

CUSTOMS and BORDER PROTECTION Over The Horizon
Enforcement Network
COTHEN



NETWORK ARCHITECTURE OVERVIEW



COTHEN State-of-the-art Technology

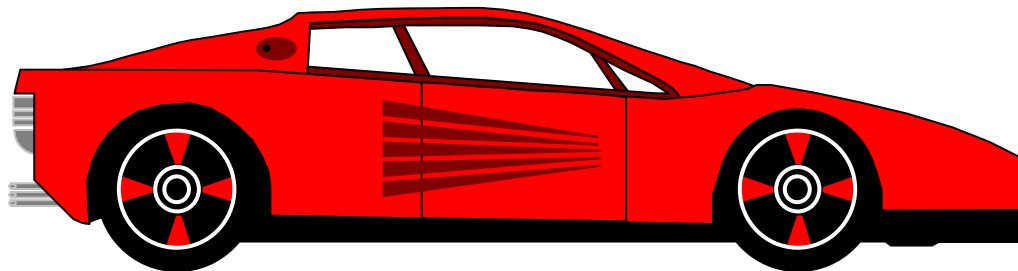
Transportation has evolved from the horse and buggy to the automobile. HF has evolved from single frequency to COTHEN CELLULAR





Original COTHEN architecture in 1985 introduced a signaling waveform for Automatic Link Establishment (ALE)

ALE couples a computer(radio processor) to the HF radio for automatic best frequency selection and makes HF more like using a telephone i.e. enter a three digit address (telephone number) and the radio establishes the link



COTHEN Introduces Automatic Link Establishment 1985 to Present

Ionosphere

Sun's influence on
the ionosphere
affects frequencies

ALE finds **best**
frequency

Working frequency 8MHz

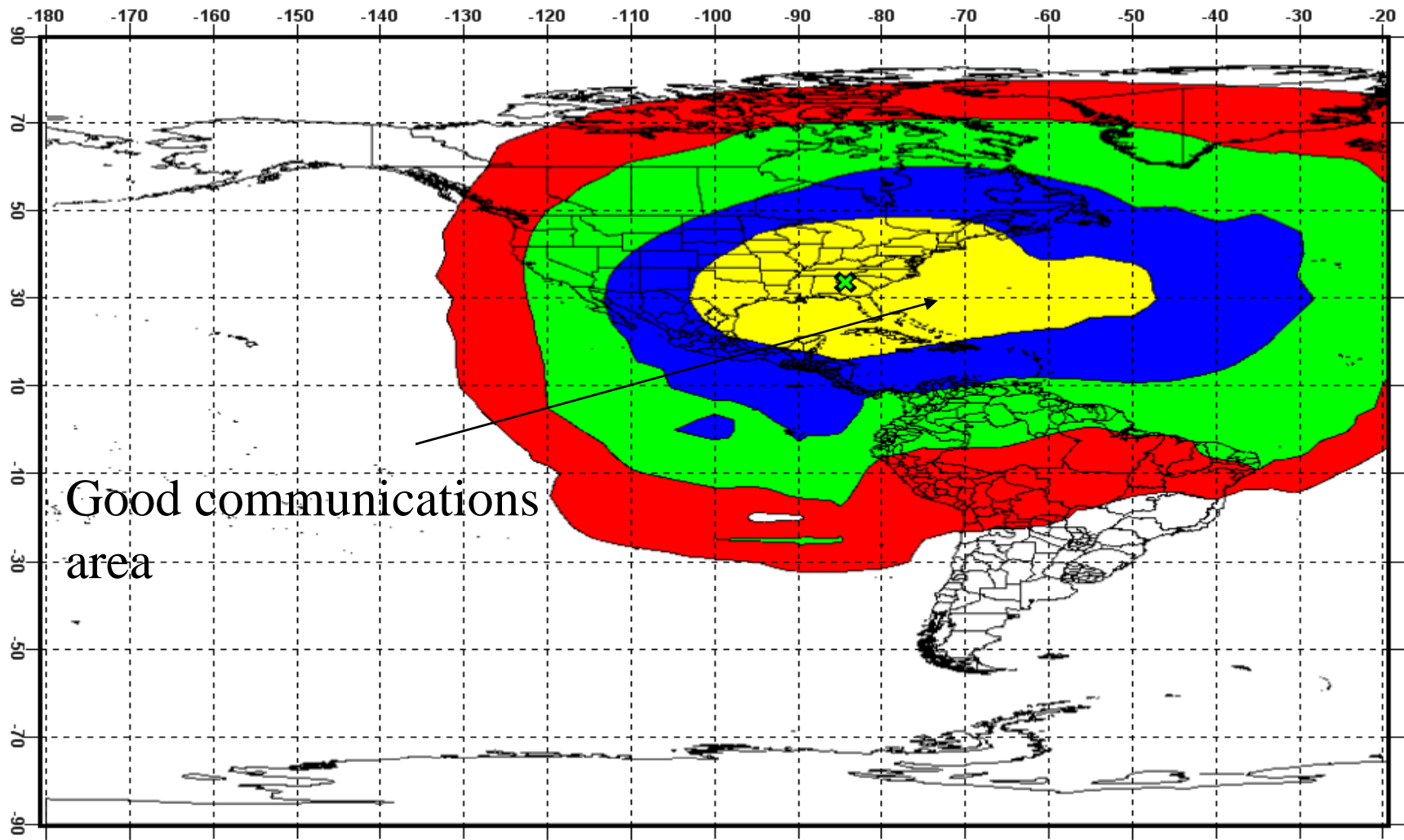


ALE Radio

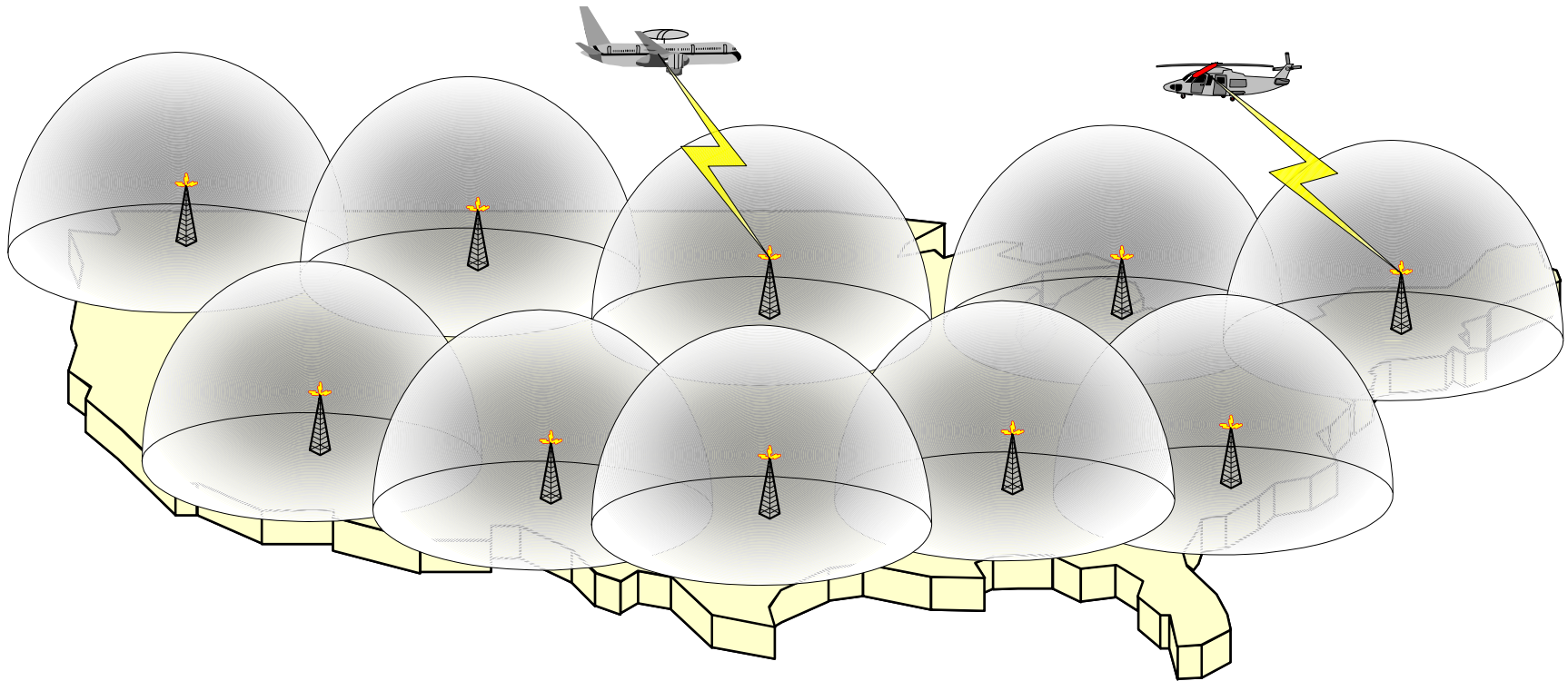


Coverage Area using ALE

Single Radio Station



Traditional Independent Radio Sites



Mobile user only has 1 Transmitter Station for communications. If unable to link with that Transmitter Station, communications are lost.

Previous COTHEN Remote Communication Consoles (RCC) network architecture connected groups of land users to a single transmitter site most suitable for their mission.

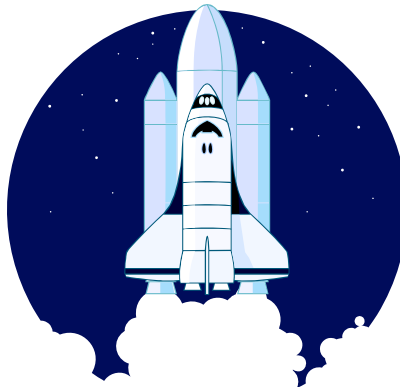




Recently the COTHEN team conceptualized, developed and upgraded COTHEN to what we call a
“CELLULAR” Network architecture

Every Mobile call is received by up to 21 transmitter stations and the best one is then automatically connected to the location being called e.g. Marine Office, Air Branch, Air Marine Operation Center, etc..

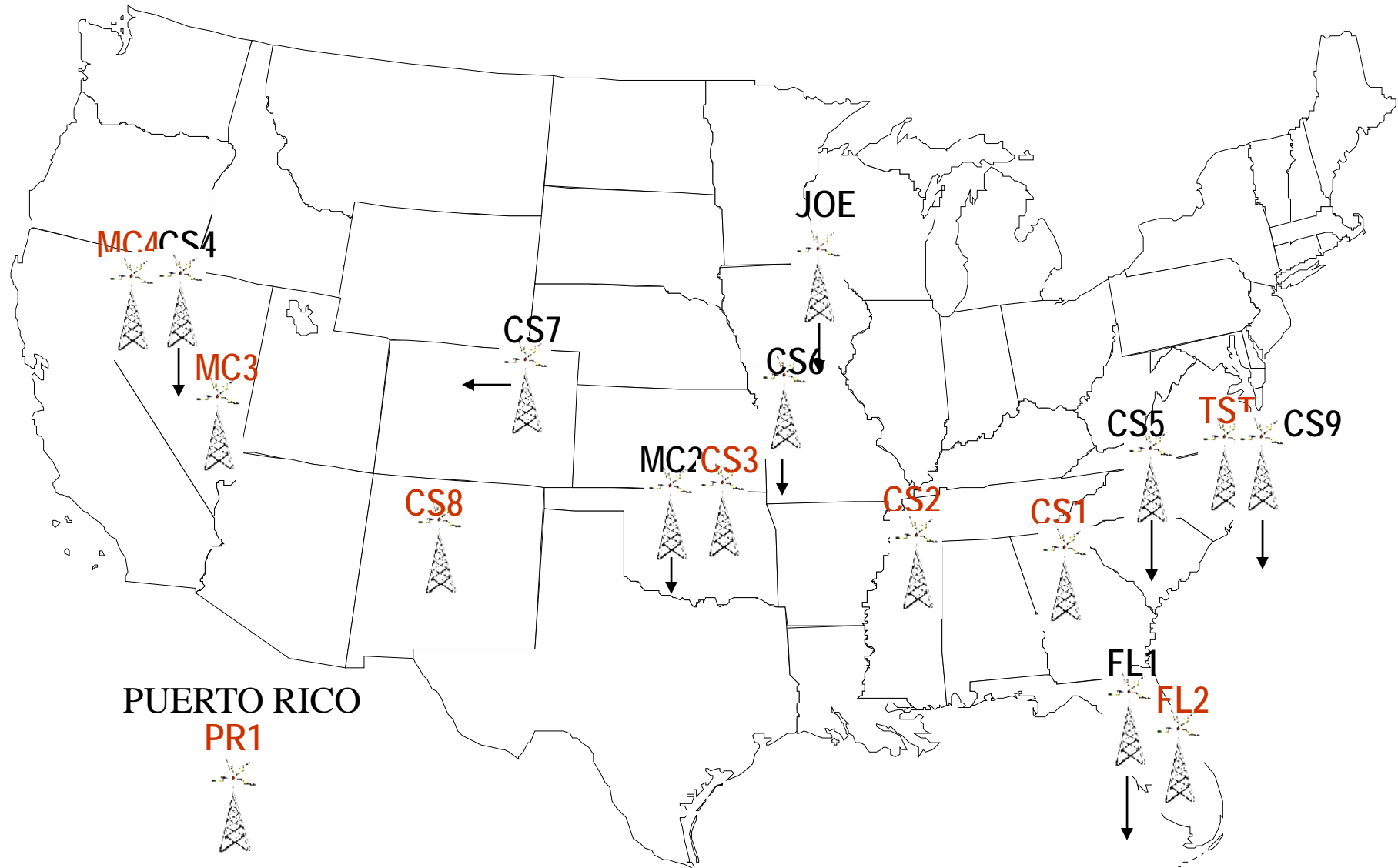
ALE technology selects the **best frequency** and
CELLULAR selects the **best Network entry station**



HF - COTHEN

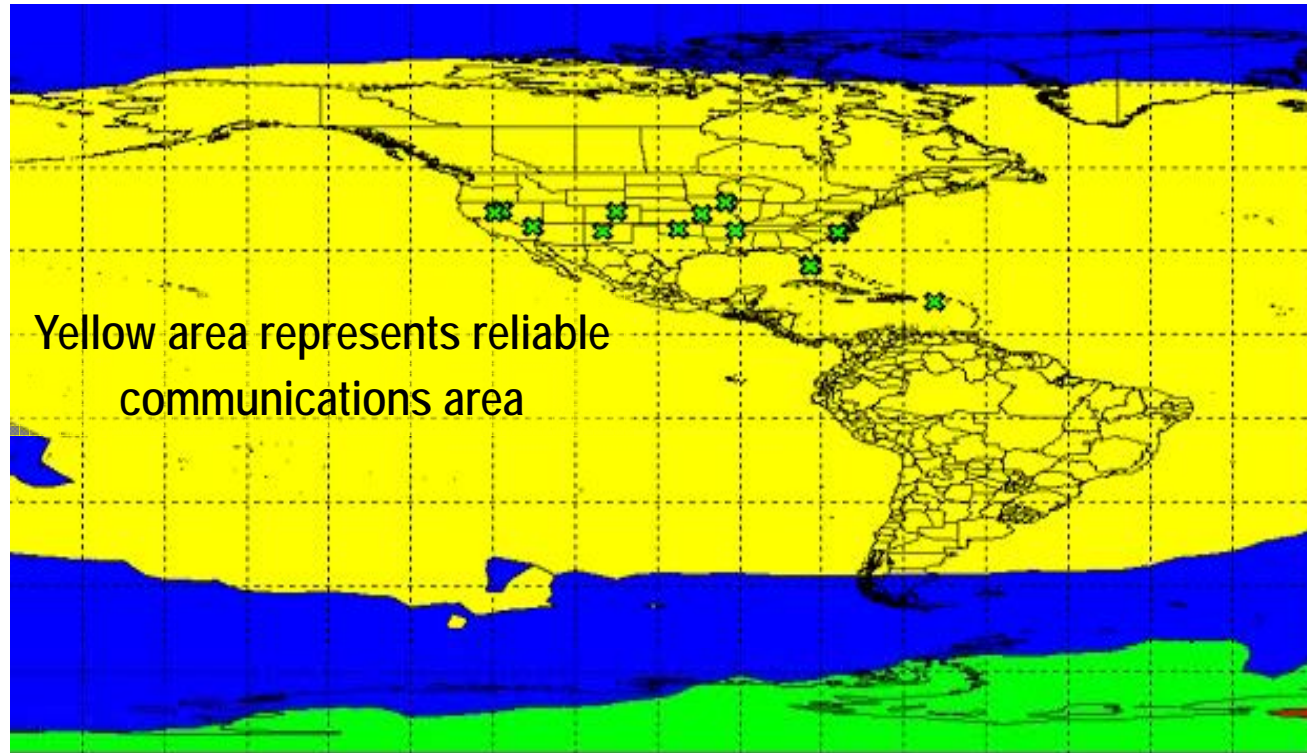
BLACK = DIRECTIONAL ANTENNAS

RED = OMNI-DIRECTIONAL ANTENNAS



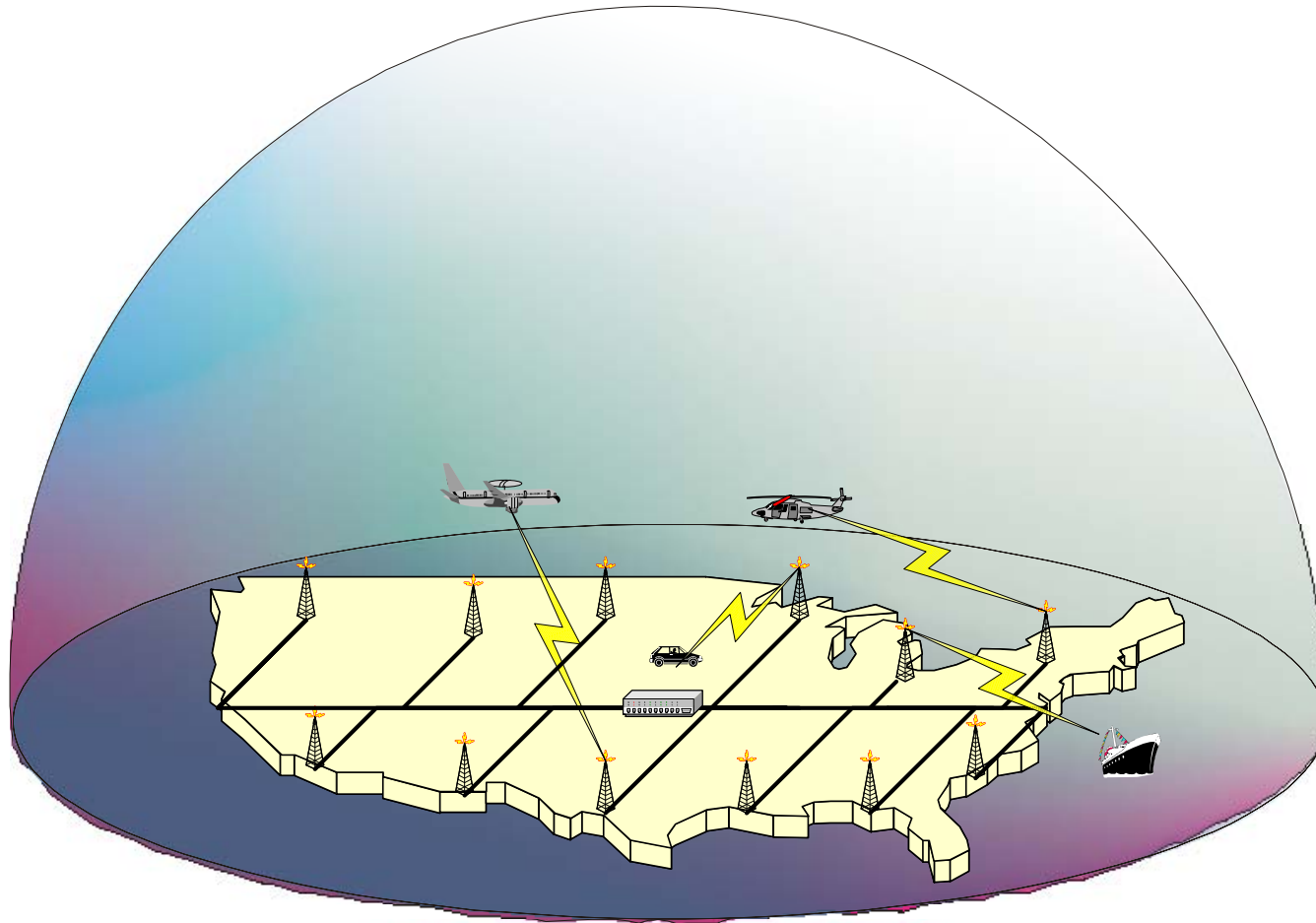


COTHEN

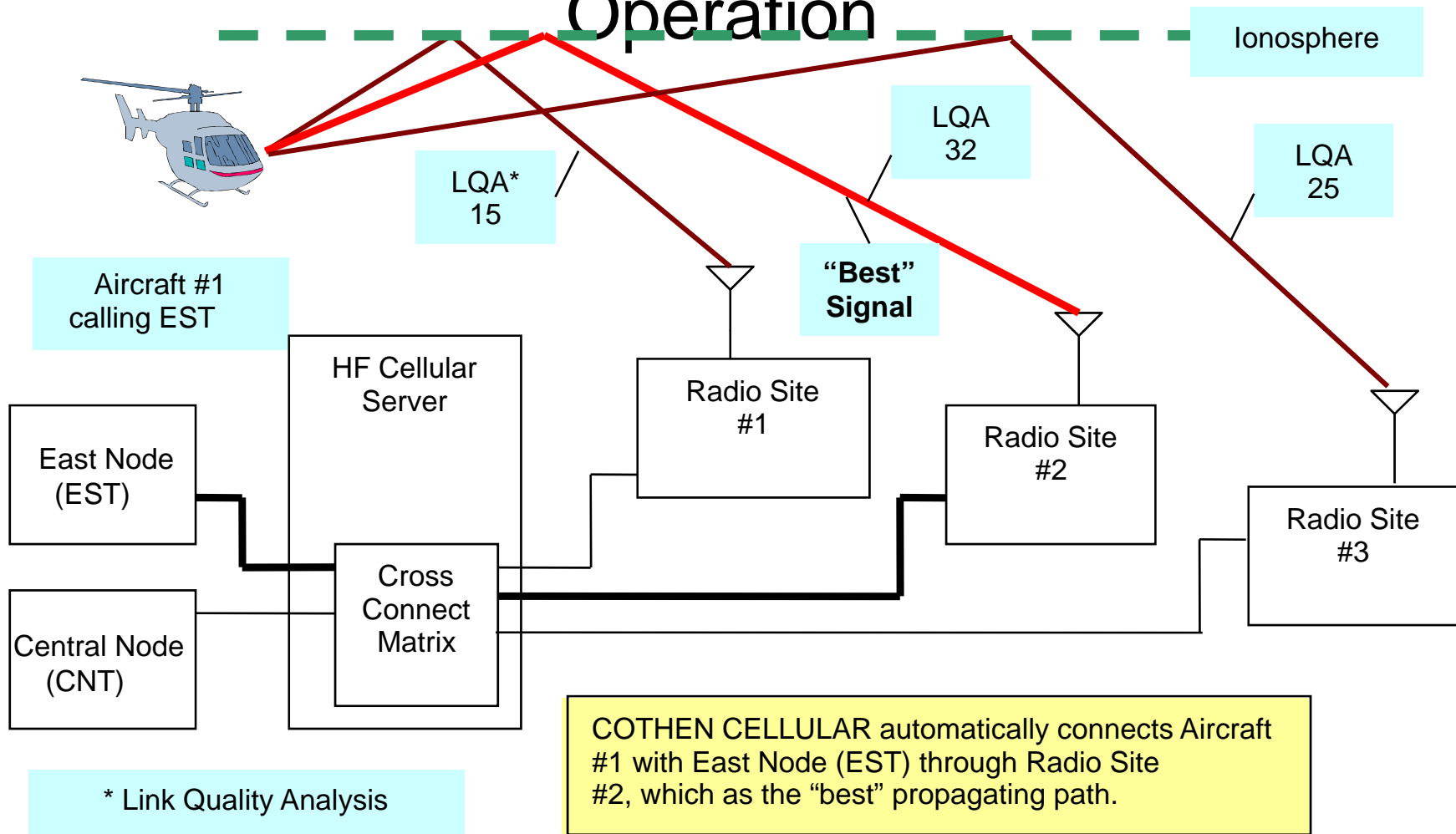


TALK AREA

Umbrella Like Coverage Using COTHEN's CELLULAR



COTHEN CELLULAR Concept of Operation



COTHEN CELLULAR General Capabilities



- ✓ Proven Technology Currently in Use by the US Customs and Border Protection, and US Coast Guard Throughout the Continental United States, Puerto Rico, and the North Pacific
- ✓ Seamless HF Communications Coverage
- ✓ Best Station Linking
- ✓ GPS Situational Awareness with TRACS
- ✓ Network Analysis at a Glance
- ✓ Active Platforms ICON Display
- ✓ Multi Net Coverage
- ✓ Alternate Station Routing
- ✓ Detect and Avoid Faulted Radios
- ✓ No Null Areas
- ✓ Redundant Capacity
- ✓ Compatible with Multi Service Operations
- ✓ Generic User Interface (HyperTerminal & Audio)
- ✓ Contingency Comms Capable for Emergency Response
- ✓ Simultaneous Calling (Collision Avoidance)
- ✓ Busy Channel Avoidance
- ✓ Radio Fault Display
- ✓ Intercom Call Routing
- ✓ SOS Priority Call Routing
- ✓ Call Forwarding
- ✓ Loopback Testing
- ✓ VO/IP Ready
- ✓ Call Logging

COTHEN CELLULAR EQUIPMENT RACKS



COTHEN CELLULAR SCREEN

The screenshot displays the HF Cellular software interface with the following components:

- HF Cellular Main Window:**
 - HF R...:** A vertical list of radio units with status indicators (green/red) and labels like ABO_CS8, ATL_CS1, CDI_CS9, CDR_JOE, etc.
 - USERS:** A grid of user icons and labels such as CAMBLANT, CAMBAC, CBT GRP, etc.
 - EXPANSION NODES:** A grid of node icons and labels like CNT, COE, CRB, CSK, etc.
 - LQA MATRIX:** A table showing signal quality metrics for various nodes.
 - HF Cellular Main:** A large central area displaying a map with aircraft icons and a list of system messages.
 - CALL MATRIX:** A table showing call logs with columns for FROM, TO, TIME, DATE, CHAN, and various radio identifiers.
 - DATA MONITOR:** A table showing real-time data with columns for FROM, TO, TIME, CHAN, and RADIO.
 - System Status:** A small window on the right showing CPU usage and other system metrics.

LQA MATRIX Data (Approximate):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ABO_CS8	25	30	31	35	27	28	27	27	27	27	27	27	27	27
ATL_CS1	34	40	29	35	35	17	27	27	27	27	27	27	27	27
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
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CDR_JOE	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDI_CS9	24	30	30	33	30	37	29	29	29	29	29	29	29	29
CDR_JOE	24	30	30	33	30	37	29	29	29	29				

LQA MATRIX

LQA MATRIX														
X52	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ABQ_CS8														
ATL_CS1	29	30	33	35	27	24	17							
CDI_CS9	34	40	29		35	17								
CDR_JOE	24	30	30	33	30	37	23							
DEN_CS7		19	11		23	27								
FTM_FL2	31	10	20		7		8	30	27	27	17			
KCM_CS6	16	33	37	27	35	35	25							
LUV_CS4	19	20	25	9	23	25	20							
MEM_CS2	19	30	35	33	33	30	25	17	17					
OKD_MC2	24	25	24	11	25	30	33	16						
OKO_CS3	26	33	30	27	25	33	35	20						
PR1														
RNO_MC4	3	22	22		19		14							
RSH_CS5	39	35	40	33	33	27	23		11	17				
SAR_FI 1	37	27	14			11	33	25	27	30	27			
SEA_TST	34	33	37	23	30									
VGS_MC3	16	25	30	11	17	23								

Age: 6 mins

Multiple Links

HF Cellular

File View Setup History Window Help

MAIN CALL MATRIX LQA MATRIX DATA MONITOR HF RADIOS EXP NODES RCC USERS FIND CAPTURE ZZZ

HF ...

USERS

CAMSLANT CAMSPAC CNT GRP CORP ENGR CRB GRP
DIAG 2 EST GRP KODIAK NRT GRP OPB GRP
ORL 12 ORL 15 ORL 4 ORL 6 ORL 9
STR GRP WST GRP

EXPANSION NODES

CNT COE CRB CSK EST LNT NRT OPB OPS1
OPS2 OPS3 PAC STR TERM TRC TSC WST

LQA MATRIX

T42

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ABQ_CS8	10	23	24	13	30									
ATL_CS1	32	27	37	30	37	17	9							
CDI_CS9	2	17	24	20	27	18	34	32						
CDR_JOE	7	17	24	20	27	18	34	32						
DEN_CS7	34	30	1	30	20	11	20	28	22	24				
KCM_CS6	17	23	23	23	24	32	34	22						
LUV_CS4	7	1	23	16	21	24	24	17	10					
MEM_CS2	17	14	20	18	30	27								
OKD_MC2	5	17	15	19	11	18	14	16						
OKO_CS3	3	19	16	13	16	26	28	17	8					
PR1	4	9	5	6	24	17								
RNO_MC4	32	21	30	30	37	40	27	22	22	8	24			
RSH_CS5	32	15	19	22	20	30	31	30	22	30				
SAR_FL1	22	13	27	20	24	11								
SEA_TST	9	10	15	6	21	13	24	20						
VGS_MC3														

HF Cellular Main

C20

J16 J40 J03 J41 J28 J31

720 T97 500 T42 I57 F12 F39 F04

T07 F33 I94 I54 I3L T59 T7Y I52

I75

CH LNK 3

EST CDI_CS9 T42

F33 SAR_FL1 SC LNK 2 TSC

LNT Acquiring F04

J03 RSH_CS5 SC LNK 5 OPS2(LNT)

CH CA 11 LUV_CS4 I3L

WST

DATA MONITOR

FROM TO TIME CHAN RADIO

CNT	I3L	15:16:27	11	VGS_MC3
I3L	CNT	15:16:27	11	VGS_MC3
LNT	F33	15:16:36	07	SEA_TST
LNT	F33	15:16:36	07	VGS_MC3
CNT	I63	15:16:56	06	VGS_MC3
???	T42	15:17:37	03	SEA_TST
T42	EST	15:17:37	03	SEA_TST
FST	T42	15:17:37	03	SEA_TST
WST	I63	15:19:37	09	VGS_MC3
F33	TSC	15:19:41	02	SEA_TST
???	LNT	15:21:15	04	SEA_TST
LNT	F04	15:21:19	04	VGS_MC3
LNT	F04	15:21:48	04	SEA_TST

CALL MATRIX

FROM	TO	TIME/DATE	CHAN	LINKED/LQA	ABQ	ATL	CDI	CDR	DEN	FTM	KCM	LUV	MEM	OKD	OKO	PR1	RNO	RSH	SAR	SEA	VGS
I3L	CNT	15:16:16, 06/07/2005	11	RNO_MC4/3				27		25		35	24							22	22
LNT	F33	15:16:17, 06/07/2005	7	No				40													
CNT	I63	15:16:26, 06/07/2005	6	No										(?)							
LNT	J03	15:16:43, 06/07/2005	4	No															35		
EST	T42	15:17:14, 06/07/2005	3	No																	
WST	I63	15:19:19, 06/07/2005	?	No										(?)							
F33	TSC	15:19:38, 06/07/2005	2	SAR_FL1/37				32			32	23			30					[37]	
WST	I63	15:19:47, 06/07/2005	9	No																	
WST	I63	15:20:11, 06/07/2005	7	No																	
WST	I63	15:20:57, 06/07/2005	10	No																	
LNT	F04	15:21:04, 06/07/2005	4	No								43								(?)	
WST	I63	15:21:27, 06/07/2005	?	No																(?)	
LNT	F04	15:21:29, 06/07/2005	?	No								35									
J03	OPS1	15:21:45, 06/07/2005	5	No				25													
J03	OPS2	15:21:45, 06/07/2005	5	RSH_CS5/43					22												[43]
WST	I3L	15:22:11, 06/07/2005	11	No								35									

CPU Usage

CPU L

15 %

Start SAS Router... Windows T... HF Cellular BOGAS AD... 11:22 AM

Remote Communications Console (RCC)

9.6K, 56K & VOIP capable



Remote Communications Console Display

The screenshot shows the 'Long Range Radio Controller' interface. At the top, there are four tabs: 'ALE Address Name', 'User Call Sign Name', 'PTT Monitor', and 'Network Activity Window'. Below these, the main interface has a menu bar with 'File', 'Login', 'View', and 'Help'. The 'Your Callsign' field is set to 'THE LAB', and the 'Your ALE Address' field is set to 'CNT'. A 'RECEIVE' button is visible. To the right, the 'HELPLINE:' is '1-800-829-3333' and 'Last Cmd From:' is 'LQA'. On the left side, there is a 'Radio Check' section with buttons for 'WWV...', 'Intercom...', 'Return To Scan', and 'Show Map'. Below this is an 'Intercom User Calling' section. At the bottom left, there is an 'Asset Tracking Map' section. The main display area shows a grid of aircraft icons with call signs: MR4, MV5, MR1, F41, I00, T6P, I55, I01, F35, I08, F04, T91, T42, M46, D31, D70, D90, 720, 700, 502, D48, D43, D45, D46, 500, 713, 701, J15, J23, J01, A70, J39, J14, J42, X93, J28, J19, H95, J40, A50. Below the grid, there are icons for 'CS5' and 'ANY ADDR'. At the bottom, there is a status bar with 'CNT', 'CH CA 5', and 'MV5'. A 'Return To Scan [End Call]' button is also present.

ALE Address Name

User Call Sign Name

PTT Monitor

Network Activity Window

Radio Check

Intercom User Calling

Asset Tracking Map

Double Click ICON Calling

Any ALE Address Call

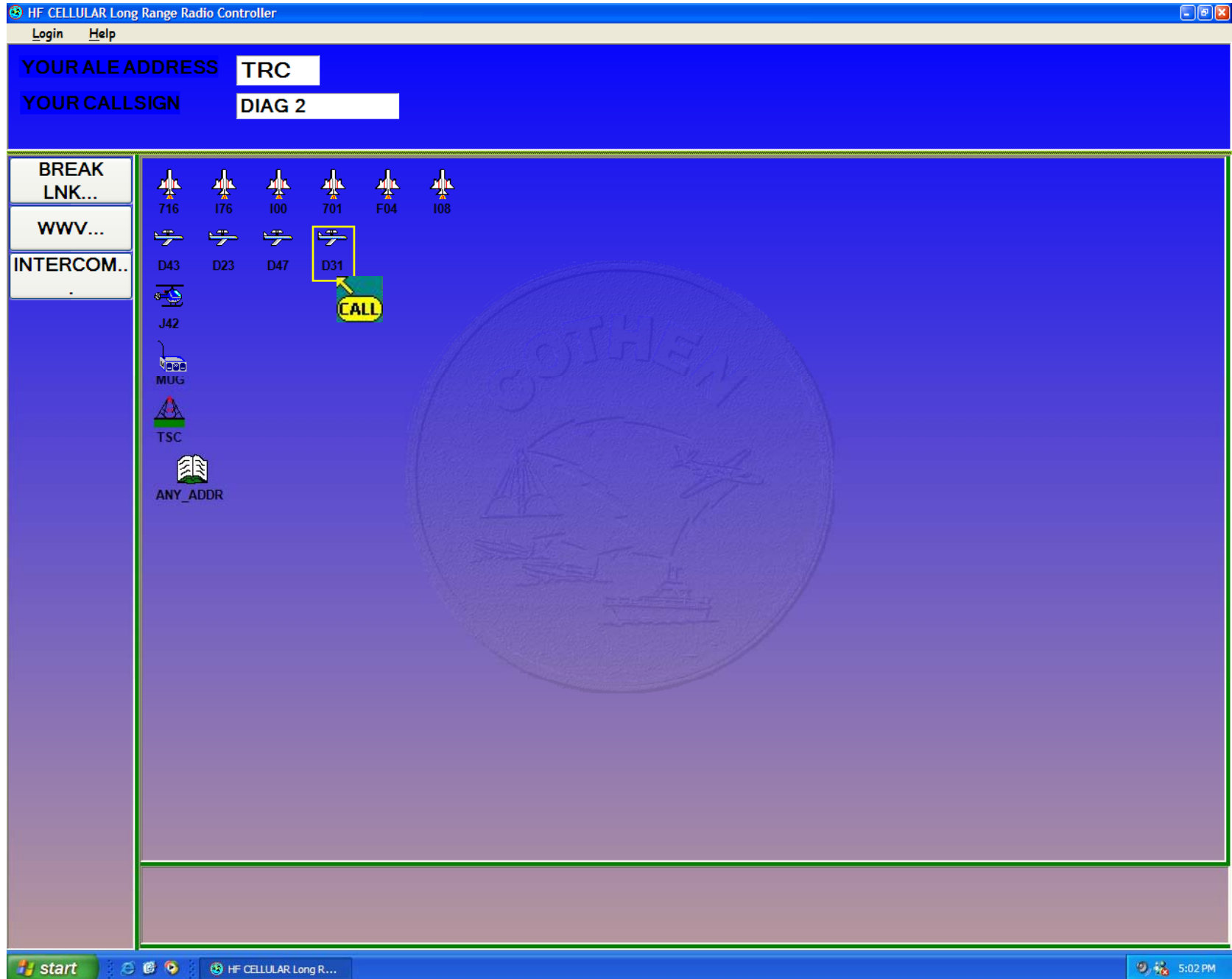
ALE Call Progress Display

Single Button Hang-Up

3 ways to place a call

- Cursor to platform icon
- Enter calling address
- Intercom only call

Call out from RCC





Technical Service Center (TSC) Orlando, FL



Mission

Insure COTHEN users maximum connectivity using advanced technical tools while avoiding operational involvement.



The COTHEN TSC Team in Orlando

Technical Service Center (TSC) 7 x 24 as "Network Guardians". COTHEN engineers and men working in TSC are DEDICATED to successful Tactical communications anytime and anywhere

- TSC is the "state-of-the-art "Interagency Gateway" for backward compatibility and interoperability with other Agency 's HF equipment
- TSC can connect with any HF radio, on any platform, if the guarded HF frequency of the asset is known and someone is listening.



THE COTHEN TEAM IN ORLANDO cont.

- VHF Land Mobile SECTOR (STR) in Orlando is fully COTHEN capable
- Using advanced one-of-a-kind monitoring tools and CELLULAR, TSC examines every call attempt to guarantee successful communications
- Every call attempt that is observed having a problem is immediately assisted or re-routed to get the traffic through.



THE COTHEN TEAM IN ORLANDO cont.

- Tactical mission communications are saved in real time
- COTHEN is used to coordinate connectivity problems on UHF and TACSAT

COTHEN TSC strives to make it's proactive technical assistance transparent to the user

PHONE PATCH SERVICE

Your Office, Home, Cell or STU phone patched over HF radio link to any Deployed unit

Secure Link Interface Control
(SLIC)



C O T H E N

From any Phone To any Mobile Platform

Other Patchable Communications Devices
(not encrypted)

VHF
RADIO



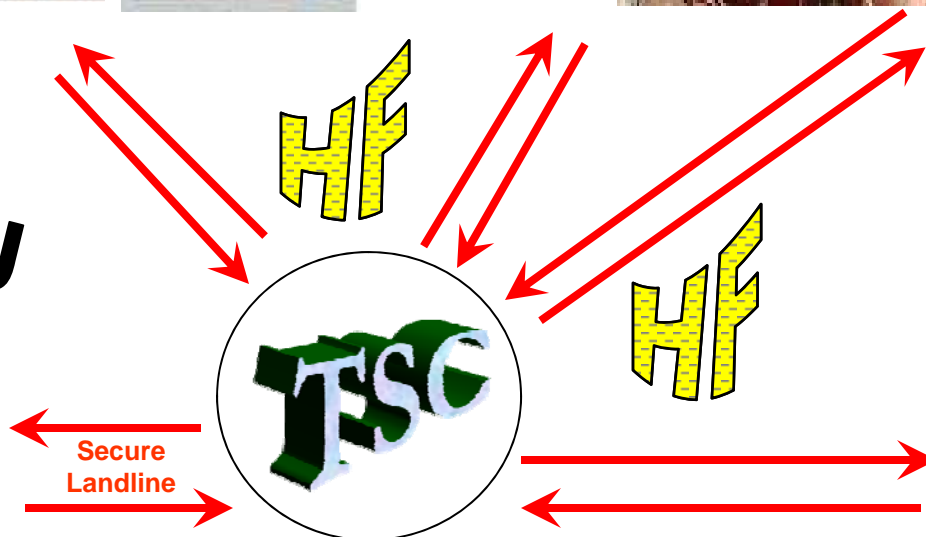
CELL
PHONE



IRIDIUM
SATELLITE
PHONE



Your STU

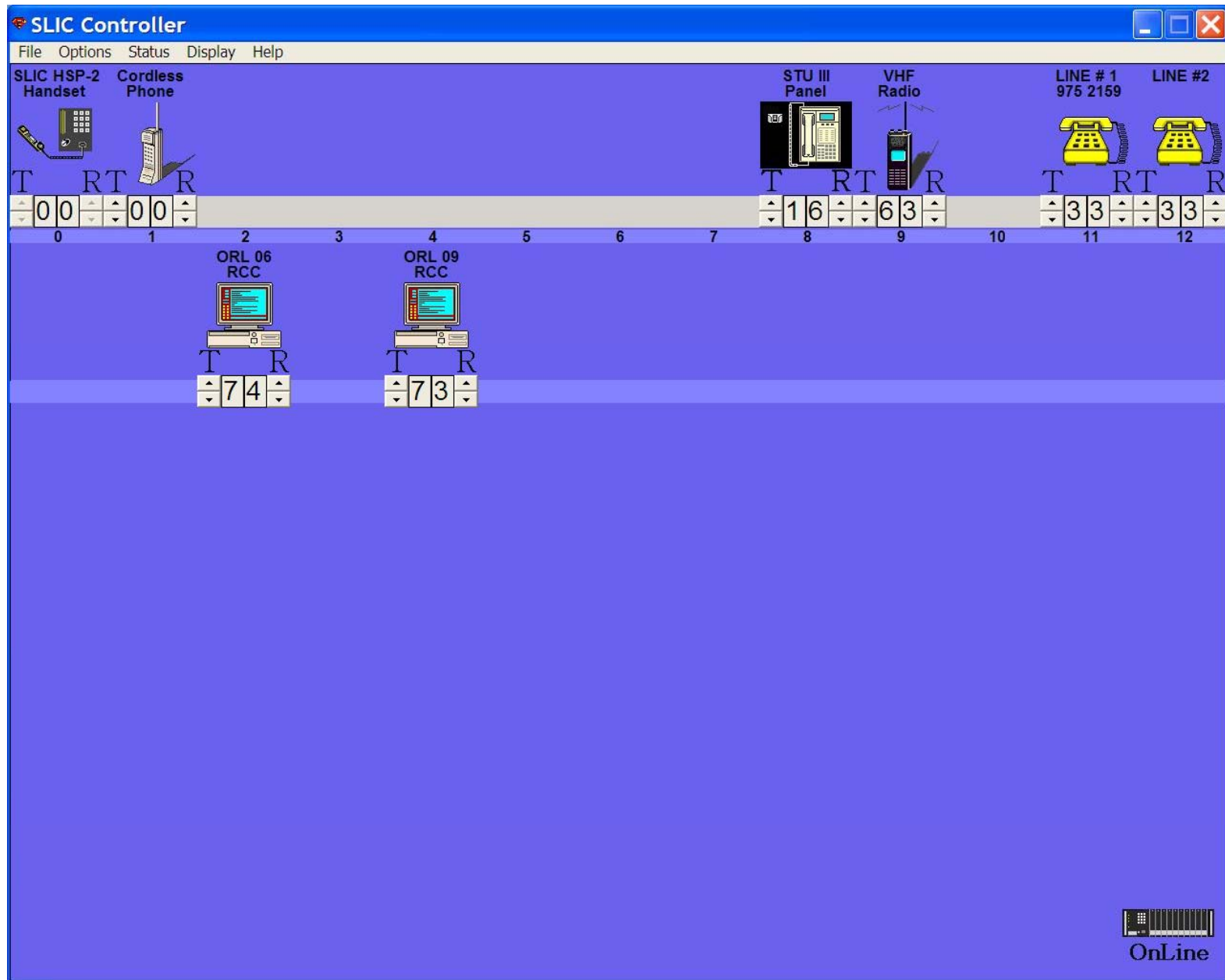


COTHEN SERVICE CENTER



SLIC CONTROLLER/Assisting 2 Aircraft

Transmitter Stations acting like repeaters



TACTICAL VOICE PRIVACY



Key Management Center



- **Over-the-Air**
- **Reloads Encryption Unit (VP-110/VP-116)**
- **Verify Serial Numbers**
- **Quarterly Key Change**
- **Privacy Key Capable**
- **Exportable and USA only Algorithm**



Key Management Center

- Database Management
 - Unit Identifiers
 - Key Code Sets
 - Dates
- Generate Key Codes
- Verify authenticity of key recipients
- Load, Update

No Action Required by End User



OTAD (Over The Air Diagnostics)

Monitoring data and voice for all calling problems and taking real-time actions to get users connected.

- Troubleshooting
- Superior
Coordination
- Configuration



COTHEN TACTICAL SUPPORT



COTHEN Team provides communications whenever and wherever, many in less than 48 hrs notification

Advanced technology of COTHEN's CELLULAR architecture makes it possible to get extreme reliability from the small rapid deployment systems

Hurricane Katrina – Six Rapid Deployment Systems 09-05

Manta Ecuador - Transportable, 3-26-04

Super bowl - Two Mini RCCs 2-04-04

Willow Grove - Transportable 3-14-03

Reagan Airport - Transportable 3-12-03

JAX during relocation - Mini RCC 2-11-03

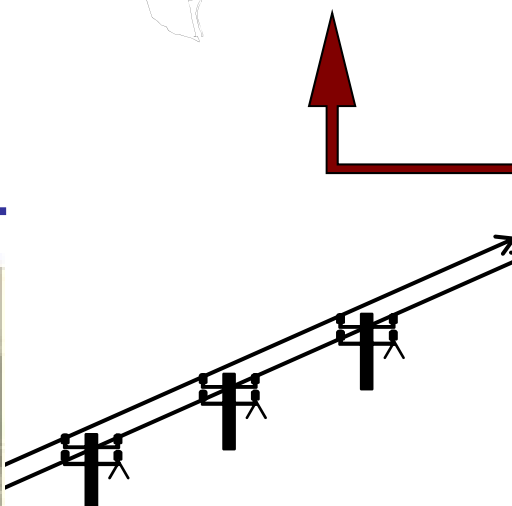
NCRCC - Transportable, 12-13-02

Salt Lake Olympics - Mini RCC and Transportable 1-20-02



**Gain access to
the entire
COTHEN Network**

**Dial in using two
standard PSTN lines...**



Bridged at TSC



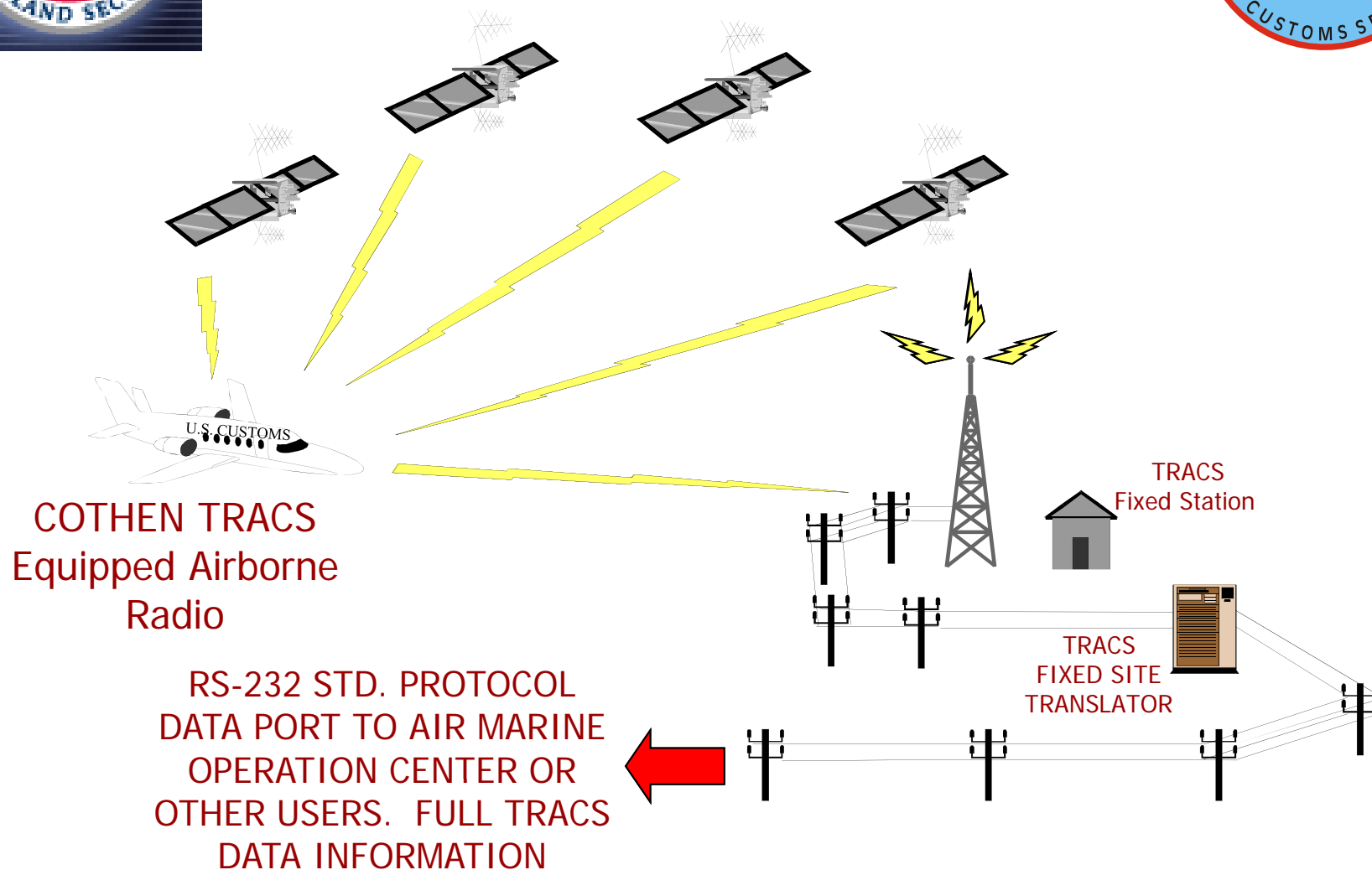
Asset Tracking

Air requested the COTHEN team to develop a mobile asset reporting system

- Tracking and Communications System (TRACS) and ground display system completed
- Tested on aircraft, boats, vans
- Position display tested
- Reports from the Mobiles are encrypted
- Asset info at authorized RCC locations only



TRacking And Communications System (TRACS)



MapTRACS - [D48]

File View History Configuration Options Window Help

Addr: D48 Date: 04/13/2001 Time: 00:35:00 Lat: N123953.0 Lon: W0704750.0 Knots: 209 Alt (ft): 14763 Dir: 95

