

USCG AUX



Operations
Department

Ditching, Water Survival and Why You May Need A New ELT

How to manage the risks of flying over water

Skills you never want to use,
but you'd better know just in
case!

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How to plan not to ditch, but how to stay alive if you do.

- The Hazard – Cold water can kill
- Things to do to prevent trouble – Risk Assessment and Management
- What to do if things go very wrong – Ditching Technique
- How to call for help - Signaling
- How to stay alive until help comes – Water Survival
- Stuff to use to help stay alive – Equipment (Including those new ELTs)

Some Terms

- **Ditching:** Forced landing of an aircraft on water. (Not crashing)
- **Survive:** To remain alive.
- **SAR – Search and Rescue:** Use of available resources to assist persons in distress.

Risk Management Terms

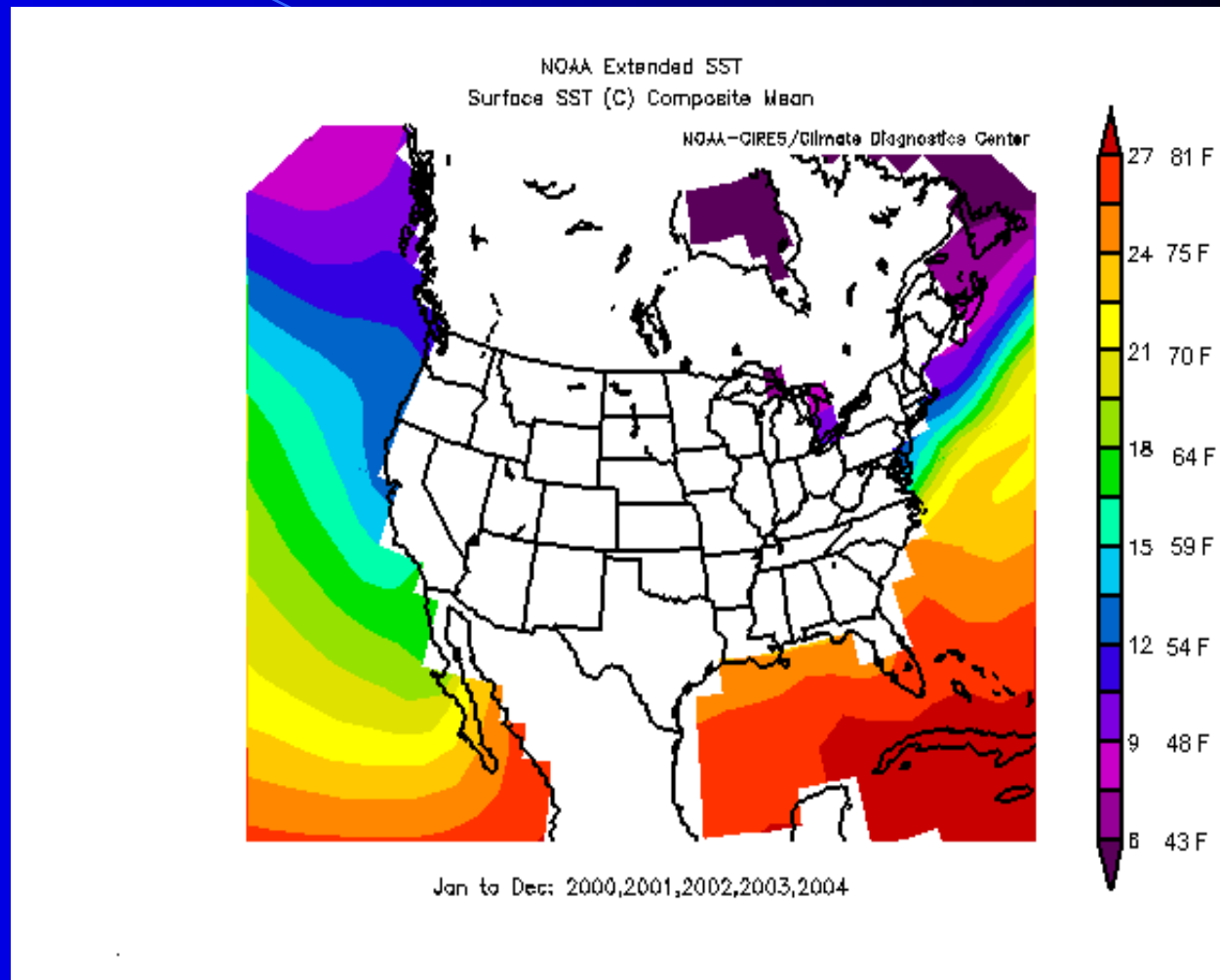
- Risk – Chance of injury or loss
- Mishap – Unplanned event causing loss
- Hazard – Real or potential danger
- Severity – Potential Consequences
- Probability – Likelihood of Mishap
- Exposure – Amount of time, # people
- Risk Assessment – Evaluation of Risk for Specific Hazards

Risk Management 101

- Avoid Unnecessary Risk
- Accept Necessary Risk When Benefits Outweigh Costs
- Reduce Unavoidable Risk by Reducing
 - Exposure
 - Probability
 - Severity

The Hazard

- It's not just the Great Lakes!
- Long term average Sea Surface Temperatures on much of both the East and West coast are less than 50° F.



Consequences of the Hazard

- Cold Water is a Big, Big Deal!
- Sudden immersion in extremely cold water can cause sudden **death**. And if it doesn't,
- Cold water removes heat, and with it life, from your body.
- Your life expectancy depends on the temperature of the water.
- You have to stop heat loss to the cold water or **you will die**.

Average time until death under good conditions

- 60 degree water - survival time 7 hours
- 50 degree water - survival time 2.5 hours
- 40 degree water - survival time 2 hours
- 32 degree water - survival time 1.5 hours

Reduce Probability & Exposure

- **Make Sure Aircraft is in Good Condition**
(Sounds obvious, but apparently it isn't.)
- **Make Sure Fuel is Sufficient**
(Again, sounds obvious, doesn't it? Then why are so many ditchings fuel related?)
- **File an Flight Plan - VFR or IFR**
- **Use Lake / Island Reporting Service, or**
- **Use Flight Following**

Reduce Probability

- Most sudden engine stoppages are fuel related.
- Check the fuel carefully for sufficient quantity and quality (correct type, no contamination). Then check it again.
- Make sure all tanks needed are feeding correctly before going “feet wet” (over water).

Reduce Severity

- Be Equipped w/ Life Jackets (PFDs) & Raft / Exposure Suits
- Wear PFDs over Water
- Have a Plan
- Practice your Plan

Reduce Severity

- Yes, wear the PFDs when flying over water.
- They are very difficult to put on in the plane, while you are preparing to ditch.
- They do no good way in the back of the plane with the tow bar, spare oil can, expired charts, tie down ropes and \$100 hamburger wrappers.

Be Prepared!

- Most Ditchings occur in critical phases of flight – Take Off, Landing or Hover.
- 92% have less than 1 minute warning.
- 28% have less than 15 seconds warning.

Recognition

- Don't be in Denial (It's not just a river in Egypt)
- At 500 ft you have about 30 seconds before impact
- Fly the Airplane - Best Glide Speed
- Make Radio Call - MAYDAY - Position - POB (Persons on Board) - Intentions
- Activate ELT - Transponder to 7700
- Aim for any vessels you see.

Initial Actions

- Secure Loose Items
- Get Raft Ready
- Secure Door or Canopy Open
- Stow Headsets & Loose Items
- Remove & Stow Eyeglasses
- Tighten Restraining Gear
- Broadcast MAYDAY
- **FLY THE PLANE!**

Ditching

- Determine the direction of the Swells and of the Wind.
- Fuel Off unless power is still available.
- If power is still available, use it to insure control and a margin above stall.
- In retracts, leave gear up.
- Tighten PFD's and restraints
- Have Passengers assume **Brace Positions**
- Reduce Sink Rate
- **DO NOT STALL!**

Fly the aircraft, remain under control.



From AOPA Pilot July 1999 by Thomas Home "In flight Emergencies -----"

Brace Positions

- Keep feet outside of seat crush zone.
- Feet forward of seat and flat on floor.



Brace Positions

- Cross arms.
- Slip thumbs under shoulder harness straps.
- Grip straps firmly.



Brace Positions

- Tuck head into the V formed by your crossed arms.
- This will help prevent your neck from rotating forward and hyper extending.



Brace Positions

- Seat belts should be low on the hips and as tight as possible.
- Shoulder restraints should be tightened as much as possible.
- Seat should be aft as far as possible.



Brace Positions

- For single strap shoulder restraint systems,
- Grasp the single strap as shown earlier.



Brace Positions

- Then grasp your shoulder with the other hand.
- Again, this forms a V in which you nest your head.



Brace Positions

- Then tuck your head into the V formed by your arms,
- Grip the shoulder strap and your unrestrained shoulder very tightly.



Ditching

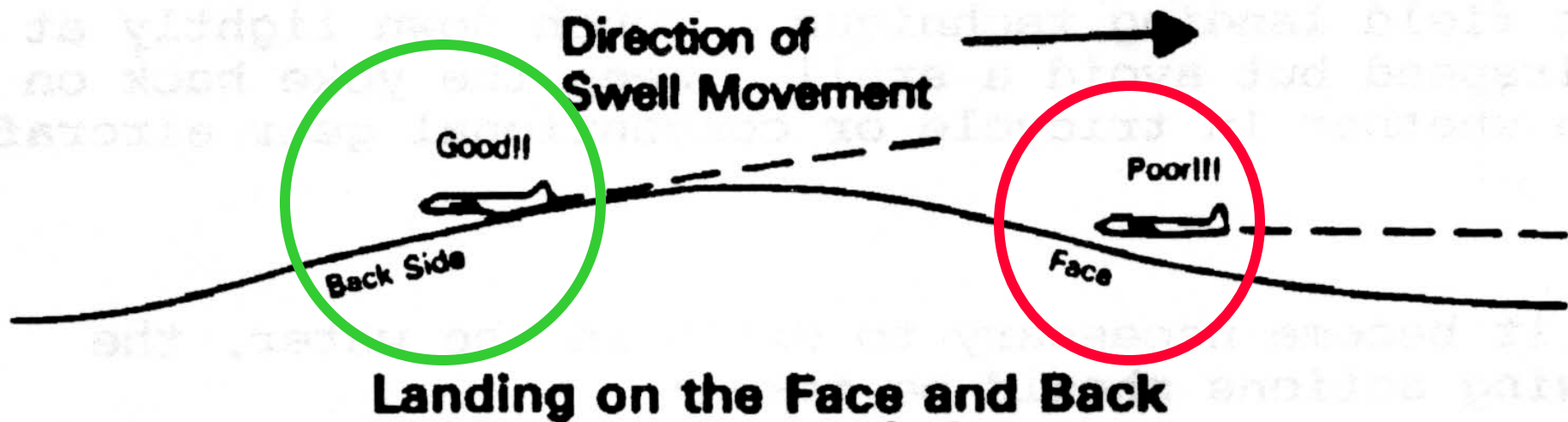
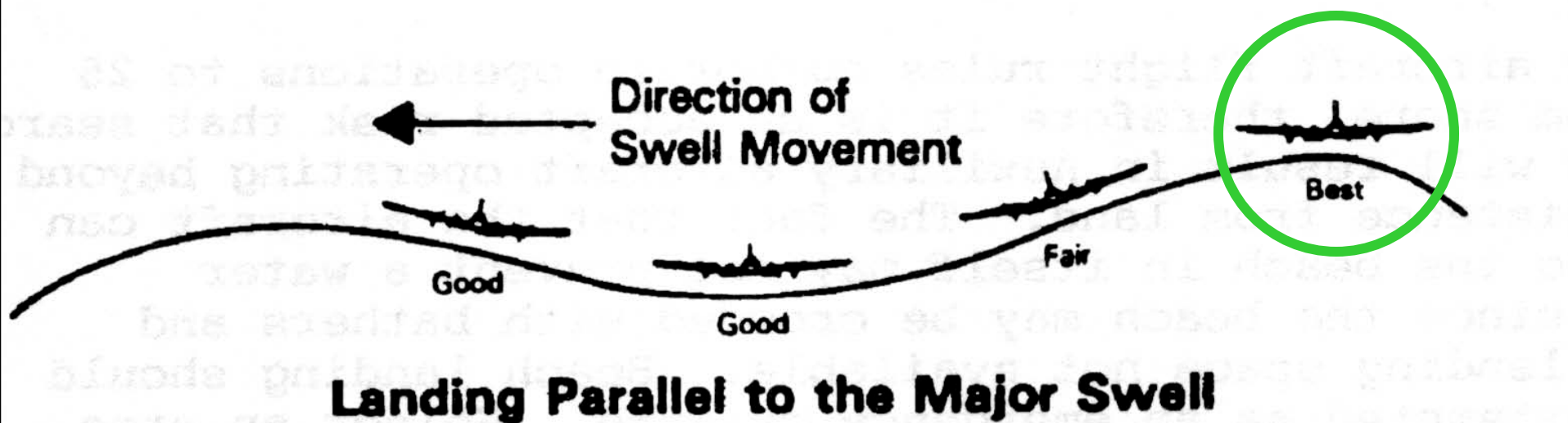
If no power is available, a greater than normal approach speed should be used down to the flare. This speed margin will allow the glide to be broken early and more gradually, thereby giving the pilot time and distance to feel for the surface -- decreasing the possibility of stalling high or flying into the water.

- - - Aircraft Emergency Procedures Over Water, USCG CG-306

Ditching

- Calm Water - Land into wind
- Low wind speed - Land parallel to swells, on top of swell if possible
- High Wind speed - Land into wind on back side of swells
- **Avoid the face of a swell!**

Ditching



Thumbs Outside of Yoke

- To prevent them from being broken if the yoke is forced back by the impact.

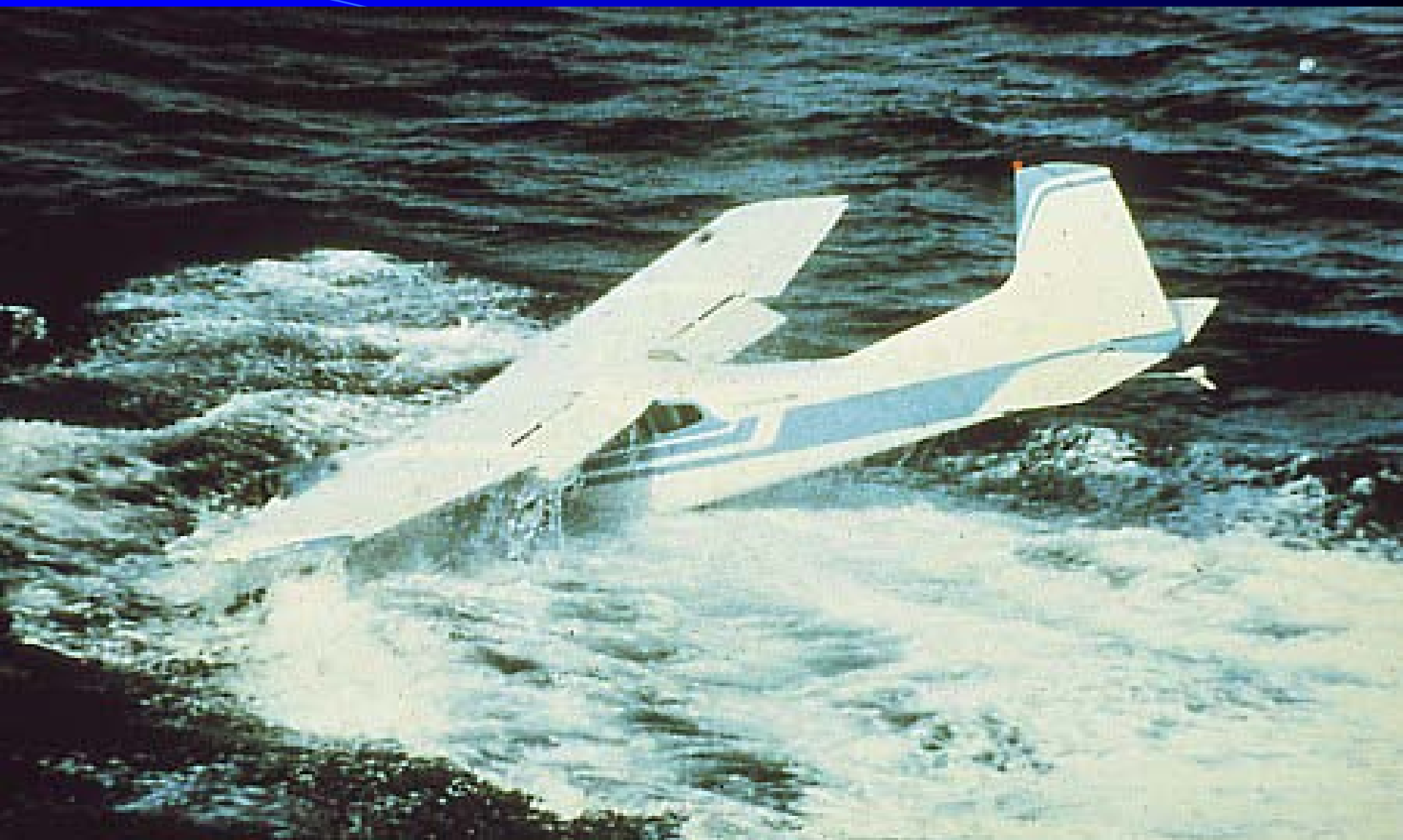




From AOPA Pilot July 1999 by Thomas Home "In flight Emergencies -----"

Touchdown!

- Brace for Impact w/ thumbs outside of yoke.
- Touchdown at the lowest speed possible, but don't lose control.
- Use soft field landing technique.
- Use any power still available.
- Plane may or may not be upright. You have about a 50/50 chance of being upright or inverted.
- It may be dark. You may be underwater.
- Keep your shoes on! Don't panic!



From AOPA Pilot July 1999 by Thomas Home "In flight Emergencies -----"

Egress

- Establish and Hold **Reference Point**
- Keep your feet on the deck to maintain orientation.
- Remember – what was on your right when you were upright is still on your right when you are inverted.
- Do not release restraints 'till motion stops!
- **Don't let go with both hands at the same time!**

Egress

- Open Doors - Windows
- Wait for Motion to Stop
- Take Deep Breaths before being submerged.
- Count 3 - 4 seconds - release harness
- Use **Hand over Hand** method to Egress-
always have one hand in contact w/ the
aircraft to remain oriented.
- Keep your feet on the deck to remain
oriented.
- **DO NOT INFLATE PFDs** until clear of aircraft!



From AOPA Pilot July 1999 by Thomas Home "In flight Emergencies -----"

Egress – Get out already!

- Breath out - bubbles go to surface
- Get Clear of Aircraft
- Do NOT Inflate PFD or Raft until clear of aircraft
- Secure raft to yourself, not to airplane. Tie individual rafts together
- You may have less than a minute before aircraft is submerged

Egress – Get out already!



To find sources, search the Web using “Seat Belt Cutter” in your favorite search engine.

- A Seat Belt Cutter may be a useful tool to have readily available.
- They are inexpensive, and could save your life if your restraints do not release.

Survival

- Get Away from Aircraft
- Inflate PFD
- Do a Head Count
- Deploy Raft - Get In
- Inventory Gear - Assess Situation

Most Important Stuff!

- Remain afloat – Life Jacket / PFD
- Get out of the Water - Raft or Immersion Suit
- Get help – Signaling Gear, PLB

Rescue!



This pilot kept his cool and was rescued!

Life Jackets / PFDs – Personal Flotation Devices



“Susponder” type –
manufactured by several
makers, including:

SoSpenders

Mustang

Light Weight & Comfortable.

Relatively inexpensive.

Cold Water is a Big Hazard!

- Now that you've survived the ditching, and have gotten out of the aircraft and are afloat, you still have a big problem.
- You have to get out of the water, or stop the heat loss, or **you will die.**
- The clock is running . . .
- Your remaining lifespan depends on the temperature of the water and how you can stop your heat loss.

When Immersed in Cold Water:

- Hypothermia can begin within 10-15 minutes.
- Hypothermia can cause death, or contribute to drowning.
- Unconsciousness occurs when core temp. is 89.6 degrees. (Normal 98.6)
- Death likely when core cools below 86 degrees.

Under good conditions

(life jacket, light clothing, staying still) --

- 60 degree water - survival time 7 hours
- 50 degree water - survival time 2.5 hours
- 40 degree water - survival time 2 hours
- 32 degree water - survival time 1.5 hours

Survival Factors in Cold Water

- **Will to Live** - Most important in all survival situations.
- **Flotation** - Personal Flotation Device (PFD) essential.
- **Heat Retention** - Clothing / Raft / Survival Gear

"STAY" Rules for Cold Water Survival

- Stay Afloat
- Stay Dry
- Stay Still
- Stay Warm
- Stay with Aircraft / Boat

Stay Afloat

- Must breathe to prevent drowning
- Must control panic to breathe.
- Panic decreases ability to float.

Lifejacket / PFD

- Non-swimmers need assistance of PFD.
- Provides advantage recovering from cold shock and allows better breath control.

Without PFD

- Flotation is possible even with heavy clothes.
- Trapped air in clothing assists flotation.
- Hold onto floating debris.

Stay Dry

- Get out of water ASAP.
- If that's impossible, get main heat loss areas out of water (hang on to floating object).
- Get head dry and out of water.
- Head in water increases heat loss by 80% over head out of water.
- A dry suit is best protection, but not as good as being out of the water.

Stay Still

- Movement increases circulation and heat exchange in extremities.
- Staying still decreases heat loss by 30% over swimming or treading.
- It is difficult to float motionless without Lifejacket / PFD

Stay Warm

- Main Heat Loss Areas
 - Head & Neck
 - Groin
 - Sides of Chest
- Protect main heat loss areas
- Wear coat & hat

Stay Warm

- If getting out of water is impossible, assume **HELP, HUDDLE, Human Carpet** or **Human Chain** positions.
- These positions double survival time over swimming or treading.
- These positions are impossible without a PFD.

Stay Warm



H.E.L.P.

Heat Escape
Lessening Posture

Impossible without a
PFD



HUDDLE

A “group hug” to
conserve heat

Impossible without a
PFD

STAY WARM

Human Chain



Human Carpet



Stay with Aircraft / Boat

- May be possible to get out of water.
- Better chance of being spotted - larger target.
- Success in swimming to shore depends on many variables. Swimming increases heat loss.
- In 50 degree water, average person wearing PFD and light clothing can cover a distance of only .85 mile before being incapacitated by hypothermia.

Life Rafts



Patten Group

1 Man LRU-18/U Raft

This is the “One Man Yacht” used by the Coast Guard

Also available with protective covers

Life Rafts



The Patten Group one person raft is also available in a wearable package. This insures that the raft goes out of the plane when you do.

Life Rafts



Winslow Life Raft

Manufactures a wide variety of excellent quality rafts, suitable for boats, aircraft, off shore, etc.

ADC

Aviation Dry Suit Coverall

Worn with special undergarments, ADCs are expensive, require training and maintenance. But for pilots who spend a lot of time over water, they may be lifesavers.



So now you're floating around in your little boat. Now what?

- Assess your situation – what shape are you in – breathing, injured, warm, dry?
- Do you have an ELT, or PLB?
- Are there any vessels or aircraft nearby?
- How can you attract attention?

How long is it going to take to be rescued?

- That depends a great deal on your prior planning!
- Does anyone know that you're in trouble?
- Did you file a Flight Plan?
- Did you send a MAYDAY?
- Were you in communication w/ ATC, an AFSS, or anyone else?
- Did your ELT automatically activate or did you manually activate your ELT, or PLB?
- If no one knows you're there, get comfy. It'll be a while!

How long. . . ?

- If in contact w/ ATC, rescue services will be notified immediately.
- Accurate position info greatly expedites recovery.
- A 406 MHz ELT or PLB gives immediate notification, accurate location.

What about Flight Plans?

- Search process begins 30 minutes after flight plans expire, if not cancelled,
- BUT:
- The initial search is by radio & phone, to see if you have landed along your route.

When a Flight Plan Expires...

- At ETA +30 min an **INREQ** -Information Request - is sent by FSS or ARTCC to begin a **PRECOM** - phone calls to enroute airports and quick ramp checks.
- **ALNOT** - ALERT NOTICE - sent 1 hour after an **INREQ**. **EXCOM** begins – All ATC Facilities are notified. Search area is up to 50 miles either side of route.
- 1 hour after **ALNOT**, (if not before) Rescue Coordination Center is notified, then SAR services. Search area is expanded to maximum range of aircraft.

SAR Response Time Line

- ETA + 30 Minutes INRQ 30 min
 - ALNOT + 1 hour 1+30 min
 - RCC notified + 1 hour ~2+30 min
 - SAR forces are activated ~3+00 min
-
- *THESE TIMES ARE ONLY IF YOU FILE A FLIGHT PLAN!*
 - *See why we don't want to depend on THAT?*

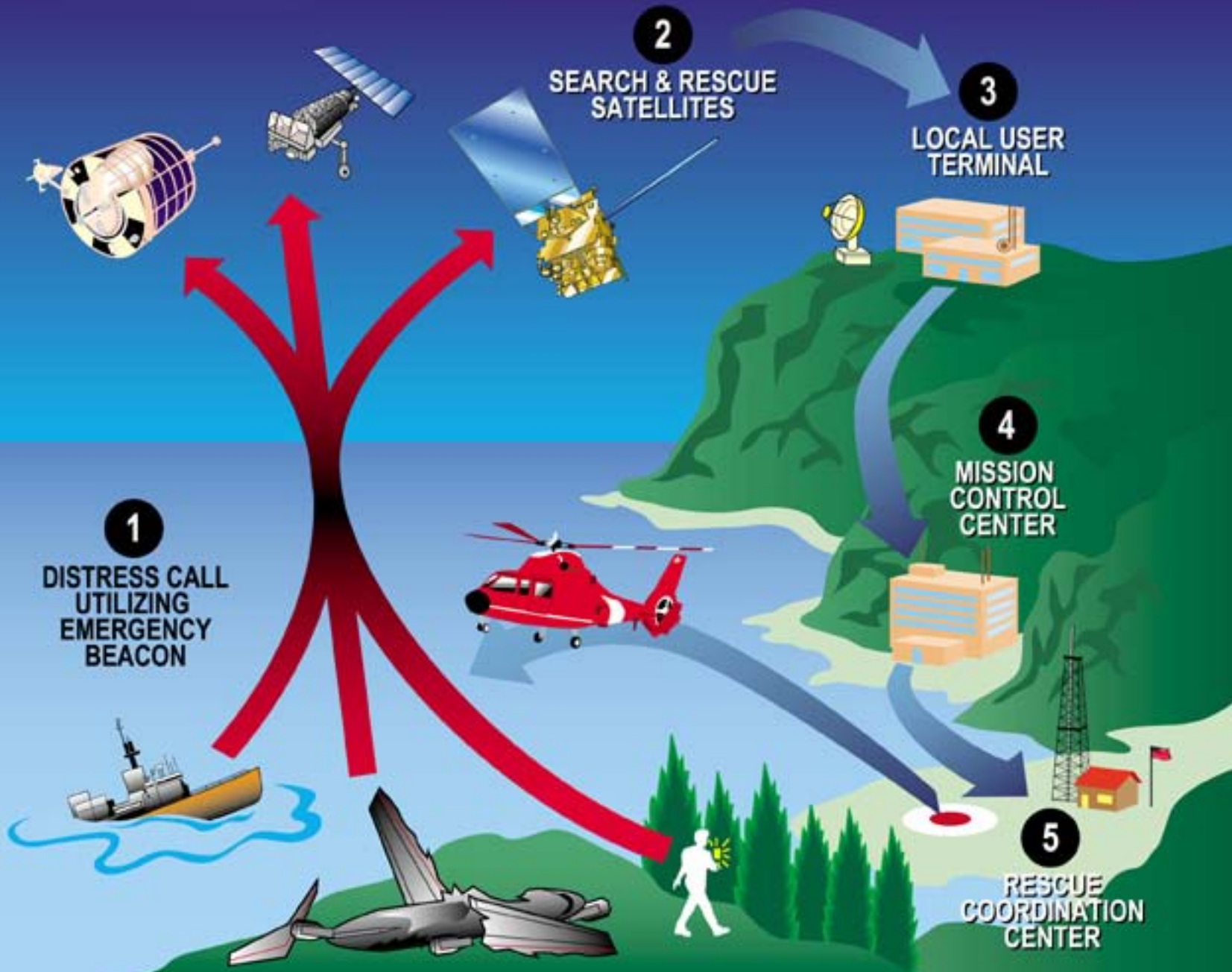
How long. . . ?

- The less info SAR units have about your location, the larger the Search Area.
- The larger the Search Area, the longer the search until you are located.
- The more accurately you communicate position information, the more accurate your flight plan is regarding time and route, and if your 406 MHz ELT registration information is complete and current, the better your chances for a speedy recovery.

How long. . . ?

- ELT searches initially require location processing by Satellites.
- 121.5 MHz beacons can take one hour or more to alert (due to satellite positions).
- These are subject to a high false alarm rate (97%), so confirmation is required before SAR forces are deployed.
- 406 MHz emergency beacons are vastly superior to 121.5 MHz units, and result in a much faster, more accurate response.

COSPAS-SARSAT System Overview



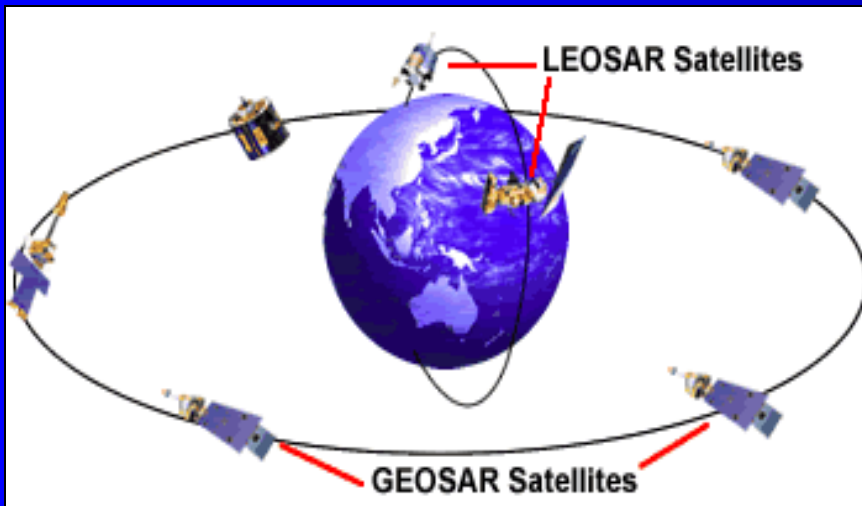
Why You May Need A New ELT.

- “The International Cospas-Sarsat Program will terminate satellite processing of distress signals from 121.5 and 243 MHz emergency beacons on **February 1, 2009**.
- After this date, mariners, aviators and other persons will have to switch to emergency beacons operating at 406 MHz in order to be detected by satellites.”

What's the difference in . . . Coverage?

406 MHz

- Global coverage with Geostationary satellites and MEOSATS



121.5 MHz

- Ground station dependent
- Ground stations have about 1800 mile radius
- Only 1/3 of the globe covered
- Waiting time increases closer to Equator (can be > 2 hrs)
- No immediate alerting capability unless satellite directly over distressed vessel.

What's the difference in . . . False Alarms?

406 MHz

- All alerts from beacons
- 1 in 10 alerts are actual distress
- Beacon registration allows rapid verification
- 80% of false alerts are resolved by phone w/o launching SAR responders

121.5 MHz

- 1 in 8 alerts from beacons
- Non-beacon interferers have included ATM machines, pizza ovens, and stadium scoreboards!
- Less than 2 in 1000 alerts are actual distress
- Analog signal only: no digital ID code to let SARSAT system know signal is from a beacon
- No way to verify alerts

What's the difference in . . . Alerting?

406 MHz

- SAR assets launch on first alert.
- Average 2.5 hrs saved in maritime, 6 hrs in inland.
- Assets on scene earlier
- Vessel/aircraft ID, POC with alerts allows rapid corroboration or stand-down.
- Near instantaneous detection
- 5.0 Watt output

121.5 MHz

- High false alarm rate makes first-alert launch unfeasible.
- Absent independent distress corroboration, RCCs must wait for additional alert info.
- Alerts are anonymous.
- No instantaneous detection.
- 0.1 Watt output

What's the difference in . . . Position Information?

406 MHz

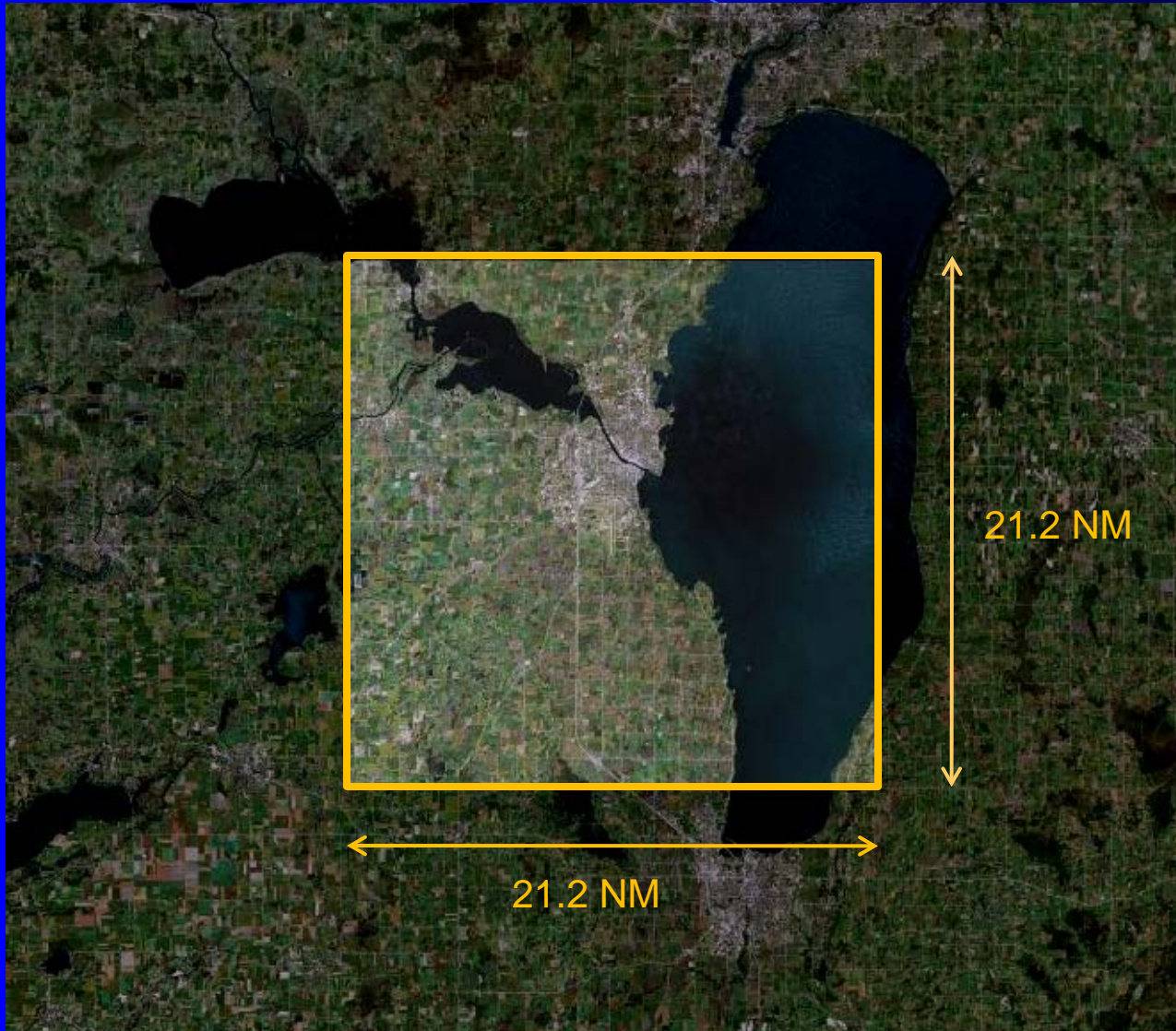
- 1-3 nm accuracy
- 100 yard accuracy with GPS-equipped beacon
- Non-GPS initial search area about 12.5 sq nm
- GPS-equipped beacons reduce search area to a negligible area
- Search area reduced 97% vs 121.5 beacons

121.5 MHz

- 12-16 nm accuracy
- 450 sq nm initial search area on average

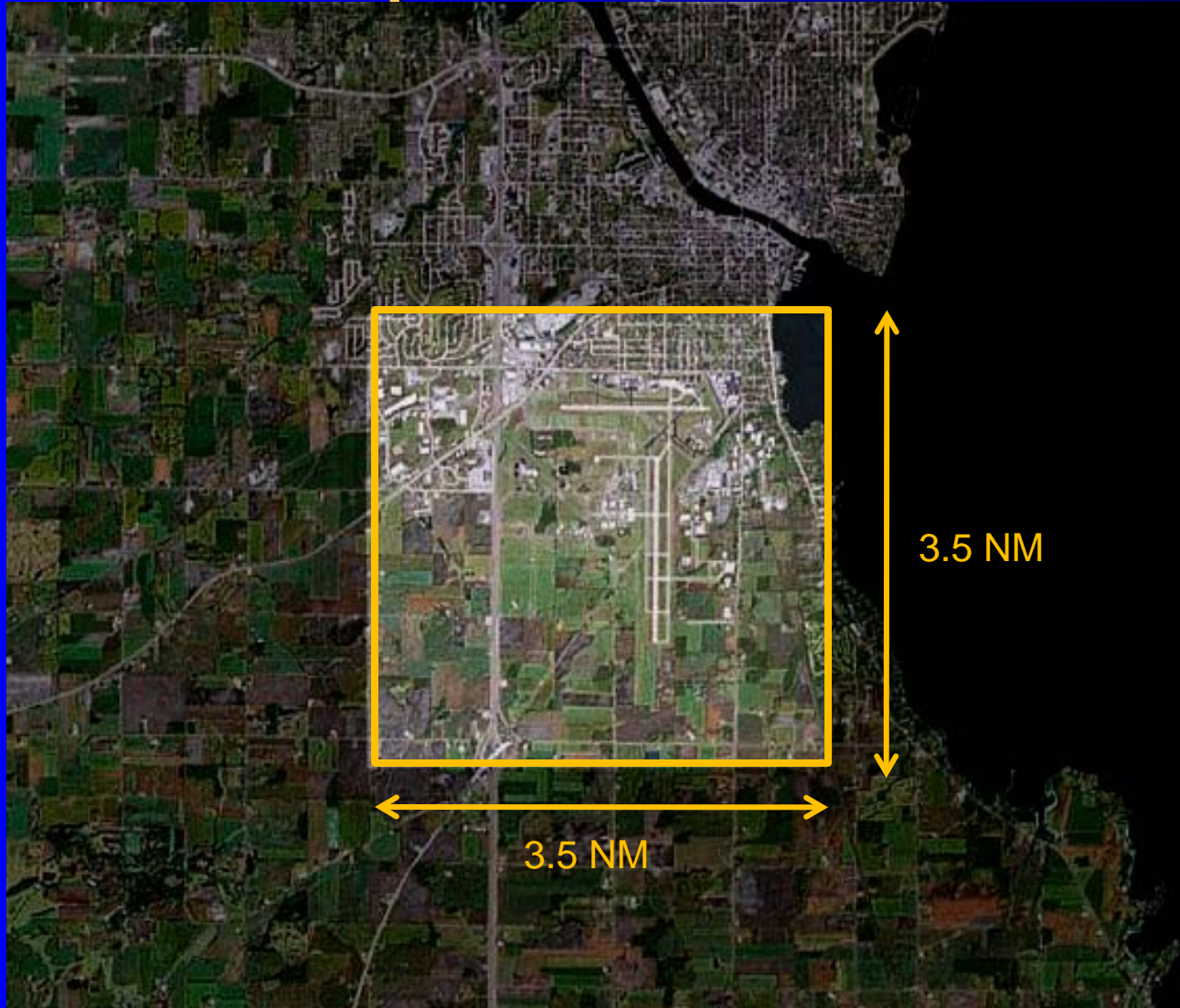
Let's see what that looks like.

121.5 Beacon – 450 Sq Mi Search Area

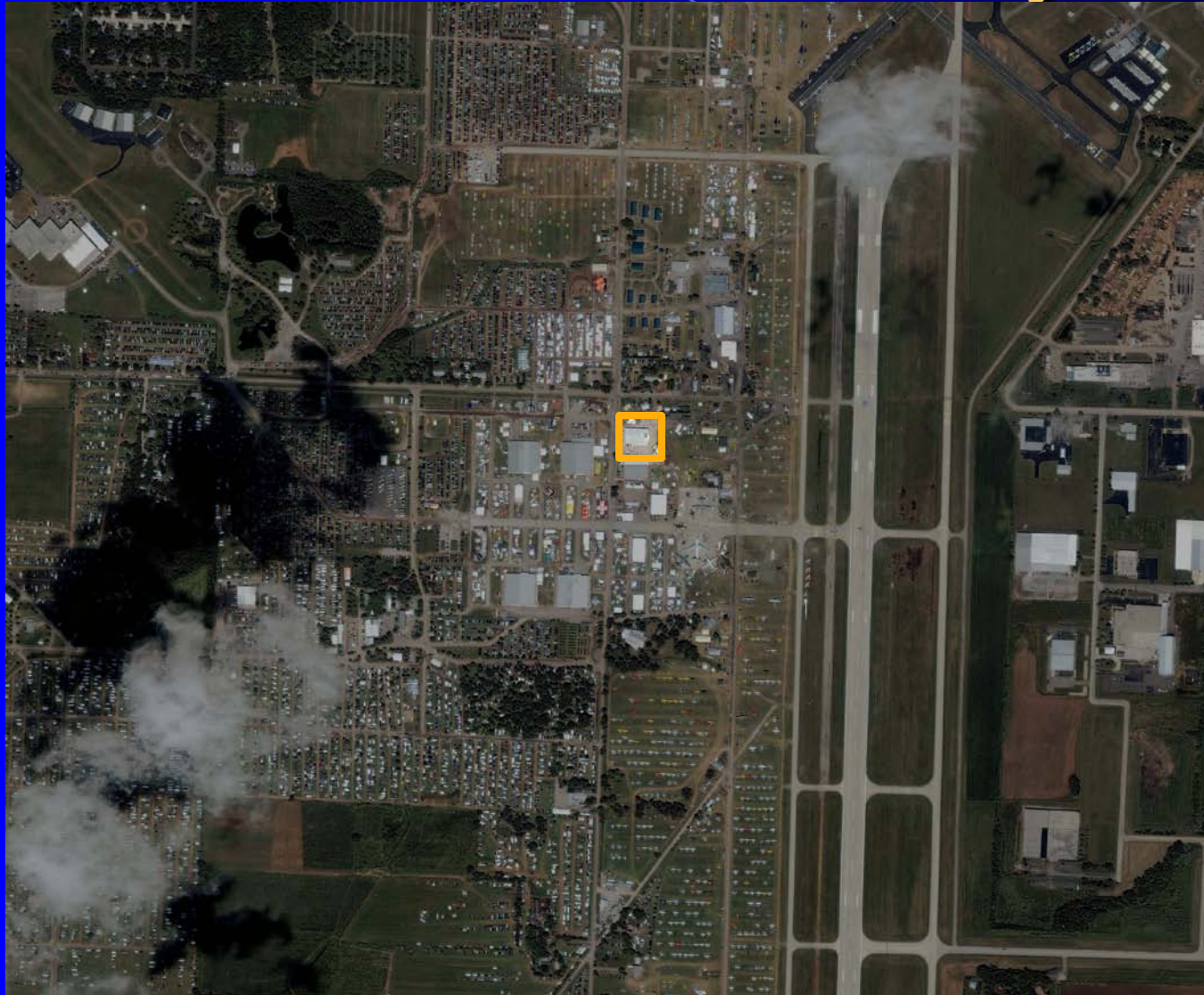


406 Beacon w/o GPS

12.5 Sq MI Search Area



406 Beacon w/ GPS 100 Yard Accuracy



406 Beacon w/ GPS 100 Yard Accuracy



What's the difference in Cost?

406 MHz

- Starting at \$1000
- GPS units \$1500



121.5 MHz

- Starting at \$500



Ask yourself . . .

- What's your life worth? What's your family's life worth?
- If you ever really need it, won't it be worth whatever it cost to have it work?

Other voices . . .

- “It is important to note that after 2009, existing 121.5-MHz ELTs, although still legal from the FAA's perspective, will provide extremely limited assistance if an aircraft crashes, especially in a remote location.” - - - AOPA Regulatory Brief



Other voices . . .

- “134 extra lives and millions of dollars in SAR resources could be saved per year if aircraft switched to 406 MHz ELTs.”

- - - NASA Goddard Spaceflight Center



Other voices . . .

- “Due to the obvious advantages of 406 MHz beacons and the significant disadvantages of the older 121.5 MHz beacons, . . . all pilots are highly encouraged to consider making the switch to 406!”

- - - US Coast Guard Office of Search and Rescue



So how long. . . ?

- Unless your MAYDAY call was heard . . .
- Unless you have a 406 MHz ELT . . .
- . . . it will likely be several hours before anyone starts looking for you.
- Then, SAR units have to plan a search and be deployed.
- And then, you still have to be found!
- You may have drifted with the wind or waves, enlarging the search area.
- Care to look at those cold water survival times again?

Remember, this is under *good* conditions!

- 60 degree water - survival time 7 hours
- 50 degree water - survival time 2.5 hours
- 40 degree water - survival time 2 hours
- 32 degree water - survival time 1.5 hours
- *This is why getting out of cold water is a big, big deal!*

What are my chances of surviving any of this?

- Very good, IF you are prepared.
- A *ditching* is an intentional water touchdown under control, not an uncontrolled crash.
- Of the 179 ditchings reviewed, only 22, or 12 percent, resulted in fatalities.
- The overall general aviation ditching survival rate is 88 percent.

Now, we go
to work!



Signaling Devices

- Mirror
- Flares
- Whistle
- ELT (or PLB can be carried as extra equipment)
- Dye - SeeRescue Device
- Chemical Light Sticks
- Strobe
- Cell Phone or Aviation Handheld Radio
if in waterproof bag

Where is the person ?



Where's the person?



Signaling Gear

Be Seen to Be Rescued



SeeRescue® Streamer

Replaces dye markers

Doesn't disperse in strong winds or currents

Very conspicuous from the air

Signaling Gear - ELT

Emergency Locator Transmitter

- Most U.S. civil aircraft are required to carry ELTs by congressional mandate.
- 406 MHz ELTs are required to be registered. This registration is free and can be done on line at <http://www.beaconregistration.noaa.gov/>

ELTs should only be tested according to the manufacturers instructions.



Signaling Gear - PLB



Personal Locator Beacon

Optional distress alerting satellite beacon.

- Like a “personal” ELT except that it must be manually activated.
- PLBs operate on 406 MHz.
- Some include GPS.
- About the size of a cell phone.

If you don't get a new ELT, at least get one of these!

Signaling Gear



Signal Mirror and Whistle – Two very basic, very inexpensive and very effective signaling devices, which could save your life.

Signaling Gear



Strobe lights – Inexpensive and essential for recovery at night.

Survival Gear Pouch



A pouch like this can be used to carry essential signaling and survival gear, when attached to PFDs without built in equipment pouches.

Have a plan!

- Actors and athletes practice over and over to get their actions correct.
- Isn't survival more important than a show or a game?
- Plan, and practice the plan.
- Don't let an emergency be the first time you practice survival skills.
- You practice flying. Practice surviving.

Practice your Plan

- Make Ditching / Egress procedures part of every pre-flight briefing.
- **Include:**
- Emergency calls
- Ditching procedures
- Brace Positions
- Removal of restraints
- Egress procedures
- Survival equipment

Pilot / Crew Egress Exercise

- Make radio calls
- Secure 'stuff' in the cockpit
- Tighten restraints
- Don't inflate PFD yet
- Who opens doors
- Door opening procedure
- How to jam doors open
- How to move the seats
- What is the alternate egress path
- Brace positions
- Who takes out the raft / signaling gear
- Bring hats, coats, wear shoes
- Order of egress
- What to do after egress
- How to inflate PFD / Raft
- Where to meet
- Who does head count
- Tie rafts together

Practice your Plan

- While practicing egress, check position of flaps vs. doors. In some high wing planes lowered flaps block the doors.
- Add to survival equipment –
 - **Orange** stocking (watch) cap- keeps head warm, increases visibility.
 - Large Industrial Strength Trash Bags – can provide thermal protection if worn in water.
- Practice estimating swells and wind speed by observing the water surface.
- Practice Soft Field Landings.

Plan to avoid mishaps!

- Safety isn't an event, it's an attitude!
- Avoid long flights over water if you aren't properly equipped.
- Check your aircraft, check your survival equipment, check your planning, check yourself.
- Check your fuel quality, fuel quantity, and know how to use all of the fuel you carry.
- Check the weather, then check the fuel again. One more time, check the fuel.

Plan your Flight, Fly your Plan!

- No one plans to have a mishap.
- But lots of mishaps occur from lack of proper planning.
- The best way to avoid using Water Survival skills is to plan to avoid a mishap.
- But plan to use those skills in the event of an un-planned event.
- Even the best of plans can go awry.
- Plan on it happening to you!
- See a pattern here?

Let's not meet by accident!

