



**AmericanTechnology™**  
CORPORATION

*Shaping the future of sound®*

# **Long Range Acoustic Device Neo Planar**

January 10, 2006

**Supported by Paz Logistics**

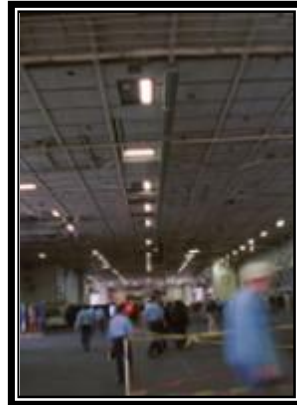
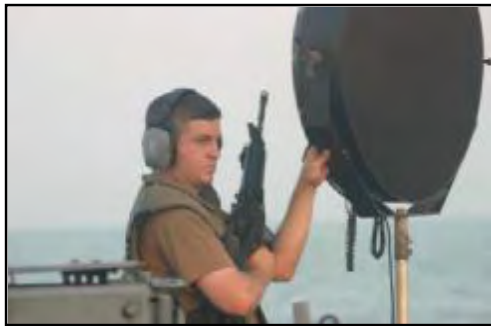


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- | **Supported by Paz Logistics**
- | Founded in 1980 by Mr. Woody Norris
- | Mr. Woody Norris was the recipient of 2005 Lemelson MIT Inventor of Year award
- | Small business: ~50 employees
- | Offices in San Diego, CA and Topsham, ME
- | Engineering and acoustic competencies
- | Over 140 Technology Patents
- | NASDAQ: ATCO

# ATC Sound Technologies



[www.pazlogistics.com](http://www.pazlogistics.com)

# NeoPlanar™

## Technology

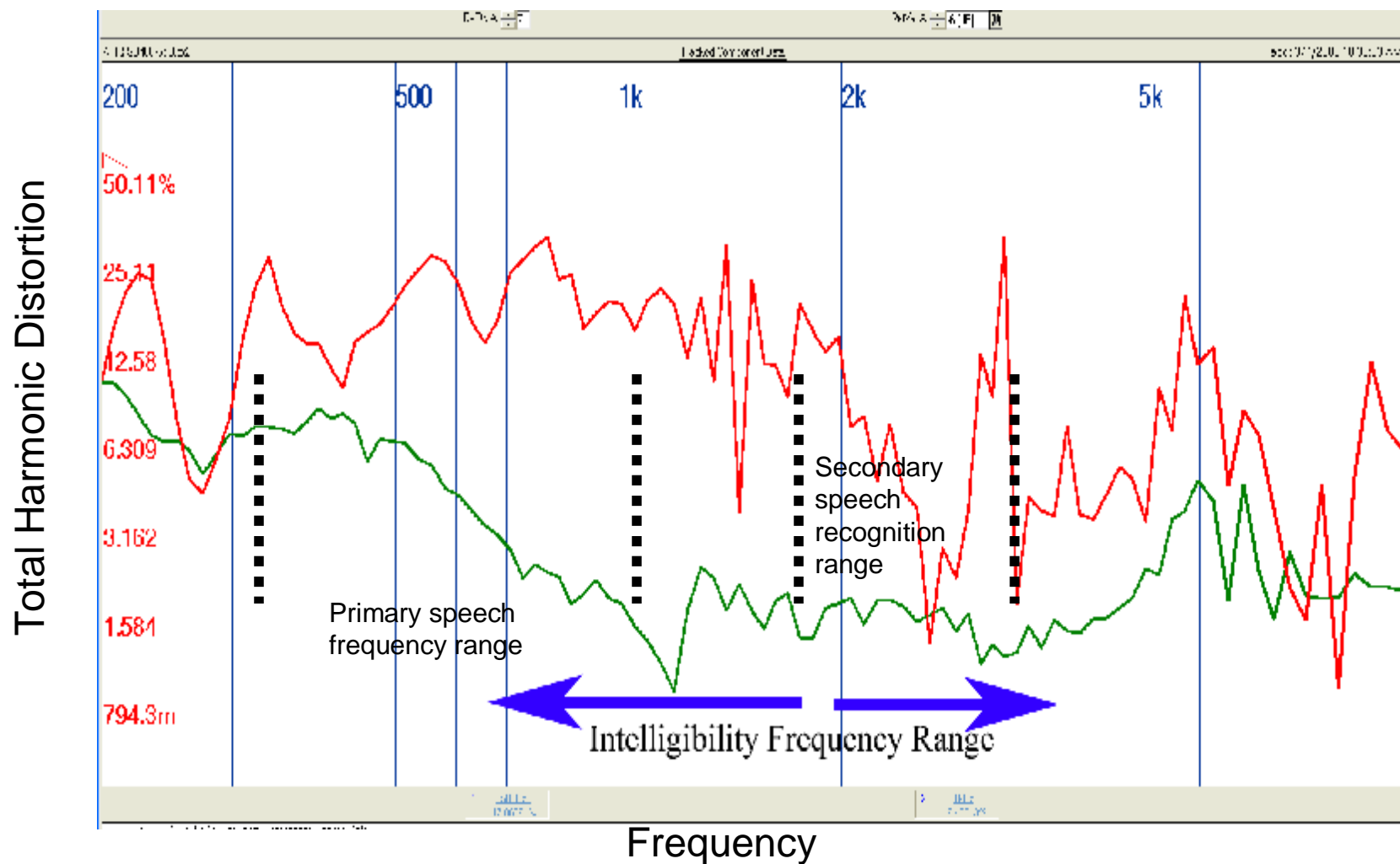
# History

- NeoPlanar™ is an **ultra-thin** film magnetic transducer, 1/8" or less using an innovative, proprietary diaphragm structure.
- Planar magnetic transducers, have been in existence for decades and widely considered to be among the finest signal conversion technologies available, **BUT** they have been
  - expensive
  - heavy
  - inefficient
  - fragile
- Previous problems with planar magnetics were driven by **LACK** of suitable materials, **NOT** understanding the theory of operation

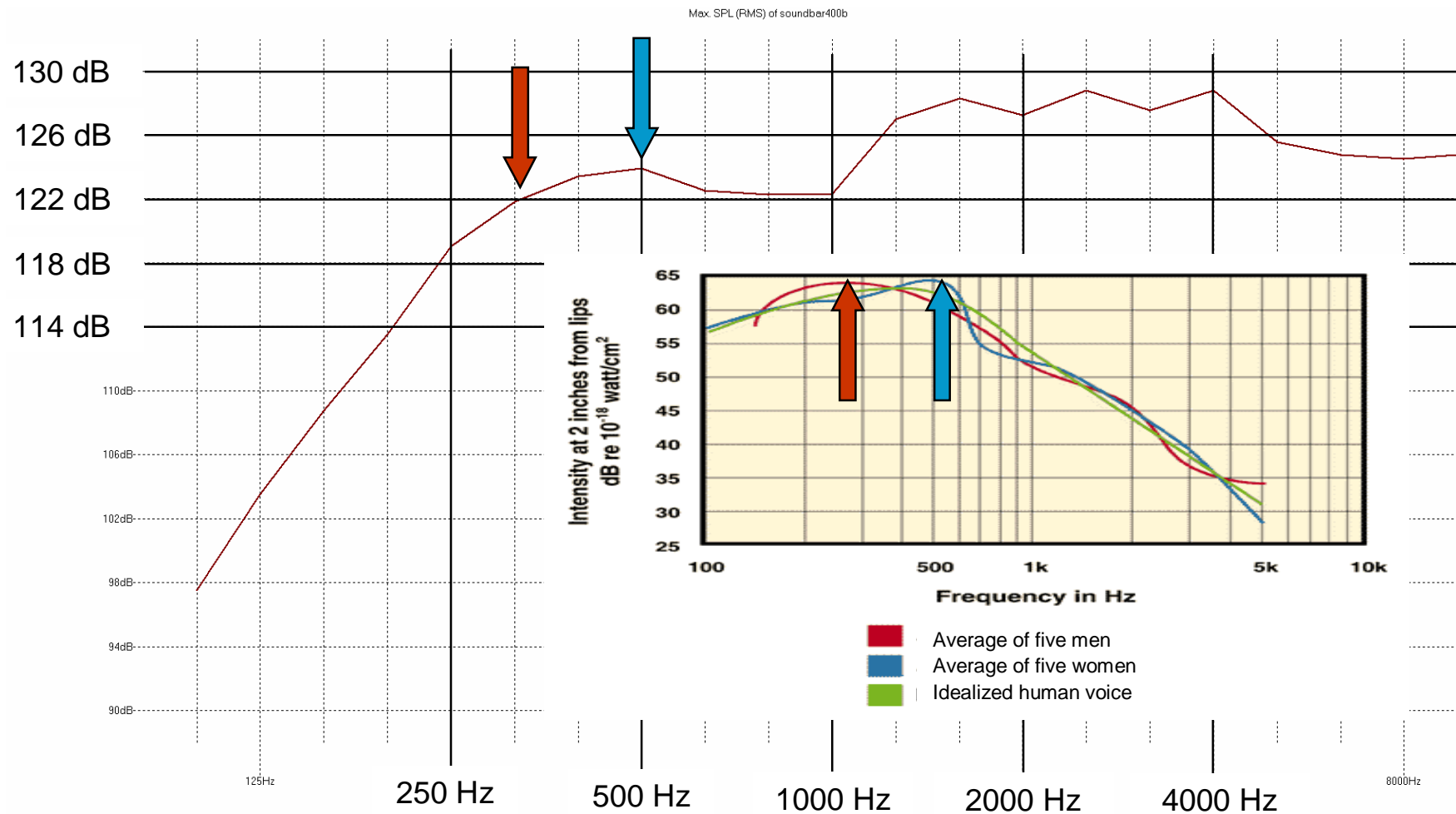
## Technology Advantages

- Purely **resistive** amplifier load
- Very low THD, less than 1%
- Easily adaptable to form **acoustic arrays** with high **front to back ratios**
- Very **high power** handling capacity with superior **sound pressure** levels
- **Flat, thin** form factor
- Standardized sizes for ease of use across **multiple applications**
- Superior **phase coherency** with no **break-up** resonance
- Clean, **airy, transparent** and natural sound





# SoundSaber 400





# Applications



*Clear, intelligible voice at 700+m !*

## **CURRENT INSTALLATIONS**

Philips Exeter Academy Emergency Announcing System  
USS Carl Vinson, Hangar Bay #2  
USS Winston Churchill, DDG81  
NAS Brunswick, ME, Hangar #6  
BIW Waterfront Security System  
Portland, ME Jetport  
Five US Army Forts

## **PENDING INSTALLATION**

Bath, ME SUPSHIPS Campus Alerting System  
US Navy CVN installation (to be named)



*"These new speakers are awesome and have really done the job...."*  
**CDR Chuck Espinosa, Chief Engineer, USS Carl Vinson**





NOTE: Four of these units mounted on cardinal headings covered 12,500 sq-meters of campus!

## Hangar #6, Naval Air Station Brunswick Maine



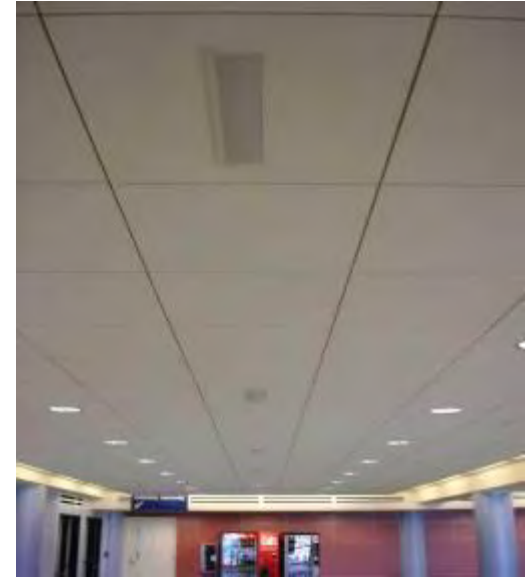
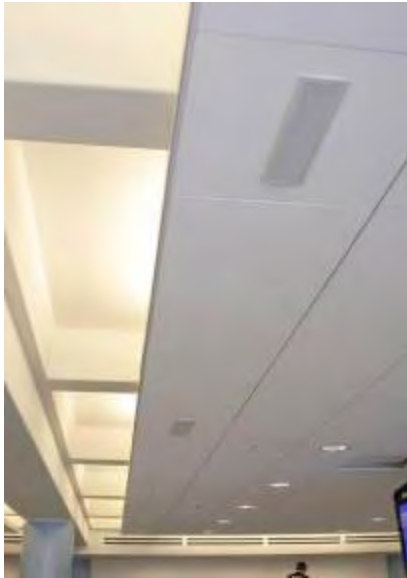


## BIW Waterfront

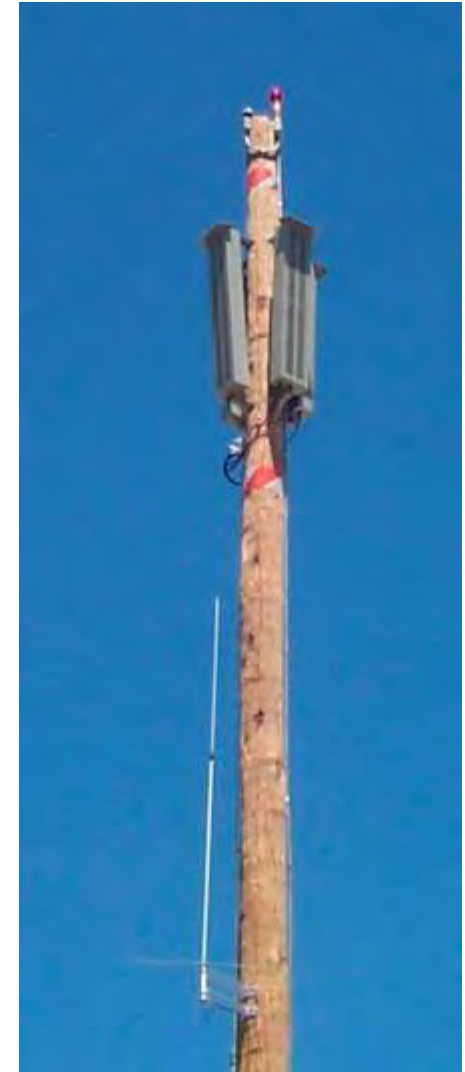


Portland Jet Port

PWM



## US Army Installations



## SoundTraveler™




System design	NeoPlanar emitters (3) completely self contained
Input	CD, MP3, MIC, line level audio
Frequency response	200 Hz to 20 kHz
Output	125 dB @ 1 meter
THD	1% > at 70% power
Power	120VAC 50/60 Hz
Power consumption	450 watts
Dimensions	72.4cm X 36.8cm X 20.3cm
Mass	17.7 kg



## Engineered SoundSaber Solutions

- h *Ultra-thin, High Output Magnetic Transducers*
- h *Purely resistive load*
- h *Array capable*
- h *Maximum Sensitivity and greater power handling capabilities*
- h *All-Weather, Ruggedized Acoustic system*
- h *Low Maintenance*





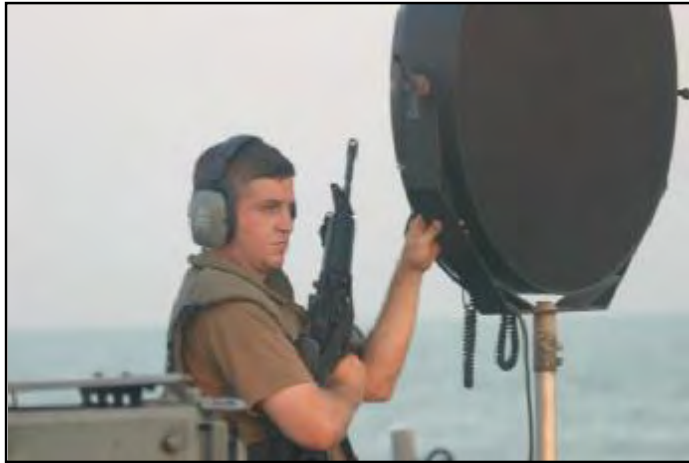
**The Long Range Acoustic Device  
fills a critical capability gap that  
was exposed after the  
USS Cole  
attack on October 12, 2000**

# ***Long Range Acoustic Device***

- Is a highly directional acoustical array for clear intelligible long range **hailing, notification and unmistakable warning**
- Used to communicate at safe standoff ranges to gain **compliance and determine intent** to support an appropriate response
- Provides an immediate enhancement to the force protection posture for critical infrastructure and homeland security applications.

## ***FOCUSED ACOUSTIC ENERGY***

**At Sea since May 2003**



**In Combat since Dec 2003**



**Commercial Vessels  
since Aug 2004**



**Public Safety  
since Aug 2004**



# **Near term Directed Energy objectives to determine intent prior to Non Lethal and Lethal engagement**

- I Kinetic vs Directed Energy
- I Directed energy
  - Electromagnetism
  - Light
  - Sound
- I Scalable between 7- 30 Meters
- I Two requirements for Military and Public Safety
  - Increase standoff distance
  - Buy more time to react

# LRAD supports Law Enforcement Less than Lethal Missions and Applications

Barricade  
Hostage  
Domestic Violence  
Potential Suicide  
Fleeing Felon  
Mass Notification  
Crowd Control





**Weight:** 45 lbs

**LRAD Emitter Dimensions:** 33 in diameter x 6.1 in depth (circular)

**Power:** 90-240 volt AC 50-60 Hz

**Current:** Max 4 amps, continuous 2 amps (at 120v)

**Audio input:** Networks, Microphones, MP3, CD, Computer Audio Output

**Amplifiers:** Internal

**Operating mode SPL:**

- Regulated 120 dB
- **Maximum 151dB**

**Max Acoustic Power (inst.):** 151 dB @ 1 meter

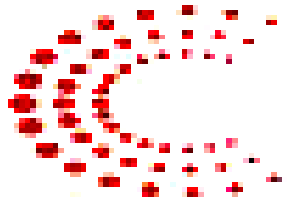
**Continuous Acoustic Power:** 146 dB

**Beam width:** 12° to 20°

**Beam Pattern:** Conical-Symmetrical

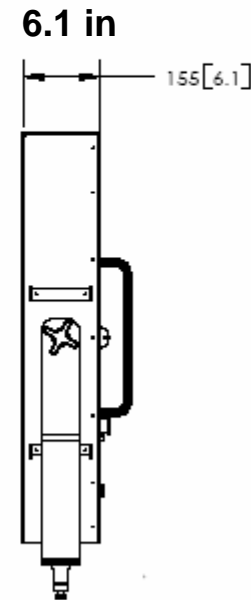
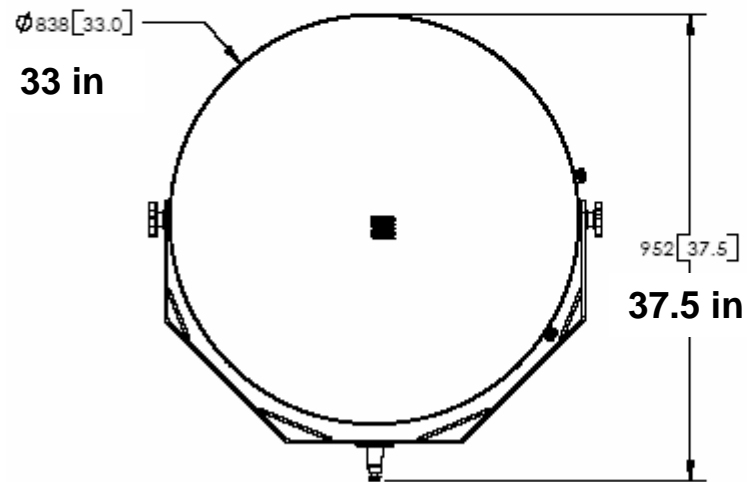
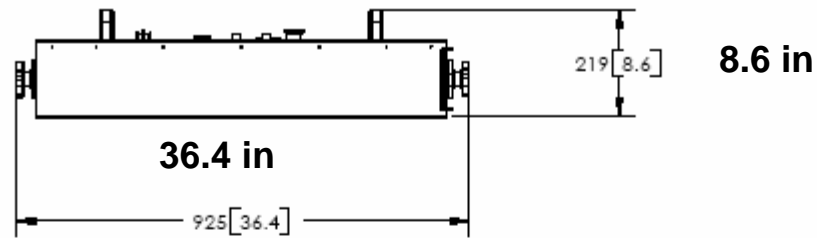
**Total Harmonic Distortion:** < 10% @ 134 dB (rms)





**LRAD**

# Physical Dimensions





# Long Range Acoustic Device

## LRAD 1000 and LRAD 500







### **LRAD 1000**

**SPL: 151 dB @ 1 meter**  
**Angle: +/- 15Degrees**  
**Tone: > 1000 meters**  
**Voice: > 500 m**  
**Power: 2 amps**  
**33" Wide, ~45 lbs**



### **LRAD 500**

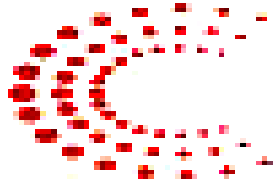
**SPL: 142 dB @ 1 meter**  
**Angle: +/- 30 Degrees**  
**Tone: > 500 meters**  
**Voice: > 300 meters**  
**Power: 2 amps**  
**20" Wide, ~28 lbs**

# Hearing 101

- I Human hearing occurs in two dimensions:  
frequency and intensity
- I In the frequency domain the range of human hearing is between approximately 20 to 20,000 Hz. In the intensity domain there is roughly 120 dB dynamic range
- I The ear does not hear all frequencies with equal sensitivity. **Humans are most sensitive to frequencies around 2000 Hertz** and less sensitive to frequencies which are higher or lower.
- I **LRAD is optimized for 2000 Hertz**

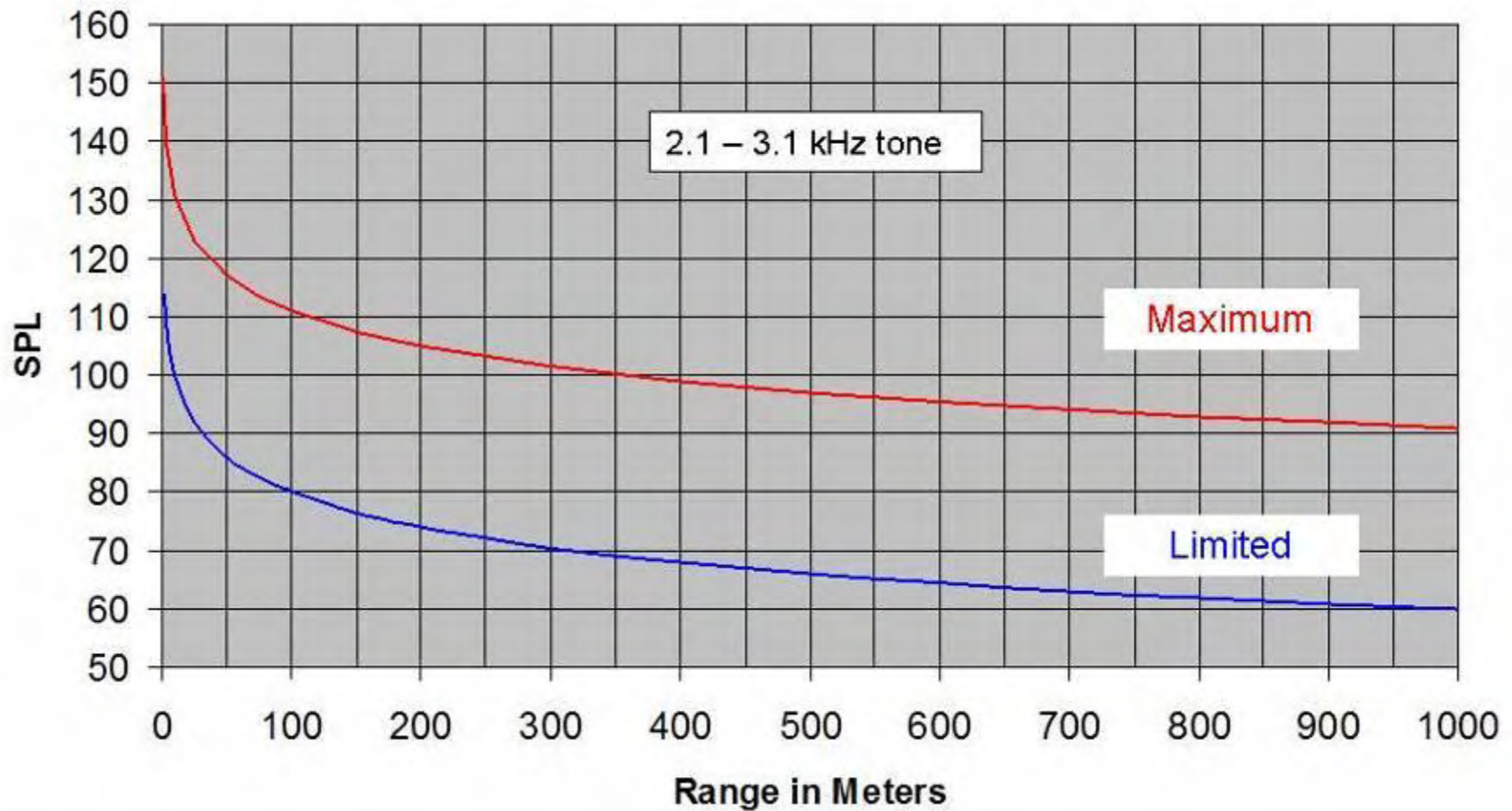
# Intensity and Source Levels

- I 0 dB Threshold of hearing
- I 20 dB Leaves rustling
- I 60 dB Normal conversation
- I 70 dB Busy street traffic
- I 80 dB Vacuum cleaner
- I 85 dB OSHA requires protection based on exposure
- I 98 dB Large orchestra
- I 100 dB Walkman at max level
- I 110 dB Front row of rock concert
- I 120 dB Threshold of pain
- I 130-135 Max Typical hailer (no beam forming)
- I 140 dB Military jet takeoff
- I 151 dB LRAD (100 times louder than 130dB)
- I 160 dB Permanent hearing damage



**LRAD**

## Comparative Sound Levels with Range



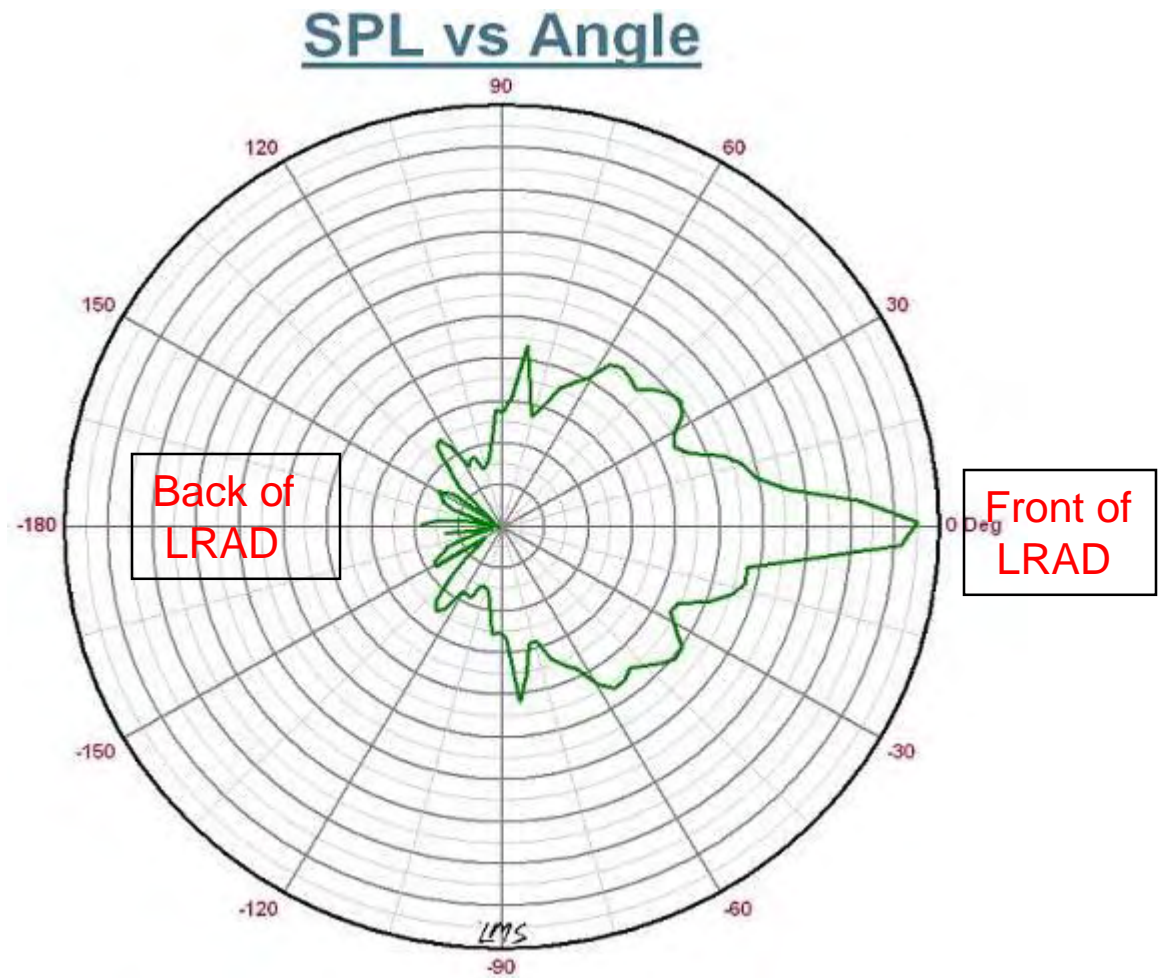


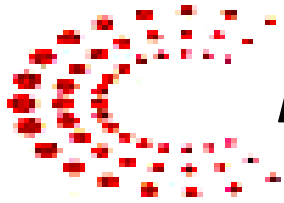
**LRAD**

**Polar plot of sound emitted  
from LRAD**

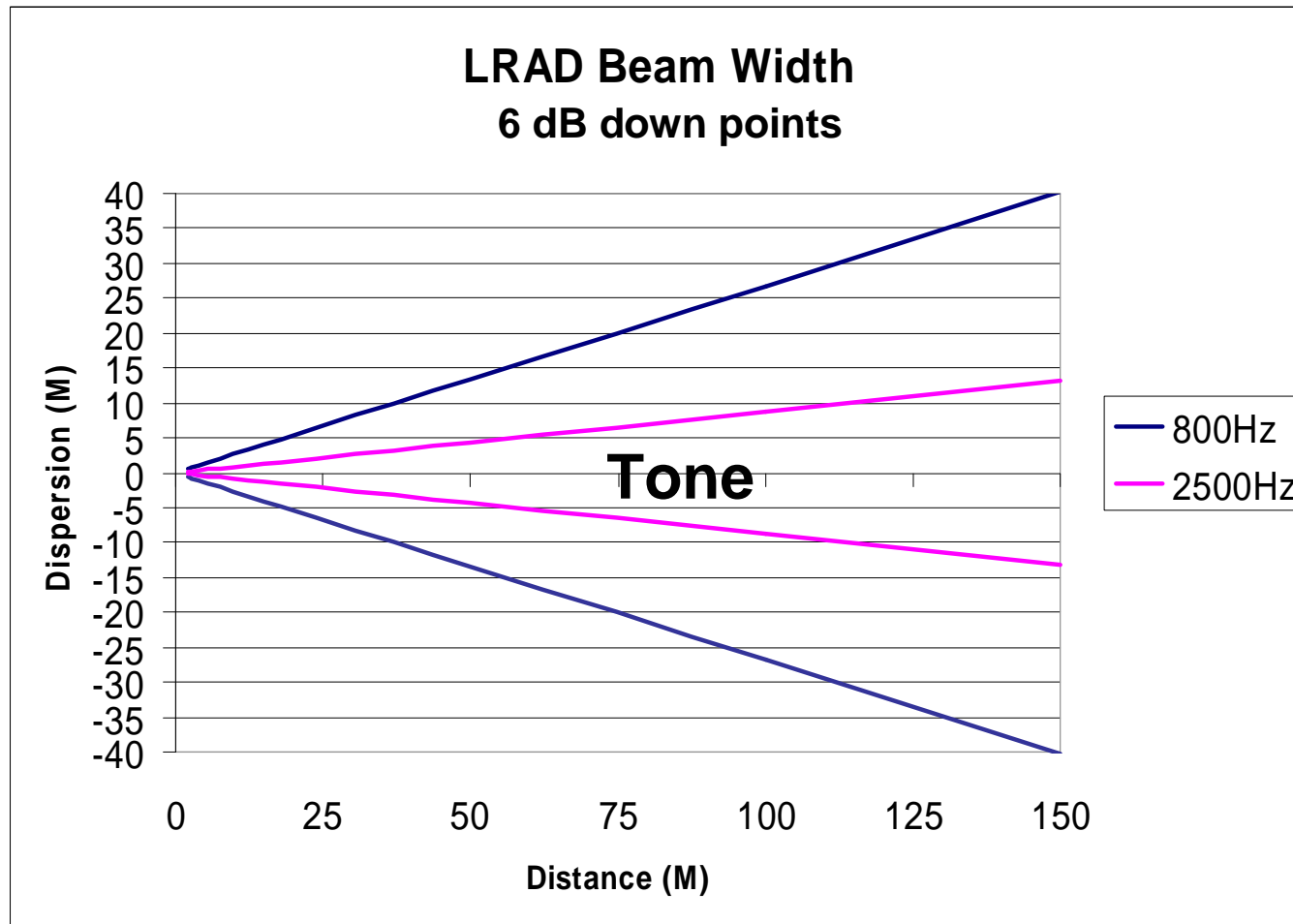
**Front to back noise ratio ~60:1**

**Focused beam**

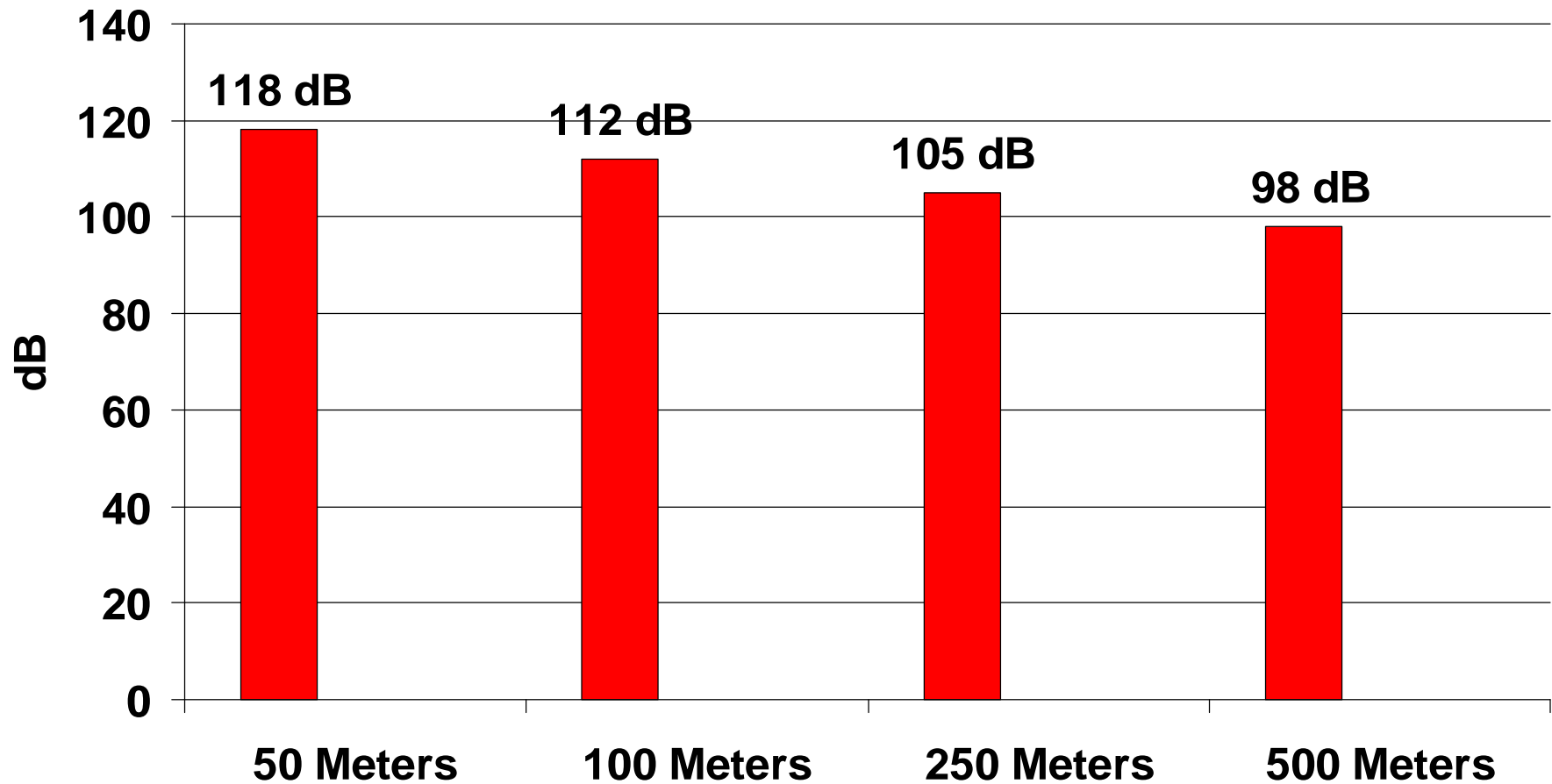




**LRAD**



## LRAD Sound Pressure Level at Range







# **LRAD**

# **Operational Experience**



**LRAD provides an immediate enhancement to the fundamental force protection requirement on land or at sea and significantly extends the standoff and perimeter in friendly or hostile environments.**





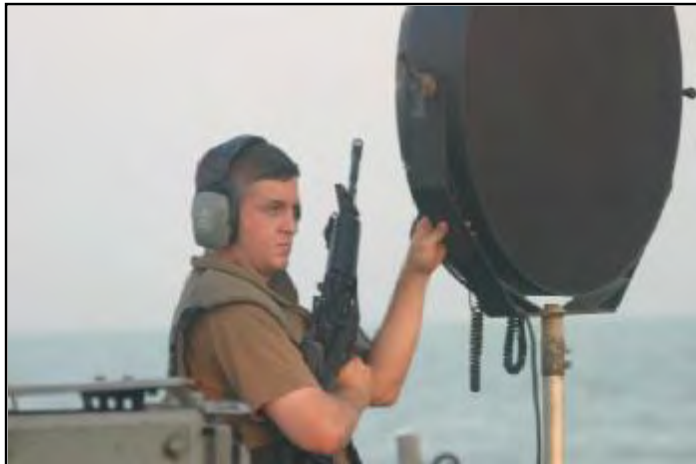
**LRAD exceeds the CINCLANTFLT Naval Vessel Protection Zone for stand off distances for ships  
pierside, at anchor or in restricted waters**



# LRAD Deployed in Persian Gulf AOR



# LRAD on Watch

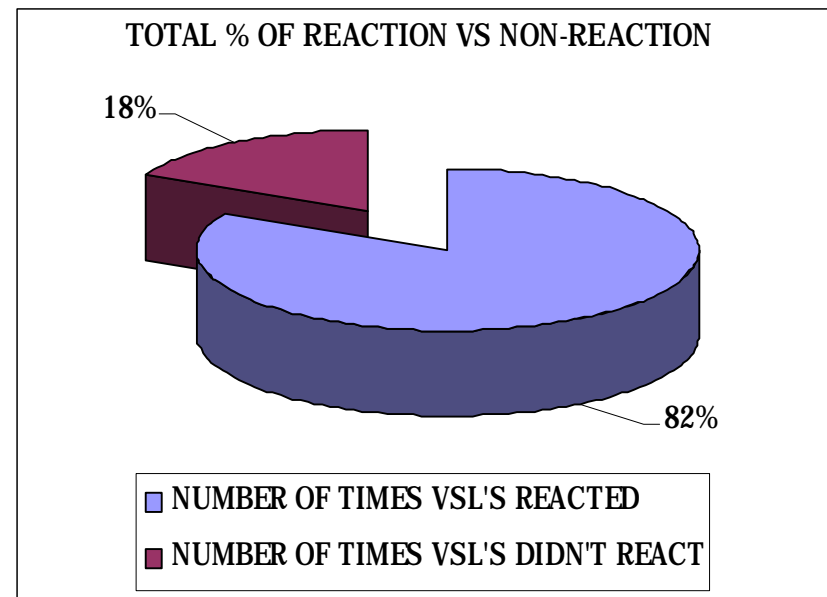




# LRADS deployed immediately after oil terminal attack in the North Persian Gulf in April 2004



# LRAD - 85% success rate for Maritime Interdiction Ops Persian Gulf July 04 - Sept 05



- § Pushes “Stand off” capability in excess of 500 meters
- § Reduces “pull along sides”
- § Increases patrol efficiency in shipping lanes
- § Provides hailing and warning for oil terminals and shore installations
- § Critical in determining intent of non combatants
- § Significantly enhances the SAFETY for personnel and vessels



**US Navy unclass message excerpts  
R 261233Z OCT 05 PSN 671947I34  
SUBJ/IMPROVED LOUD HAILER CAPABILITY REQUIREMENT//**

- I IMPROVED LOUD HAILER CAPABILITY (ILHC) HAS PROVEN HIGHLY EFFECTIVE IN SUPPORTING NAVCENT INFORMATION OPERATIONS (IO) AND FP MISSIONS. SPECIFICALLY, ILHC SUPPORTS THE **DIFFICULT TASK OF DETERMINING INTENT OF APPROACHING VESSELS** AND IMPROVING COMMUNICATIONS WITH SHIPS AND SMALL VESSELS THAT CANNOT BE RAISED OVER BRIDGE TO BRIDGE RADIO.
- I THE LONG RANGE ACOUSTIC DEVICE (LRAD) IS AN IMPROVED LOUD HAILER THAT **HAS BEEN IN USE IN THE NAVCENT AOR SINCE JULY 2004.**
- I LRADS ARE ONE OF NAVCENT'S MOST EFFECTIVE NON-KINETIC TOOLS FOR ENHANCING SECURITY IN THE MARITIME ENVIRONMENT. **LRAD SYSTEM USAGE AVERAGES 100 TIMES A WEEK WITH REMARKABLE RESULTS.**
- I THIS IS A NAVCENT MISSION CRITICAL CAPABILITY

# USCG Under Way in North Persian Gulf





# Theater Support Vessel (TSV-1X) “Spearhead” US Army Advanced Concept Technology Demonstrator

- I “In all cases, when the TSV employed the LRAD in a: NL, vessel identification/intent, force protection mode, or hailing an escort, they always had a positive response on it's operation and capability.”
- I **Hailing at ranges of up to 1300 yards to an escort vessel is no problem**



# Excerpts from USN Force Protection Officers

I “Hailing at ranges of up to 1300 yards to an escort vessel is no problem.”

I “as a way to gain attention of vessels/swimmers that are within 800 yards of the unit using the device”.

I “CLEAR COMMUNICATIONS BEYOND 500 YARDS”

I “making the difficult decision regarding hostile intent a touch easier.”



# Excerpt from USS Leyte Gulf

**“effective against small boats, during underway replenishments, secondary means of communication when hailing other units, and as a way to gain attention of vessels/swimmers that are within 800 yards of the unit using the device.**

Overall the LRAD is a device/tool every ship should have as a Force Protection tool.”

# LRAD provides support to existing communications venues





# Excerpts from USS Peleliu

The LRAD was used for port visits and again, it was set up on the seaward side 50 cal machine gun mount. The **unit was used successfully during approaches by unknown small boats**. Effective range was once again assessed at approximately 400 yards.”

**“It is unfortunate I did not have one other of the units, since I had poor coverage with only one.”**

“Overall , I am quite satisfied with the utility of the LRAD. I think has value due to its ability to focus a clear warning on an ambiguous target, **making the difficult decision regarding hostile intent a touch easier.**”



# HMS Marlborough and Argyll



# USS Blue Ridge email excerpt 11 March 2005 (LRAD on board since Nov 2003)

- I **“It’s one of our primary warning devices, next to high powered spotlights.**
- I We use it during all Sea & Anchor evolutions (pulling in & out of ports), Straights, transits, In port both pier-side and at anchor
- I It’s been though driving rain, humidity; fog all sorts of weather and still works great.”



# LRAD is a key “element” in Marine Interdiction Operation Procedures to determine intent



# Land Based LRAD





# Critical Support for Military Operations Other Than War



## 2nd Marine Air Wing at Camp Lejuene after prototype test flight

- I “together this weekend to encapsulate the results, **but the bottom line was – GREAT!**
- I Had very good results with the mount and unit. Also, good effects with the unit on ground contacts. Found that the MP3 files were unintelligible, but that the microphone worked great. **Also, the warbled tone was great.**
- I Is there any way to hard-wire the tone into the unit, so you push a button and activate the tone? Would be much more effective for us as a loud hailer.
- I **More to follow, but we are happy with the initial go.”**





# Psychological Operations Company report from Iraq

- I “it will reach out and touch someone at **over 1,000 meters**. It is ideal for PSYOP applications. The LRAD becomes increasingly directional as distances to targets increase. **It forms a “tight beam” of sound that is exceptionally clear...**”
- I “During distance tests **at 100 meters, the sound was painful to listeners**, even with hands held over the ears and ear plugs in...”
- I “**At 300 meters**, they could understand every word, still with his hands over plugged ears.”
- I “At **800 meters**, they could hear every syllable through ear plugs.”
- I “The LRAD has proven useful for clearing streets and rooftops during cordon and search, for disseminating command information, and for **drawing out enemy snipers** who are subsequently destroyed by our own snipers.”

# PSYOPS



# Internment Facility Southern Iraq Military Police Battalion April 2005

- I “...allowing the system to be rapidly deployed. The LRAD offered a system that **the guard force was able to directly communicate with large numbers of detainees.** The LRAD offers a controlled means to directly communicate with detainees.”
- I “The LRAD offers a great tool to communicate to large numbers of detainees, especially **those that can’t read.**”
- I “It was also observed the LRAD **has incredibly focused effects, even at great range.** At full power, a message was delivered the 150-meter long compound with little spillover. Tower guards continued to work and **had no difficulty using their portable radios.**”
- I “Remove all bull horns”

# Internment Facility Gains Compliance





**MRAD mounted on STS Ballistic Barrier  
for Hailing, notifying, warning and  
determining intent  
Before taking lethal action  
Range 500 plus yards**



# Land Based Check Point





# Convoy Protection Support



# LRAD integrated into Crew Served Weapons Mount to Determine Intent at 3-500 meters



# Crew served weapons mount





# Multi Spectrum Non-Lethal Weapon System Features

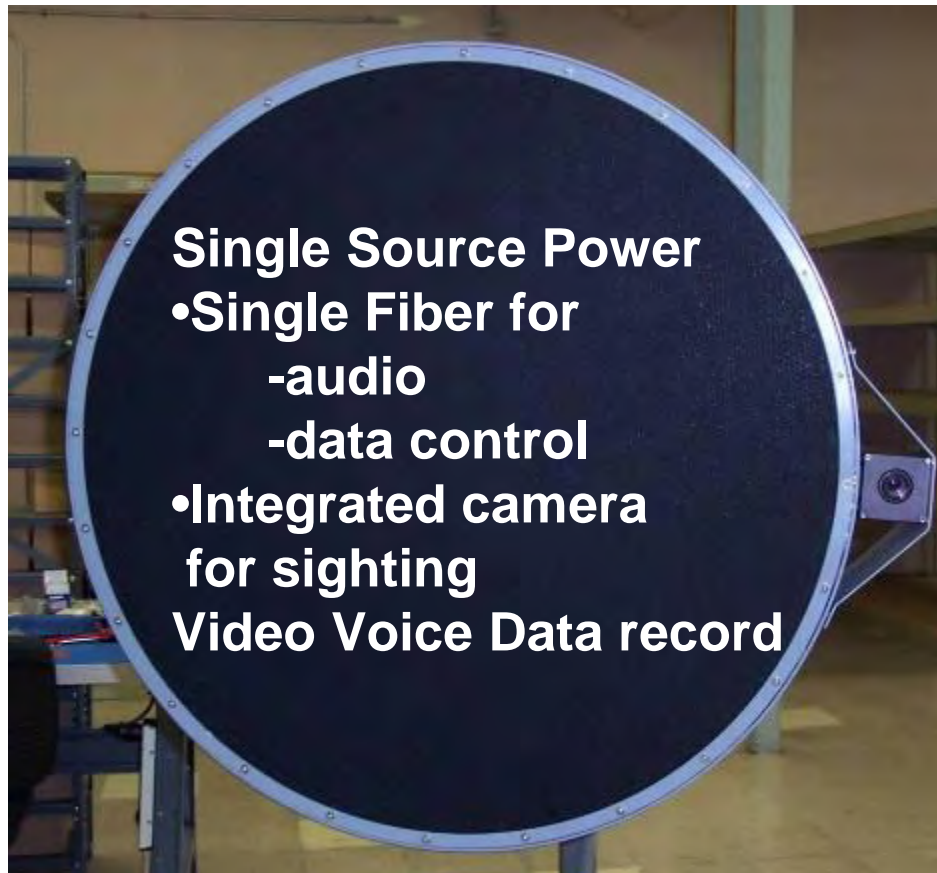
- Same weight as existing shield system
- Adds See Through Shield Capability
- Adds Communications
- Adds Light
- Adds Laser Dazzler
- MRAD & Weapon are aimed in unison:
  - No need to aim multiple items.
  - Vehicle commander inside of HMMWV can communicate while gunner maintains eyes on target.
- LRAD 500 & Weapon can swing separately if desired.
- Fold LRAD out of the way or store inside when not in use.



# Remote Controlled Pan Tilt LRAD



# Automated Pan Tilt







# Hackensack Bridge New York Port Authority







# USS Roosevelt







# Integrated Operational Enhancement Accessories



**Phraselator**

# **LRAD Integrated Searchlight**

## **Xenon Short Arc Lamp**



- | 6 Million Beam Candlepower**
- | Illuminates targets 1 1/2 miles away**
- | 1 to 40 degree beam**
- | Rugged aluminum and high impact copolymer construction**
- | Weather resistant**
- | Programmable**
- | Remote or local Control**
- | 12 Volt DC operation**
- | 3 1/2 Lbs**



# 2 Inch Receiver Truck Mount



# LRAD Mounting



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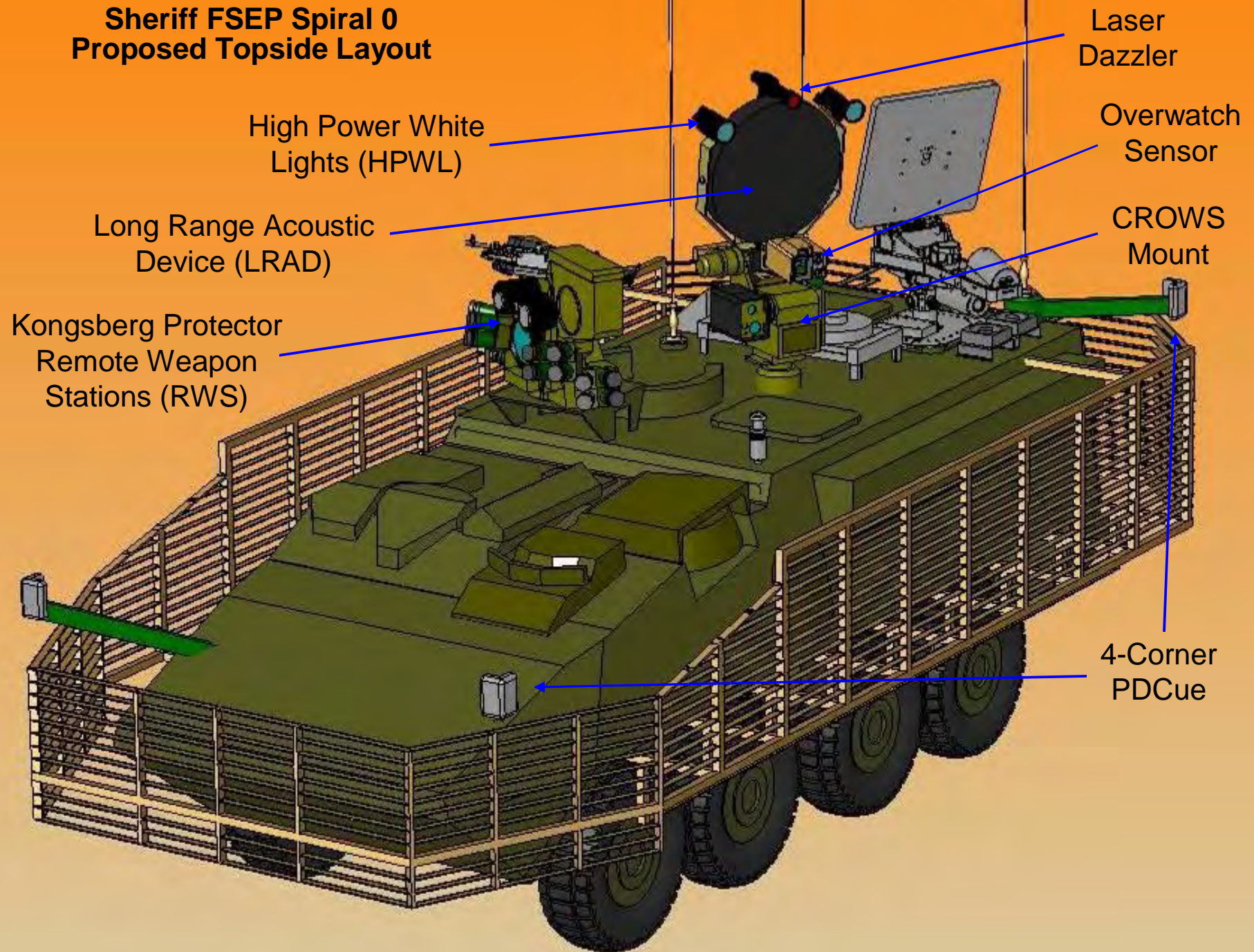


# Rail Clamp attaches to any 2 inch or less rail





## Sheriff FSEP Spiral 0 Proposed Topside Layout







~88db

~ 130dB

**LRAD**  
**Used to make the difficult decision to**  
**Shoot wish you hadn't**  
**Or**  
**Don't shoot wish you had**

**Typical mission can include**  
**Combat**  
**Peacekeeping**  
**Humanitarian**

# Control Celebration or else it results in Mayhem and Vandalism





# Preventive - NYPD deployed LRAD for crowd control and communications at the Republican National Convention



# Public Safety Departments Deploy LRAD for Crowd Control and Long Range focused Intelligible communications





# LRAD Provides Immediate Enhancement

## I Public Safety

- Mass Communications
- Natural disaster
- Crowd control/compliance
- Check Points
- Traffic and Access Control Points
- Mass Notification
- Critical Infrastructure Force Protection
- Fires, humanitarian efforts

## I Deployment

- Vehicle Mounted
- Dismounted
- Man Portable
- Helicopters



# Planned - LRAD used to successfully issue a Warrant without having to enter or approach the house



**07/22/2005**

## **America's Leading Police Departments Deploy Breakthrough Non-Lethal Technology**

- I Most recently in June, the Santa Ana, Calif. **SWAT team used LRAD to drive gang members from a house in their community.**
- I . In serving a search warrant on the Santa Ana house, the SWAT team turned on the LRAD tone for 30 seconds and swept the house that the suspects were in. Their initial intel was that three or four suspects were inside the house, but **after employing the LRAD, 10 suspects emerged from the house without the need for any type of lethal force or sending officers inside.**
- I Santa Ana SWAT Team Commander Tony Levatino said, **“We used LRAD on a search warrant on the house, and it worked like a charm.** The team operated it and used the tones to wake the house up, and everyone clearly heard the instructions.”
- I ***Policeone.com***

# Arizona Border Patrol





# Critical Infrastructure



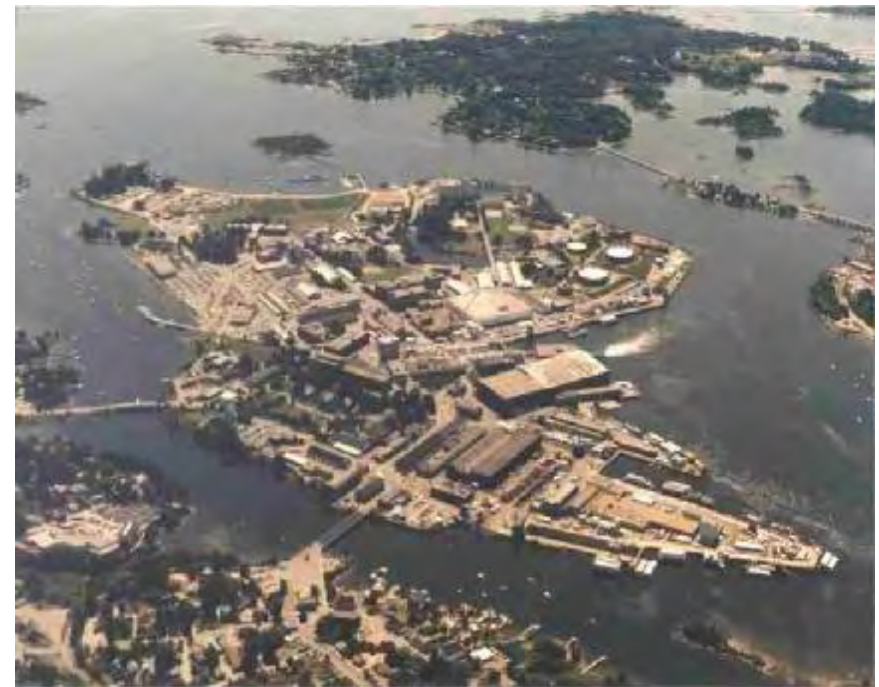


# LRAD can provide Emergency Mass Notification at public gatherings

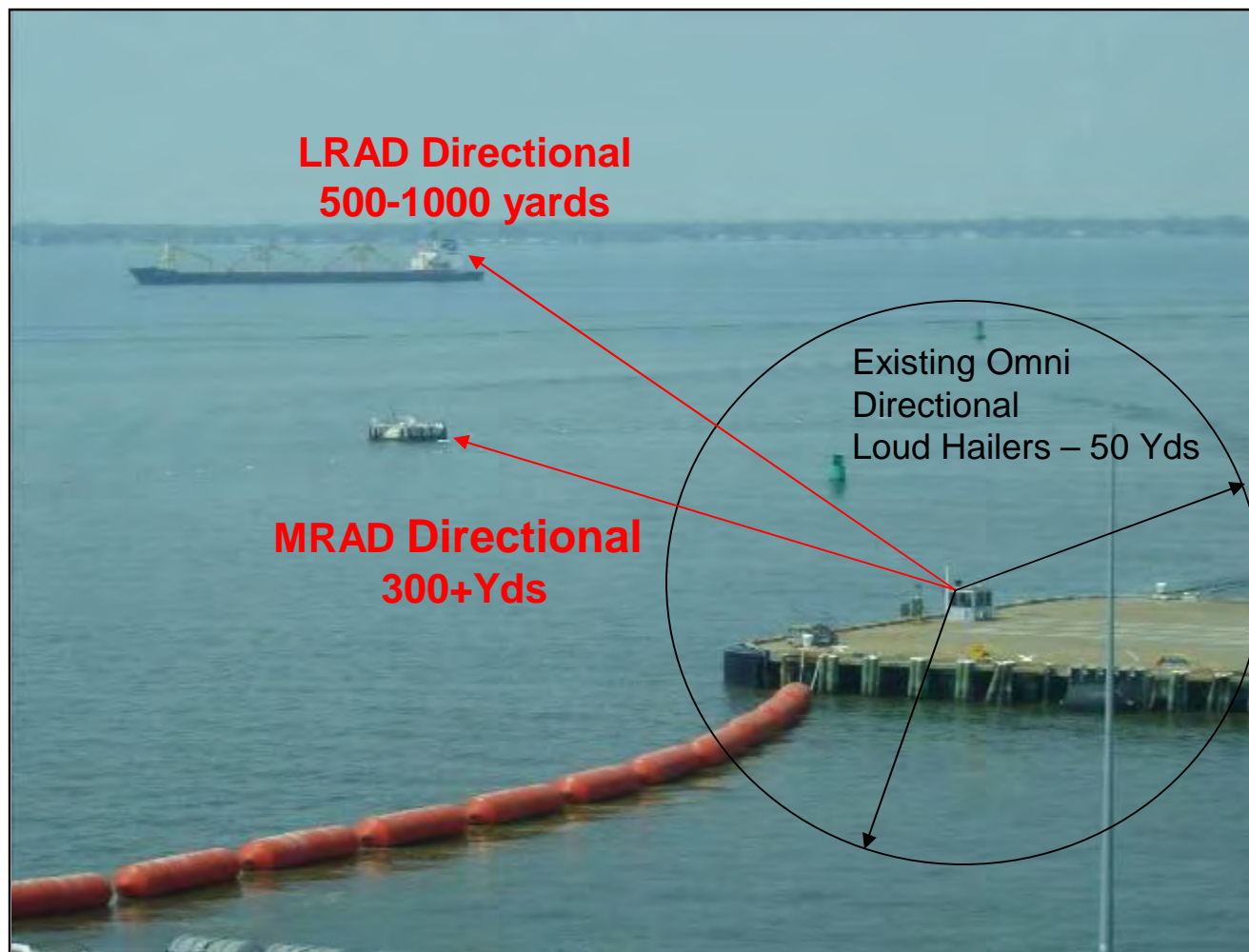
- I LRAD range > 500 yards
- I 151 db at 1 meter
- I 108 dB at 300 yards
- I 103 dB at 500 yards
- I Power 2 amps
  - 5 times less hair dryer
  - battery operated
- I Portable
  - less than 30 lbs
  - Sets up in less than 5 mins
- I Tertiary emergency communications when power and generators fail



# Hail, Notify and Warn for Critical Port Infrastructure



## Focused Intelligible Clear Hailing of Vessels Entering Restricted Zones





# Determine intent before lethal action





# Excerpt from Recent Army Times article Sep 2, 2005



**But his amplified voice only  
reached a few rows into the mob**

I “For God’s sake, please don’t separate yourself from your children,” **screamed** Air Force Capt. John Pollard of the Texas Air Guard’s 149th Security Squadron into a **microphone**. Pollard screamed numerous times. “Keep your families together.”

I Priority mission: Reuniting missing children with parents after Katrina by Joseph R. Chenelly

# LRAD 500 at the Super Dome



# Cruise Lines Commission LRADS for ATFP







# **Nov 6, 2005 Pirate Attack “LRAD was a key element in thwarting the attack it performed well under fire”**



## **USS Gonzalas CO's remarks after meeting Cruise ship Captain the next day after the Pirate Attack**

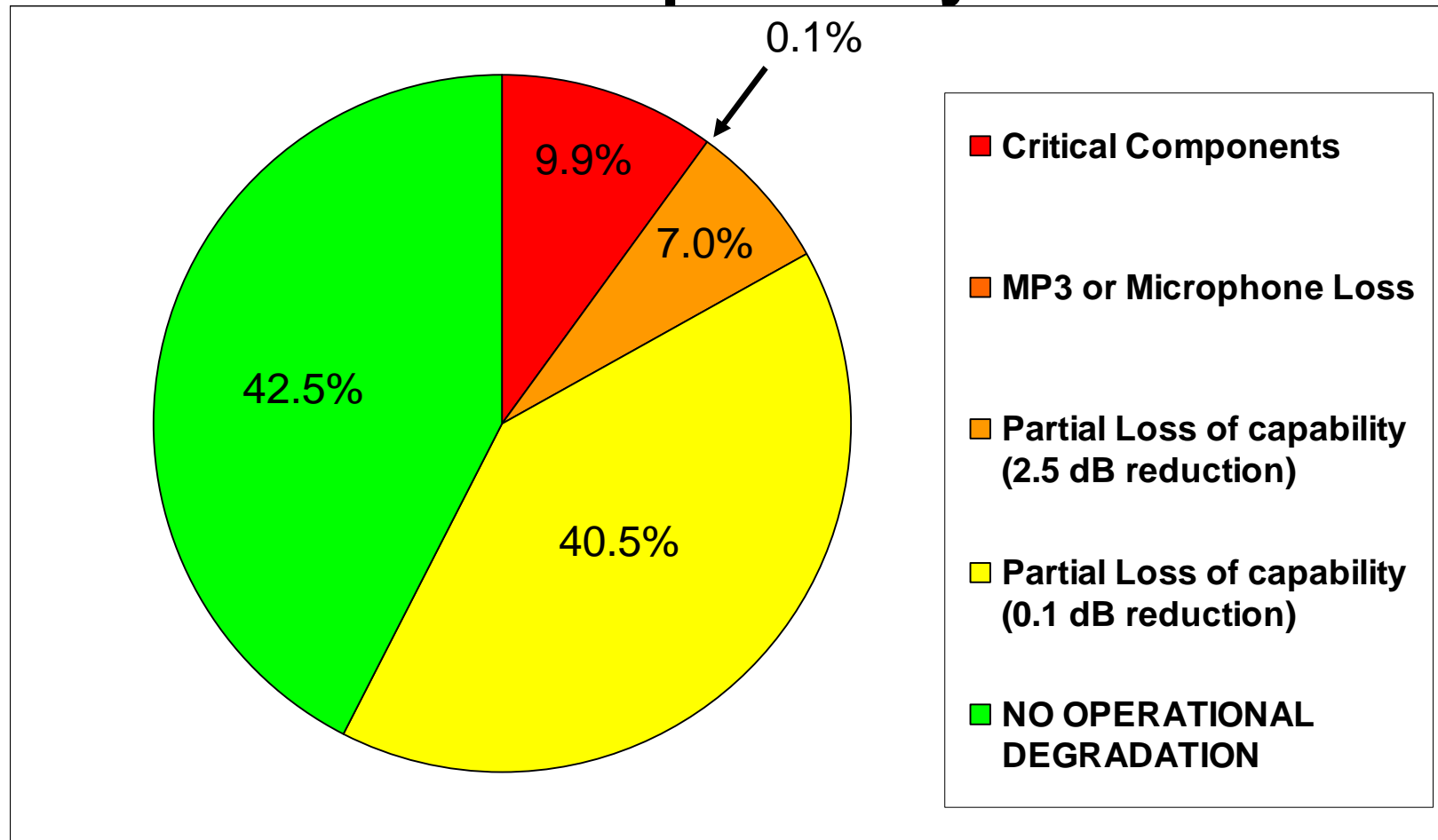
- I "In evading the pirates, the Captain of the ship did everything that he was supposed to. He mustered the passengers and crew internal to the ship with the exception of security personnel. He increased to maximum speed, and he maneuvered the ship aggressively, at one point actually trying to ram one of the pirate's small boats.***

# Report Continued

- | *The security team also did well. Under fire, the charged fire hoses to keep the pirates from boarding, they assisted passengers to get them inside the skin of the ship, and they deployed LRAD.*
- | *The Security Officer was particularly enthusiastic about the performance of **LRAD, and in his opinion it saved the day.** He had his man focus LRAD in the alarm mode, max volume, directly at one of the pirate's small boats when it was about ten meters from the ship.*
- | *The pirates actually covered their ears and began shooting at the LRAD. The one person injured in the attack was the LRAD operator, who received fragments in his head and wrist when a bullet passed through the LRAD.*
- | *Despite the bullet hole, LRAD kept working and the pirates turned outbound and abandoned their effort."*

# LRAD Damage Survivability

## Less than 10 % of the surface area prone to non operability





# LRAD Product Validation

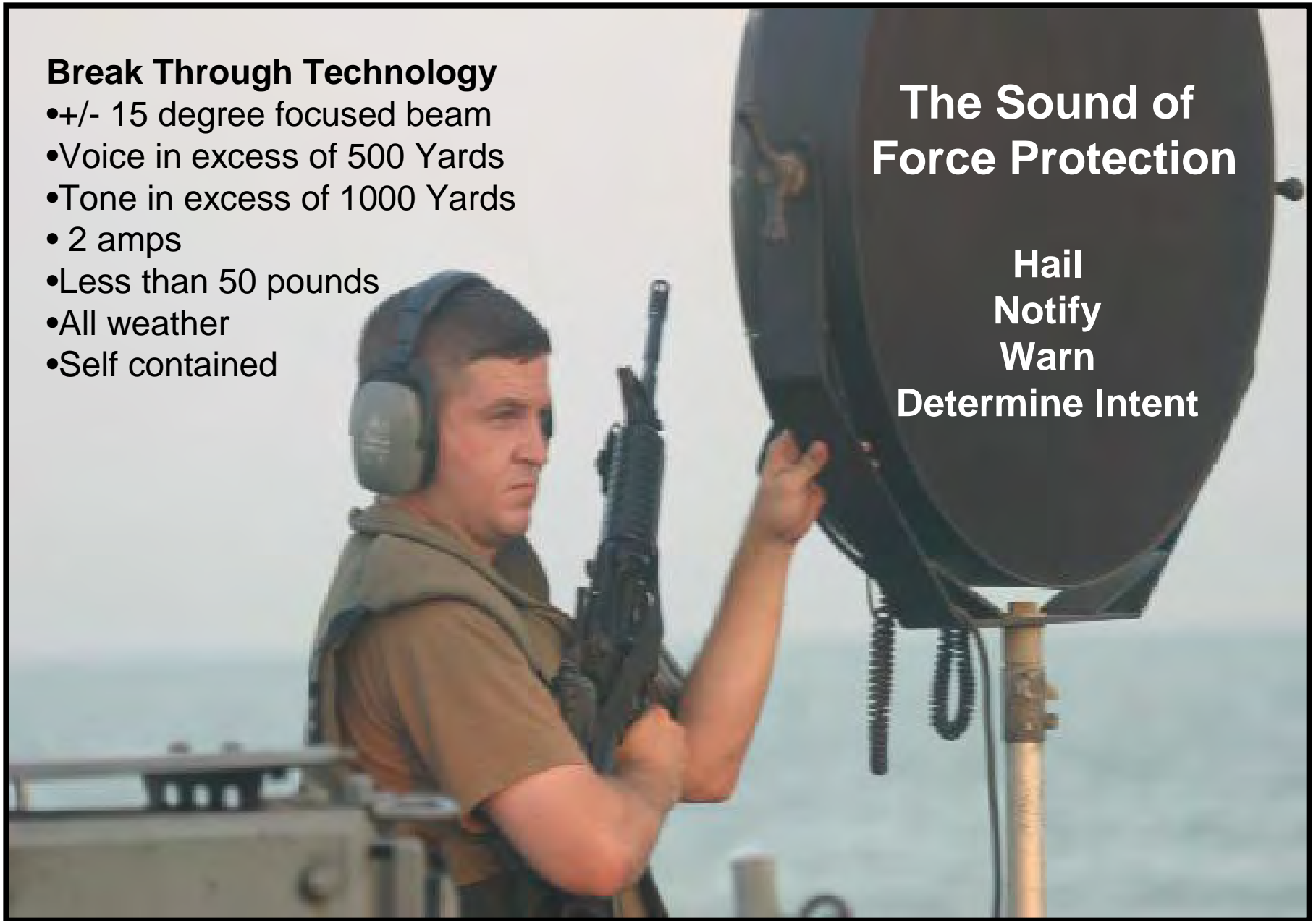
- | Has reached maturity under arduous conditions
  - At sea since May 2003
  - In Combat since March 2004
- | Has performed exceptionally well
- | Over 400 units deployed
- | Less than 10 units have been returned
- | DoD has become believers
- | Government and Public Safety Sector

## Break Through Technology

- +/- 15 degree focused beam
- Voice in excess of 500 Yards
- Tone in excess of 1000 Yards
- 2 amps
- Less than 50 pounds
- All weather
- Self contained

## The Sound of Force Protection

Hail  
Notify  
Warn  
Determine Intent



CORPORATION  
Shaping the future of sound

[www.pazlogistics.com](http://www.pazlogistics.com)



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