 - Associated Earth Station and Service Area
- ITU
 - Reviews CRC for Completeness/Conformance
 - Distributes to Its Members



Phase 2 (Continued): CRC

- ITU Members
 - Review CRC; Provide Specific Interference Concern/s to Filing/Registration Administration
 - Based on Frequency Overlapping, Closed Orbital Separations, Co-located Service of filing Networks
- Filing/Registration Administration
 - Contacts Concerned Administration to initiate Coordination
- Coordination
 - Administration - Administration, or Operator - Operator
 - Long Process (Negotiations)
 - **End Result**: Eliminated/Minimized Potential for RF Interferences between Networks and Obtained Agreements from Affected/Concerned Administrations



Phase 3: Notification & Phase 4: Confirmation

- Phase 3: Notification to ITU
 - Provide Status of Completed Coordination/Obtained Agreements With All Affected/Concerned Administrations
- Phase 4: Confirmation
 - Launched Satellite – Within 7 years of API Date
 - Send Confirmation (Satellite On-Orbit)
 - Established “Date of Bringing Into Use” -- Operational Date --
- If Didn't Launch Satellite within the 7 Years Filing Period
 - ITU Cancels Filing
 - Re-file (Go Back to Phase 1)
 - Lost Priority