CUSTOMS and BORDER PROTECTION Over The Horizon Enforcement Network

COTHEN

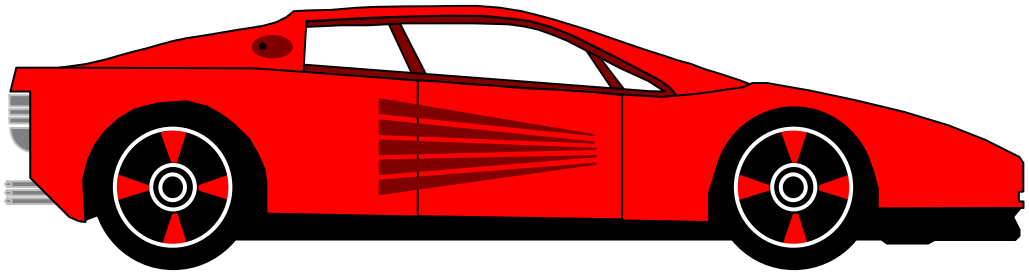
NETWORK ARCHITECTURE OVERVIEW

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

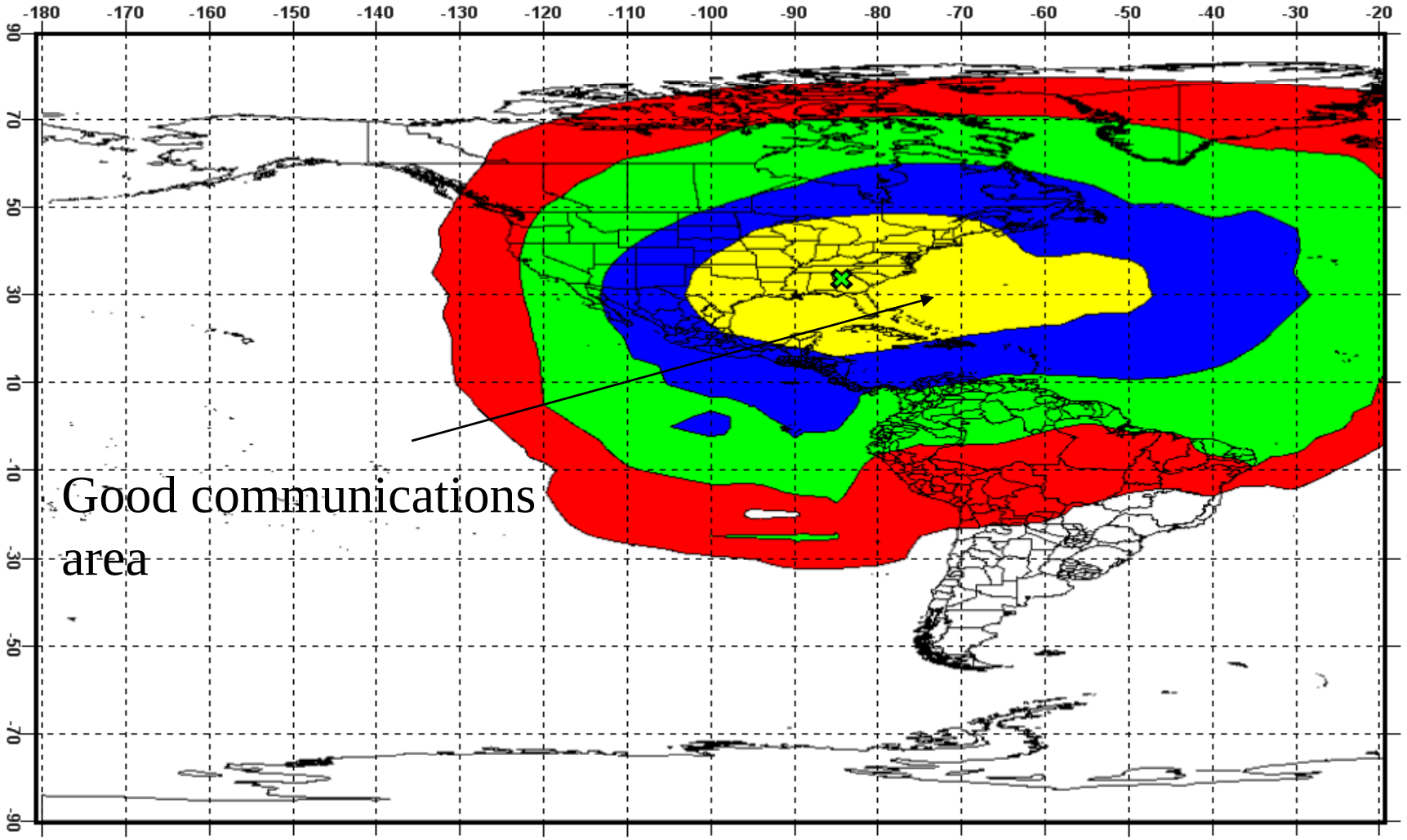
ALE finds **best** frequency

Working frequency 8MHz

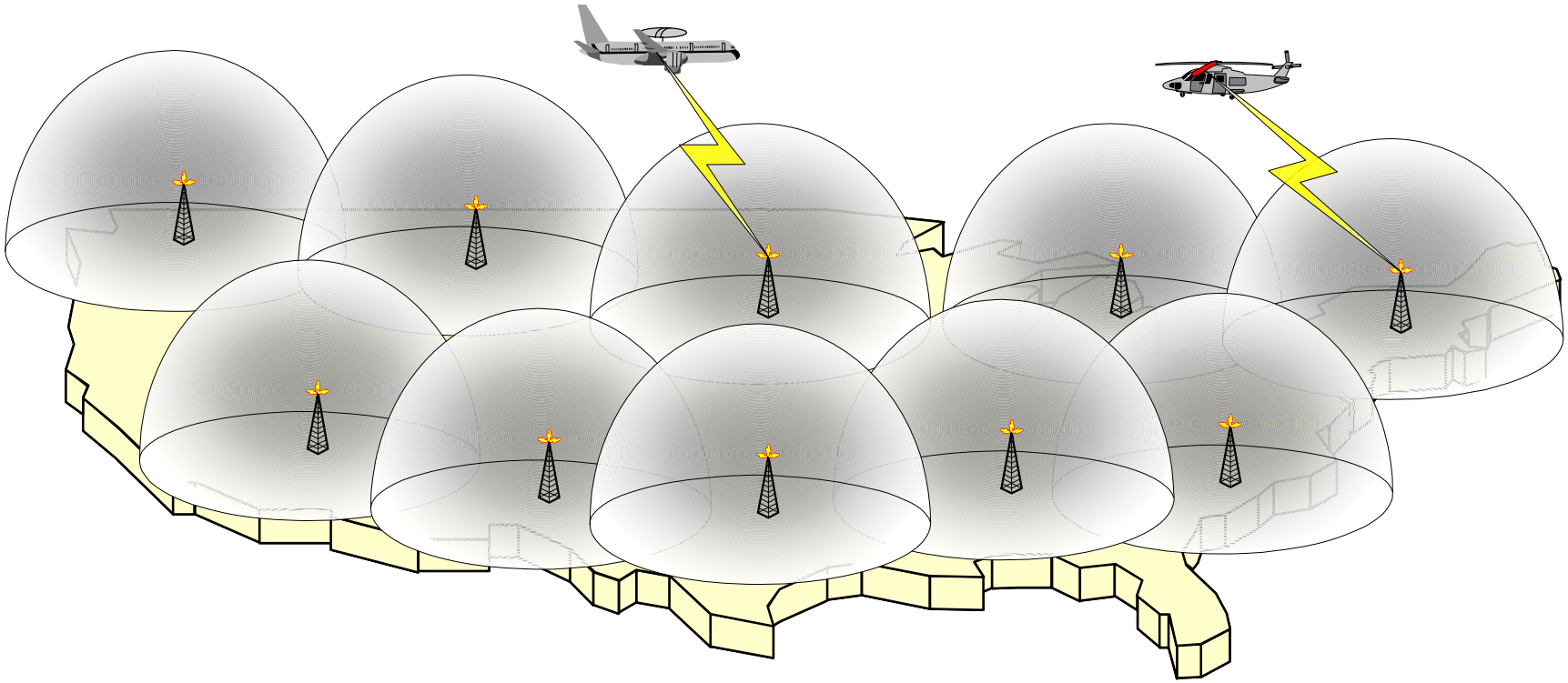
ALE Radio

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.

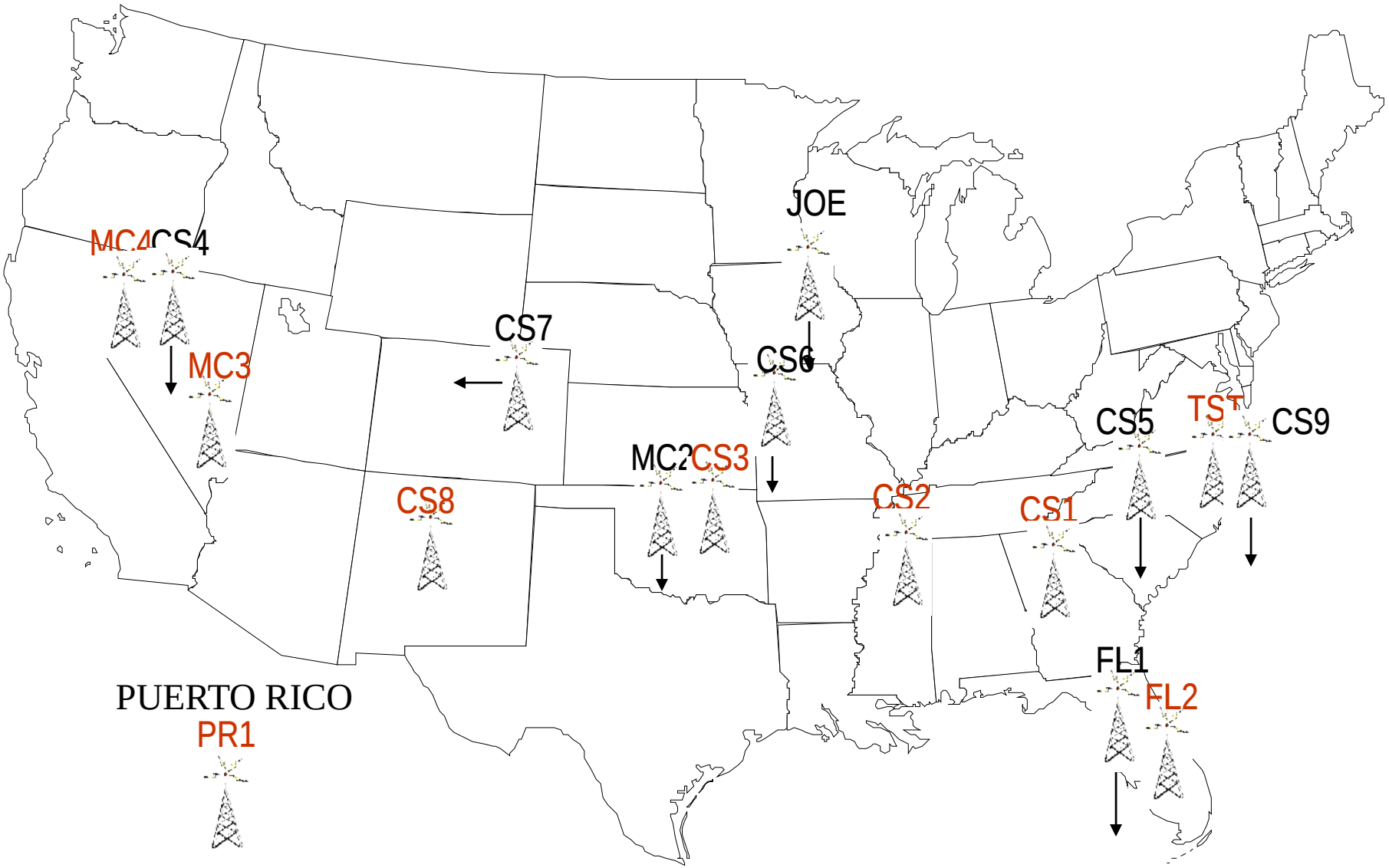
Previous COTHEN Remote Communication Consoles (RCC) network architecture connected groups of land users to a single transmitter site most suitable for their mission.

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

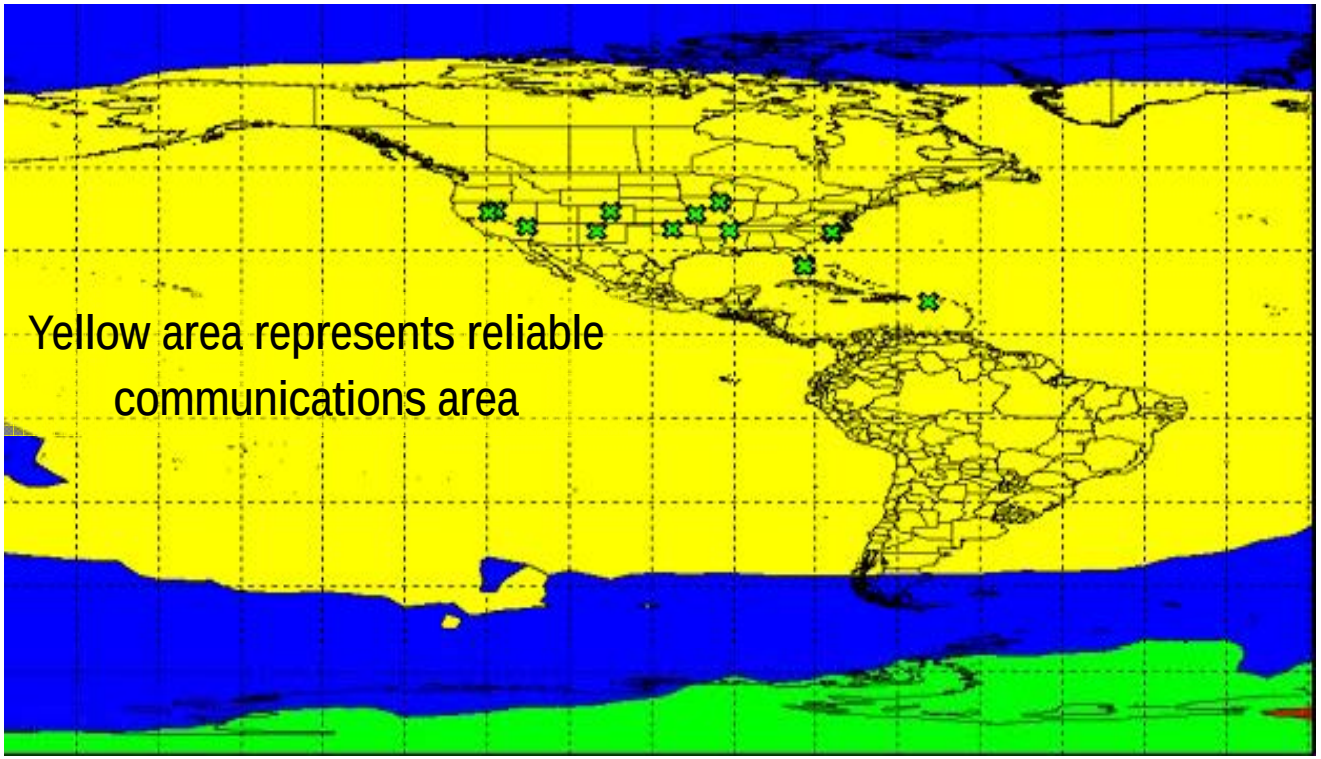
Every Mobile call is received by up to 21 transmitter stations and the best one is then automatically connected to the location being called e.g. Marine Office, Air Branch, Air Marine Operation Center, etc..

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

HF - COTHEN
BLACK = DIRECTIONAL ANTENNAS
RED = OMNI-DIRECTIONAL ANTENNAS

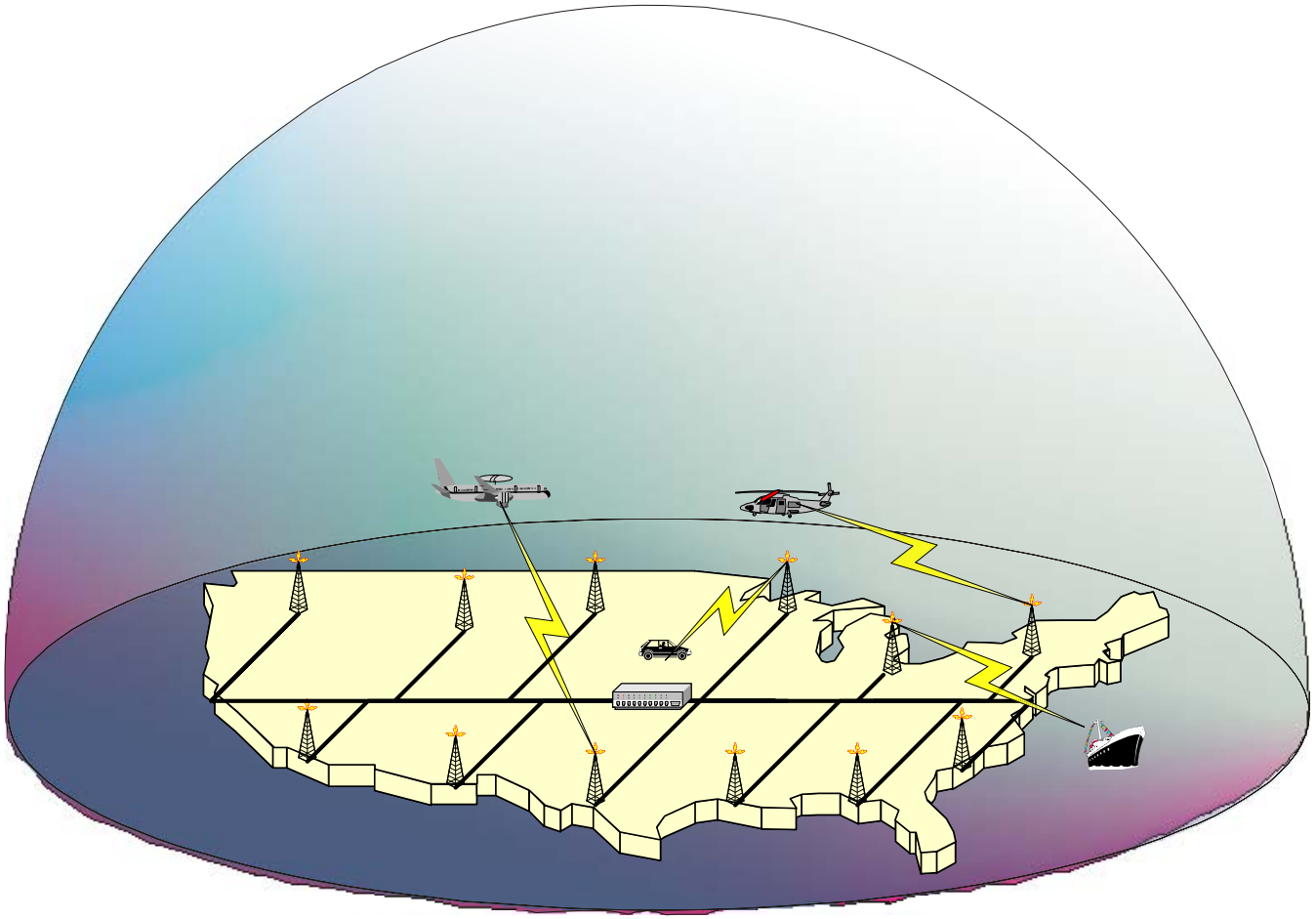


COTHEN

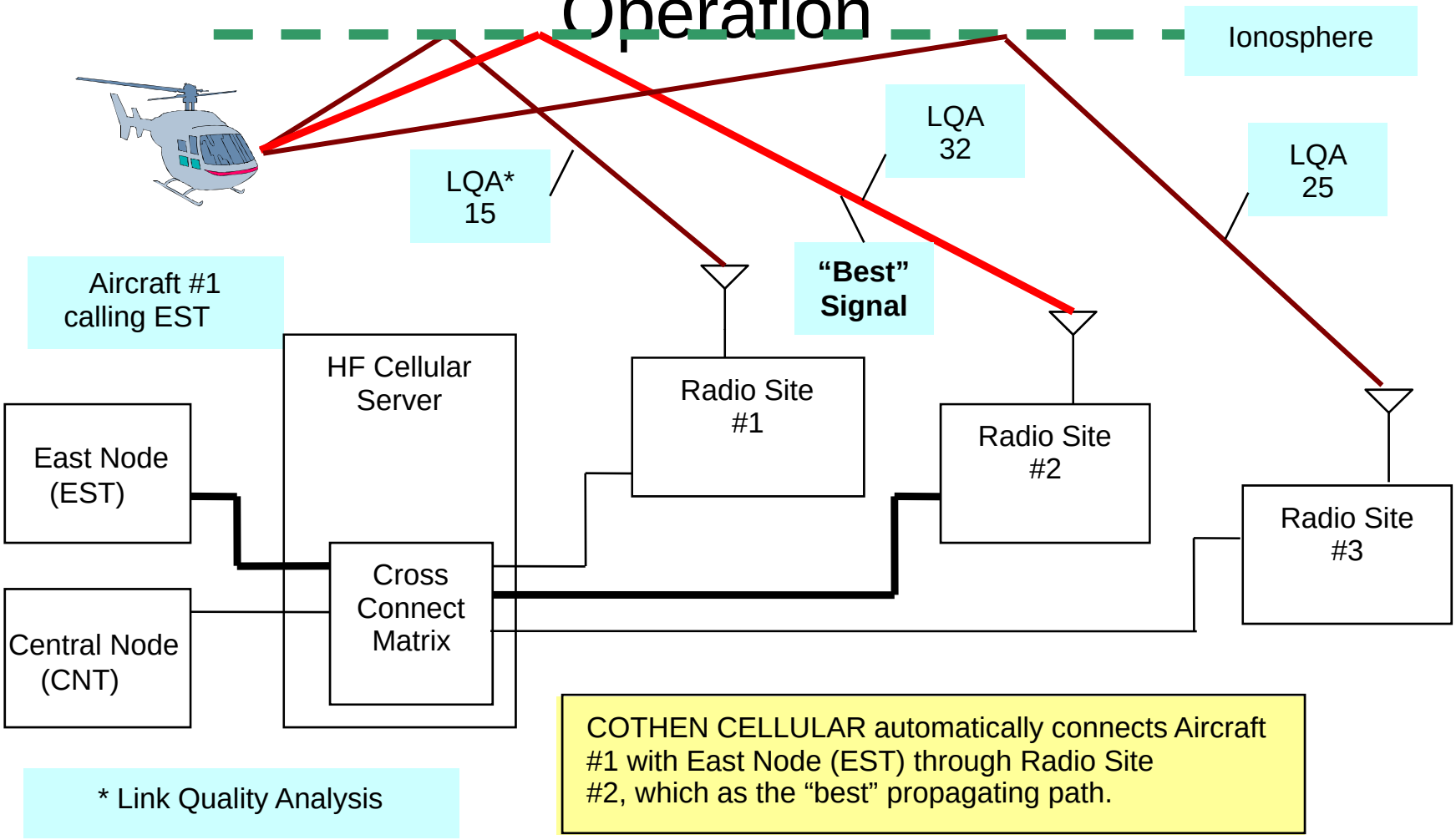


TALK AREA

Umbrella Like Coverage Using COTHEN's CELLULAR



COTHEN CELLULAR Concept of Operation

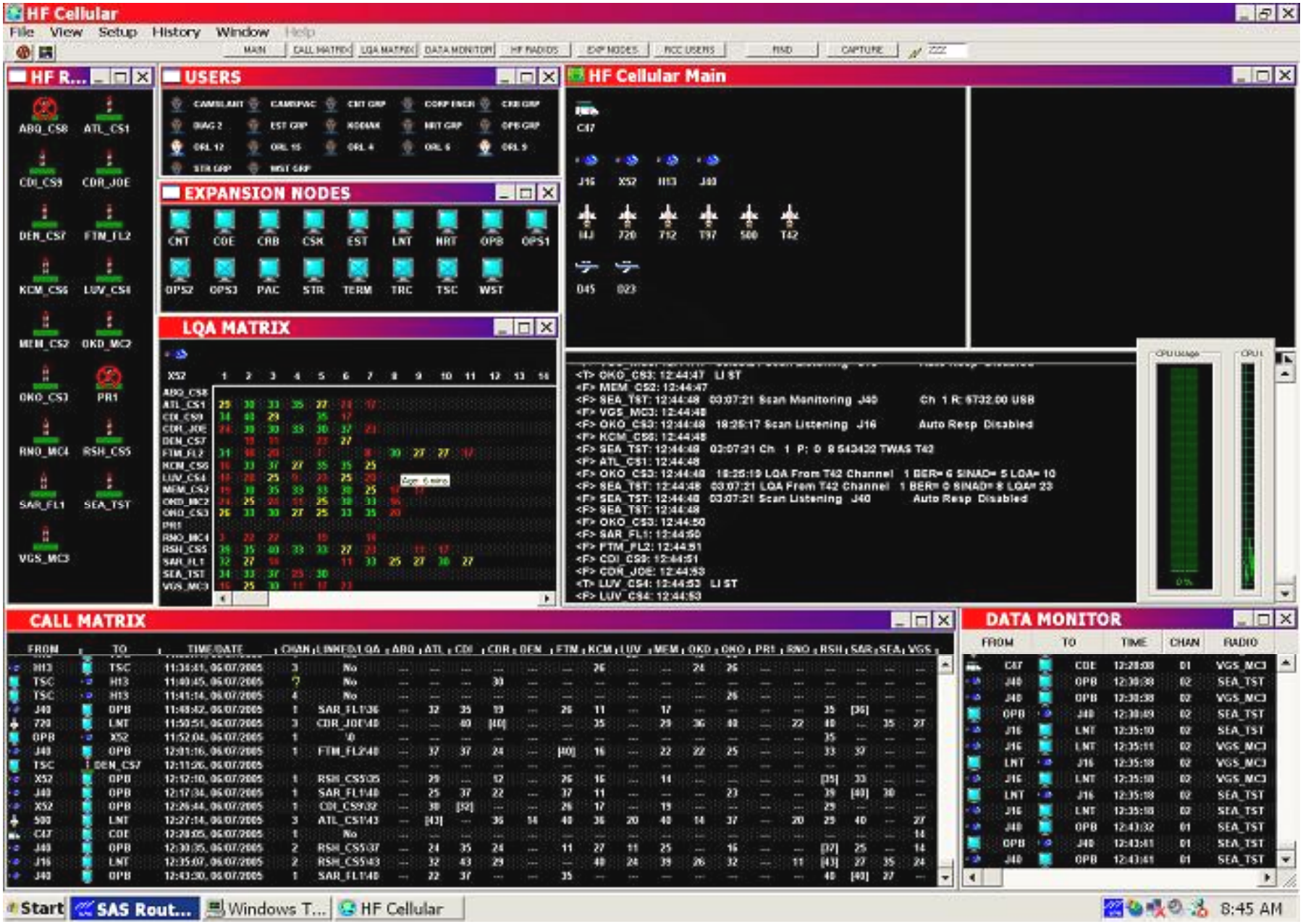


COTHEN CELLULAR General Capabilities

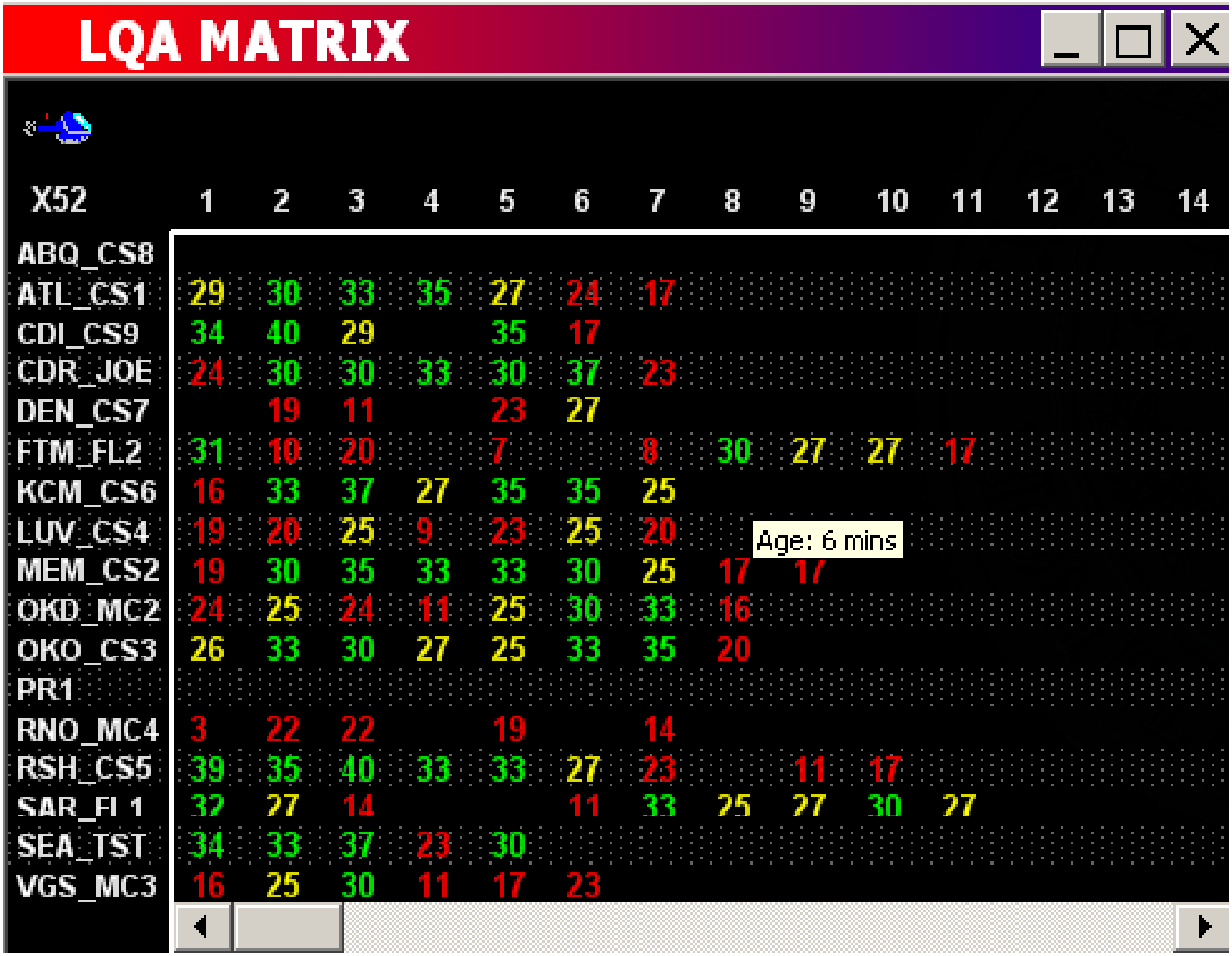
- ✓ **Proven Technology Currently in Use by the US Customs and Border Protection, and US Coast Guard Throughout the Continental United States, Puerto Rico, and the North Pacific**
- ✓ **Seamless HF Communications Coverage**
- ✓ **Best Station Linking**
- ✓ **GPS Situational Awareness with TRACS**
- ✓ **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

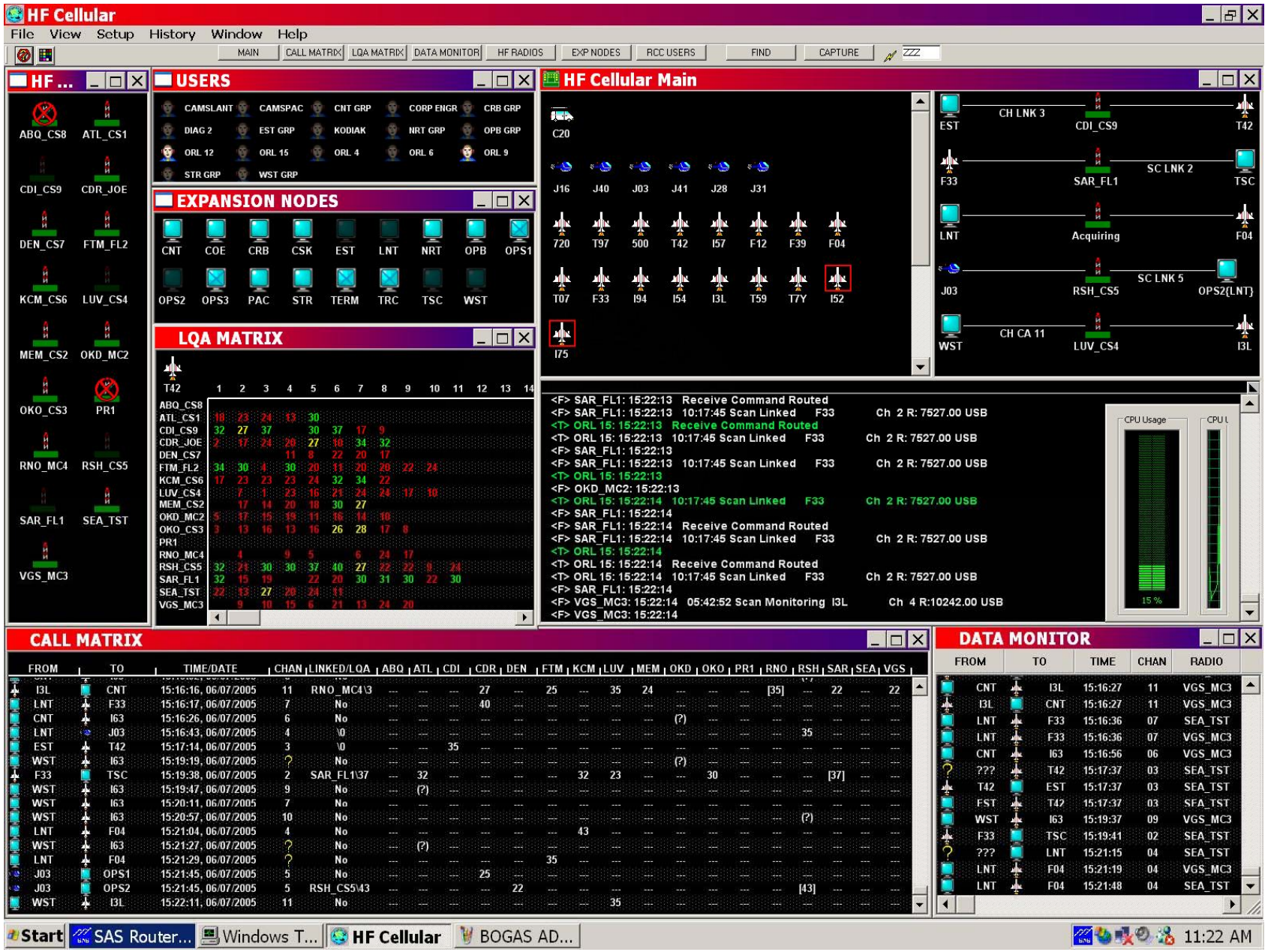
COTHEN CELLULAR SCREEN



LQA MATRIX

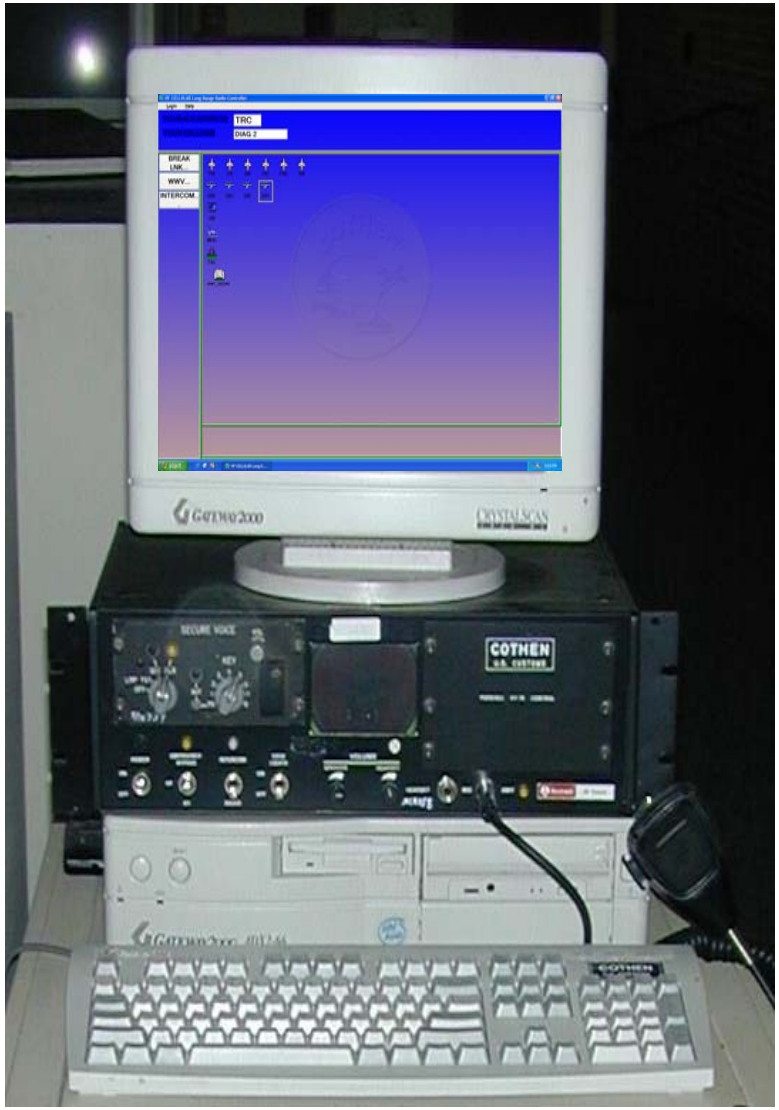

LQA MATRIX
X52 1 2 3 4 5 6 7 8 9 10 11 12 13 14
ABQ_CS8
ATL_CS1 29 30 33 35 27 24 17
CDI_CS9 34 40 29 35 17
CDR_JOE 24 30 30 33 30 37 23
DEN_CS7 19 11 23 27
FTM_FL2 31 10 20 7 8 30 27 27 17
KCM_CS6 16 33 37 27 35 35 25
LUV_CS4 19 20 25 9 23 25 20
Age: 6 mins
MEM_CS2 19 30 35 33 33 30 25 17 17
OKD_MC2 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 32 27 14 11 33 25 27 30 27
SEA_TST 34 33 37 23 30
VGS_MC3 16 25 30 11 17 23

Multiple Links



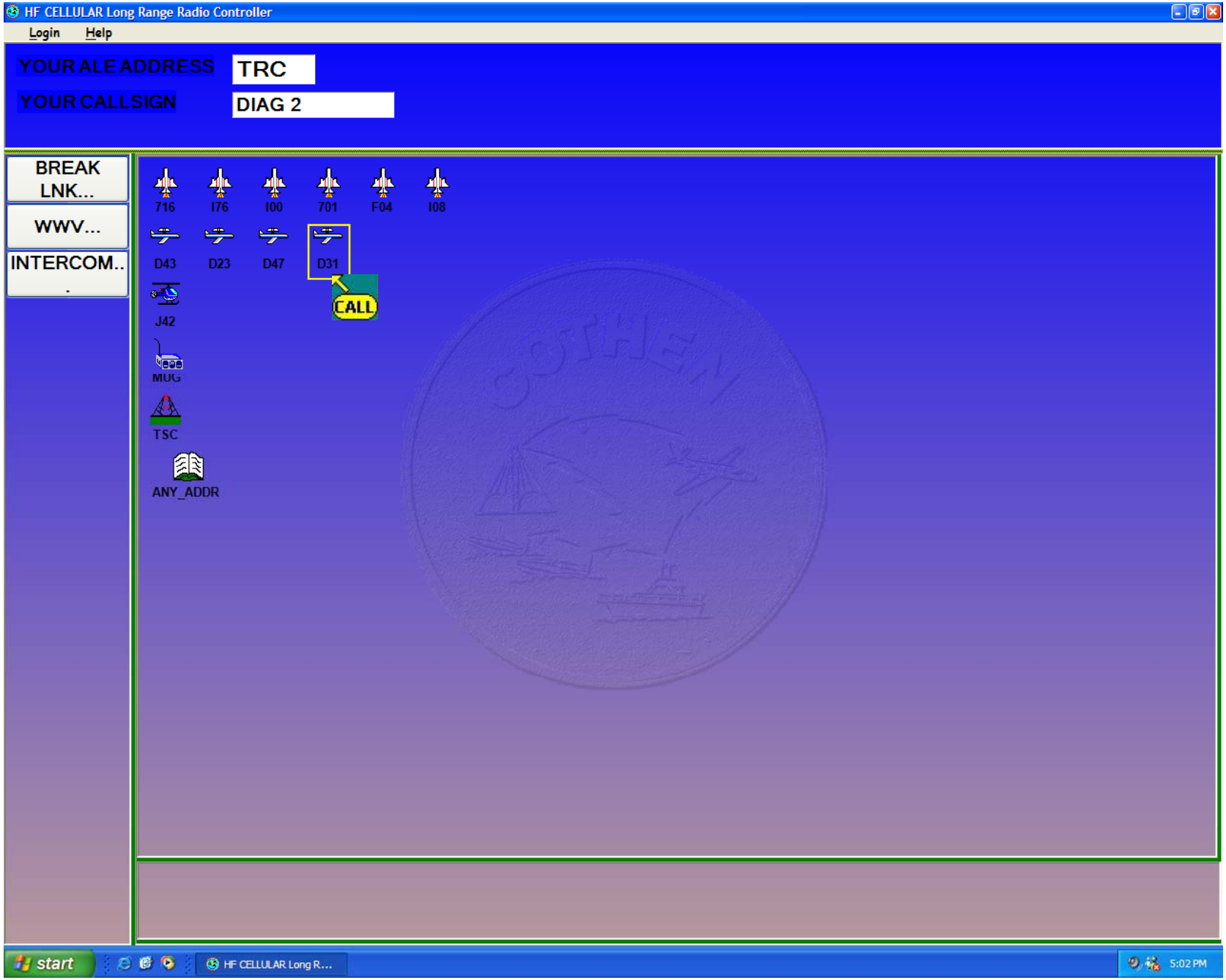
Remote Communications Console (RCC)

9.6K, 56K & VOIP capable



Remote Communications Console Display

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

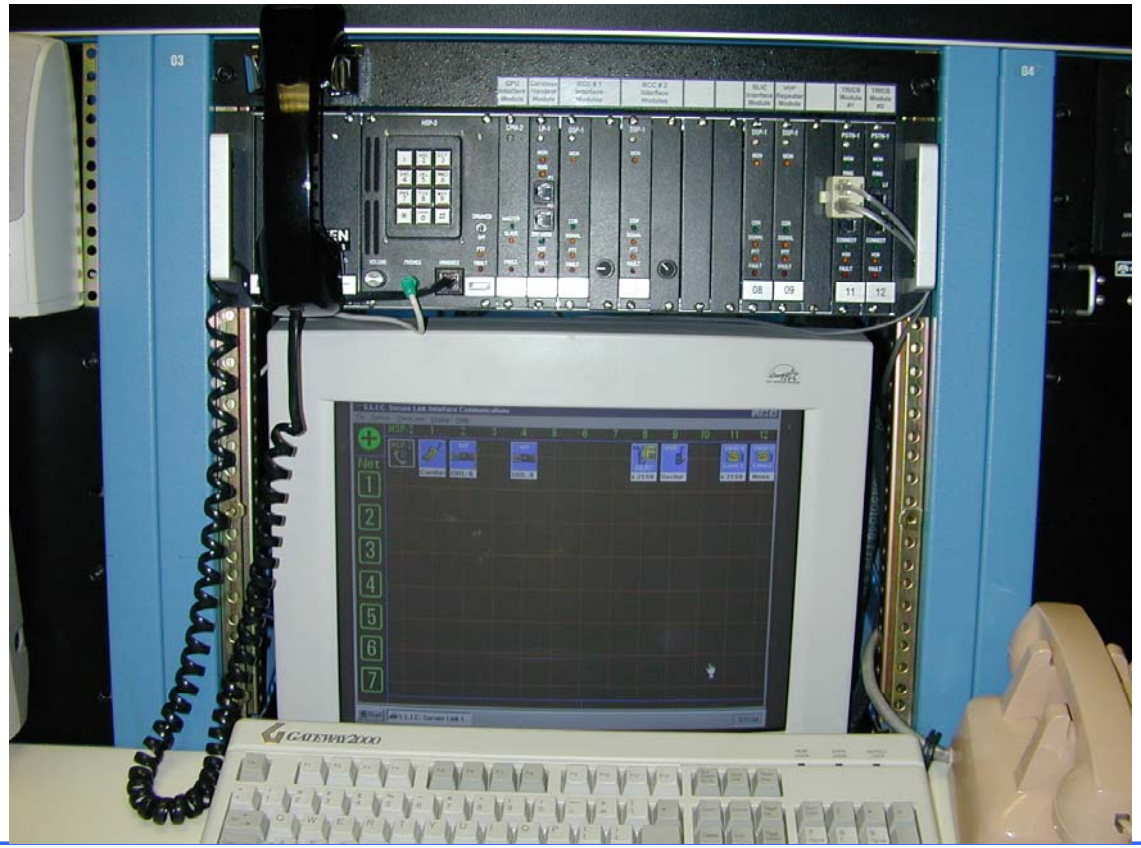
COTHEN TSC strives to make it's proactive technical assistance transparent to the user

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

HF

HF

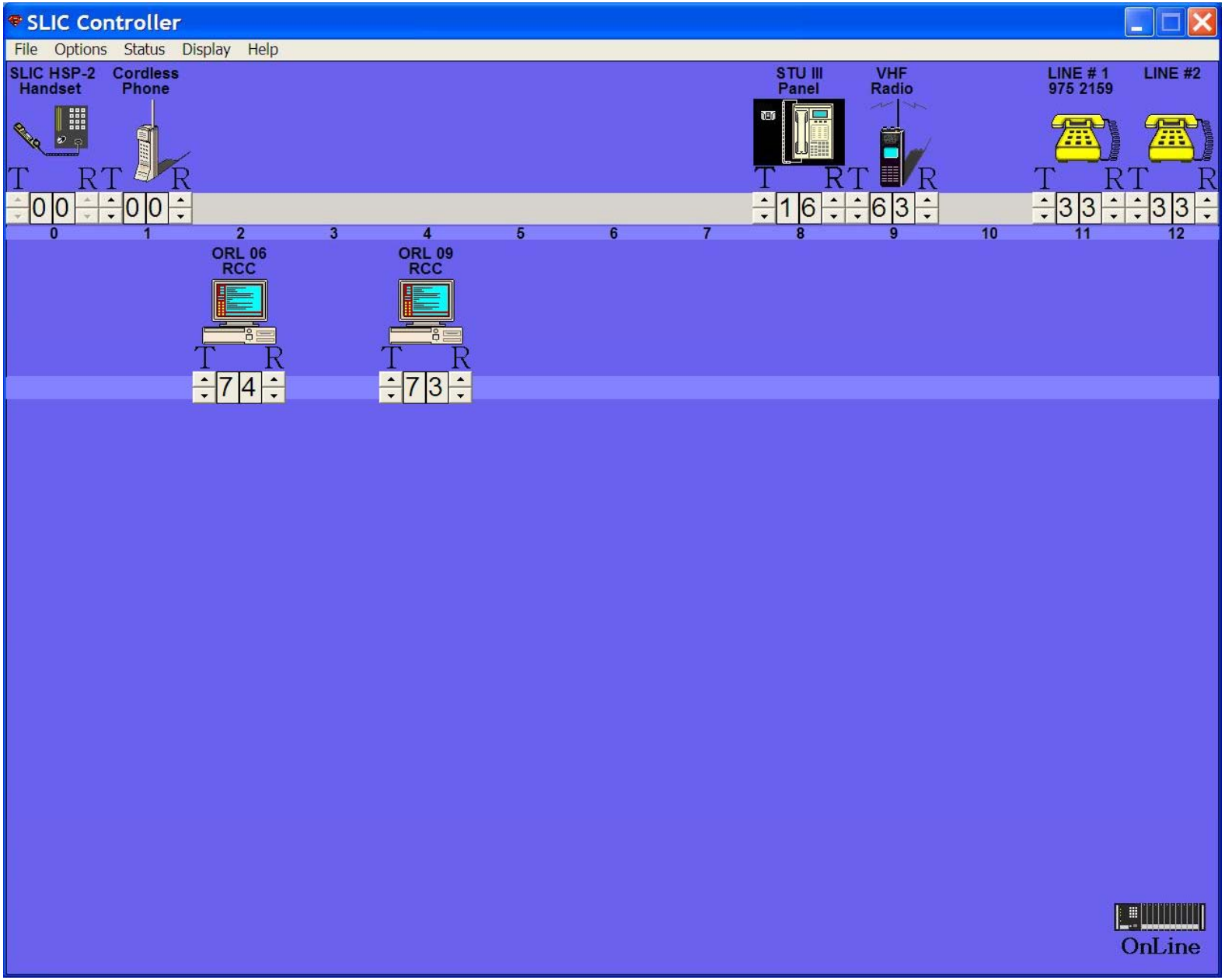
TSC

Secure Landline

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

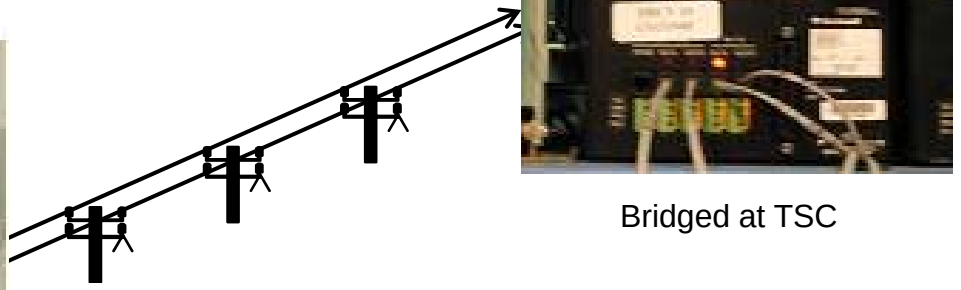
COTHEN Team provides communications whenever and wherever, many in less than 48 hrs notification

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 Transportable1-20-02

Gain access to the entire COTHEN Network

Dial in using two standard PSTN lines…



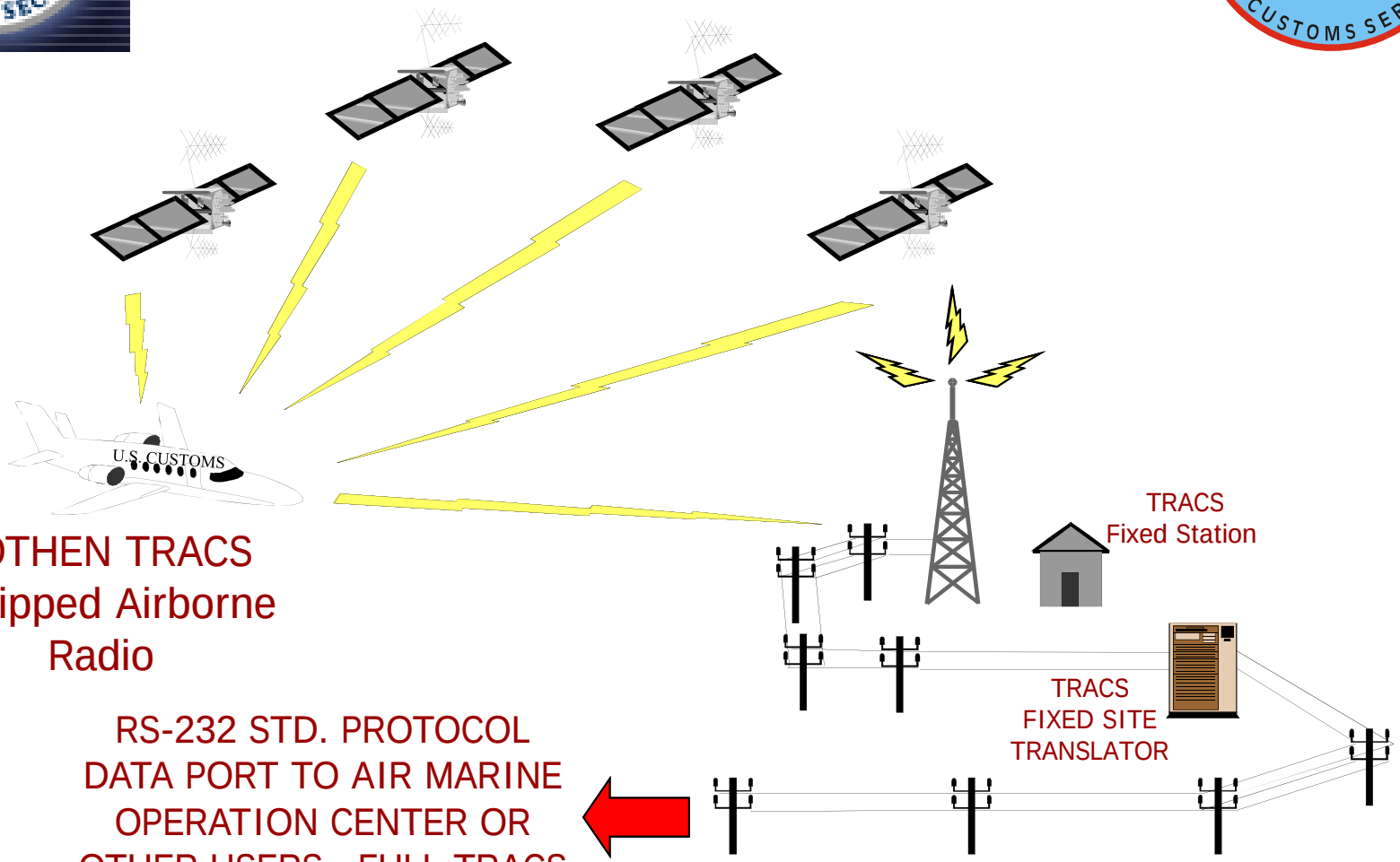
Bridged at TSC

Asset Tracking

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

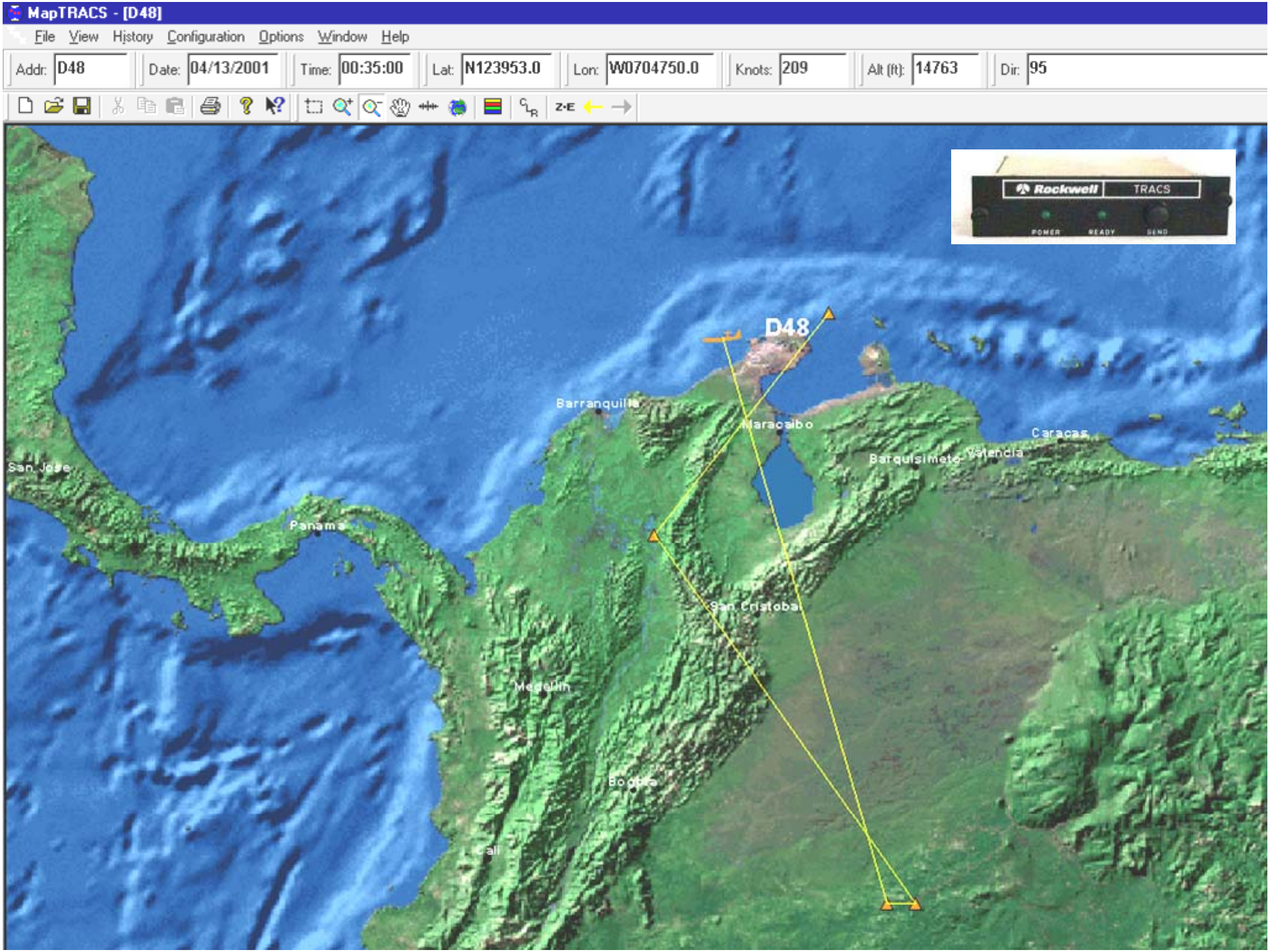
- Tracking and Communications System (TRACS) and ground display system completed
- Tested on aircraft, boats, vans
- Position display tested
- Reports from the Mobiles are encrypted
- Asset info at authorized RCC locations only

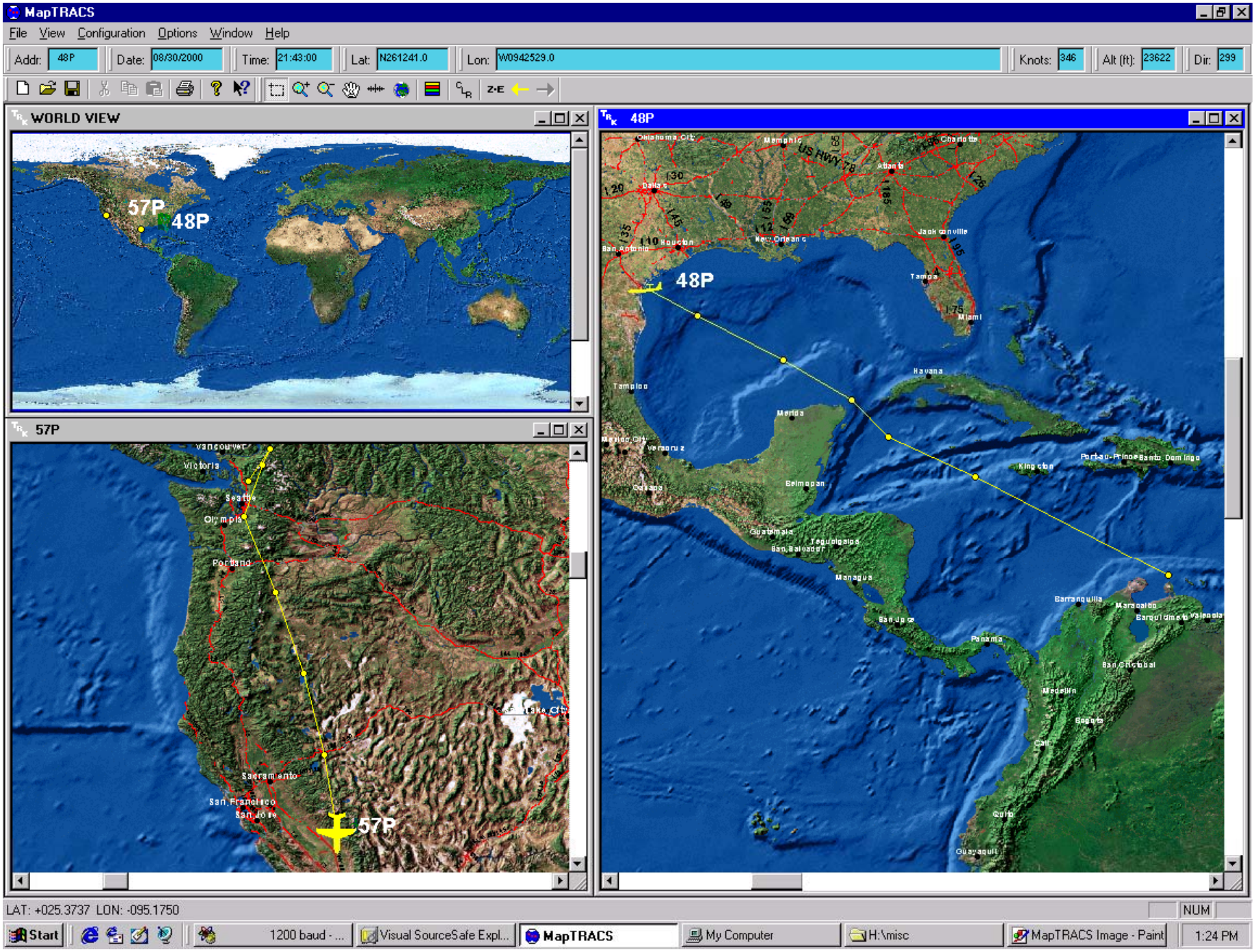
TRacking And Communications System (TRACS)

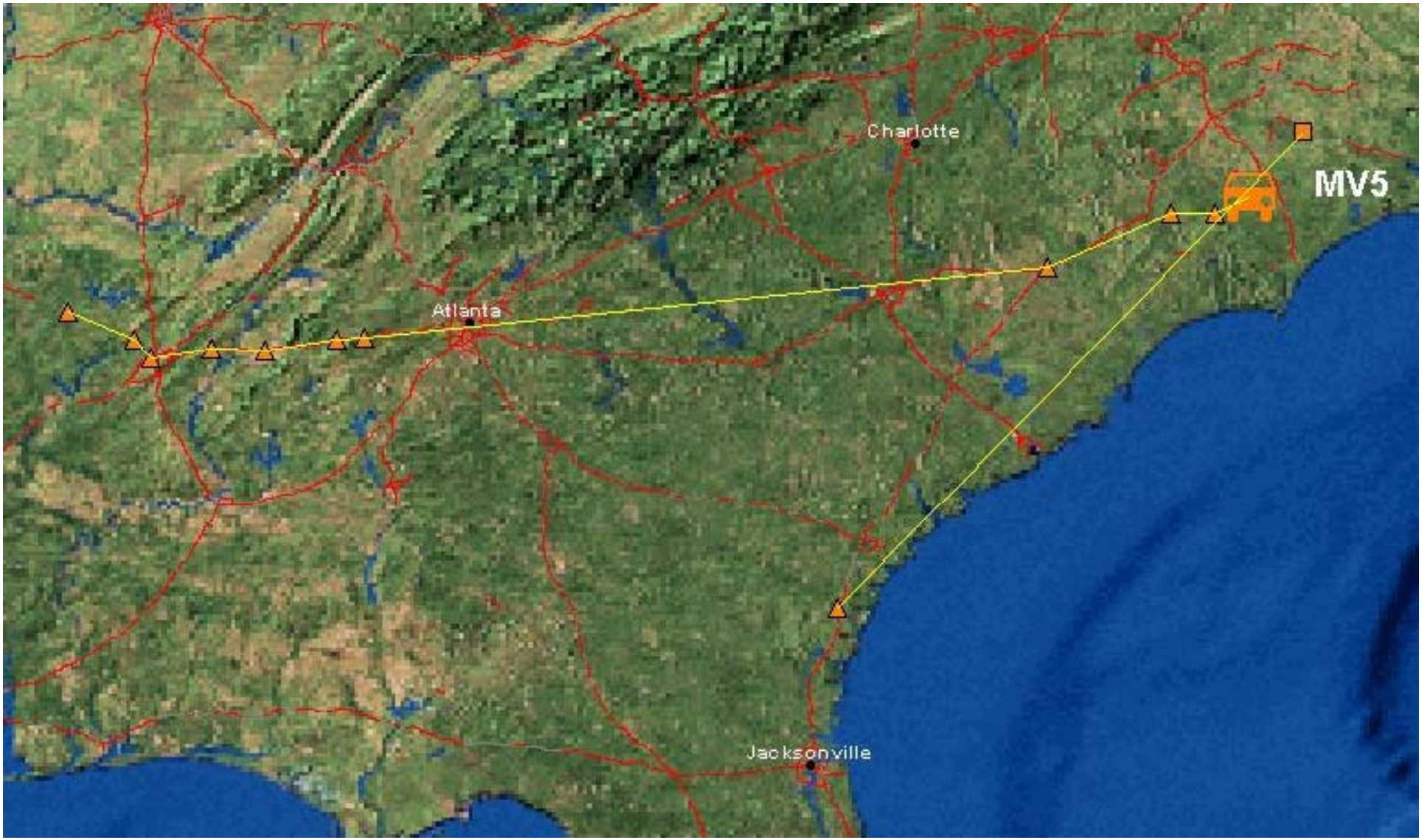


COTHEN TRACS Equipped Airborne Radio

RS-232 STD. PROTOCOL DATA PORT TO AIR MARINE OPERATION CENTER OR OTHER USERS. FULL TRACS DATA INFORMATION


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
Z-E
Rockwell TRACS
POWER
READY
SEND
D48
Barranquilla
Maracaibo
Caracas
Barquisimeto
Valencia
San José
Panama
San Cristobal
Medellin
Bogota
Cali


MapTRACS
File View Configuration Options Window Help
Addr: 48P
Date: 08/30/2000
Time: 21:43:00
Lat: N261241.0
Lon: W0942529.0
Knots: 346
Alt (ft): 23622
Dir: 299
WORLD VIEW
57P
48P
57P
Vancouver
Victoria
Seattle
Olympia
Portland
Sacramento
San Francisco
San Jose
Salt Lake City
48P
Oklahoma City
Memphis
Charlotte
Atlanta
Dallas
Houston
San Antonio
New Orleans
Jacksonville
Tampa
Miami
Havana
Tampico
Merida
Mexico City
Veracruz
Belmopan
Guatemala
Tegucigalpa
San Salvador
Managua
Kingston
Port-au-Prince
Santo Domingo
Barranquilla
Maracaibo
Valencia
Panama
San Cristobal
Medellin
Bogota
Cali
Quito
Guayaquil
LAT: +025.3737 LON: -095.1750
NUM
Start
1200 baud - ...
Visual SourceSafe Expl...
MapTRACS
My Computer
H:\misc
MapTRACS Image - Paint
1:24 PM


Charlotte
MV5
Atlanta
Jacksonville