



## *"LRP - Heart Transplants and Face-lifts for LORAN"*

### INTERNATIONAL LORAN ASSOCIATION

30th Annual Convention and Technical Symposium

7-10 October 2001

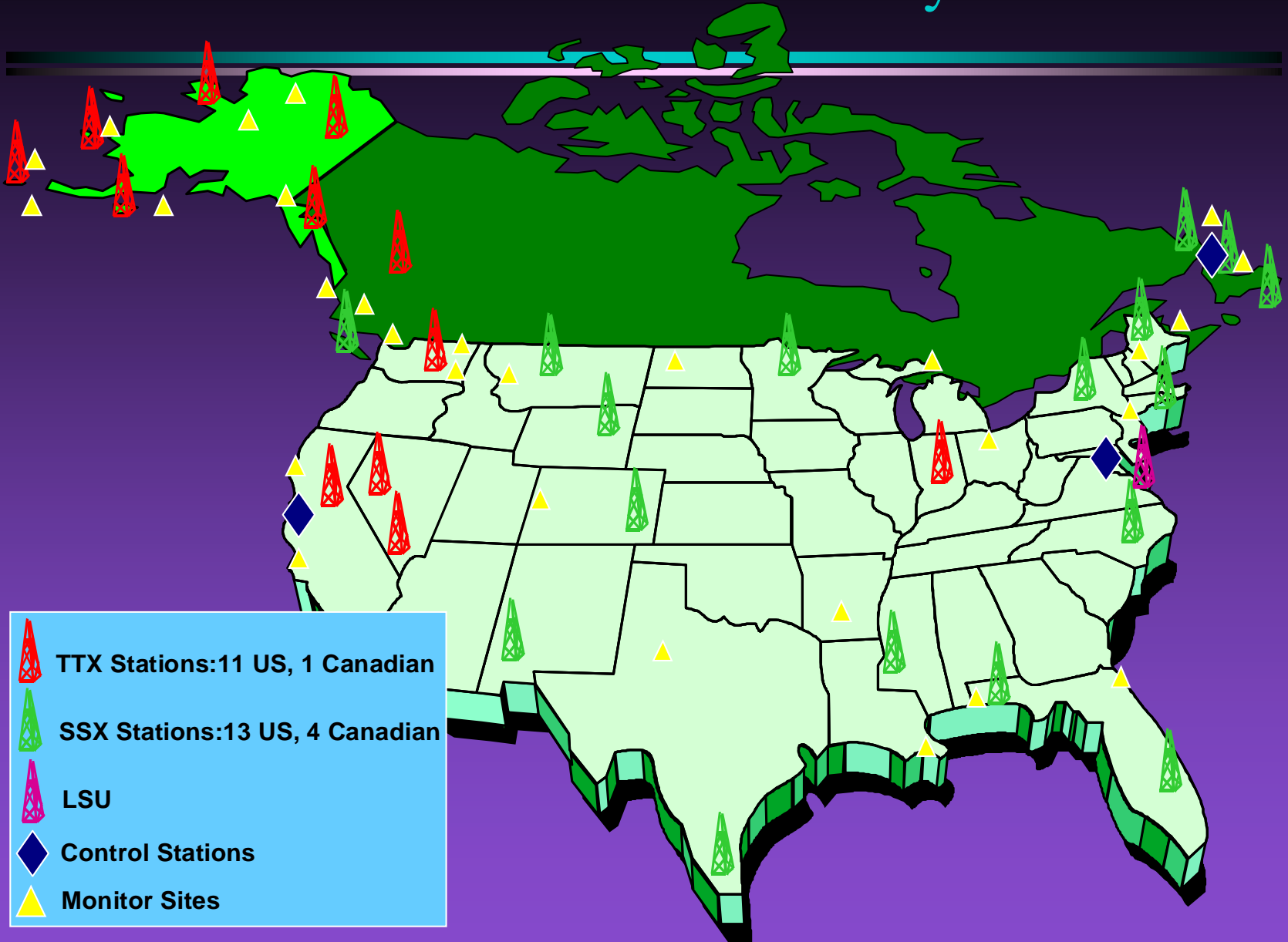
St. Germain-en-Laye Paris, France.

*LCDR Jay Boyer, U. S. Coast Guard*  
*Chief of Engineering*  
*USCG Loran Support Unit*

# *Outline*

- The Loran-C System
- Loran Recapitalization Background, Mission, & Goals
- Major Components
- Loran: Before and After
- Conclusions

# North American Loran-C System



# *LRP Background, Mission & Goals*

- 
- FAA/USCG Interagency Agreement DTFA01-97-Z-02033 signed JUL1997:
    - “.... *provide for the upgrading and modernization of the Loran-C System.*”

## LRP Mission:

*“Modernize the U. S. Loran system to meet present and future radionavigation requirements while leveraging technology and funds to optimize operations, support and training, and reduce total cost of ownership.”*

# *Major Components*

- Transmitter Procurement
- Civil Engineering
- New Command and Control Equipment - ( At all PCMS, ConSites, LorStas)
- FAA Aviation-Specific Work

# Loran Station Command & Control Equipment

**Before**

## Loran Station C2 Equipment....Before

- ◆ 29 Locations (24 U.S. & 5 Canadian)
- ◆ 1960's-1980's Vintage Equipment
- ◆ Required Several Independent Systems
- ◆ Required Extremely Large Footprint
- ◆ Difficult to Maintain
- ◆ Required Several Weeks of Formal C-School Training
- ◆ Large Power Requirement
- ◆ Required over 280 Hours/Year/Site for PMS
- ◆ Operating & Personnel Cost Estimated at \$6.5M/Year for 24 U.S. Sites

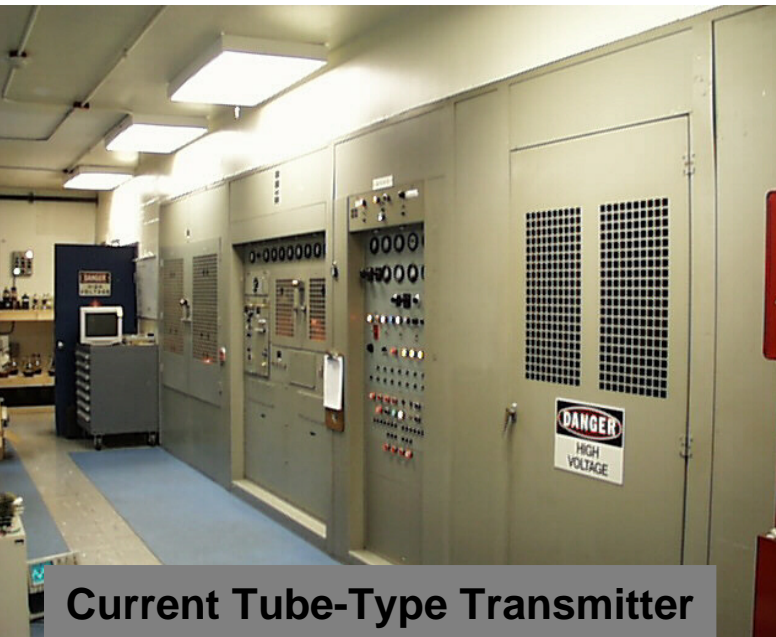




# Loran Station (circa 1996)



**Current Operations Room Equipment**



**Current Tube-Type Transmitter**

OR



**Current Solid-State Transmitter**

# Loran Station (circa 1996)





# Loran Station (circa 2003-2004)

## LORSTA Equipment...After

- ◆ Automatic Blink System (ABS)
- ◆ Time of Transmission Monitor (TTM)
- ◆ New Cesiums (HP-5071)
- ◆ Remote Automated Integrated Loran (RAIL)
- ◆ New Casualty Control Receivers (Locus)
- ◆ New Transmitter (Sept 2001)
- ◆ Service Live Extension Program (SSX SLEP)
- ◆ New Timing & Frequency Equipment (Oct 2001)
- ◆ Operations Room UPS (2 done, 2 more in Sept)
- ◆ Transmitter Room UPS (LSU's)
- ◆ Loran Data Channel Communications (LDC)
- ◆ Prototype Automated Loran Station (PALS)



# Loran Station HP-5071A Oscillators

## LORSTA Equipment....After Cesium Clocks:

- ◆ Replaced HP-5061A's (below) at all U. S. Lorsta's.
- ◆ Heartbeat of timing system
- ◆ Necessary for new TFE.



**Done**

# Loran Station Remote Automated Integrated Loran (RAIL)

## LORSTA Equipment....After RAIL:

- ◆ Contract awarded in Sept.
- ◆ Dell Computer Systems
- ◆ Start final form installations in next couple of months.

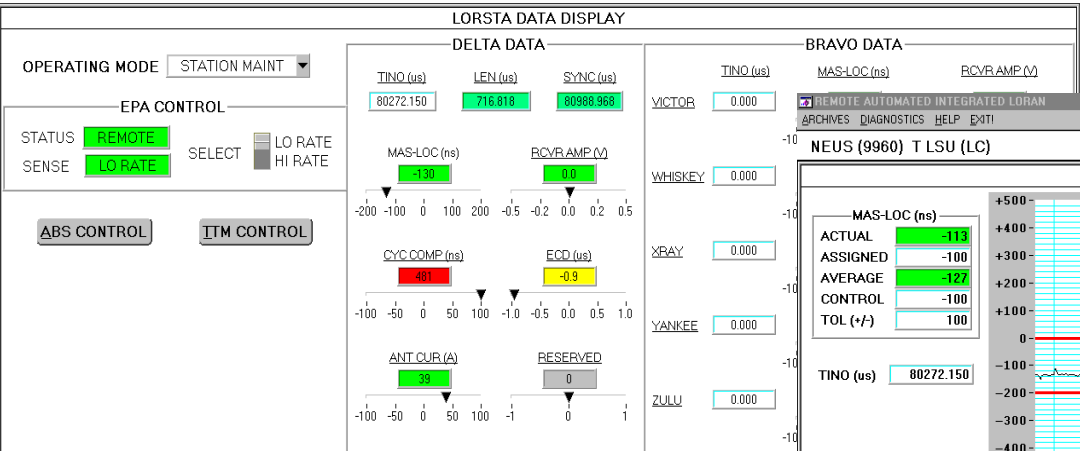




# Loran Station Remote Automated Integrated Loran (RAIL)

REMOTE AUTOMATED INTEGRATED LORAN  
ARCHIVES DIAGNOSTICS HELP EXIT

NEUS (9960) T LSU (LC) REMOTE AUTOMATED INTERGRATED LORAN SYSTEM TIME: 14:23:43Z 14 SEP 1999



HIGH PRIORITY ALARMS

14:24:45Z CYC COMP OUT

LOW PRIORITY ALARMS

13:43:10Z ECD 80% OT

ALARMS / COMMANDS

| TIME      | EVENT              |
|-----------|--------------------|
| 14:14:10Z | V AMP BRAVO OUT    |
| 14:14:15Z | V AMP BRAVO 80% OT |
| 14:14:20Z | V AMP BRAVO IN TOL |
| 14:15:45Z | V AMP BRAVO 80% OT |
| 14:15:50Z | V AMP BRAVO IN TOL |
| 14:16:50Z | V AMP BRAVO 80% OT |
| 14:16:55Z | V AMP BRAVO OUT    |
| 14:17:10Z | V AMP BRAVO IN TOL |
| 14:18:15Z | V AMP BRAVO 80% OT |
| 14:18:30Z | V AMP BRAVO IN TOL |
| 14:18:50Z | V AMP BRAVO OUT    |
| 14:19:05Z | V AMP BRAVO IN TOL |
| 14:19:35Z | V AMP BRAVO OUT    |
| 14:19:40Z | V AMP BRAVO 80% OT |
| 14:19:55Z | V AMP BRAVO IN TOL |
| 14:20:15Z | V AMP BRAVO 80% OT |
| 14:20:20Z | V AMP BRAVO IN TOL |
| 14:21:30Z | V AMP BRAVO OUT    |
| 14:21:40Z | V AMP BRAVO IN TOL |
| 14:22:10Z | V AMP BRAVO OUT    |
| 14:22:30Z | MAS-LOC 80% OT     |
| 14:22:40Z | MAS-LOC IN TOL     |
| 14:23:05Z | V AMP BRAVO IN TOL |
| 14:23:10Z | MAS-LOC 80% OT     |
| 14:23:15Z | MAS-LOC IN TOL     |

TTY NETWORK

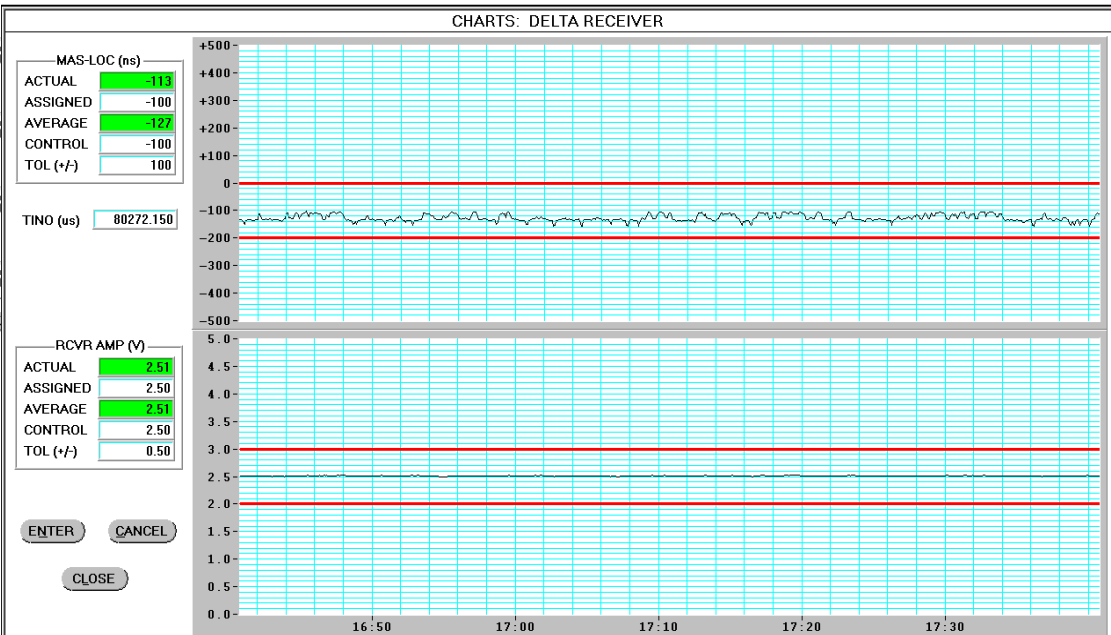
XXLCBKOFF  
XXLCBKOFF

16:01:37Z TIME STAMP  
16:01:38Z TIME STAMP  
16:01:38Z TIME STAMP  
VVVV  
00:00:00Z END LORAN DAY  
14 SEP 1999 TTY NETWORK DATA  
00:00:00Z NEW LORAN DAY  
XXLCBKOFF  
XXLCBKOFF

13:58:57Z TIME STAMP  
13:58:58Z TIME STAMP

REMOTE AUTOMATED INTEGRATED LORAN  
ARCHIVES DIAGNOSTICS HELP EXIT

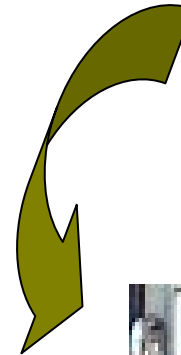
NEUS (9960) T LSU (LC) REMOTE AUTOMATED INTERGRATED LORAN SYSTEM TIME: 17:40:54Z 20 SEP 1999



# Loran Station Casualty Control Receiver

## LORSTA Equipment....After Casualty Control Receiver:

- ◆ Locus LRS IIID
- ◆ All-in-view Receiver, so no longer need one receiver at Master for each Secondary in chain.
- ◆ Need one receiver per rate transmitted.



# Loran Station Timing and Control Equip.

## LORSTA Equipment....Present Timing and Control Equip:

- ◆ All of the Timing and Control Equip that will be replaced by new TFE.
- ◆ Contract awarded end of September for new Timing and Frequency Equip to Timing Solutions Corporation of Boulder, Colorado.



## LORSTA Equipment....Future Timing and Frequency Equip:

- ◆ Future Equipment may resemble the existing products of TSC.





# Loran Station Operations Room UPS

## LORSTA Equipment...After OPS Room UPS:

- ◆ APC Symmetra
- ◆ Ends Momentaries - Critical for Aviation use.
- ◆ Operations Room UPS (4 done - LorSta's Jupiter, FL; Grangeville, LA; Carolina Beach, NC; & Malone, FL. 2 more in Oct - Raymondville, TX & Nantucket, MA. 2 more in Nov - Caribou, ME & Seneca, NY)



# Loran Station Transmitter UPS

## LORSTA Equipment....After Transmitter UPS:

- ◆ APC 120KW for 32 HCG & 240KW for 64 HCG
- ◆ Ends Momentaries - Critical for Aviation use.
- ◆ Transmitter UPS (Initial one installed at LSU for testing. After passing initial testing will start installs at LorSta's)



# Loran Station Transmitter (circa 2003-2004)

## Replacement Transmitters

### LORSTA Equipment....After New SSX Transmitter:

- ◆ Contract Awarded for New Transmitters to replace aging Tube-Type Transmitter Inventory at the end of Sept to Megapulse Inc. out of North Billerica, MA.
- ◆ Representative of potentially new SSX Transmitter from Megapulse, Inc.



# Loran Station (circa 2003-2004)







**Manned Loran Transmitting Station**

**Loran Program Costs (2000)**



**Loran Program Costs (2006)**

**Potential Reinvestment  
Opportunity**

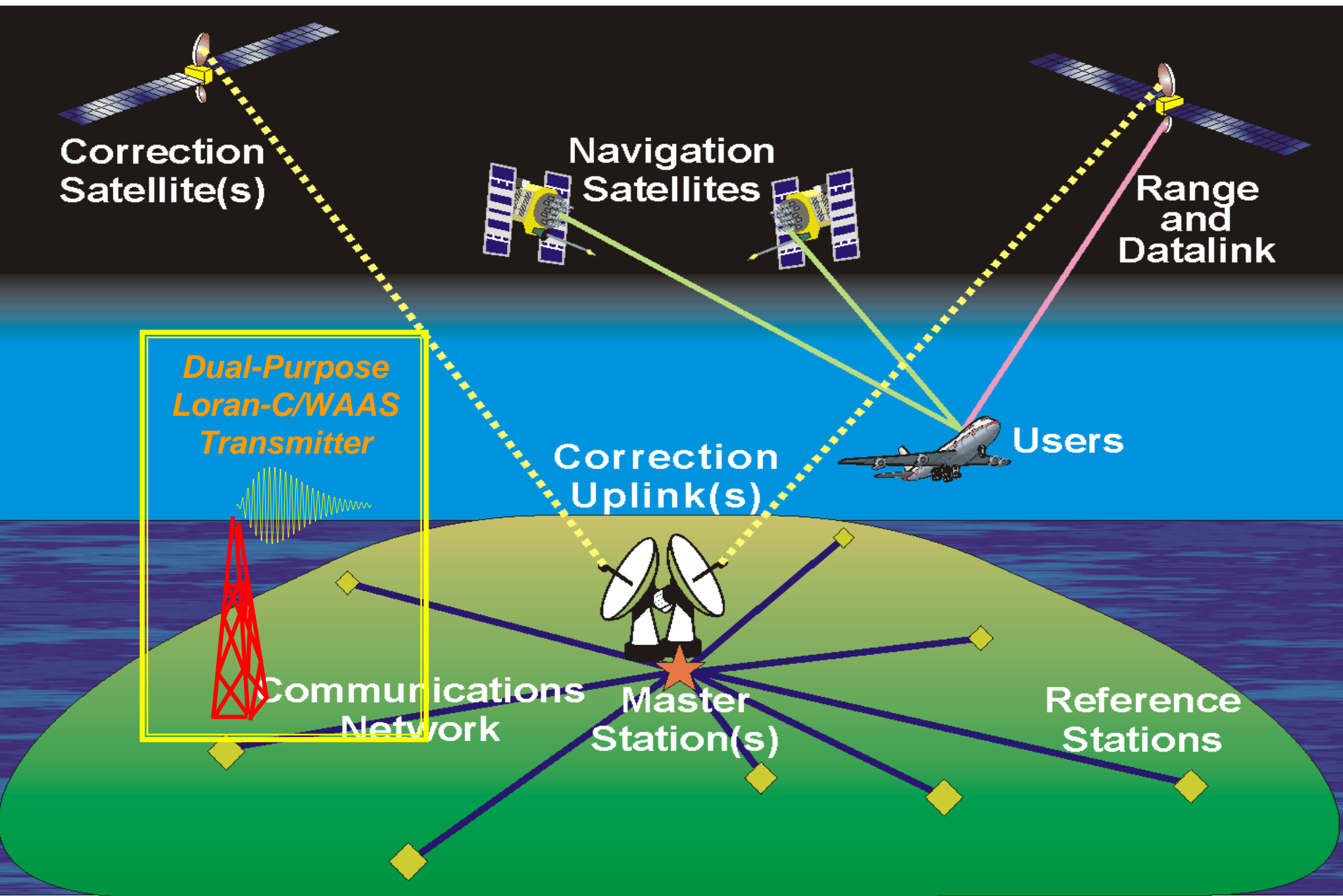
**Other OE  
Costs**

**Personnel Costs**



**Automated, Unmanned Loran  
Transmitting Site**

# Loran-C as Part of the Federal Aviation Administration's Wide Area Augmentation System (WAAS)





# *Conclusions*

- The entire North American Loran-C System is undergoing a complete “heart transplant” and “face-lift”.
- LRP is paving the way to improve the
  - Availability,
  - Continuity,
  - Integrity, and
  - Accuracyof the world’s *premier* radionavigation system!



**QUESTIONS????**

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