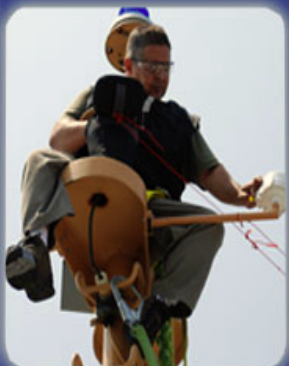


The Next Generation LF Transmitter and its Impact on Loran, eLoran, and Tactical (e)Loran Systems.

Presented by Charles Schue

With thanks to Nautel, Inc. & Symmetricom, Inc.

Engineering Solutions



IT Solutions



Professional Services



Products



News

Sep 18, 2008

Bill Woodward presented a paper that he co-authored with Rich Webb entitled "Integrating Monolithic ..."



We are the exclusive worldwide Value Added Reseller of Nautel's (e)Loran products.

What is the problem?



U.S. Air Force Space Command Commercial

What is the problem?



Constellation Status Summary



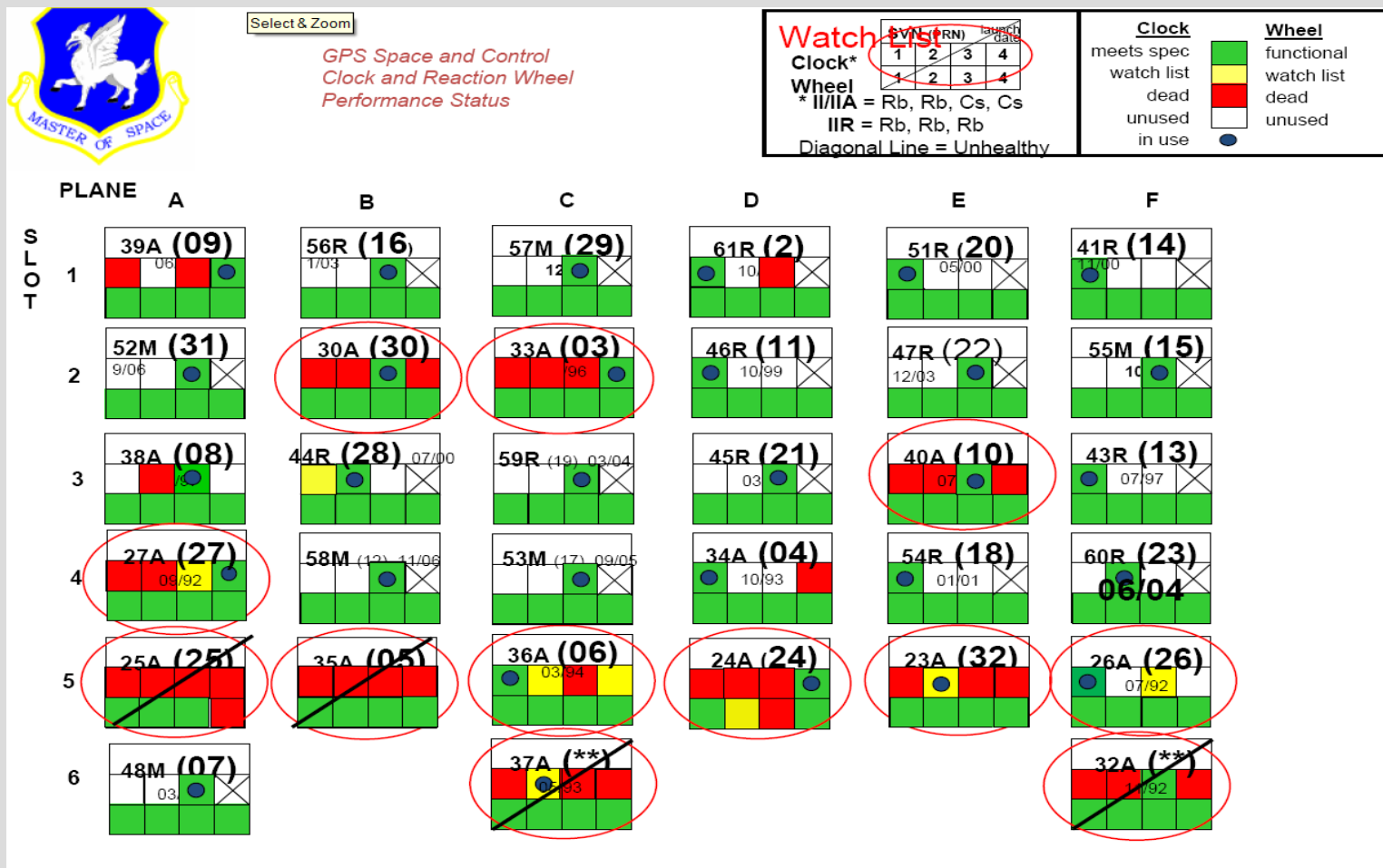
Total SVs in Category

Changes Since Last Update

- 19 (+0) SVs past design life
- 15 (+0) SVs past pre-launch mean life estimate (MLE)
- 18 (+0) SVs one component away from nav mission failure
- 8 (+0) SVs one component away from bus failure
- Anomaly Summary
 - SVN 25 set unhealthy
 - SVN 35 set unhealthy

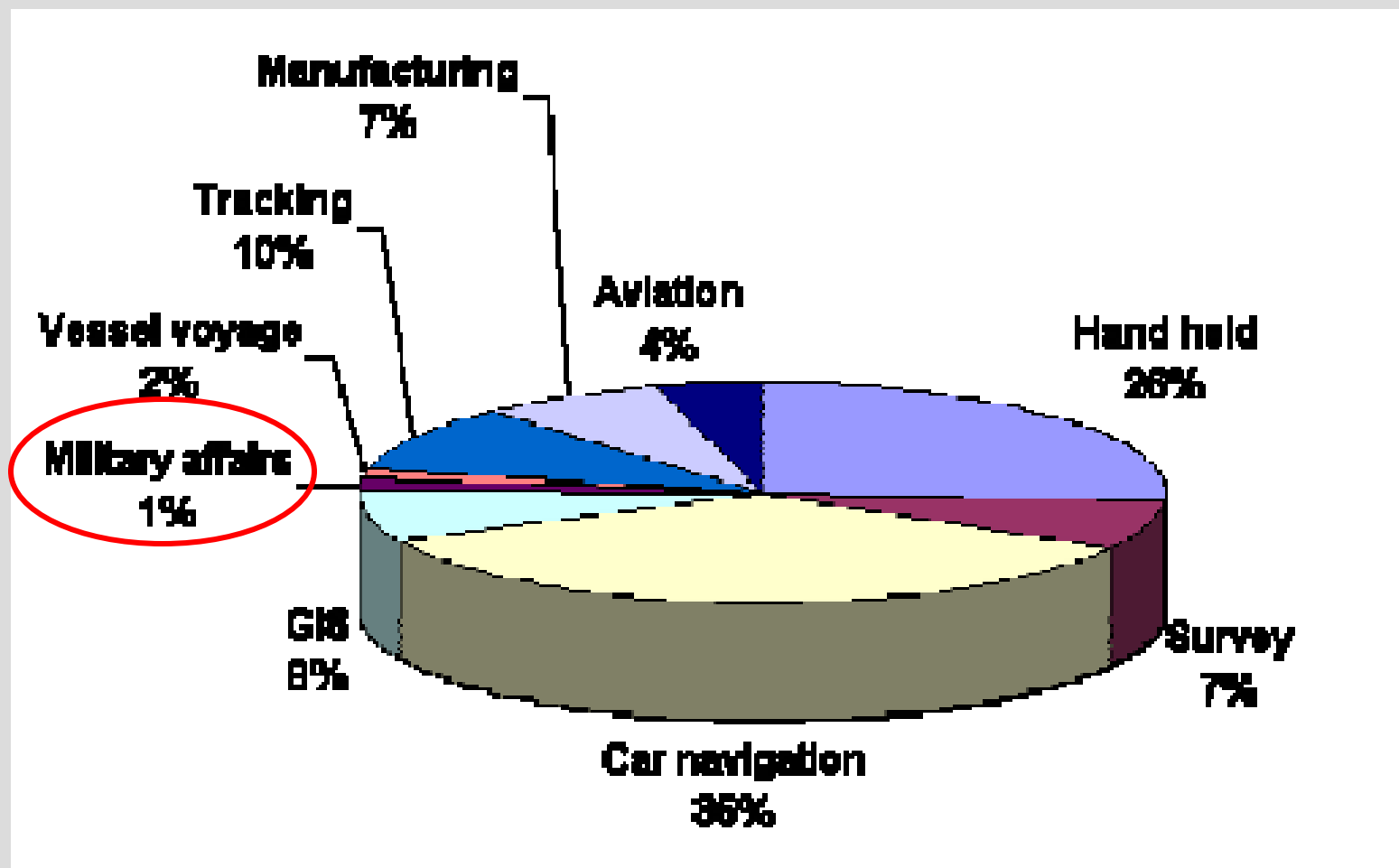
Unclassified – Sep2008

What is the problem?



Unclassified – Sep2008












What is the “market”?



Real World GPS Case Study | President, GM OnStar | Oct 2007

- “GPS location & clock are critical enablers for all OnStar services”

OnStar Monthly interactions (Avg. May-July '07)

	Airbag Notification 800/Month		Advanced Automatic Crash Notification 900/Month		Emergency Services 10,000/Month
	Good Samaritan 6,100/Month		Stolen Vehicle Location Assistance 700/Month		Remote Unlock 66,000/Month
	Roadside Assistance 35,000/Month		Route Support 351,000/Month		OnStar Hands-Free Calls Placed Over 15.0 Million/Month
	Remote Diagnostics (on demand) 68,000/Month		OnStar Vehicle Diagnostics More than 3.0 Million Participants Enrolled (Aug '07)		



In addition, OnStar uses GPS to be an effective advocate against crime

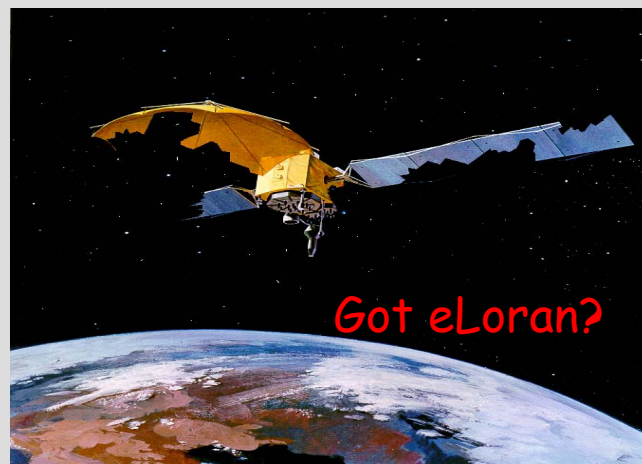
- Targeted Amber alert with the National Center For Missing Children
- Stolen Vehicle location
- GM and Red Cross partner to provide information to those in crisis

OnStar currently has over 5 million active subscribers

OnStar will be standard across all General Motors retail vehicles in the U.S. & Canada (~4 Million per year)

What are the solutions?

- Loran
 - PNT service in use in many parts of the northern hemisphere
- eLoran
 - PNT&D service
- Tactical (e)Loran
 - Deployable (e)Loran PNT&D service



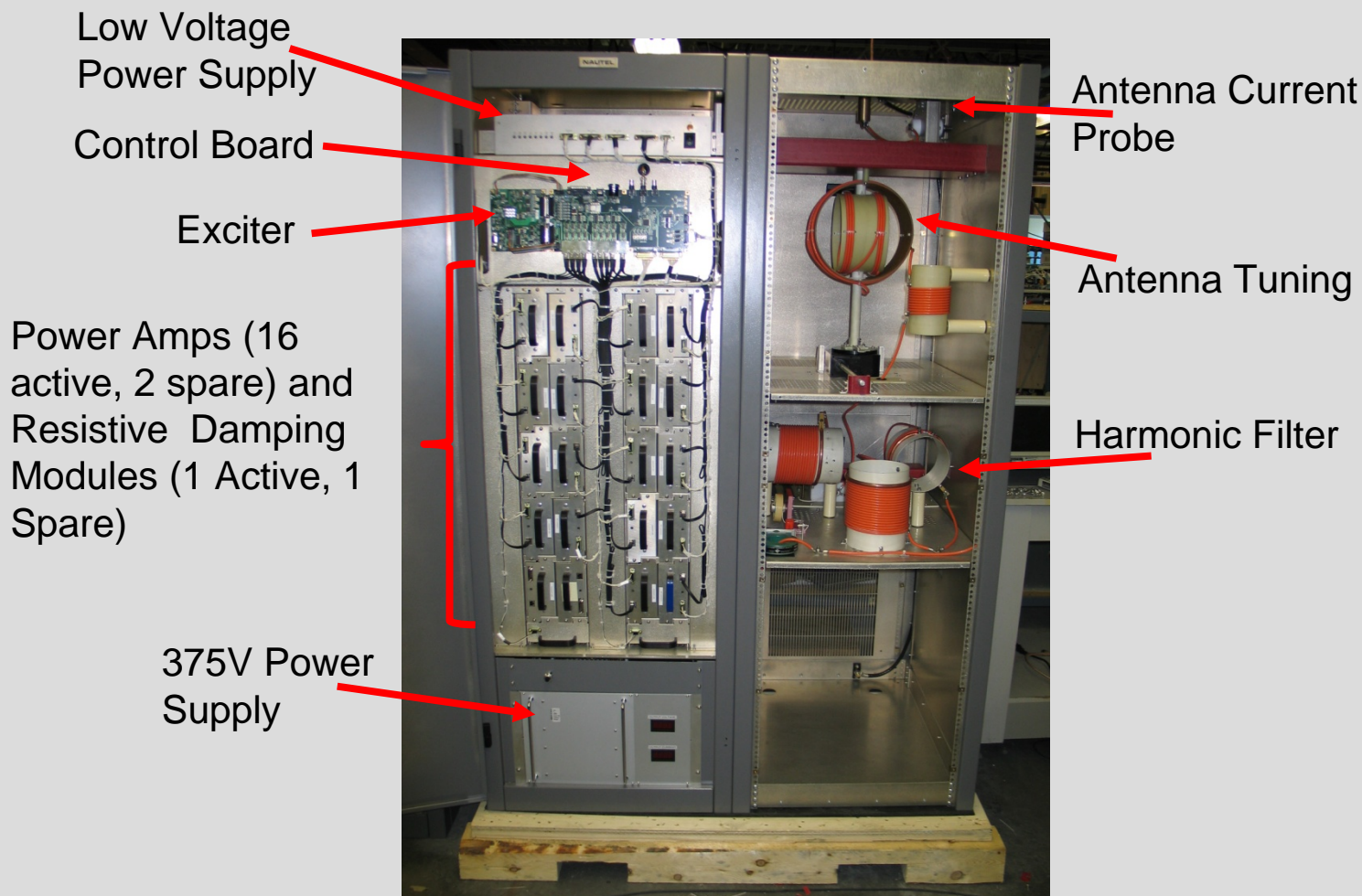
Are you prepared?

Why not?

\$\$?

Introducing the Next Generation LF (e)Loran Transmitter

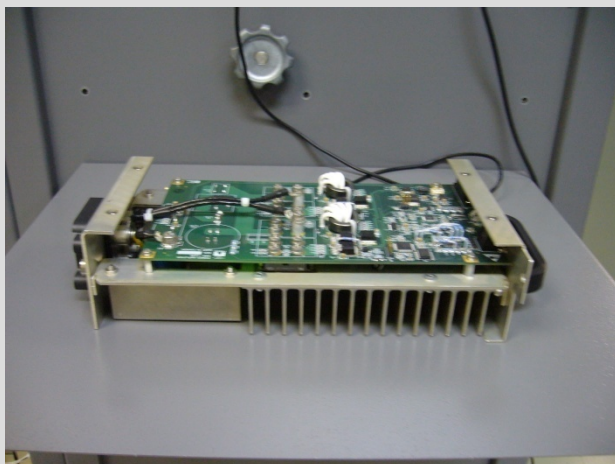
Next Generation LF (e)Loran Transmitter



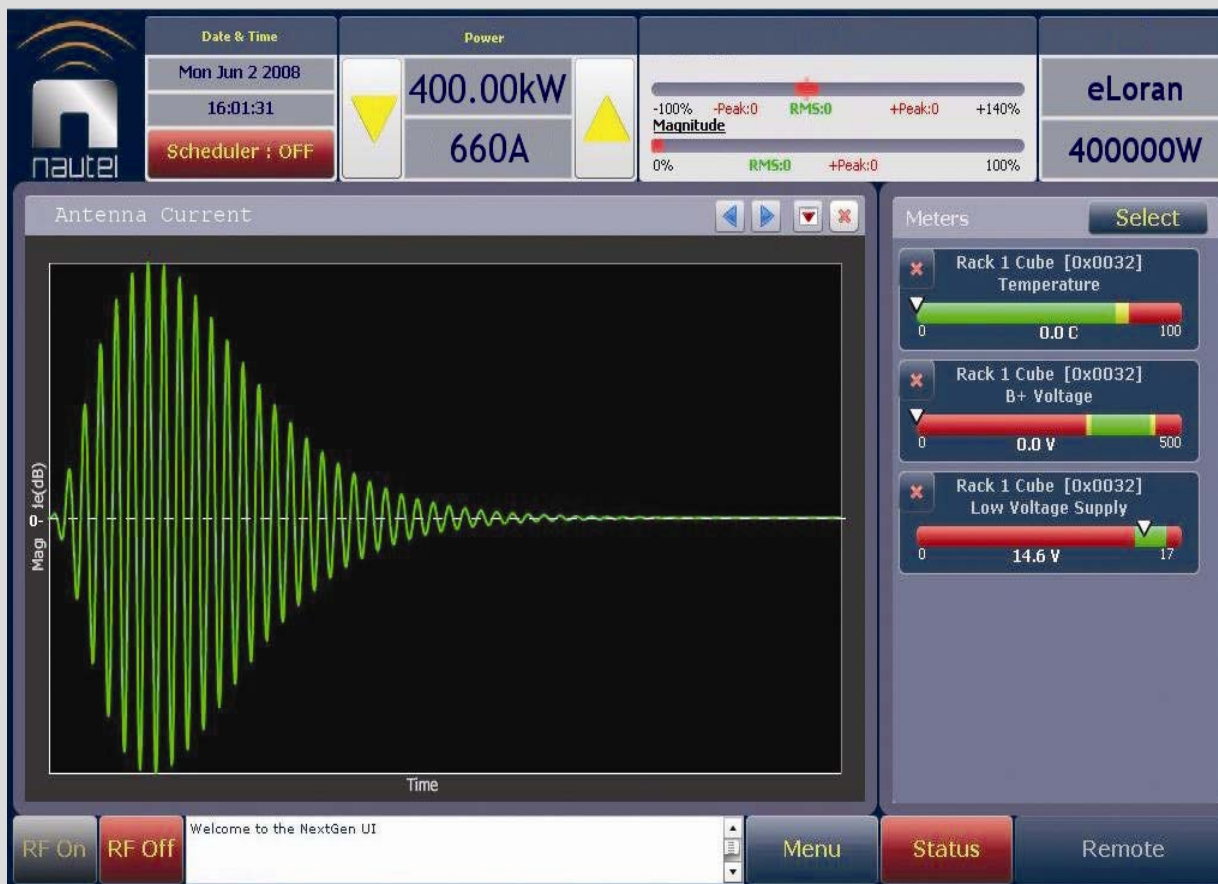
Next Generation LF (e)Loran Transmitter



RF amplifier



Next Generation LF (e)Loran Transmitter



Advanced User Interface (AUI)

Next Generation LF (e)Loran Transmitter



Proof-of-Concept Transmitter in Halifax, NS - April 2008

Next Generation LF (e)Loran Transmitter



Proof-of-Concept Transmitter in Wildwood, NJ – May 2008

Next Generation LF (e)Loran Transmitter



First pulses into 625-foot TLM: 1100, May 12, 2008

Next Generation LF (e)Loran Transmitter (Conceptual)



480 kW ERP Production Model **NL Series** Transmitter
(Maximum 1.84 m H x 2.88 m W x 1.12 m D)

Next Generation LF (e)Loran Transmitter

- Dual exciters and controllers
- Redundant power supplies
- Advanced User Interface (AUI) with touch screen display and web-enabled remote control/monitoring capability
- Automatic antenna tuning and pulse optimization
- “Hot swappable” power amplifiers for on-air serviceability
- Reserve power amplifiers allows soft fail capability

Next Generation LF (e)Loran Transmitter

- Modern/State-of-the-Art design
- Allows use of current and proposed modulation techniques
- Highly stable pulse timing
- Greater than 67% efficient AC in to RF out
- Pulse Repetition Rates in excess of 600 PPS
- MTTR 1 hour
- LRU diagnostics & fault monitoring / Built-in analytics

Next Generation LF (e)Loran Transmitter

- ↓ size
- ↓ weight
- ↓ input power
- ↓ maintenance
- ↓ installation time
- ↓ installation personnel
- ↓ installation materials
- ↓ HVAC
- ↓ price
- ↓ manufacturing time
- ↓ logistics tail
- ↓ training
- ↓ staffing
- ↓ shipping
- ↓ sparing
- ↓ ...

- ↑ efficiency
- ↑ reliability (MTBF)
- ↑ availability
- ↑ continuity
- ↑ accuracy
- ↑ operational ease
- ↑ PPS
- ↑ soft fail capability
- ↑ stability
- ↑ diagnostics
- ↑ analytics
- ↑ flexibility
- ↑ modulation types
- ↑ modulation speed

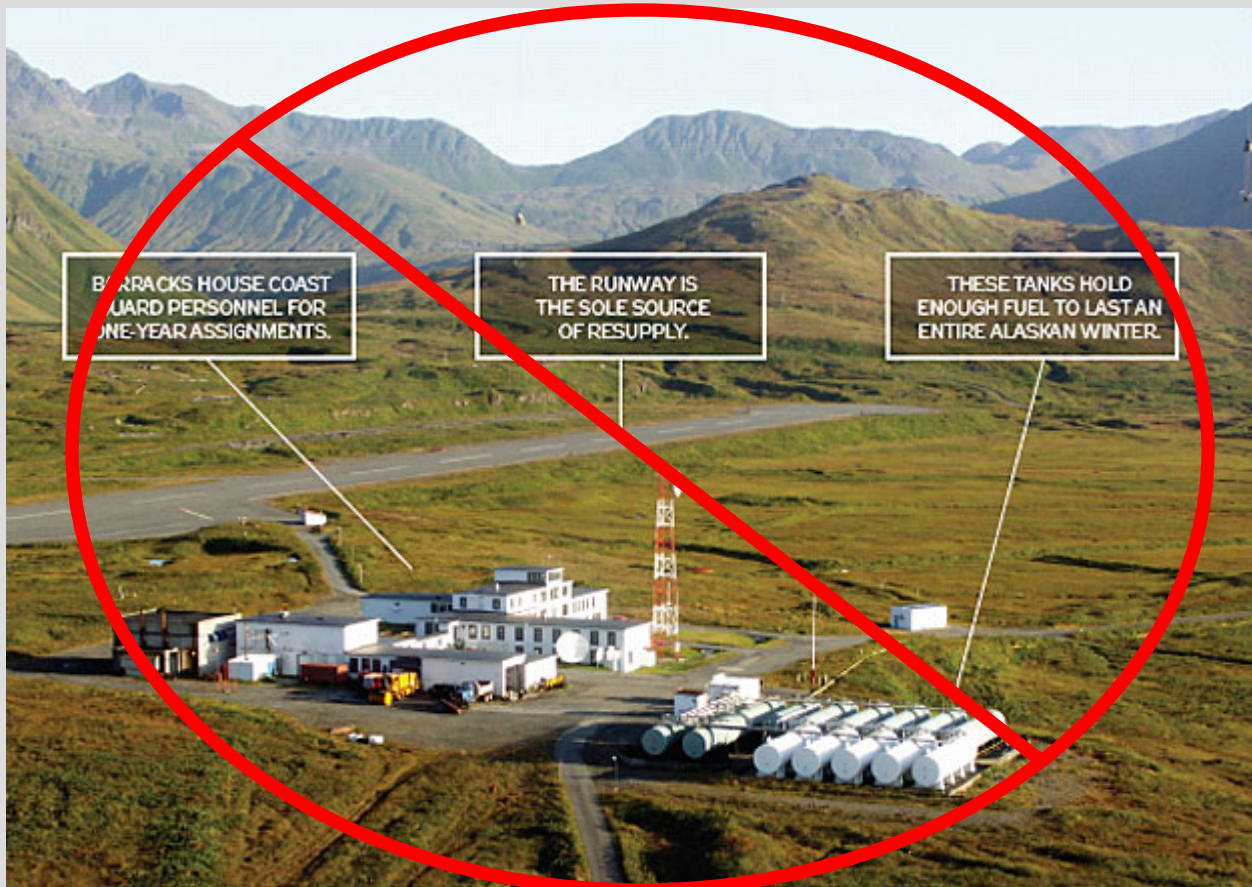
Why a Next Generation LF (e)Loran Transmitter?

- Take cost out of the system
 - apply new, cost effective technology
- Reduce system risk
 - replace legacy equipment that is costly to operate and maintain
- Increase system agility
 - install technology capable of today's enhancements
 - include some level of future-proofing
- Win the Dr. Sally Basker "X-Prize" for innovative public/private applications of "high-speed" eLoran data service

So, how do we ...

- Take cost out of the system,
- Reduce system risk, and
- Increase system agility?

Goal: destination / Build: station



Popular Mechanics Magazine Photo

Goal: provide a service / Build: site



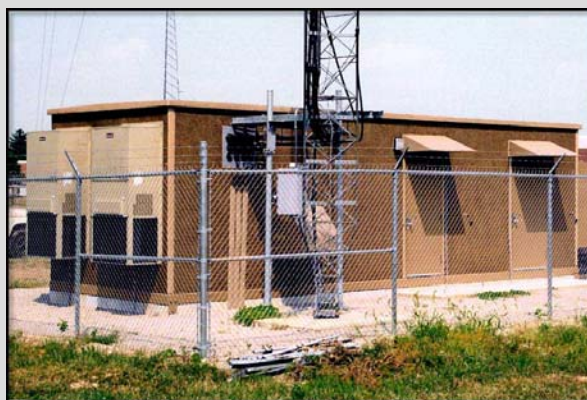
April 2000 Solution



Thermo Bond



Shelter One



Miller Building Systems



Yesterday's Systems

- Larger SWAIP
- More expensive
- More manpower intensive



USCG Photos



Yesterday's Systems

- Large SWAIP
- Expensive
- Manpower intensive



USCG Photos



Today's Systems

- Large SWAIP
- Expensive
- Less manpower intensive



USCG Photos



Today's Systems



- Smaller SWAIP
- Less expensive
- Less manpower intensive



3 container solution

GLAs & VT Communications Photos

Tomorrow's Systems: (e)Loran-in-a-Box (ELB)



Tomorrow's Systems: NL Series-based (taking orders today)



- Smallest SWAIP
- Most economical
- No staff

6' H x 2' W x 2.5' D

Maximum 6' H x 12' W x 3' D

Some Applications

- Augmentation to improve poor geometry
- Determining optimum station/site location
- Testing station relocation
- Component solutions (crisis contingency; temporary site)
- Additional service/sites – low to middle latitudes
- Additional service/sites – high latitudes
- System backup (R21, GMDSS, NAIS – VTS, SCC)
- Tracking and monitoring (convicts; telematics)
- System replacement (TACAN)
- High security event PNT&D (Presidential Inauguration)
- Southern hemisphere



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