DIRECTION FINDING IN THE MODERN AGE

UNITED STATES COAST GUARD
CG-711
OFFICE OF AVIATION FORCES

Presented by: CDR Joe Deer, CG-711

Taking the “Search” out of SAR !

This presentation covers modern 406 MHz direction-finding requirements and capabilities. It will touch upon identified solutions and several solvable problem areas.

It will cover: 1) portable options 2) R21 initiatives 3) the following aviation assets:

- **C-130H**
- **HH-60**
- **C-130J**
- **CASA 235-300M**
- **HH-65**
- **HU-25**

How does the 406 EPIRB work?

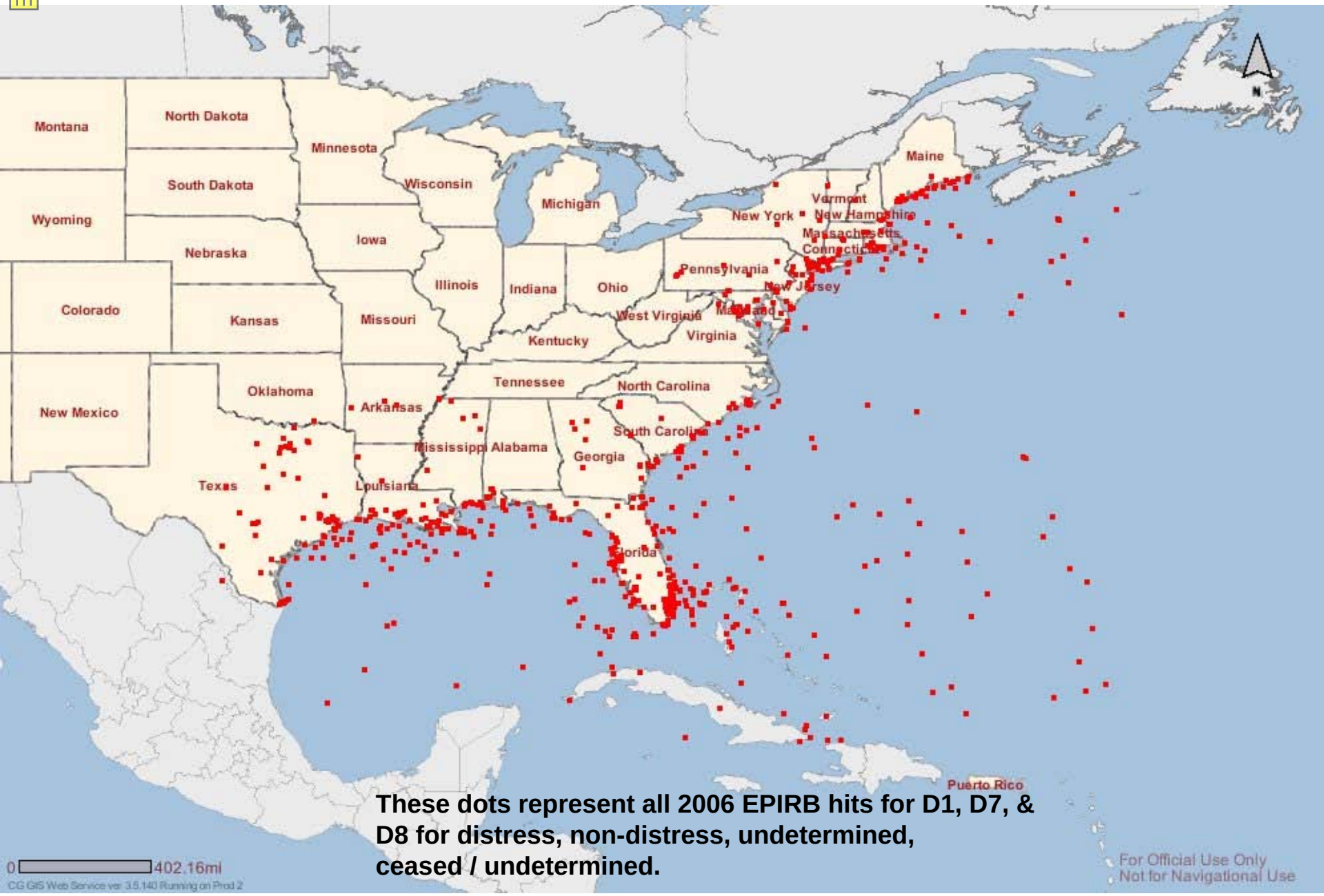
4 ITEMS:

1. **Emits a low power, 25 milliwatt sweeping-tone signal constantly on 121.5 MHz (easily blocked by ship hull, structure, human body). Legacy DF signal.**

2. **5 watt burst every 52 seconds on the 406 MHz frequency (200 times stronger). 440 milliseconds.**

3. **Hexadecimal code is embedded in the 406 signal. A "fingerprint" of sorts for your vessel.**

4. **GPS signal (if equipped) is also embedded in the 406 signal; achilles heel; 30% success rate.**



These dots represent all 2006 EPIRB hits for D1, D7, & D8 for distress, non-distress, undetermined, ceased / undetermined.

Recent 406 MHz EPIRB statistics:

Period: Aug 2004 to 26 Jan 2008

Activations: 6,071 406 MHz activations given to CG.

(This isn't all of them according to the RCC watch-standers).

False Activations: 95.7%

Actual: 259 were SAR.

CG Sorties breakdown:

943 total

259 SAR (27.4%)(Most done w/ Aviation assets)

401 False Activations

283 Unknown

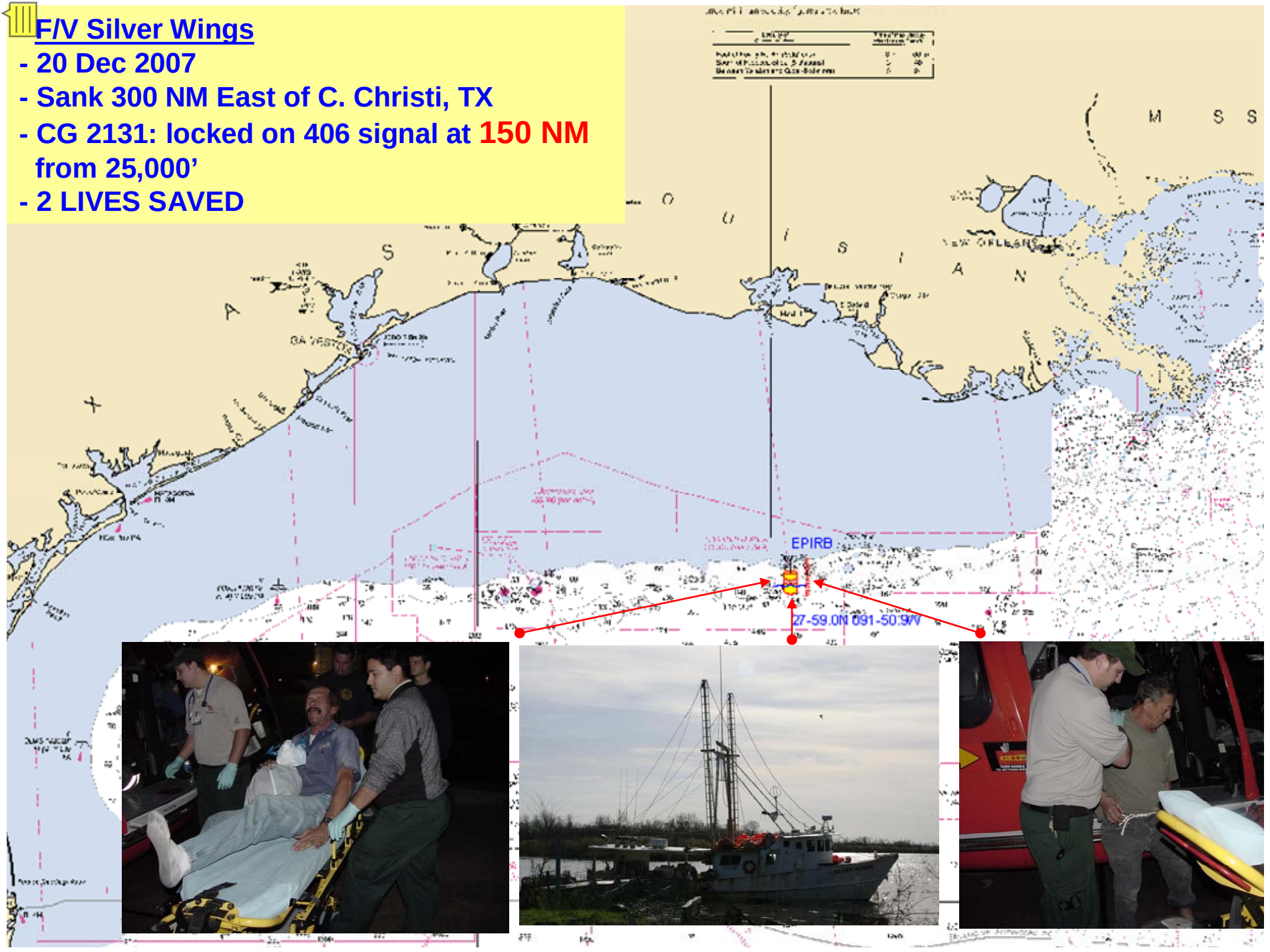
SAR CASES EXECUTED WITH 406 DF CAPABILITY

F/V SILVER WINGS

- **Date: 20 Dec 2007**
- **Unit: Corpus Christi**
- **On Scene: 0000Z**
- **CG 2131 out of Corpus Christi locked on at 150 NM out and went directly to scene.**
- **Initial commence search point over 2 miles away from PIW.**
- **TWO LIVES SAVED!!!!**

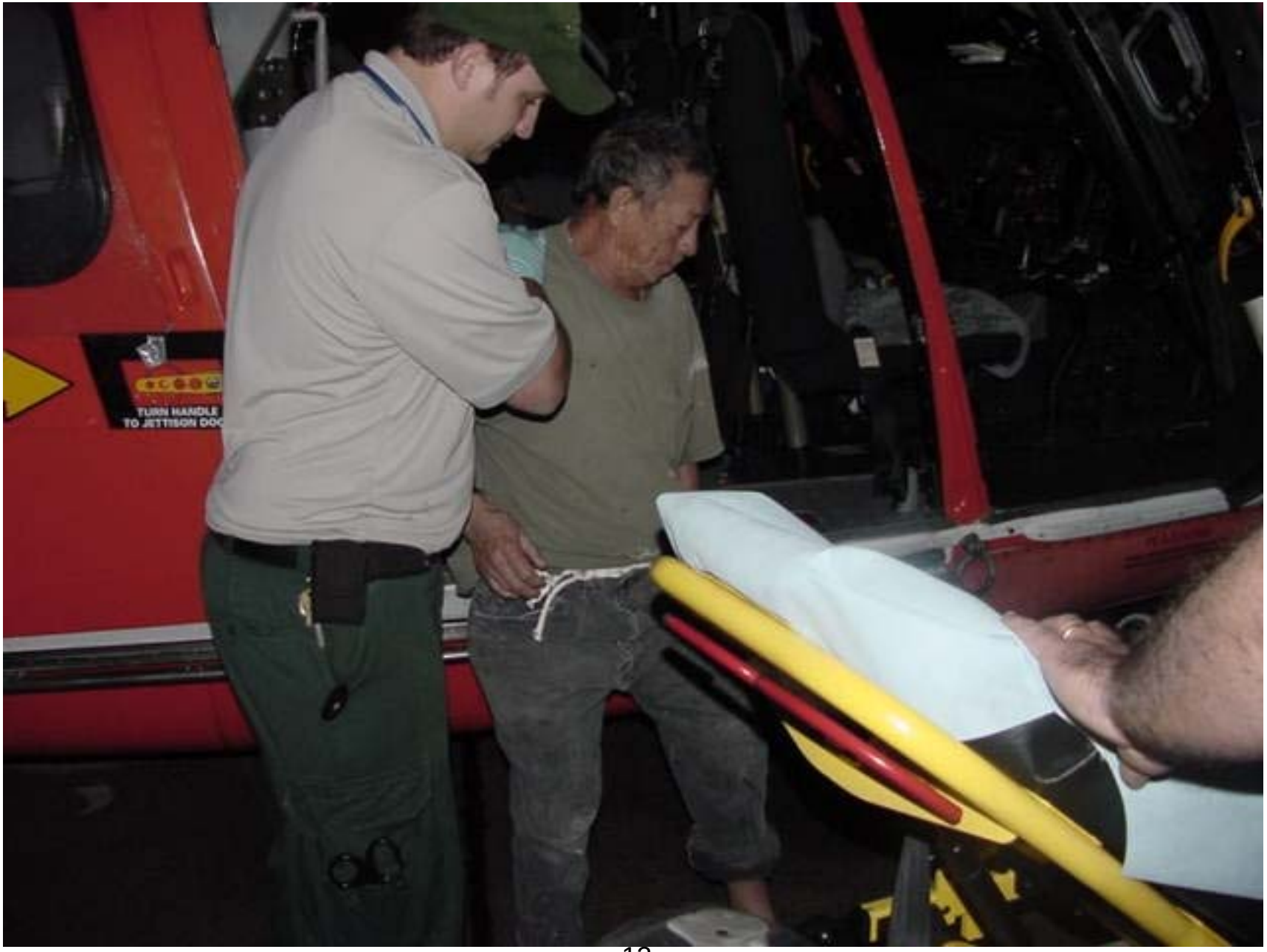
F/V Silver Wings

- 20 Dec 2007
- Sank 300 NM East of C. Christi, TX
- CG 2131: locked on 406 signal at 150 NM from 25,000'
- 2 LIVES SAVED




ILVER WINGS


SILVER WINGS


TURN HANDLE
TO JETTISON DOO


ESCUE

Pilot's comments

The DF equipment work extremely well. Once we got up into the Class "A" airspace (above 18,000') we were picking up multiple DF hits. At about 150 nm's out, we got a solid lock that coincided with the position passed by our Command Center. As we got closer, it was apparent that the DF was pointing a few miles away from the GPS coordinates passed by the Sector...probably due to normal drift - wind/current. We went strait to the where DF needle was pointing us. The weather on scene when we initially got there was really crappy...night time, low ceiling, lightning in the vicinity, about 60-65 knot winds, and at least 8 ft seas. There was a pretty intense weather system that was passing through the area and we hit the tail end of it. Luckily, it was moving away from us. We weren't able to locate the strobe on the first pass. We did get a good needle swing and marked the associated position. With the next couple of passes we positively identified the strobe on the beacon...maybe 15 minutes total into the sortie...the DF was spot on. The 121.5 was very very weak...only being audible for a period of a few seconds when we were directly overhead. One thing I thought was interesting was that we got the standard erroneous DF needle indications while in turns. For whatever reason, I assumed this was eliminated with this equipment. During our third or fourth passes we located the object that we thought might be the raft. Once again the weather was inclement and we were having a hard time positively identifying it. It was about 1 nm away from the strobe. We then flew overtop several OSV's trying to hail the one's closest to the EPRIB and raft. We actually got 3 or 4 of them to respond... (Challenger, Miss Sherri, Kevin Grove, and the Sea Lion) They were all very helpful. Right before we had to bingo for fuel, the Kevin Grove confirmed that we had spotted the life raft and they were pulling it out of the water. Apparently it was in pretty bad shape...half sunken. I'm pretty sure the Challenger picked up the first survivor just after we departed scene because once we got on deck, I called Sector NOLA to make sure everyone was on the same page and they passed the info about the first survivor to me.

Co-Pilot's comments

Within the search area we sighted what looked to be a strobe light the size of a pinhead (the EPIRB) and a separate small steady light that was the intensity of a dim flashlight (the partially deflated life raft); talk about needles in a hay stack. Making several passes at both, we were unable to visually identify their sources. The lights gave a halo effect that obstructed the observers view when looking through the NVGs, and with the FLIR unable to completely focus, the SSO only caught a single quick glimpse at something undeterminable. Low on fuel and unable to get a good visual, luck was on our side that so many Good Samaritans responded to our call for assistance. It was reported that the survivors showed early signs of hypothermia and that neither was wearing a life jacket. It amazes me how fast things can happen when the vessel sank with so many other vessels in the immediate area and nobody knew it. The cover flight was also a bit challenging as we continued to search with an inop TCAS while keeping visual track of the helo using Air to Air TACAN. Ironically, right before finding the second survivor, the helo was about to change its search area closer to the reported debris field. This case is a great example of teamwork involving all communities as well as successful CG implementation of new technologies. I thank everyone involved and my sympathy goes out to the families of the men who did not survive.

S/V PARADOX

PO Box 2671
Durango, CO 81301
August 4, 2007

Rep. John Salazar
1531 Longworth HOB
Washington, DC 20515
VIA FAX: 202-226-9669

813 Main Avenue, Suite 300
Durango, CO 81301

Dear Congressman Salazar:

On the US Coast Guard's 217th anniversary, as 2 of the lives saved by the Coast Guard and as 2 of your constituents, we want to express to you our great appreciation for the services of the both the USCG and the National Oceanic and Atmospheric Administration.

On the evening of April 10 of this year, on a voyage from Honduras to Florida, our sailing catamaran *Paradox* was hit by a tornado and capsized about 220 miles southwest of Tampa, FL. Fortunately we were not injured. Our EPIRB (Emergency Position Indicating Radio Beacon) automatically set off a signal which was received by NOAA. NOAA relayed the information about the signal to the USCG, who contacted our family in Durango for information about our vessel and voyage. Because of difficulties with our EPIRB signal the CG was unable to get a good fix on our vessel until the next day. At 5 pm on April 11 we were spotted by a CG C-130, and at 8:30 pm, after 24 hours in our overturned catamaran, we were rescued by a CG helicopter. We understand both the Miami and Clearwater, Florida, units were involved in our rescue.

We have since learned that we were found thanks to a new piece of Deepwater System equipment, the DF-430, on the C-130 which located us (see Testimony To Congress, 12 June 2007 by Adm. Thad Allen). **For both NOAA and the US Coast Guard, we want to urge you to provide increased funding for research and development of new technologies, and full funding for personnel and activities of both agencies.** We do not know if we would have survived our shipwreck without our EPIRB and the willing response of the USCG. Even for citizens of land-locked Colorado, maritime services of the federal government can be critical.

We want to express our thanks for both the US Coast Guard and the National Oceanic & Atmospheric Administration.

Sincerely yours,

Tom Galbraith

Stanna M. Galbraith

Cc: Admiral Thad Allen
Commandant, U.S. Coast Guard

Vice Admiral Conrad C. Lautenbacher, Jr.,
NOAA Administrator

F/V EXTRACTOR

On 12 Jun 05, 10 separate aircraft, 18 sorties, 19 search areas, and 13,118 sq. miles were expended to locate the 34’ P/C Extractor 26 miles off the coast of Florida. After thousands of miles of cumulative search effort, CG 1504 launched from Elizabeth City, NC (with a DF-430-F prototype on board) en-route to the assigned datum. While still 90 NM from scene, at 17,000 feet, the DF-430-F locked onto an ELT signal. The C-130H Hercules crew flew directly to the new electronic intercept solution and located two hypothermic survivors clinging to the bottom of an overturned craft, thus ending a 20 + hour search. An HH-65 was vectored to the position and hoisted the two survivors to safety. These two survivors had been holding onto the bottom of the boat for over 24 hours.

BERMUDA SAILING VESSEL

On 21 Dec 05, CG 1504 (again with a DF-430-F prototype) launched out of Elizabeth City, NC to a position 100 NM south of Bermuda. While still 102 NM from datum at 21,000 feet, the DF-430-F locked onto the ELT signal which provided an intercept solution. The aircrew flew to the updated position and the DF-430-F placed the crew precisely over a sunken sailing vessel with the survivors alongside in a survival dinghy; a Good Samaritan vessel was vectored in for an uneventful pickup of all survivors.

406 DF Successes to Date:

- **2006: BEGAN 406 MHz DF INITIATIVE**
- **55 LIVES SAVED OR ASSISTED TO DATE**
- **GREATEST 406 MHz LOCK DISTANCE: *160 NM***
- **AVERAGE LOCK DISTANCES:**
  - **0-2000': 24 NM**
  - **2001'-5000': 35 NM**
  - **5001- 10000': 53 NM**
  - **10001-15000': 92 NM**
  - **15001 – 25000': 116 NM**

406 DF Successes to Date:

- **55 LIVES SAVED OR ASSISTED**

- **Many of these were after legacy aviation assets without 406 MHz DF capability were not able to locate survivors.**

- **CG 1504 (Elizabeth City) (Initial proto-type):**

- **Jun 2005: Locked on at 90 NM from 17,000' (2 lives saved)**
- **Dec 2005: Locked on at 102 NM from 21,000' (2 lives saved)**

- **CG 1504 (Clearwater) Proto-type re-installed on 21 Mar 07:**

- **Mar 2007: Locked on at 62 NM from 8,000' (3 lives assisted); F/V Bandit II.**
- **Apr 2007: Locked on at 15 NM from 10,000' (2 lives saved); S/V Paradox.**
- **Jun 2007: Locked on at 85 NM from 10,000' (5 lives assisted)**

- **CG 2133 (Cape Cod) (HU-25 proto-type delivered on 04 Sep 07):**
- **08 Sep 07: Locked on at 72 NM from 15,000'; no distress.**
- **06 Oct 07: Locked on at 37 NM from 5500'; no distress.**

- **CG-1720 (Clearwater):**
- **19 Nov 07: Locked on at 50 NM from 10,500'; no distress; F/V Jenna Dawn.**

- **CG-2131 (Corpus Christi):**
- **20 Dec 07: Locked on at 150 NM from 25,000' (2 lives saved); F/V Silver Wings.**
-
- **CG-2133 (Cape Cod):**
- **09 Jan 08: Locked on at 35 NM from 5500'; no distress; F/V United States.**

- **CG 1720 (Clearwater):**
- **04 Jan 08: Locked on at 150 NM from 24,000'; no distress; R/V Falcon Explorer.**

- **CG 1706 (Hawaii):**
- **29 Jan 08: Locked on at 125 NM from 14,500'; no distress; F/V Lady Ann Margaret.**

- **CG 2113 (Miami):**
- **10 Feb 08: Locked on at 18 NM from 500'; no distress; M/V Rubecon**

- **CG 1717 (Hawaii):**
- **25 Feb 08: Locked on at 125 NM from 18,000'; no distress; F/V Princess K**

- **CG 2131 (Corpus Christi):**
- **04 Mar 08: Locked on at 70 NM from 7500'; (2 lives saved); S/V Air Pirate**

- **CG-2133 (Cape Cod):**
- **15 Apr 08: Locked on at 60 NM from 5500'; no distress; signal came fm Philadelphia; given to C.A.P.**

406 DF Successes to Date:

- CG-1701 (Clearwater):
- 23 May 08: Locked on at 100 NM from FL 210; no distress; M/V Lioness C.

CG-2133 (Cape Cod):
- 26 May 08: Locked on at 68 NM from 5500'; F/V Dona Maria; (3 lives saved).

CG-2140 (Cape Cod):
- 15 Jun 08: Locked on at 110 NM from 12,000'; P/C On Trial (DIW); (2 lives assisted).

CG-2133 (Cape Cod):
- 30 Jun 08: Locked on at 98 NM from 14,500'; S/V Patriot; (1 life assisted).

- CG-2120 (Mobile):
- 07 Aug 08: Locked on at 40NM from 5500'; no distress; M/V Malila.

- CG-2140 (Cape Cod):
- 09 Aug 08: Locked on at 95 NM from 5,000'; no distress; F/V Water Proof.
-

CG-1713 (Hawaii):
- 12 Aug 08: Locked on at 98 NM from 15,500'; F/V Lady Chul; (5 lives saved).

- CG-2141 (Corpus):
- 08 Sep 08: Locked on at 30 NM from 5000'; no distress; abandoned shoreline EPIRB.

- CG 2114 (Miami):
- 19 Sep 08: Locked on at 23 NM from 1500'; disabled F/V Cajun Gator; (3 lives assisted).

- CG-2127 (Mobile):
- 18 Oct 08: Locked on at 45NM from 6500'; no distress; group of vsls vic lower Mississippi.

- CG 2128 (Miami):
- 23 Oct 08: Locked on at 60 NM from 10,000'; no distress; F/V Green Flash.

- CG-2131 (Corpus):
- 24 Oct 08: Locked on at 62 NM from 9500'; F/V Rio Panuco; (3 lives assisted).

- CG-1700 (Kodiak):
- 22 Oct 08: Locked on at 94 NM from 22,000'; F/V Katmai; (4 lives saved).

406 DF Successes to Date:

- CG-2006 (Elizabeth City):
- 7 Nov 08: Locked on at 131 NM from FL 270; F/V Jose' Almuia.

- CG-2129 (Cape Cod):
- 09 Nov 08: Locked on at 137 NM from 17,000'; S/V Symphonie I; (2 Lives Saved).

- CG-2113 (Cape Cod):
- 19 Nov 08: Locked on at 100 NM from 15,500'; no distress; SY (Sailing Yacht) Signe.

- CG-2001 (Elizabeth City):
- 19 Nov 08: Locked on at 100 NM from FL 210; no distress; SY (Sailing Yacht) Signe.

- CG-2129 (Cape Cod):
- 12 Dec 08: Locked on at 100 NM from 10,000'; rec'd GPS position fm EPIRB @ 50 NM; no distress; F/V Pandora II.

- CG-1501 (Clearwater):
- 12 Dec 08: Locked on at 30 NM from 1,000'; no distress; F/V Nite Hawk One.

- CG-1502 (Clearwater):
- 27 Dec 08: Locked on at 160 NM from 17,500'; no distress; M/V Kite.
-

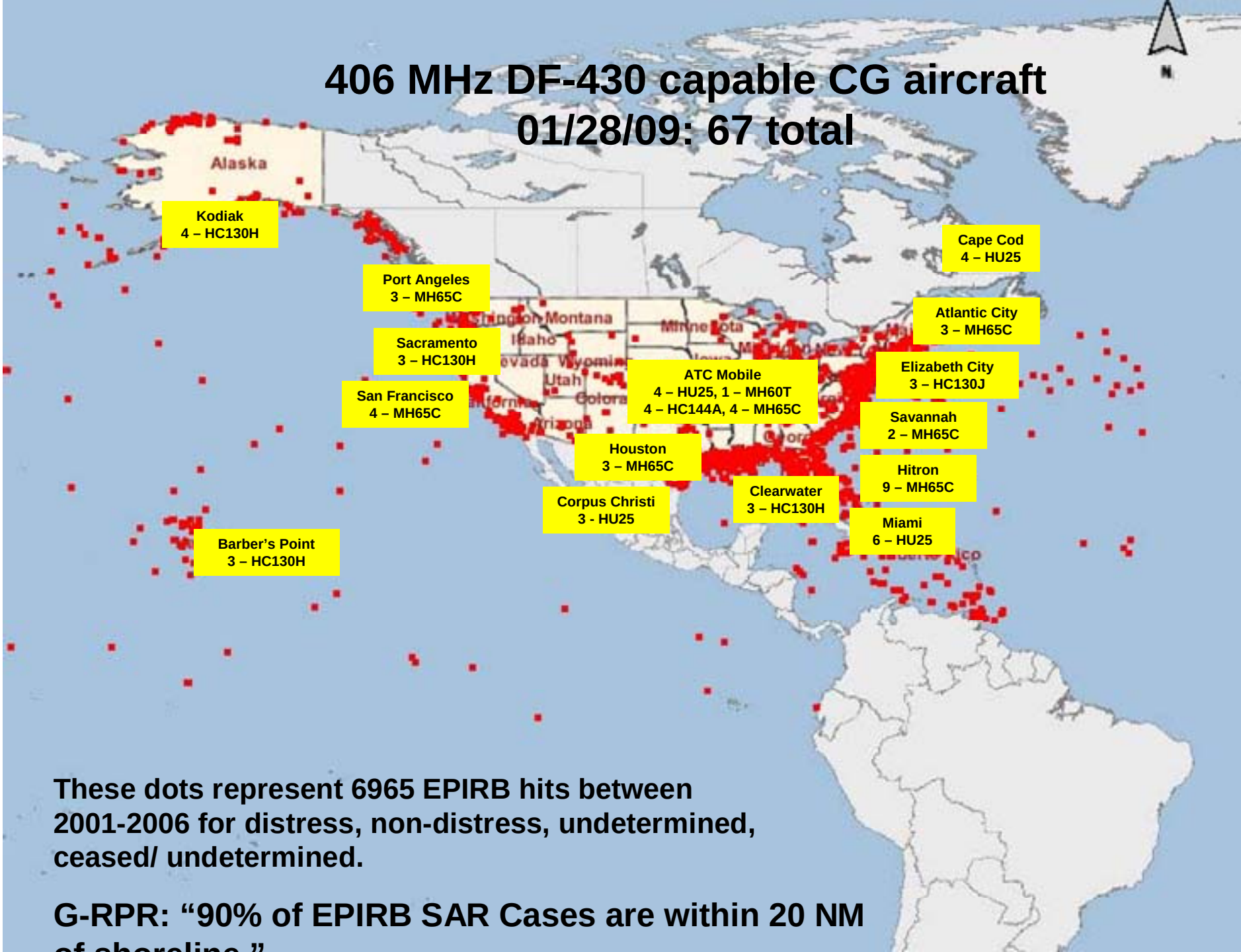
CG-2003 (Elizabeth City):

- 8 Jan 09: Locked on at 80 NM from FL 270; no distress; old floating EPIRB fm F/V Lady Juanita.

- HELICOPTER CASES

- CG-6545 (Savannah) (FIRST SUCCESSFUL USE OF ROTARY-WING ASSET) :
- 25 Jan 09: Locked on at 26 NM from 1000'; S/V Audrey; (2 lives assisted).

- CG-6542 (Savannah) :
- 01 Feb 09: Locked on at 40 NM from 4000'; F/V Gladiator; (4 lives assisted).


406 MHz DF-430 capable CG aircraft
01/28/09: 67 total
Alaska
Kodiak
4 – HC130H
Port Angeles
3 – MH65C
Sacramento
3 – HC130H
San Francisco
4 – MH65C
Barber's Point
3 – HC130H
Corpus Christi
3 - HU25
Houston
3 – MH65C
ATC Mobile
4 – HU25, 1 – MH60T
4 – HC144A, 4 – MH65C
Clearwater
3 – HC130H
Miami
6 – HU25
Hitron
9 – MH65C
Savannah
2 – MH65C
Elizabeth City
3 – HC130J
Atlantic City
3 – MH65C
Cape Cod
4 – HU25
These dots represent 6965 EPIRB hits between 2001-2006 for distress, non-distress, undetermined, ceased/ undetermined.
G-RPR: "90% of EPIRB SAR Cases are within 20 NM

Timelines

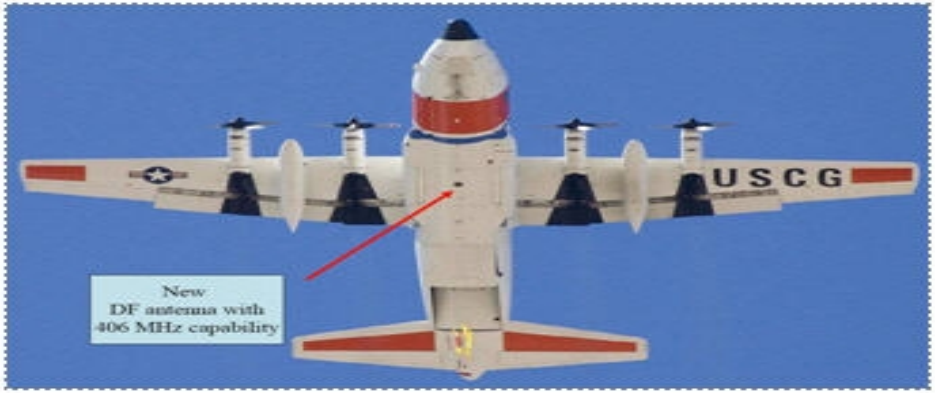
C-130 H:	2007-10/08
C-130 J:	2007-2008
HU-25:	2007-2008
CASA 235:	2007-2020 (36 TOTAL)
MH-60T:	2008-2012
MH-65C:	2007-2010
R21 Towers:	Est. 2010

Cutters small boats: RP's under review (interim solution?)

New Technology : 406 MHz Direction Finding

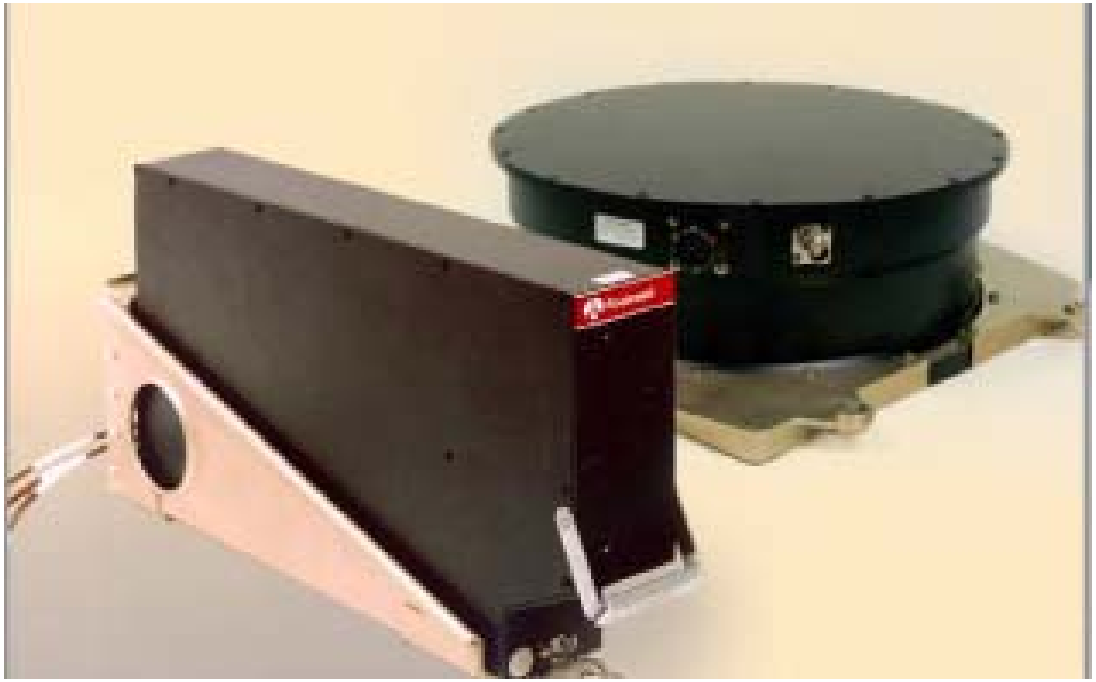
With February 2009 phase-out date for 121.5 MHz beacons rapidly approaching, SAR authorities have been investigating how to benefit from the more widespread adoption of 406 MHz beacons. One possible aid to SAR services is the recent commercial availability of direction finding (DF) equipment operating at 406 MHz.

LCDR Joseph Deer, USCG, described how the technology works as follows, "The 406 MHz EPIRB emits a low power, 25 milliwatt sweeping-tone signal constantly on 121.5 MHz, but emits a 5 watt burst about every 52 seconds at 406 MHz. The 406 MHz emission is 200 times stronger than the 25 milliwatt sweeping-tone signal and is not degraded by environmental obstacles like the 121.5 MHz emission. If the EPIRB is equipped with an internal or external GPS capability, not only can the 406 MHz DF accurately track the course to the 406 MHz signal, but the operator can read a GPS position on a monitor inside the search aircraft. Proper registration of a beacon can further assist SAR services by providing immediate access to data critical to mission success."



In April 2007, the US Coast Guard installed its first operational 406 MHz DF unit on an Elizabeth City, North Carolina C-130 aircraft

406 MHz DF equipment has been proven able to easily lock on to beacon signals from great distances. The US Coast Guard has locked-on to 406 MHz beacons from as far away as 150 nm (at 25,000 ft) and has several examples of locking-on from 80-100 nm (at 10-20,000 ft).

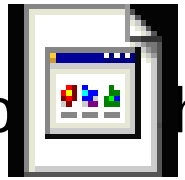
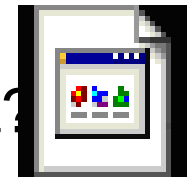


SAR CASES WITHOUT 406 CAPABILITY

SAR CASE #3

On 15 Nov 06, the 35’ F/V Biggin’s was anchored 30 NM off the coast of Florida in approximately 8’ swells. As they were doing their evening work, an unexpected rogue wave knocked their vessel over on its side and it quickly sank. They were immediately in the water with no survival gear; the only items that came to the surface were a large fish box and a 406 MHz EPIRB.

The fish box was filled with approximately 3,000 pounds of fish and ice which the two fisherman threw into the ocean prior to getting inside the fish box.

What do  hink happened next? 

FV Biggin's Rescue.wmv FV Biggin's Rescue.2.wmv

Map Favorites Declutter Tools Window Help

1 : 1,307,307

30-35.800N 079-54.200W FISHBOX
30-35.300N 079-54.100W EPIRB 9
30-30.300N 079-55.000W EPIRB 8
30-17.900N 079-59.600W EPIRB 7
30-05.100N 080-00.900W EPIRB 6
29-49.300N 080-07.800W EPIRB 5
29-31.200N 080-10.100W EPIRB 4
29-21.100N 080-13.600W EPIRB 3
29-16.800N 080-12.600W EPIRB 1
28-58.400N 079-21.900W EPIRB 2

The fishermen were in this fish box for over 26 hours.

707N 078-09.986W

29-44.029N 080-18.783W 225.00 NM

191501Z NOV

The Problem

When initially developed, the electronic signal from a factory EPIRB or ELT emanated at 75 milliwatts on the 121.5 frequency. The electronic detection equipment installed on Coast Guard aircraft at that time – the DF-301 and ANS-4 – was sufficient to detect a 75 milliwatt signal. However, the FCC subsequently mandated that the power be reduced to 25 milliwatts on the 121.5 MHz homing signal due to interference at the higher power on aircraft emergency frequencies. Unless in very close proximity (less than 5 NM), this lower 25 milliwatt power falls below the threshold of effective detection with the DF-301 and ANS-4 equipment. The DF-301 and ANS-4 have no capability of detecting a 406 MHz signal.

Global Issues

As of January 1, 2007, U.S. regulations will no longer permit usage of 121.5 MHz EPIRBs; further, starting 01 Feb 2009, the COSPAS-SARSAT system will no longer detect 121.5 MHz or 243 Mhz distress signals. This means that the entire framework of commercial and recreational watercraft will have switched to the 406 MHz system. There are approximately 150,000 registered 406 MHz beacons in the United States: 135,000 are EPIRBs carried by commercial and recreational vessels; 10,000 are Emergency Locator Transmitters (ELTs) for aircraft; 12,000 are Personal Locator Beacons (PLBs). All SOLAS Class vessels (500 GT or larger), passenger carrying vessels (100 GT or larger) and manned, non-inspected vessels are required to have 406 MHz EPIRBs on board.

406 MHz SOLUTIONS

- **Deepwater awarded $2.6 Million to ARSC on 12 Dec 06**
- **27 Rockwell Collins DF-430-F sets ordered on 21 Dec 06 ($1.4 M) for HC-130-H acft.**
- **24 Rockwell Collins DF-430-F sets ordered in 2007 for HU-25 acft.**
- **Software upgrade for .037 (406.0-406.1)**
- **R21 towers / coastal areas**
- **Auxiliary aircraft!!!**
- **Portable 406 MHz prototype**

Table H.2: Cospas-Sarsat 406 MHz Channel Assignment Table

Chan. #	Centre Freq. (MHz)	Status for Type Approval of New Beacon Models		Comments Table approved by the Cospas-Sarsat Council at the CSC-31 Session – Oct. 2003 (see note 1)
		Date open	Date closed	
	406.007	Not available		SARP-2 limitation
	406.010	Not available		Doppler shift limitation
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	406.019	Not available		Doppler shift limitation
A	406.022	C/S orbitography / reference		Reserved for System beacons
B	406.025	1982	1 Jan 2002	Open for beacon models submitted for TA before 01/01/02
C	406.028	1 Jan 2000	1 Jan 2007	Open for beacon models submitted for TA before 01/01/07
D	406.031			Reserved, not to be assigned
E	406.034			Reserved, not to be assigned
F	406.037	1 Jan 2004	TBD	Planned assignment (see note 1)
G	406.040	1 Jan 2008	TBD	Planned assignment (see note 1)
H	406.043			Reserved, not to be assigned
I	406.046			Reserved, not to be assigned
J	406.049	TBD	TBD	Available for future assignments / New developments
K	406.052	TBD	TBD	Available for future assignments / New developments
L	406.055			Reserved, not to be assigned
M	406.058			Reserved, not to be assigned
N	406.061	TBD	TBD	Available for future assignments / New developments
O	406.064	TBD	TBD	Available for future assignments / New developments
P	406.067			Reserved, not to be assigned
Q	406.070			Reserved, not to be assigned
R	406.073	TBD	TBD	Available for future assignments / New developments
S	406.076	TBD	TBD	Available for future assignments / New developments
	406.079	Not available		Doppler shift limitation
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	406.088	Not available		Doppler shift limitation
	406.091	Not available		SARP-2 limitation

Notes:

(1) Planned assignments may change if the Cospas-Sarsat Council determines that the beacon population in an active channel differs from the projected population.

TA Type approval

TBD To be determined

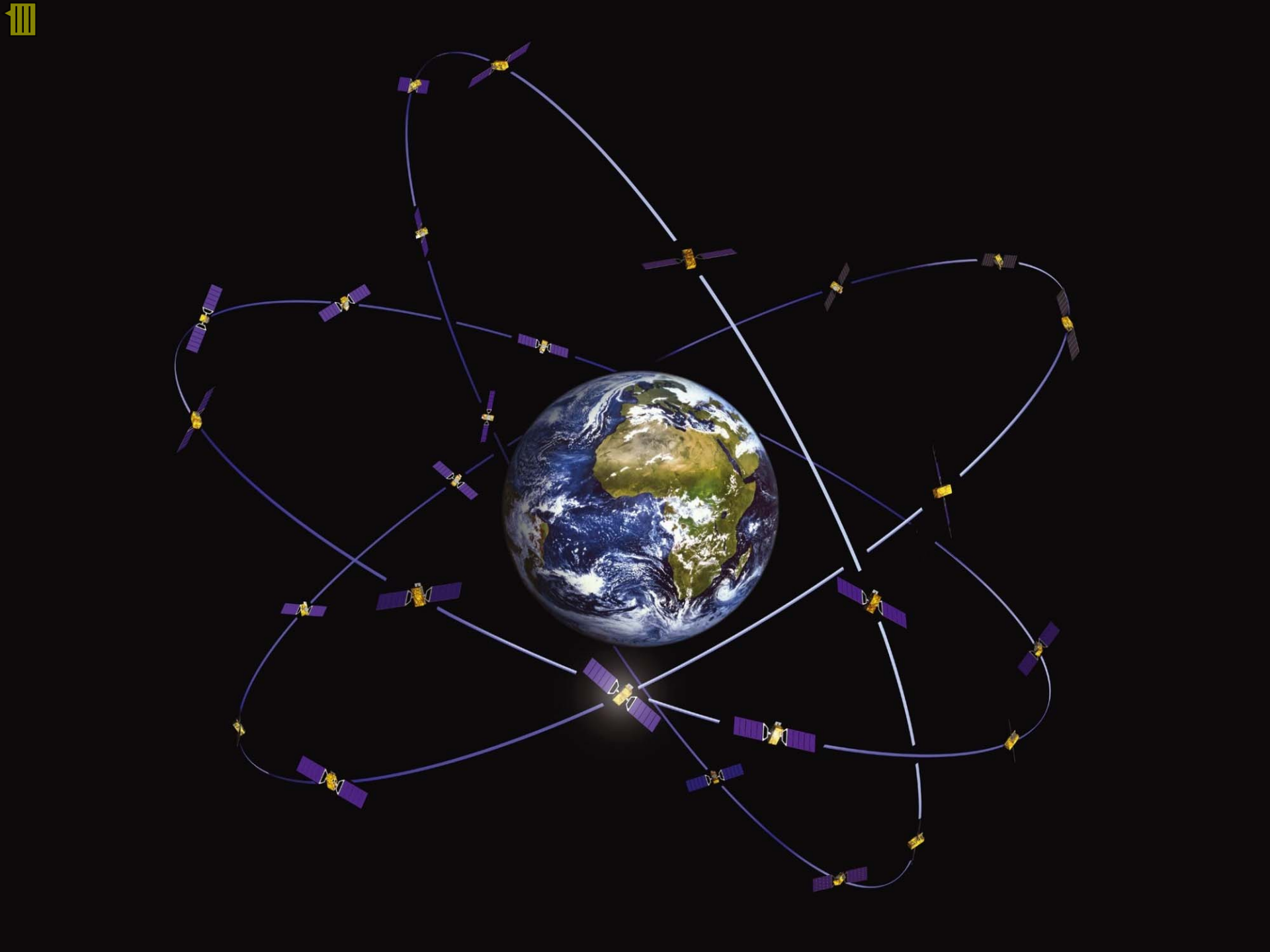
R21 / SHORE-BASED SOLUTIONS

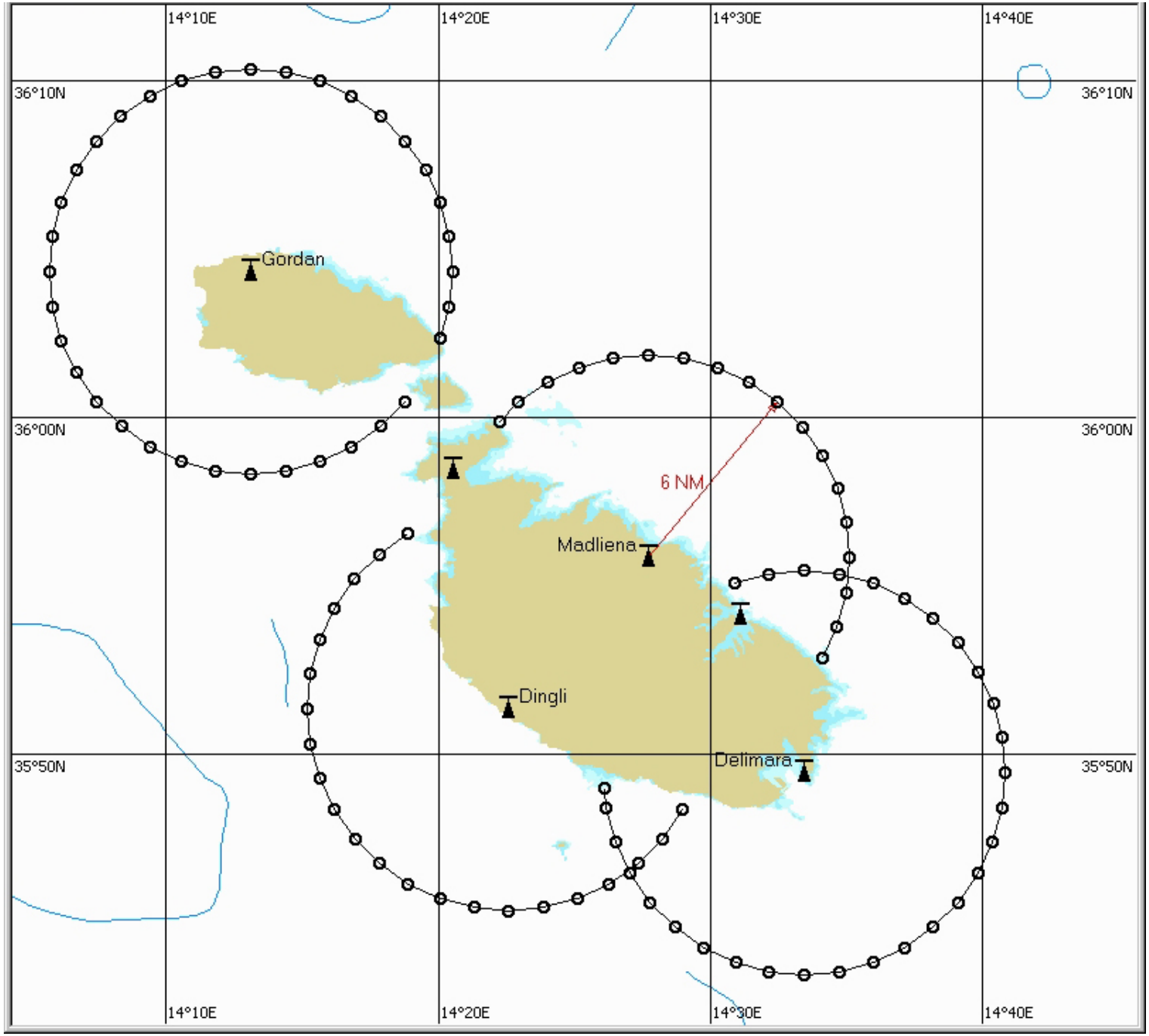
- **17 DEC 07: CG-9, CG-7, CG-93 directed 406 MHz detect and DF capability be placed on all current and future R21 towers!!!**

- **Industry testing ranges:**
  - **Sea level: 15 NM**
  - **80’ MSL: 17.5 NM**
  - **160’ MSL: 21.5 NM**
  - **560’ MSL: 25+ NM (test stopped)**

- **90% of SAR cases within 20 NM of shoreline.**

- **“Auto-sensing” towers, theoretically, will not be dependent on COSPAS SARSAT system and will provide updates every 52 seconds for 90% of cases versus waiting for LEO/ GEO data (40-120 minutes per pass).**




14°10E
14°20E
14°30E
14°40E
36°10N
36°00N
35°50N
Gordan
6 NM
Madliena
Dingli
Delimara

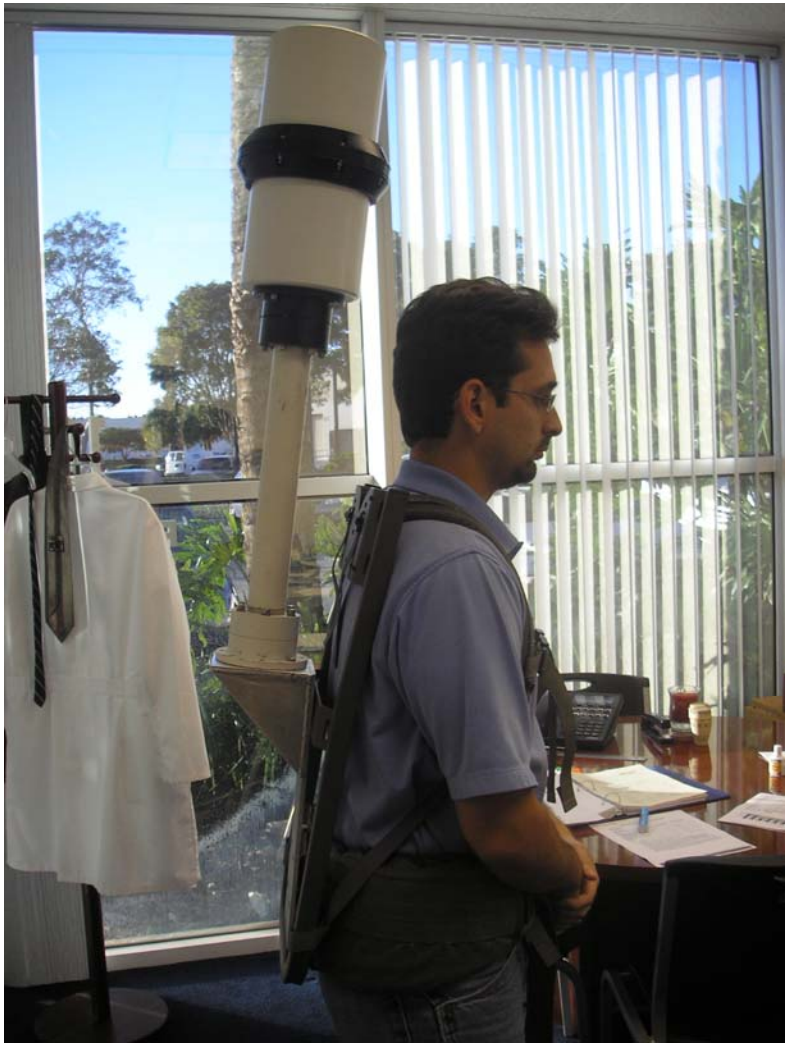
U.S. COAST GUARD AUXILIARY!!

January 2007:

- **Two twin-engine auxiliary aircraft out of Boca Raton, FL now have Becker 406 MHz DF systems on them (interchangeable)**
- **N8721Y** (Piper Twin Comanche (PA-30))
- **N6992Y** (Piper Aztec (PA-23))
- **Third auxiliary aircraft should be completed by end of February**


N8721Y
CAUTION
RPM
Collins ADF
INTERCOM
RECORD
PLAY

PORTABLE SOLUTIONS



Test Configuration

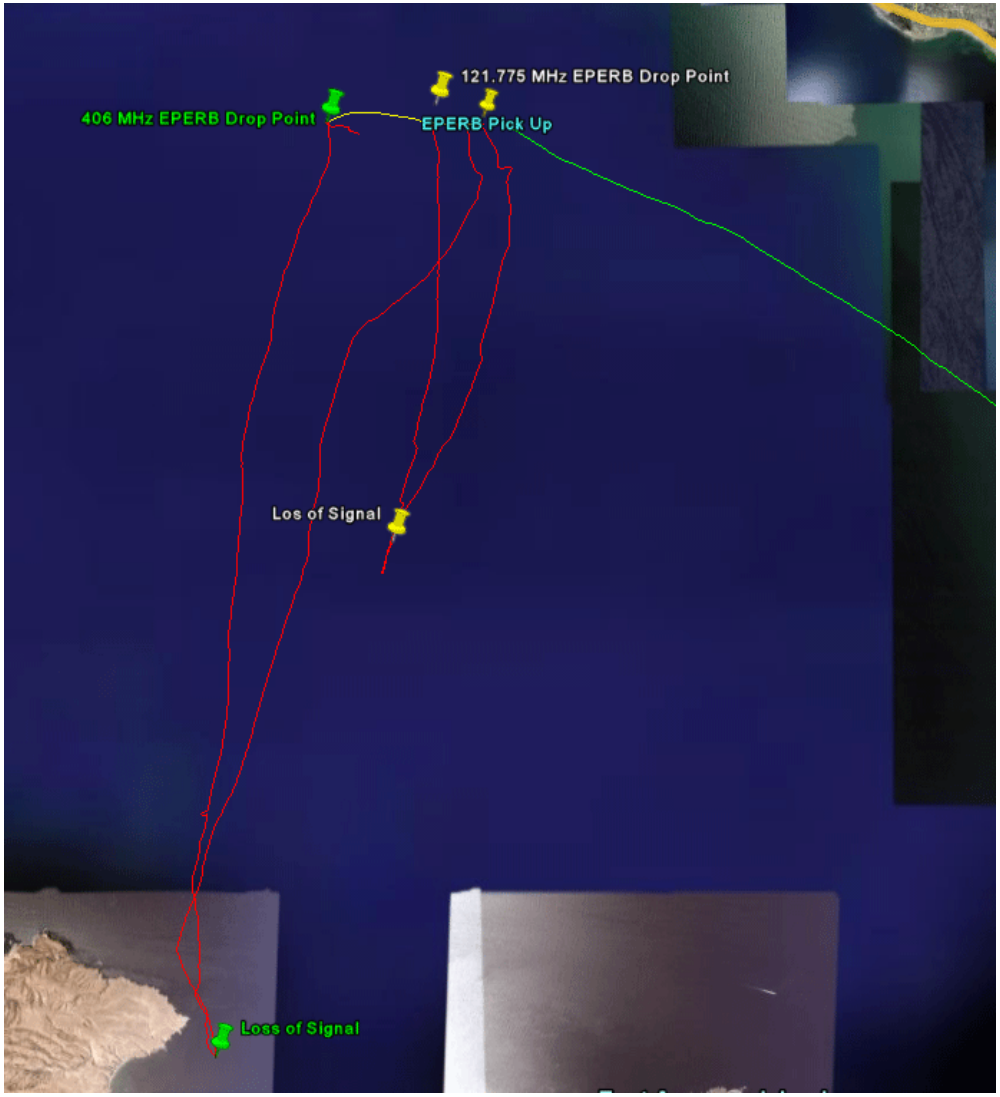
RT 500M antenna mounted on boat

Test Raft with beacons and data logger
The data logger is in the orange box

Two tests were conducted one for the 406 MHz (green push pins) and the other for 121 MHz (yellow push pins)

Maximum range of detection did not equate to maximum range of usable signal.

Another test is being scheduled to determine maximum range of usable signal.




BJÖRN CHRISTER
SJÖRÄDDNINGS SÄLLSKAPET
SAR
SJÖRÄDDNING


SAR


ADAC

Efficiencies

Fuel Costs

Cutter (2-3 PIW / PEPIRB Example)

Aircrew Safety

Cold Weather / Hypothermia

Small Boat Station / Marina

Unit duty stander efficiencies

Summary

- COSPAS SARSAT
- AVIATION
- R21
- CUTTER & SMALL BOATS
- PORTABLE SYSTEM
- CUSTOMER WE SERVE
- MANUFACTURING PROCESSES

WHAT'S NEXT?

- GET THE WORD OUT
- HAVING A 406 DEVICE "GUARANTEE"
- AVIATION / FAA CONSIDERATIONS
- REGISTER Y0UR EPIRB!!!
- IDEAS… NEED YOUR HELP

HC-144A Route of Flight

Airport	Direct Distance NM	Leg Divert Options	Estimated Winds	Est Leg Fuel	Est Time
Sevilla, Spain					
Leg 1	1639	Canary Islands	15 KT headwind	7194#	8+40
		African Coast			
		Amilcar Cabral Intl			
Praia, Cape Verde					
Praia International					
Leg 2	1433	African Coast	10 KT headwind	6580#	7+35
Fortaleeza, Brazil					
Pinto Martins Intl					
Leg 3	1605	Brazil Coast	< 5 kts	6590#	8+15
		Suriname Coast			
		Trinadad			
		Grenada			
Barbados					
Grantley Adams International					
Leg 4	1402	West Indies	20 KT Headwind	6294#	8+00
		Bahamas			
Miami, FL					
Opa Locka, Intl					
Leg 5	655	Contiguous US	< 5kt headwind	3200#	3+30
Elizabeth City, NC					
CGAS					

Seville:
Depart:160948Z

1

Sal,Cape Verde
Arrive: 161745Z
Depart: 180830Z

2

Fortaleza, Brazil
Arrive: 181620Z
Depart: 191050Z

3

Barbados
Arrive: 191850Z
Depart: 191215Z

4

Arrive: 201900Z
Depart: 211315Z

5

Arrive: 211645Z
Dec 2006

6

QUESTIONS?