Global Command and Control System – Maritime (GCCS-M) Segments

And SkyCAP Assured IP Software

UHF SATCOM I/P NETWORKING   ANYTIME   ANYWHERE

10th ICCRTS

13 June 2005

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Report Documentation Page

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Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

What is SkyCAP?

SkyCAP is a software solution to provide netted I/P access over half duplex LDR satellite (also LOS) links. It is the integration of the proposed MIL-STD-188-184A with an I/P interface. The original goal was to only pass TCP for mail, web browsing, ftp, etc. but has since been expanded to support all I/P types. SkyCAP has demonstrated use on other tactical Line-of-Sight (LOS) VHF/UHF radio networks and shows potential for Over-the-Horizon (OTH) HF radio modes.

DOD does not have a UHF SATCOM I/P network waveform.

What Is SkyCAP?

- **SkyCAP is a TDMA implementation of MIL-STD-188-184. It includes proxy-tunnel component allowing for efficient IP networking and latency tolerance. The TDMA protocol provides shared use of the satellite channel in both netted and point-to-point modes.**

- <u>**A little on 184:**</u>
  - *It is a RED side CSMA data link protocol designed for UHF SATCOM.*
  - *MIL-STD-188-184 defines an interoperable waveform standard for data controllers required to operate over single-access, 5- and 25-kHz ultra high frequency (UHF) satellite communications (SATCOM) channels.*
  - *It is designed to reliably control the flow of data over noisy communications channels at high throughput rates and with minimum setup required for interoperability and performance.*

- **SkyCAP is a modification of this MIL-STD prepared to comply with Joint Staff direction requiring that a new standard for data control be developed.**

- **This MIL-STD defines the mandatory system parameters for planning, engineering, procuring, and using data control functions that will be used to transfer error-free data over UHF SATCOM channels during joint operations.**
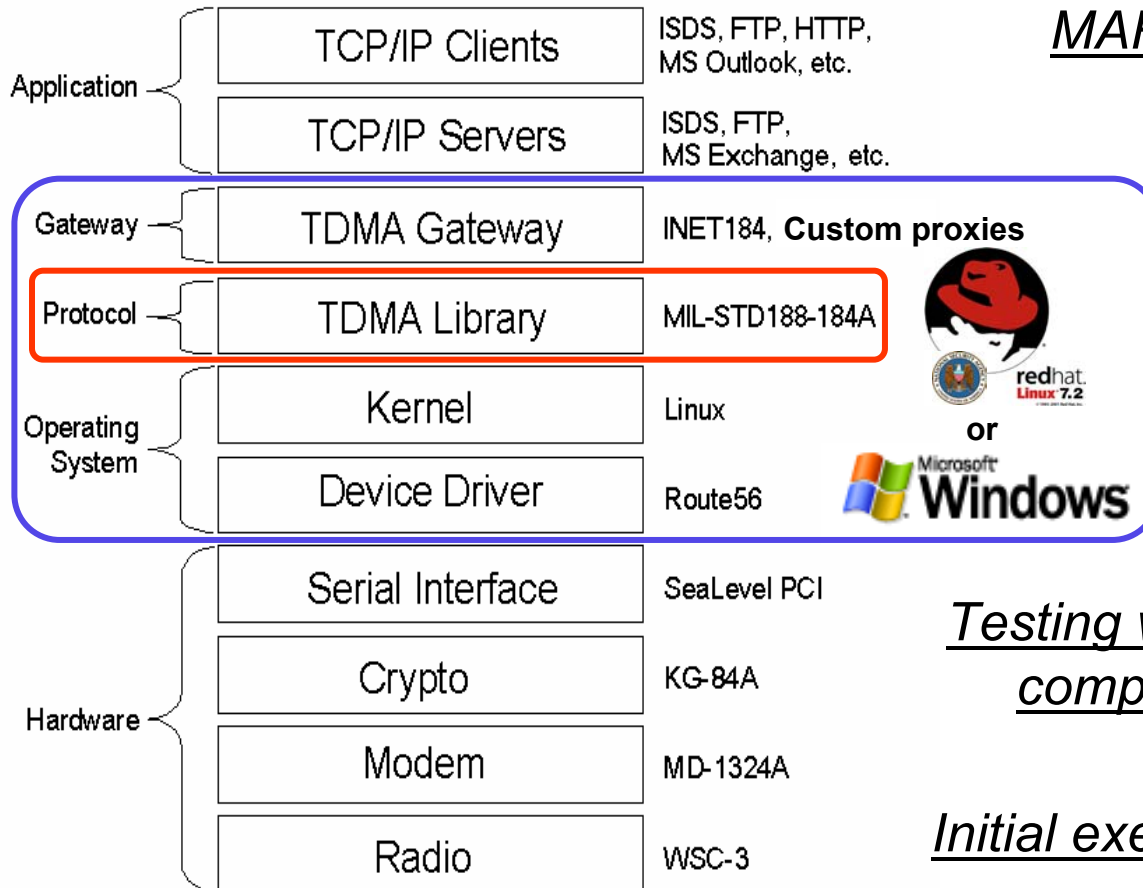
Purpose of SkyCAP

- 5kHz Program MIL-STD interoperability for basic 184

- To provide a reliable way to use ADW in support of IXS transition and demonstrate the benefits of moving towards a new integrated waveform (IW)

- To meet user requests for an easy to use low or no cost method to allow multiple users to pass I/P data across a single UHF SATCOM 5kHz or 25kHz channel and other LOS channels as appropriate

- Provide a Windows software module capable of being used across the full spectrum of Navy/USMC radio systems

Software Architecture

System Layers

Layer		Component	Technology
Application		TCP/IP Clients	ISDS, FTP, HTTP, MS Outlook, etc.
		TCP/IP Servers	ISDS, FTP, MS Exchange, etc.
Gateway		TDMA Gateway	INET184, **Custom proxies**
Protocol		TDMA Library	MIL-STD188-184A
Operating System		Kernel	Linux
		Device Driver	Route56
Hardware		Serial Interface	SeaLevel PCI
		Crypto	KG-84A
		Modem	MD-1324A
		Radio	WSC-3

redhat. Linux 7.2

or

Microsoft Windows

SkyCAP
UNF SATCOM I/P NETWORKING   ANYTIME   ANYWHERE

=

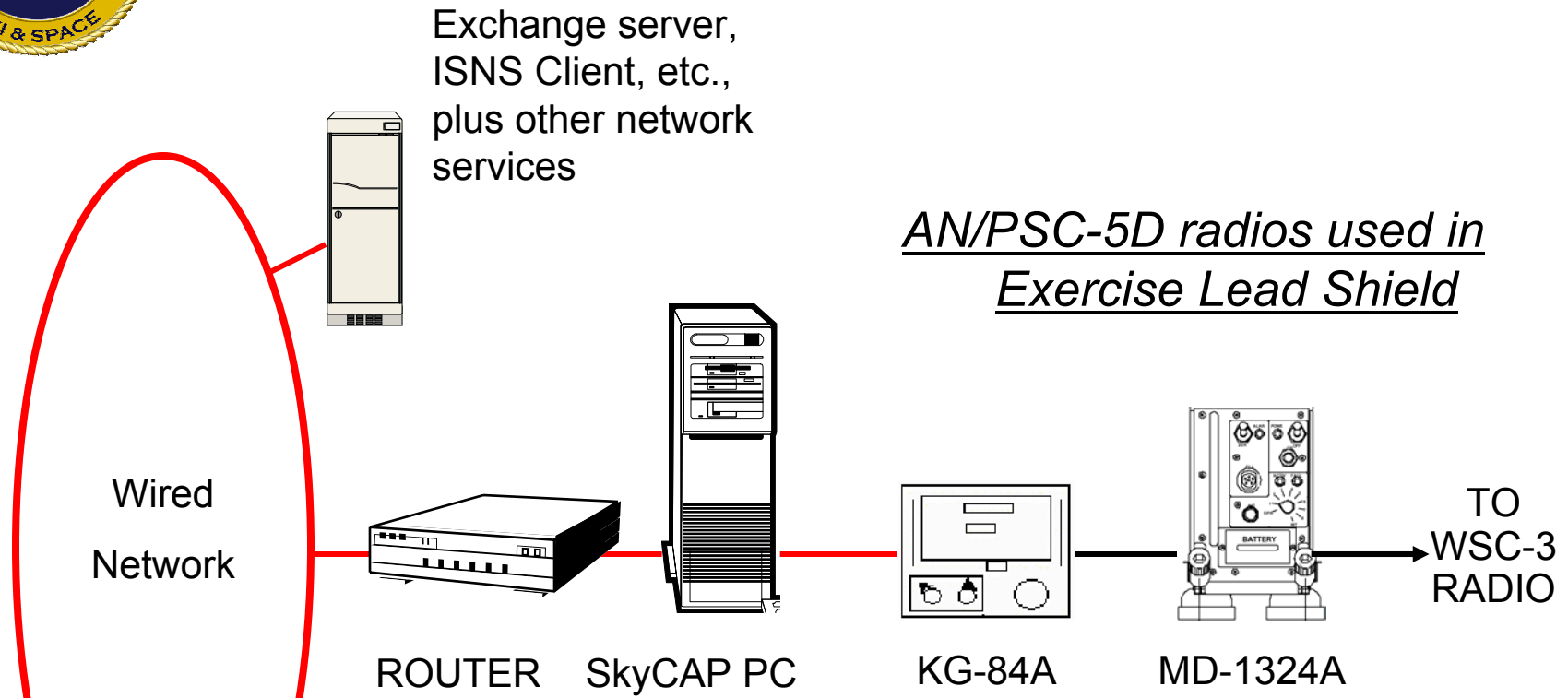*Windows development completed (DEC 2004) via direction/funding from MARCORSYSCOM C2PC Program*

Testing with GCCS-M segments completed in MAR/APR 2005

Initial exercise use in Lead Shield in MAY 2005

How It Works

Exchange server, ISNS Client, etc., plus other network services

AN/PSC-5D radios used in Exercise Lead Shield

Wired Network

ROUTER   SkyCAP PC   KG-84A   MD-1324A

TO WSC-3 RADIO

- The SkyCAP PC is assigned an I/P address; tunnels are automatically created for the desired ports; it then functions as a proxy.
- I/P data is stripped down, compressed, and packaged into SkyCAP messages with all FEC applied.
- The networking protocol then transmits the message over the WAN to the distant end where the reverse is performed.
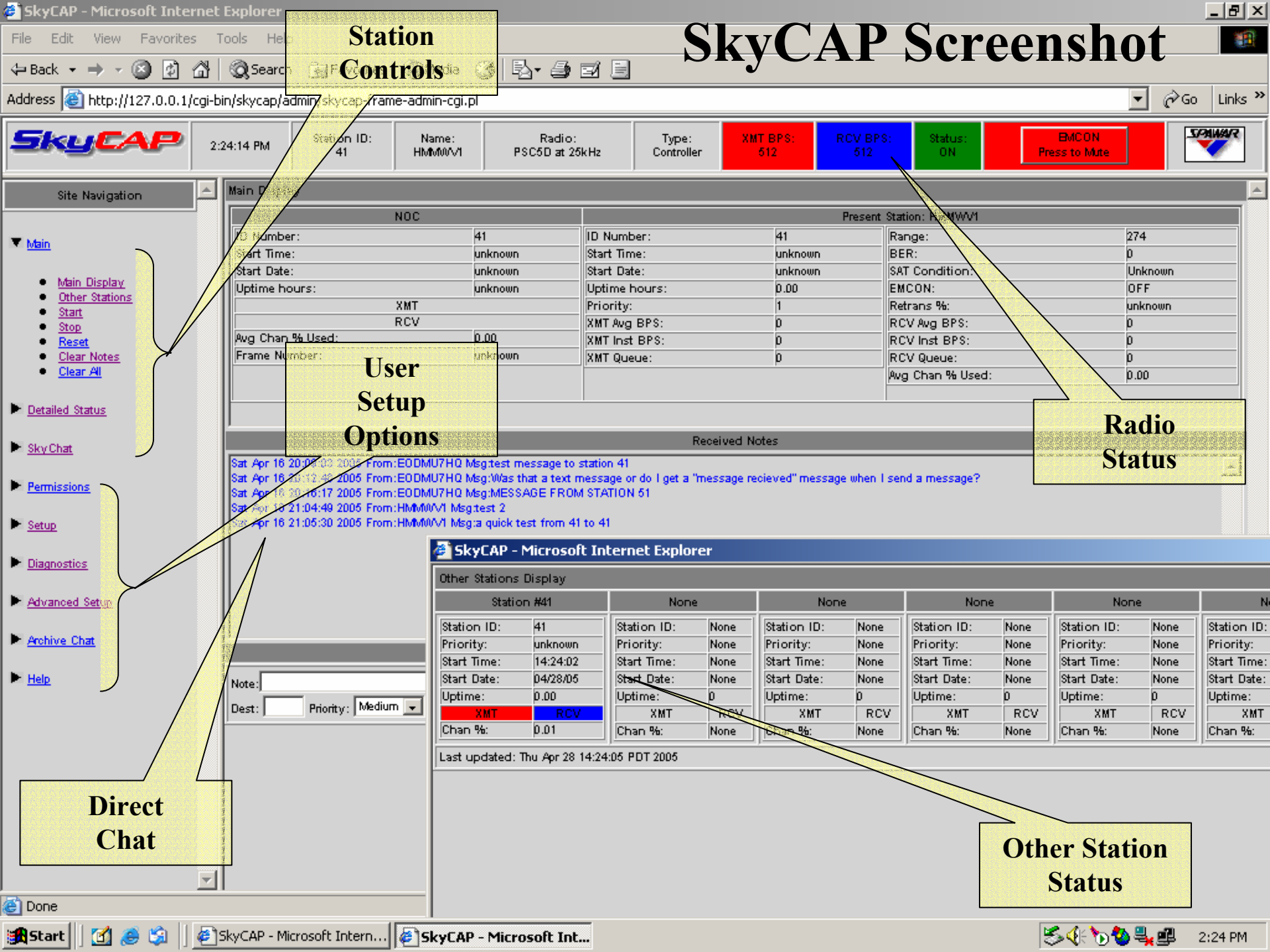
SkyCAP Screenshot

File Edit View Favorites Tools Help

Back | Search | Go

Address http://127.0.0.1/cgi-bin/skycap/admin/skycap-frame-admin-cgi.pl

SkyCAP 2:24:14 PM

| Station ID: 41 | Name: HMMWV1 | Radio: PSC5D at 25kHz | Type: Controller | XMT BPS: 512 | RCV BPS: 512 | Status: ON | EMCON Press to Mute | SPAWAR |

Station Controls

Radio Status

User Setup Options

Direct Chat

Other Station Status

Site Navigation

▼ Main
- Main Display
- Other Stations
- Start
- Stop
- Reset
- Clear Notes
- Clear All

▶ Detailed Status

▶ Sky Chat

▶ Permissions

▶ Setup

▶ Diagnostics

▶ Advanced Setup

▶ Archive Chat

▶ Help

Main Display

NOC		Present Station: HMMWV1	
ID Number:	41	ID Number:	41	Range:	274
Start Time:	unknown	Start Time:	unknown	BER:	0
Start Date:	unknown	Start Date:	unknown	SAT Condition:	Unknown
Uptime hours:	unknown	Uptime hours:	0.00	EMCON:	OFF
XMT		Priority:	1	Retrans %:	unknown
RCV		XMT Avg BPS:	0	RCV Avg BPS:	0
Avg Chan % Used:	0.00	XMT Inst BPS:	0	RCV Inst BPS:	0
Frame Number:	unknown	XMT Queue:	0	RCV Queue:	0
				Avg Chan % Used:	0.00

Received Notes

Sat Apr 16 20:08:00 2005 From:EODMU7HQ Msg:test message to station 41
Sat Apr 16 20:12:46 2005 From:EODMU7HQ Msg:Was that a text message or do I get a "message recieved" message when I send a message?
Sat Apr 16 20:16:17 2005 From:EODMU7HQ Msg:MESSAGE FROM STATION 51
Sat Apr 16 21:04:49 2005 From:HMMWV1 Msg:test 2
Sat Apr 16 21:05:30 2005 From:HMMWV1 Msg:a quick test from 41 to 41

Note: _____ Dest: ____ Priority: Medium

Other Stations Display

Station #41		None		None		None		None		N
Station ID:	41	Station ID:	None	Station ID:	None	Station ID:	None	Station ID:	None	Station ID:
Priority:	unknown	Priority:	None	Priority:	None	Priority:	None	Priority:	None	Priority:
Start Time:	14:24:02	Start Time:	None	Start Time:	None	Start Time:	None	Start Time:	None	Start Time:
Start Date:	04/28/05	Start Date:	None	Start Date:	None	Start Date:	None	Start Date:	None	Start Date:
Uptime:	0.00	Uptime:	0	Uptime:	0	Uptime:	0	Uptime:	0	Uptime:
XMT	RCV	XMT	RCV	XMT	RCV	XMT	RCV	XMT	RCV	XMT
Chan %:	0.01	Chan %:	None	Chan %:	None	Chan %:	None	Chan %:	None	Chan %:

Last updated: Thu Apr 28 14:24:05 PDT 2005

Done

Start | SkyCAP - Microsoft Intern... | SkyCAP - Microsoft Int... | 2:24 PM

Spiral Development Sequence

- JAN 04
  - Start SkyCAP live SATCOM testing (LINUX version)
- MAR 04
  - Complete SkyCAP JWID build (LINUX version)
- APR 04
  - Complete user test documentation
  - Complete software accreditation for SkyCAP for JWID 2004
- June 04
  - Participated in JWID 2004 demonstration
- DEC 04
  - Complete Windows development
  - Deliver 12 SkyCAP Windows systems to MARCORSYSCOM
- FEB-MAR 05
  - Commence SkyCAP/MEDAL tests with CMWC, NSCT-1 & EOD
- MAY 05
  - SkyCAP/MEDAL in Exercise Lead Shield III

Goals of SkyCAP in JWID

- **Use programmable traffic for scheduled allocation of resources and delivery of timed traffic**

- **Demonstrate reliable single transmission of SMTP and/or X.400/DMS to multiple domains**

- **Demonstrate reliable and timely transfer of FOTC/NETPREC GCCS-M data via SkyCAP**

- **Demonstrate SKYCHAT, a web based chat application**

SkyCAP in JWID 2004

JWID COP

JWID COWAN

HF
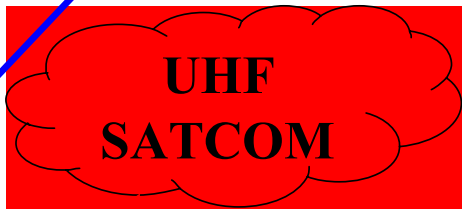
UHF SATCOM

Data Rates
HF – 19.2 kbps
SATCOM – 56 kbps

PRC-150 HF Radio (or equivalent

Ethernet

PRC-150 HF Radio (or equivalent)

EIA-530

PSC-5D or PRC-117F SATCOM Radios
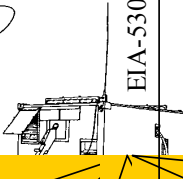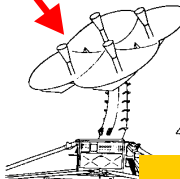
GCCS-M Workstation

SKYCAP Laptop

EIA-530

SPAWAR JWID Site

Simulated Remote Ground Station

EIA-530

SKYCAP Laptop

Ethernet

GCCS-M Workstation

DMS/chat/ Exchange Workstation

DMS/chat/ Exchange Workstation

JWID 2004 SKYCAP/EDSS/MEDAL Demonstration
High-Level Operational Concept Graphic (OV-1)

JWID 2004 Results

- **Following is quoted from official JWID 2004 final assessment:**

  - The SkyCAP demonstrated significantly improved methods of providing IP connectivity to existing GCCS-M tactical decision aids using current tactical radio systems.

  - The SkyCAP/MEDAL/EDSS combination demonstrated significantly improved methods of providing IP connectivity to existing GCCS-M tactical decision aids using current tactical radio systems.

  - The systems successfully passed the following types of data:

    - Standard GCCS-to-GCCS traffic in the form of USMTF/OTHG text messages via the GCCS NETWORK/NETPREC interfaces to a remote node representing a small tactical field unit. This was accomplished via both standard shipboard (WSC-3) and field manpack (PRC-117F) radio systems.

    - C2PC traffic as an extension of the GCCS track picture from one master Gateway to two remote Gateway/client workstations representing small ships. This was accomplished using standard field HF radio systems.

    - Imagery files (JPEG format was used, although any file type was possible).

    - Chat using Microsoft Chat.

    - Web browsing using standard Internet Explorer

What is MEDAL?

DECISION SUPPORT SYSTEM $=$

METOC	MISSION PLANNING AND EVALUATION
INTEL	
CONNECTIVITY	

SkyCAP provides
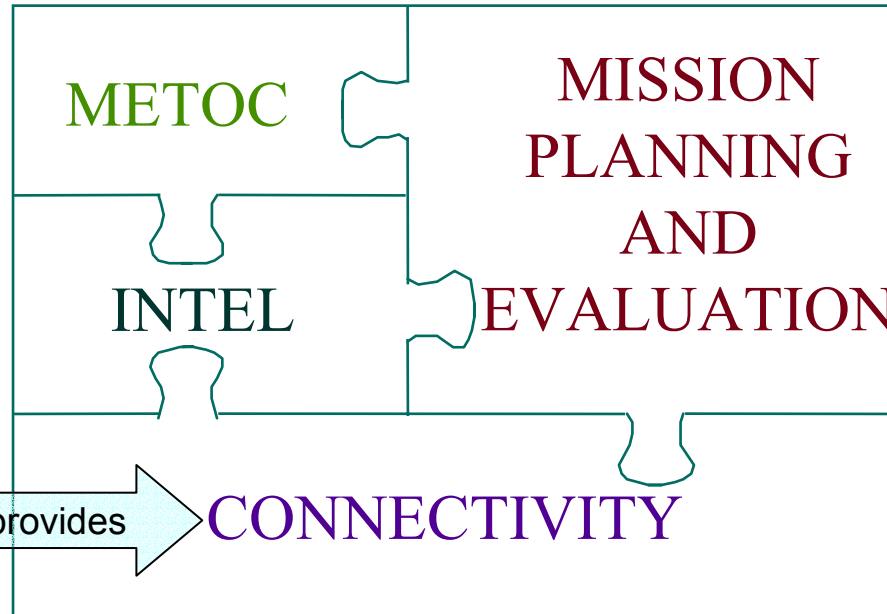
$=$ "A FORCE MULTIPLIER"

MEDAL is **THE** Integrated Mission Planning and Evaluation Tool for MIW Forces

COMINEWARCOM 201600Z NOV 96

MEDAL supports:

- MIW Mission Planning.
- MIW Evaluation.
- Command and Control of MIW forces.

MEDAL Testing

- Test offer made at initial request of EODMU 7 to test distribution of REMUS platform data via MEDAL from remote mobile teams.

- Initial testing 14-15 FEB 05 highlighted configuration and physical problems that required correction.

- Follow-on testing 1 MAR 05 at NSCT-1 was successful on both 25 KHz and 5 KHz channels.

- Continued MEDAL testing conducted in MAR/APR with EODMU-7 using base stations and mobile HMMWV's.

- Use of SkyCAP to support MEDAL data exchange in Exercise Lead Shield III 23-27 MAY 05 via SATCOM and UHF LOS links.
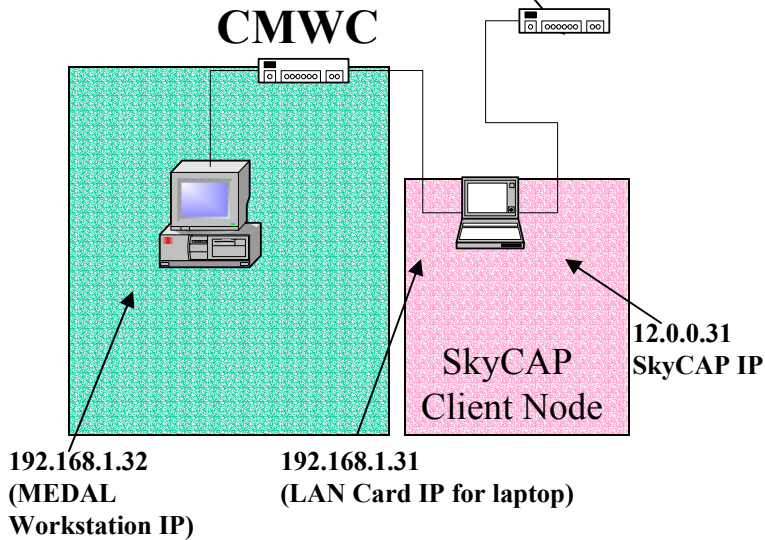
SkyCAP/MEDAL Test Configuration

25 KHz Dedicated Channel
(CONUS channel assigned by JFCOM)

Corpus Christi, TX

San Diego, CA
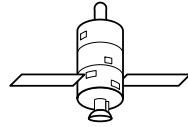
Radio on loan
to CMWC from
NSCT-1

CMWC

**EODGRU ONE
(Observer only –
Optional participant)**

EODMU SEVEN

SkyCAP Master Controller

**192.168.2.22
(MEDAL
Workstation IP)**

**12.0.0.21
SkyCAP IP**

**192.168.2.21
(LAN Card IP
For laptop)**

SkyCAP
Client Node

**12.0.0.31
SkyCAP IP**

**192.168.3.42
(MEDAL
Workstation IP)**

NSCT-1

**192.168.1.32
(MEDAL
Workstation IP)**

**192.168.1.31
(LAN Card IP for laptop)**

**12.0.0.41
SkyCAP IP**

SkyCAP
Client Node

**192.168.3.41
(LAN Card IP
For laptop)**

Items provided by
each command

**Items provided by
SPAWAR/ONR**

What is EDSS?

- **EDSS is an operational Integrated Mission Planning and Execution Tool supporting Expeditionary Forces**

  ➔ **Set of software Tactical Decision Aids serving all Expeditionary Warfare Commanders ~ Navy & Marine Corps**

  ➔ **ONR sponsored, government owned software**

  ➔ **DII COE compliant software**

    ➔ **US Navy ~ developed as a GCCS-M 4.x segment**

    ➔ **US Marine Corps ~ developed/transitioned as a C2PC v6.1 Injector**

  ➔ **Currently integrated with other Joint/Naval systems (AFATDS, ICODES, MEDAL) and designed to easily interface with additional systems in follow-on spirals (TBMCS, JMPS, etc.)**

EDSS Screenshot

System - WGS 1984: Global Definition II

File   Edit   View   Map   Favorites   Plot Controls   Bookmarks   Tools   TDAs   Tracks   Corr/Bcst   EDSS   Intelligence   Window   Help

1 : 23,104

EDSS Task Manager

System   Help

- Operational Areas - DG-04 CAPO TEULADA
  - Detailed Data
  - Export/Merge
  - Import
- Battlespace Geometry
  - Detailed Data
  - Display Controls
  - Ground Reference
- Air Assets
  - Detailed Data
- Ship and Landing Craft Assets
  - Detailed Data
- Serials
  - Detailed Data
- Force Lists
  - Detailed Data
    - Detailed Data
  - Task Organization
- Course Of Action - DESTINED GLORY 04
  - Detailed Data
  - Event Schedule
  - MAGTF Plans
    - Detailed Data
    - Units
      - Detailed Data
  - Landing Plans - ADMIN OFFLOAD
    - Detailed Data
    - Waves
      - Detailed Data
    - Scenario Alerts
    - Landing Plan Conflicts
    - Messages
      - OPTASK Amphib
      - PCS Intentions
      - LCS Intentions
    - Landing Craft Availability
    - Landing Craft Employment
    - Helo Availability
    - Helo Employment
    - AAV Availability
    - AAV Employment
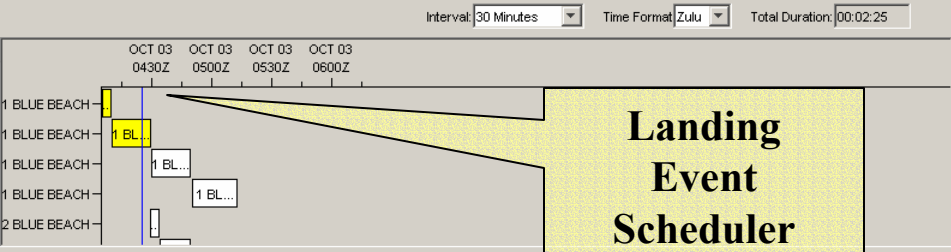 - Auto-Scheduler
  - Air Plan Editor
- Serial Tracking
  - Detailed Data
  - Serial Loads
  - PCVT
  - Find Serials

COA Planning Tools

Boat Lanes

Assault Geometry

Landing Simulation

Transit Routes

Wave Info

Message Generator

Landing Event Scheduler

BLUE BEACH

ROMEO

RDM2BLUE2 SIERRA

NEST

1 BLUE2

BLUE

BLUE FLOOD

OSCAR   PAPA

NOVEMBER

MIKE

LIMA

DD
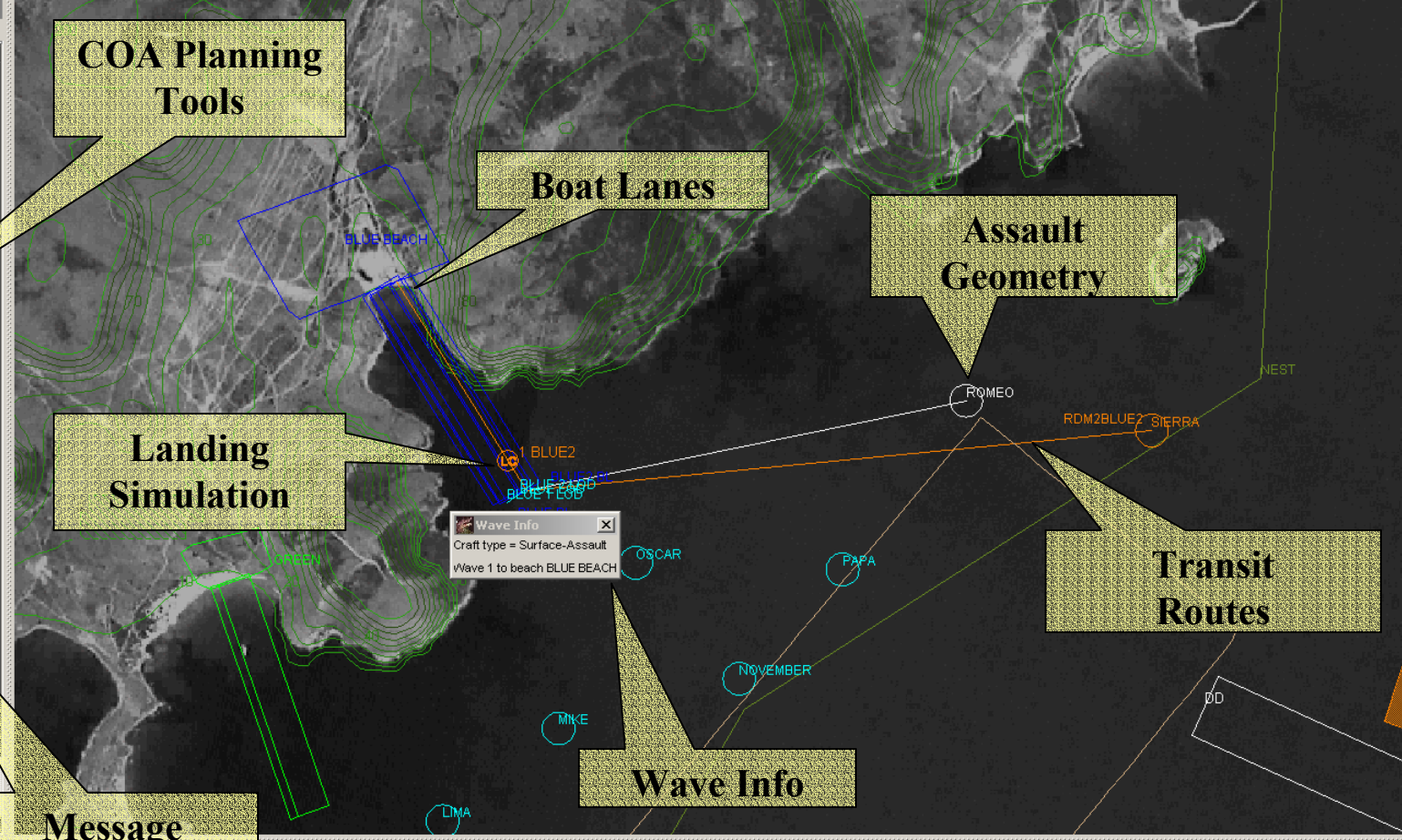
Wave Info
Craft type = Surface-Assault
Wave 1 to beach BLUE BEACH

EDSS Working Window - DG-04 CAPO TEULADA

Scenario Controls

Interval: 30 Minutes   Time Format Zulu   Total Duration: 00:02:25

Plan Name	Destination	Wave # / Unit	Craft	Start	End	Duration(HH:M	CRS/SP	Serials
ADMIN OFFLOAD	BLUE BEACH	1	LCU MK1	H-25	H-20	00:05	...	...
ADMIN OFFLOAD	BLUE BEACH	1	LCU MK1	H-20	H-Hour	00:20	RD...	...
ADMIN OFFLOAD	BLUE BEACH	1	LCU MK1	H-Hour	H+20	00:20	...	...
ADMIN OFFLOAD	BLUE BEACH	1	LCU MK1	H+20	H+43	00:23	RD...	...
ADMIN OFFLOAD	BLUE BEACH	2	CTM	H-1	H+4	00:05	...	4...

OCT 03 0430Z   OCT 03 0500Z   OCT 03 0530Z   OCT 03 0600Z

1 BLUE BEACH
1 BLUE BEACH
1 BLUE BEACH
1 BLUE BEACH
2 BLUE BEACH

Displays the Scenario Controls Window for the current Plan.

385538N 0084049E Number of Objects: -20/2276-

385423N 0084110E 7,775.72 M   020902:25Z OCT 04

Start   System - WGS 1984: G...   My Documents   Microsoft PowerPoint - [f...   Scenario Controls Window   2:02 AM

MARCORSYSCOM Testing

- **SkyCAP Windows version tested for MARCORSYSCOM at SPAWAR JICF and MCTSSA (Camp Pendleton) in DEC 04/JAN 05.**

- **Demonstrated reliable data transmission of C2PC and other network data via 25 KHz channel and LOS mode.**

- **Some C2PC data types (Overlays and Opnotes) tended to clog the circuit due to the nature of their transmission**

- **Standard GCCS-M to C2PC track distribution was not affected**

- **Twelve SkyCAP systems delivered to MARCORSYSCOM for continued testing.**

- **EDSS will become an injector of C2PC in Q1FY06**

Goals of SkyCAP in Lead Shield

- **Demonstrate reliable GCCS-M tactical data distribution of MEDAL and other data**

- **Demonstrate SKYCHAT, a web based chat application, for tactical coordination**

- **Demonstrate image file transfers from small mobile units (RHIB, swath boats)**

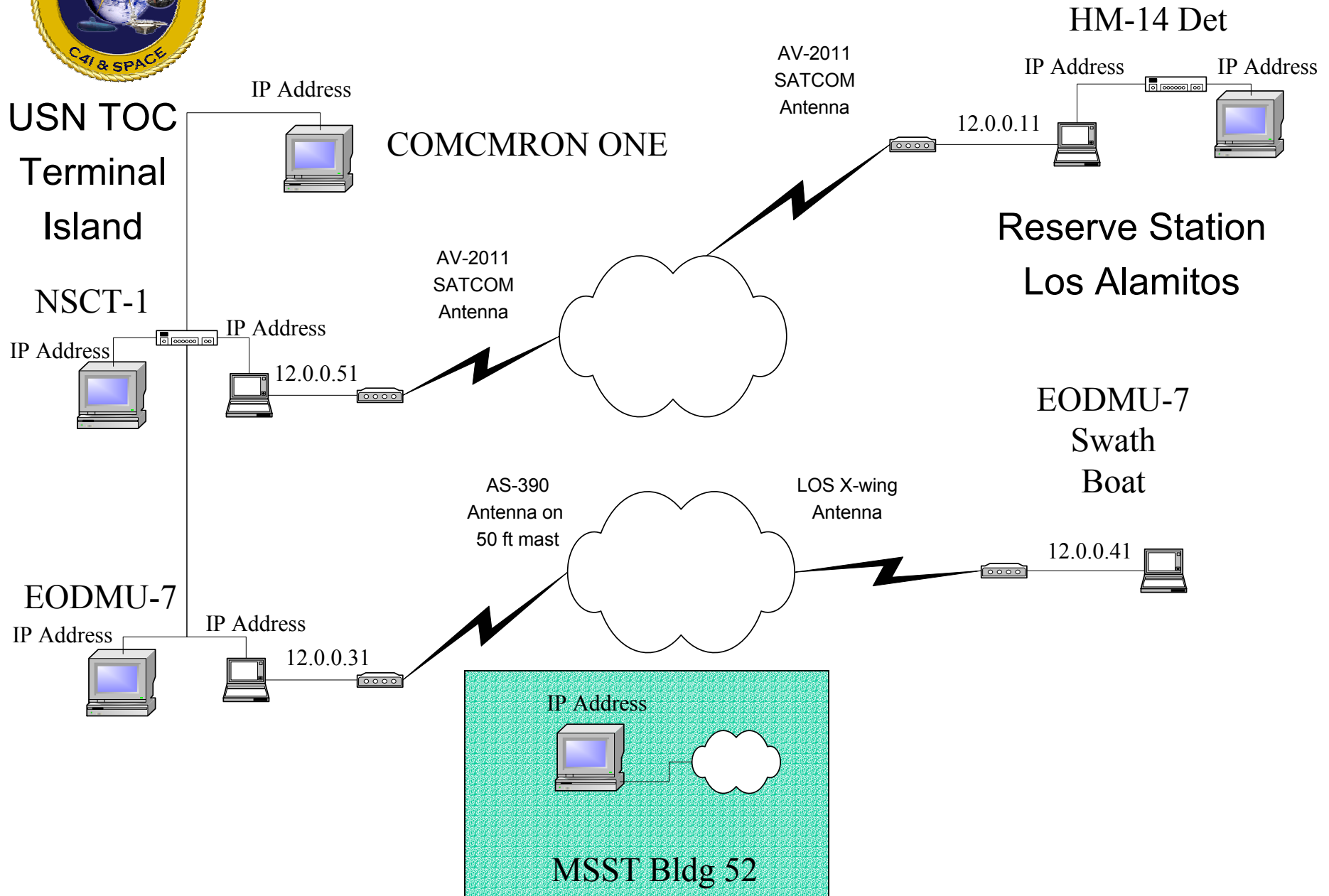- **Demonstrate full IP connectivity between supported nodes using UHF SATCOM and LOS**

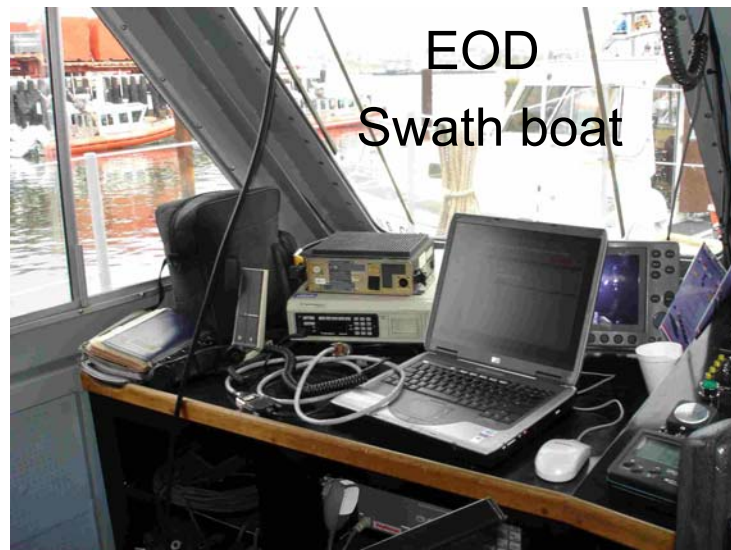# *SkyCAP Locations in Lead Shield*

USCG Base
COMCMRON ONE
NSCT-1 shore det
EODMU-7 det
SkyCAP nodes

HM-14 det
SkyCAP node

EODMU-7
Swath boat
SkyCAP
node

Mine operations locations
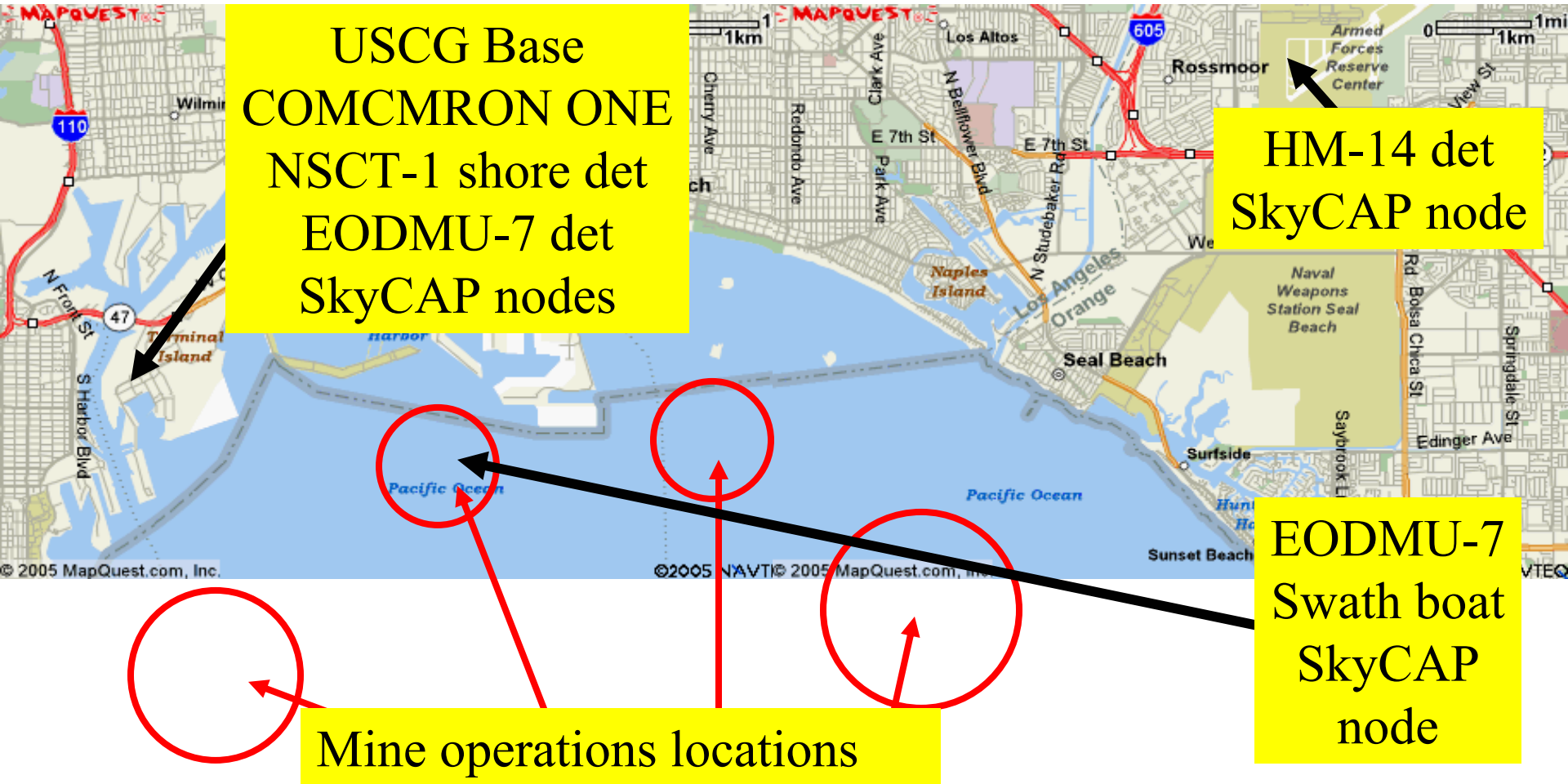
SkyCAP Data Architecture for Lead Shield

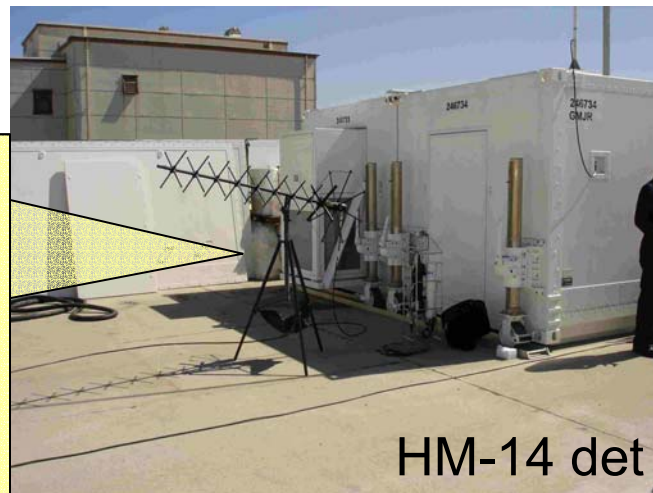# *SkyCAP Lead Shield Configurations*

USN TOC

UHF LOS Antenna on 50ft mast

EOD Swath boat
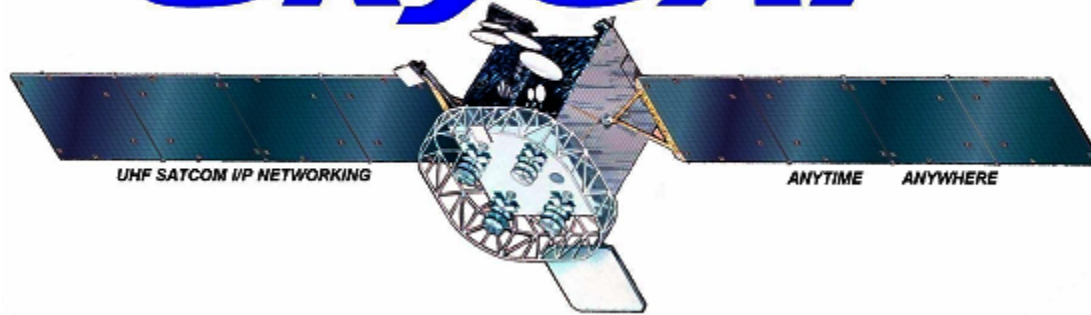
AV-2011 SATCOM Antenna

HM-14 det

What next?

- **Discussions ongoing for potential use of 25 KHz SATCOM channel to perhaps replace OTCIXS with OTCIXS-IP (SkyCAP).**

- **Additional testing with CMWC and EOD units is scheduled. SkyCAP to participate in October GOMEX with MCM forces.**

- **SkyCAP under consideration as upgrade to MCM vessel communications suite.**

- **SkyCAP to be used with ongoing ONR projects (ARVCOP).**

- **USCG expressing interest in using SkyCAP as airborne IP link to C-130 aircraft.**

- **DOD interest in using SkyCAP for medical IP data exchange from mobile medical units.**

SkyCAP

UHF SATCOM I/P NETWORKING   ANYTIME   ANYWHERE

Questions?