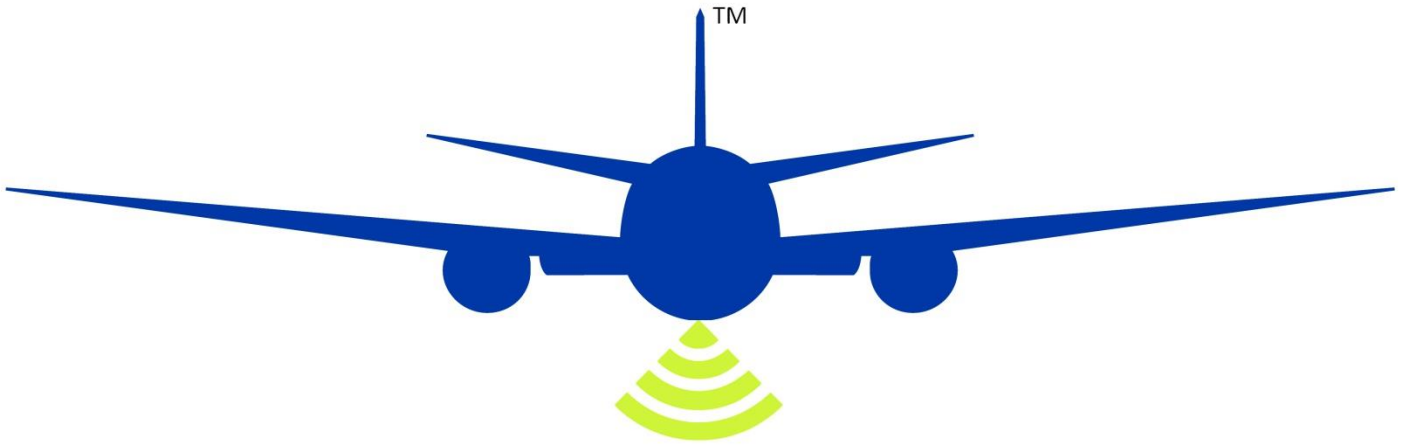

InFlight Labs, LLC

InFlight Labs is an Aerospace Research and Development Company Established shortly after Air France 447…

InFlight Labs, LLC

Lessons Learned from the Development of:

“Smart Avionics for Distressed Commercial Aircraft”...

REASONS FOR ELT FAILURE	# OF ELT FAILURES
1. Insufficient G's	245
* 2. Improper installation	12
* 3. Battery dead	42
* 4. Battery corroded	2
* 5. Battery installation incorrect	3
* 6. Incorrect battery	4
7. Fire damage	280
8. Impact damage	356
9. Antenna broken/disconnected	180
10. Water submersion	62
*11. Unit not armed	70
12. Shielded by wreckage	17
13. Shielded by terrain	9
14. Internal failure	14
15. Signal direction altered by terrain	4
*16. Packing device still installed	3
*17. Remote switch off	16
Total:	1319

InFlight Triggering Eliminates 93% of the problems in Existing ELT activation…

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Smart ELT™ Activates “During Flight and Prior to Impact”

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Advantage Business Media

WDD WIRELESS DESIGN & DEVELOPMENT®

THE RF & MICROWAVE RESOURCE FOR THE OEM DESIGN ENGINEER

Emergency Locator Transmitters

Emergency Locator Transmitters

Honeywell Aerospace introduces an improved line of distress radio beacons to aid the search for fallen aircraft.

» By Tony Paese, WDD Staff

Since 1948, 83 aircraft have been reported as officially missing worldwide, and almost all of them (77) have not been found to this day.[1] This includes the recent Malaysian Airline Flight 370, which an extended multi-national effort has yet to recover.

According to the official website of Cospas-Sarsat (Montreal, Canada), the organization responsible for monitoring specific frequencies and alerting national authorities when they receive a distress signal, more than 600 people were rescued from situations in which distress radio beacons were activated in 2012. Events requiring Cospas-Sarsat assistance were split with 30 percent coming from land vehicles, 48 percent from ships, and 22 percent from planes.[2]

Distress radio beacons used specifically in aircraft to communicate with the Cospas-Sarsat system are called emergency locator transmitters (ELTs). An ELT, as defined by the International Civil Aviation Organization (ICAO), is "equipment which broadcasts distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated."[3]

Since the inception of the system in the 1970s, ELTs have encountered criticism from investigation agencies and the aviation community. Modern equipment is imperfect, activating in only 40 percent of accidents[3], but great advancements have recently been made to improve performance.

MESSAGE MISSION CONTROL

When a plane, ship, or individual activates a distress radio beacon, the signal is sent to LEOSAR (low-altitude orbiting) and GEOSAR (geostationary) Cospas-Sarsat satellites, which relay the message to mission control centers and then to the appropriate national authorities who can deploy search and rescue teams. The goal is to provide coverage for transportation across the entire globe.

According to Cospas-Sarsat, the GEOSAR system "constantly covers the entire Earth except the high-latitude (e.g., polar) regions," but "it cannot locate the beacon unless the location is encoded in the beacon's message from a local navigation receiver." The LEOSAR satellites, on the other hand, are able to locate using Doppler processing techniques, but can only cover a portion of the Earth's surface at any given moment.[4]

To combine the advantages of both systems without the inherent limitations, Cospas-Sarsat is in the process of adding search-and-rescue receivers to new American, Russian, and European GPS satellites, which will complement both the LEOSAR and GEOSAR systems for full coverage worldwide.[4]

To signal the Cospas-Sarsat system, aircraft must be equipped with an ELT. To aid in the location and rescue of aircraft that go down, including those that hit water, Honeywell Aerospace (Phoenix, AZ) has developed the RESCU 406 series. Each RESCU 406 beacon is designed to emit a signal in the event of a crash, with several options to prepare for a variety of situations depending on the type of flight.

ACTIVATION

ELT devices can be activated automatically when the crash occurs or manually by a person. Honeywell's RESCU 406 series of ELTs offers both types of activation.

The AFN2, an automatic fixed model, is wired into the plane itself. It is triggered on impact using either an internal single- or six-axis G-switch, and includes a GPS interface, which uses the aircraft's navigation data bus to transmit location data.

"The AFN2 is half the size of its predecessor AFN and [we] integrated the navigation aircraft identification function inside the AFN2," says Scott Miller, product line director at Honeywell Aerospace, referring to the aircraft identification module (AIM) which simplifies transmission from one aircraft to another by automatically reprogramming the AFN2 unit to broadcast the necessary ID information.

Another model, the AP (automatic portable), can be seen as "a simple alternative to the AFN2," according to Miller. The AP is also triggered on impact, but differs in that it includes an internal GPS receiver so that survivors can remove it from its mounting bracket and continue to broadcast their exact location.

The Rescu 406 AP and AFN2 are roughly the size and shape of car batteries, and colored bright orange. Their battery life is ten or more years, and they can operate for 120 hours within a temperature range of -20° to +55°C. A third model, the SE2, was designed to activate when submerged in water as well as manually, but is being shelved in favor of a smaller, lighter version (with added GPS capability) currently in development.

"ELTs are manufactured by many different competitors," says Miller, "Our challenge is staying on top of what is being offered in the market for size, functionality, and human factors."

TRANSMISSION

ELTs were originally transmitted at a 121.5 MHz, a frequency that eventually became overcrowded with non-emergency transmissions and false alarms. In 2009, Cospas-Sarsat announced they would stop monitoring the frequency and begin monitoring at 406 MHz instead, which has made the program more efficient.

According to a comparison by the National Oceanic and Atmospheric Administration (NOAA) and Cospas-Sarsat, at 121.5 MHz "fewer than two in 1,000 alerts and two in 100 composite alerts are actual distress," with 80 percent of signals coming from sources other than emergency beacons, "including ATM machines, pizza ovens, and stadium scoreboards." Meanwhile about one in 12 signal actual distress at the 406 MHz frequency.[5] This saves rescue teams from wasting time and resources and makes confirming real distress calls much easier. The 406 MHz frequency, because it is utilized by newer equipment, also comes with superior position accuracy reporting, aircraft identification, and speed.

Another problem that can occur is the accidental activation of an ELT in a non-emergency situation.

"Nuisance alerts are the number one complaint about ELTs," says Miller. "Honeywell uses metal straps to mount the ELT, which basically eliminates nuisance alerts." Secure mounting ensures that the beacon will not be activated until a force of 5Gs or more acts upon it.

The biggest issue facing engineers is the 60 percent failure rate for automatic ELTs. There are many reasons for failure. A white paper by Honeywell lists the following reasons for failute: incorrect installation, flat batteries, lack of water proofing or fire protection, damage to the antenna, or an aircraft coming to rest inverted after impact.[3]

One innovation currently being incorporated into aircraft around the world will help to keep tabs on planes in advance of a crash. According to the FAA, automatic dependent surveillance-broadcast, or ADS-B, is recent technology that will allow aircraft to continuously broadcast their location, ID, speed, course, and altitude during flight. The data is transmitted to nearby aircraft and to ground stations, giving authorities important information before an emergency signal is activated.[6]

At this point in time, almost all civil aircraft are required to have ELTs installed before flight. Despite the shortcomings of early emergency radio beacon technology, today's system is a vastly refined design compared to what it was even a few years ago, and that it will continue to be improved upon in days to come. **WDD**

Honeywell emergency locator transmitters. Photo Credit: Honeywell Aerospace

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October 2014

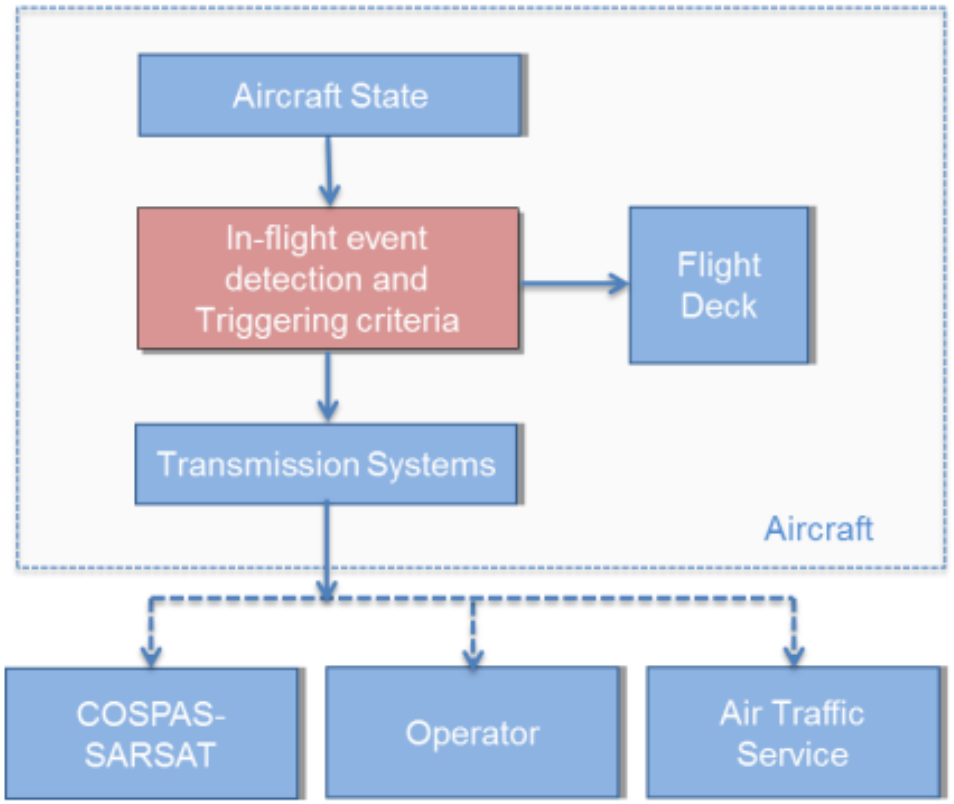
"The biggest issue facing engineers is the 60 percent failure rate for automatic ELTs."

Malaysia Airlines 370

MASPS

Minimum Aviation System Performance Specification

- ✓ **Criteria**
  - Unusual Altitude
  - Unusual Speed: low, high, vert.
  - Excessive Accelerations
  - Control Command Inputs
  - Ground Proximity
  - Excessive Pitch , Roll
  - Stall ……
- ✓ **Guidance**
  - Basic Limits
  - Persistence Time
  - Cancellation
  - Test Procedures




Smart ELT™
Autonomous Distress Tracking System™

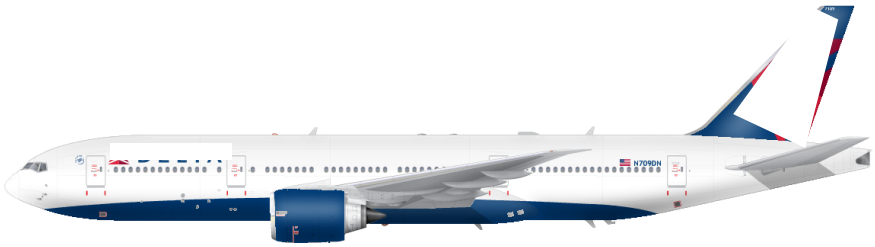
Converts a “Legacy ELT” to an ED-237 compliant device…

24-Hour Transmitting Autonomous Power Supply

InFlight Labs, LLC

SmartELT™

Autonomous Distress Tracking System™



InFlight Labs, LLC

Smart ELT™

Autonomous Distress Tracking System™

It takes a few minutes to converts any “Existing ELT” to an ED-237 compliant device…

One Product Works for all Legacy ELT’s

Smart ELT™

Smart ELT™ is an independent, self-powered "plug and play" add-on to an existing ELT configuration or can be merged into a New ELT design...

Product Simulation

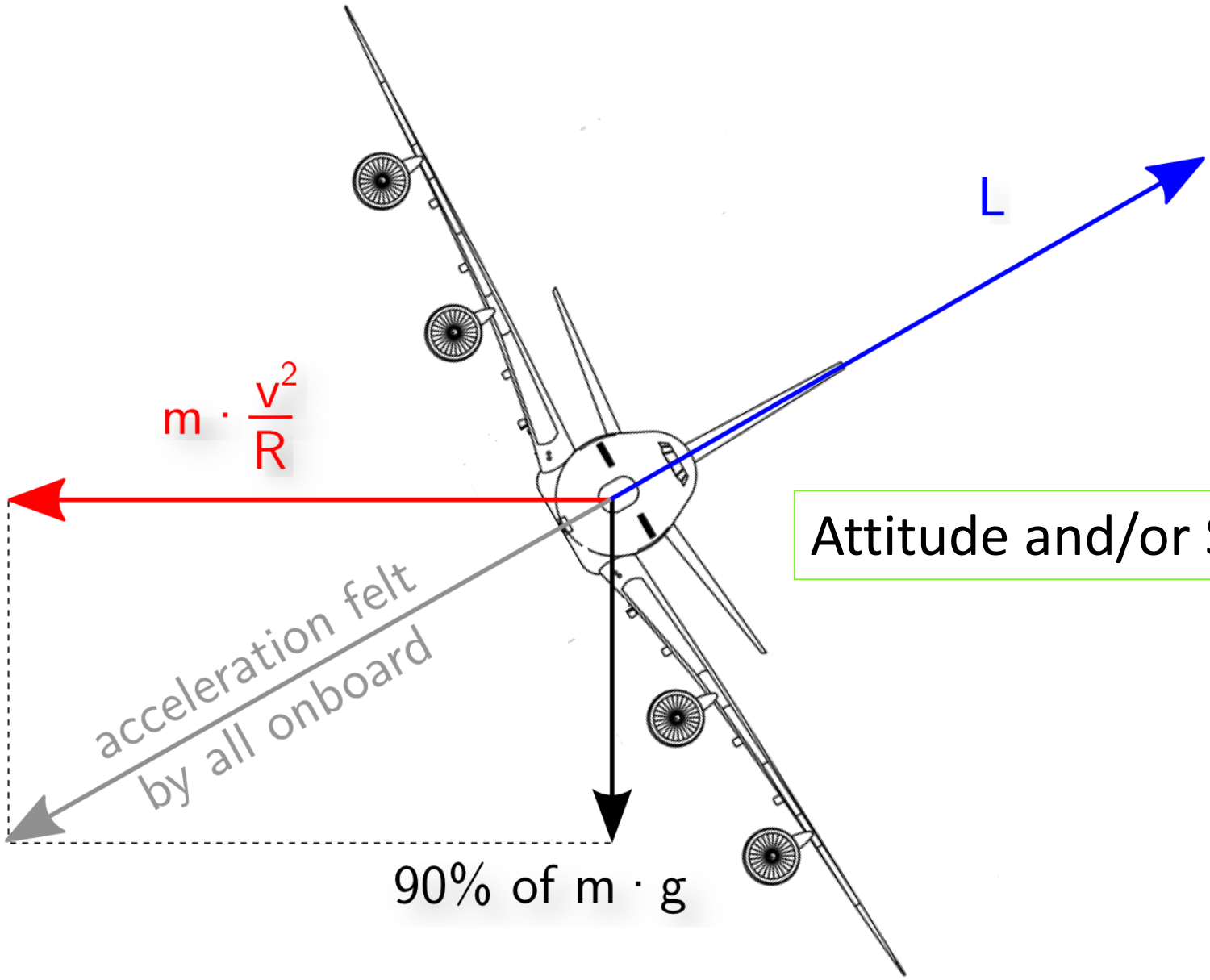
Integration through the Existing Wire Configuration

Smart ELT™

Smart ELT™ InFlight ELT Activation System is triggered:

Product Simulation

When **Smart ELT™** Detects an Avionics Anomaly...



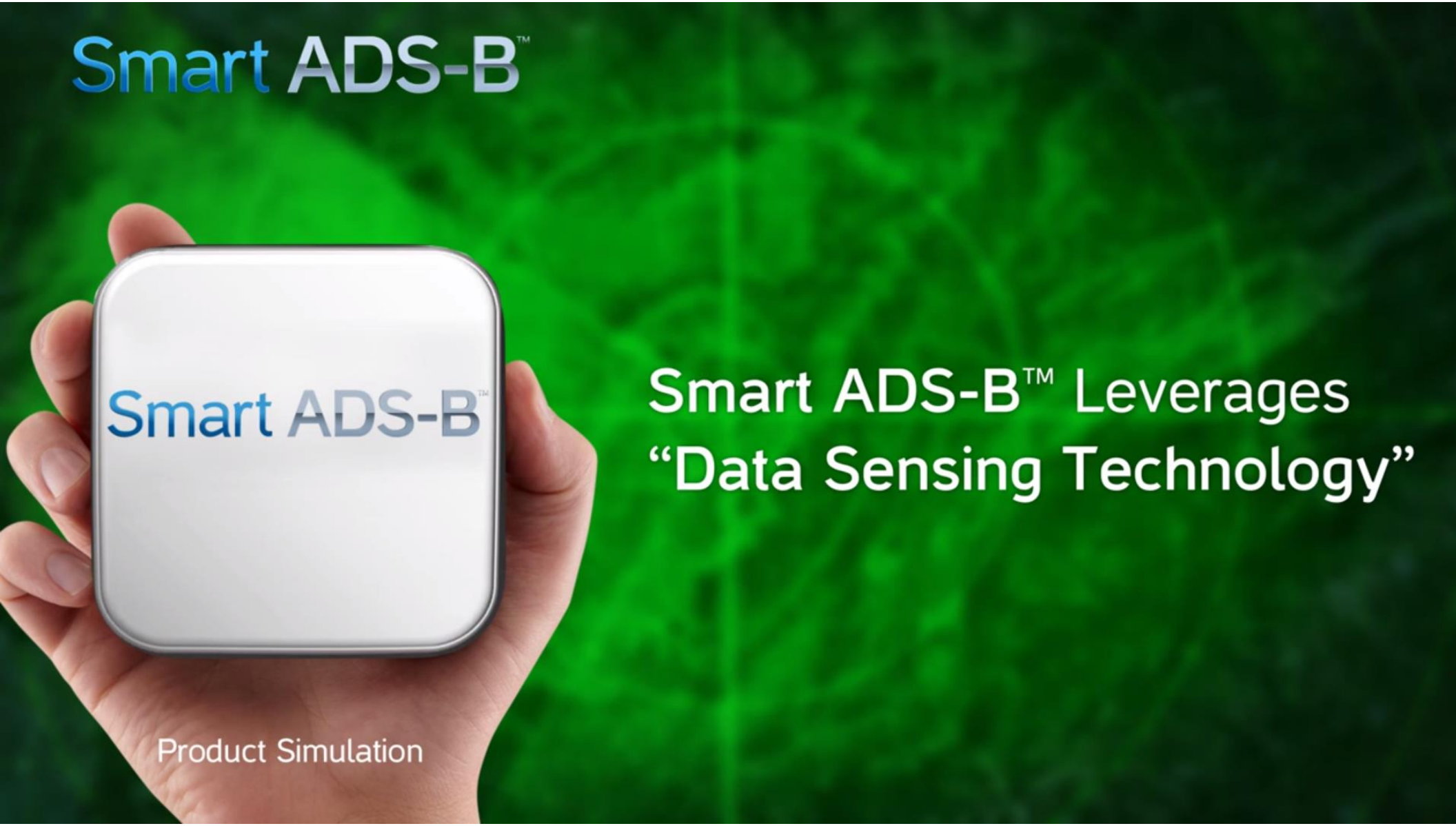
Attitude and/or Speed

When **Smart ELT™** Detects an Attitude Parameter Breach...

When Smart ELT™ Detects a Data Sensing Breach...

InFlight Labs, LLC

When **Smart ELT™** Detects a Power Sensing Breach...


Smart ADS-B™
Smart ADS-B™
Smart ADS-B™ Leverages
“Data Sensing Technology”
Product Simulation

If the Aircraft, ADS-B or Transponders' Power is Disrupted During Flight...

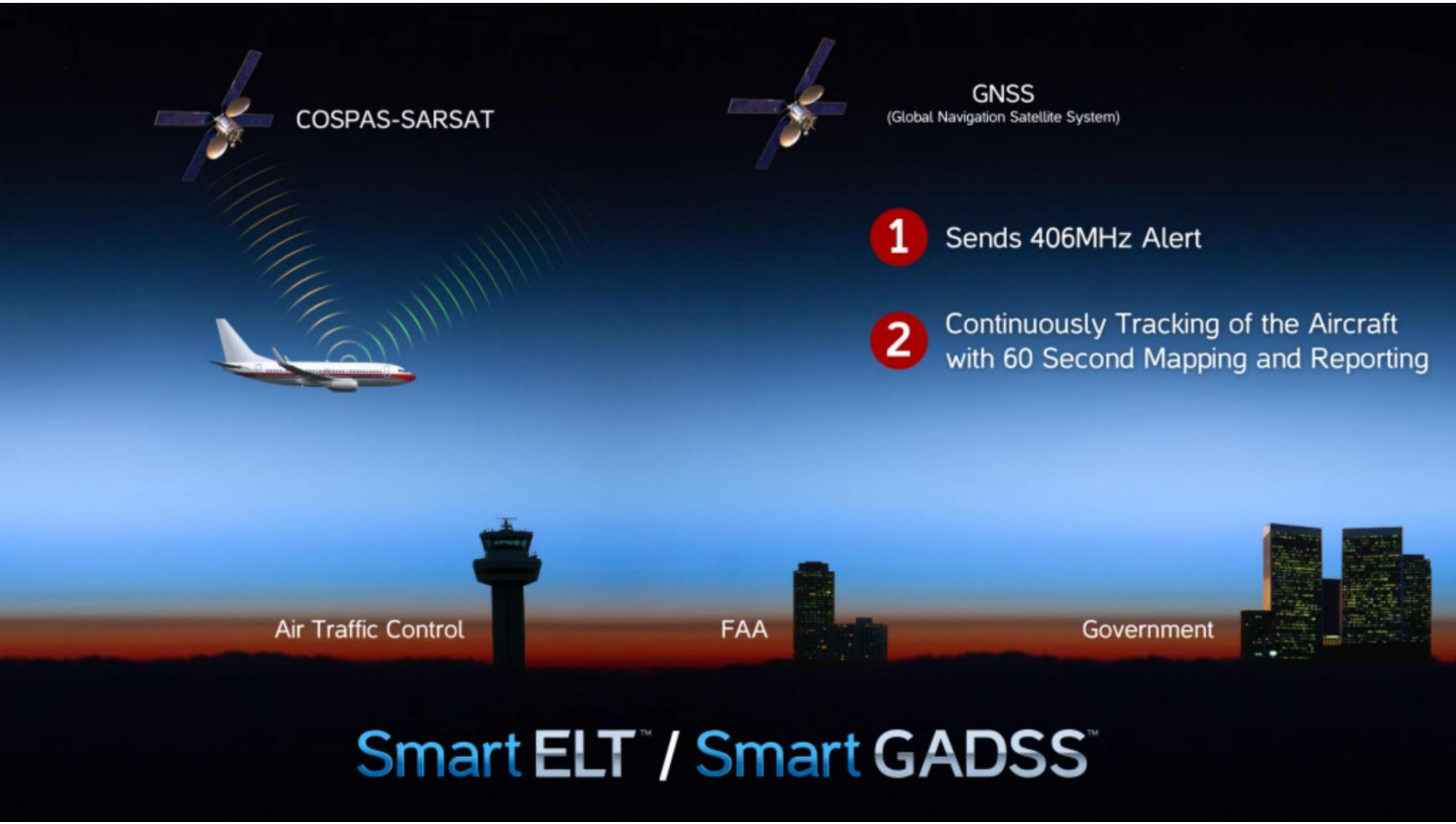
Key Avionics Become Tamper-proof…


If Power Management is Interrupted to the existing ADS-B / Transponder; Smart ELT™ will Automatically be Deployed... and Advanced Warning System Broadcast Message is sent to Authorities...
Smart Transponder™
Smart ADS-B™
Smart ELT™

ICAO

- ✓ **ICAO made a presentation giving a preview of a Letter to the States regarding Global Aeronautical Distress Safety System (GADSS).**
- ✓ **The letter will outline the requirements for implementing GADSS normal and distress tracking with a mandate targeted at 2021**
  - The GADSS implementation is technology agnostic. Any combination of technologies can be implemented by the Operators (airlines) and ATS (Air Traffic Services).
  - It was specifically mentioned that the GADSS tracking device will be able to take of the place of one of the two ELTs currently required by ICAO.
  - A 2nd Generation beacon can be used to meet the GADSS mandate, and a 1st or 2nd Gen beacon can be used to fulfill the carriage requirements.
  - ICAO Workshop on Normal Tracking will held May 8-9 in Montreal.


Additionally, Smart ELT™ and Smart GADSS™
can be Deployed Independently to work
in Concert with Select Avionics...
Smart ELT™
+
Smart GADSS™


COSPAS-SARSAT
GNSS
(Global Navigation Satellite System)
1
Sends 406MHz Alert
2
Continuously Tracking of the Aircraft
with 60 Second Mapping and Reporting
Air Traffic Control
FAA
Government
Smart ELT™ / Smart GADSS™

Smart ELT™
Smart GADSS™

Product Simulation

Smart ELT™ / Smart GADSS™ can also be REMOTELY activated (or reset) “Over-The-Air”* by ATC...

*Existing Satellite Constellation

Smart ELT™ Smart GADSS™

Real-time Reporting of:

- Smart ELT Status
- Lon/Lat
- GPS Tracking
- Map/Location
- Battery Status

Global Coverage


COSPAS-SARSAT
GNSS
(Global Navigation Satellite System)
✓ ATC Remotely Actives Smart ELT™ / Smart GADSS™ over Secure Aircraft Communications...
✓ Smart ELT™ / Smart GADSS™ Continuously Tracks the Aircraft with 60 Second Reporting...
Air Traffic Control
Smart ELT™ / Smart GADSS™

Smart ELT™
Smart GADSS™

Product Simulation

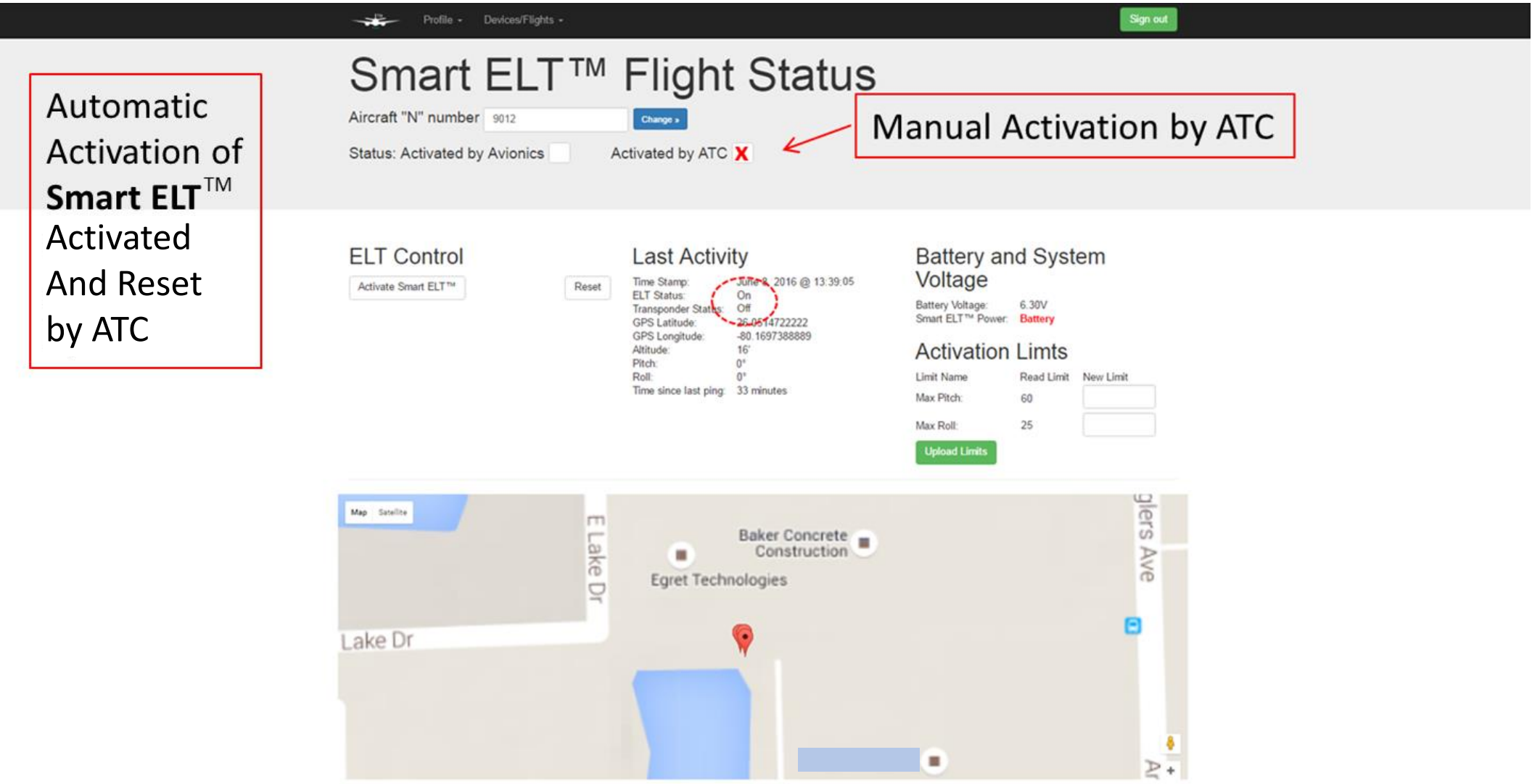
Smart ELT™ / Smart GADSS™ can also be REMOTELY activated (or reset) "Over-The-Air" by ATC when...

- ✓ Aircraft disappears Off of ATC monitoring system or deviates from Flight Plan
- ✓ Aircraft squawks 7700, 7600 or 7500
- ✓ Aircraft "Mayday" Call is received
- ✓ Aircraft stops communicating
- ✓ ATC is Notified by other InFlight Labs Devices

Smart ELT™
Smart GADSS™

- ✓ Activates While Aircraft is In-Flight
- ✓ Activated by Attitude, Avionics, Data or Power Anomaly
- ✓ Activates by Imminent TAWS or EICAS Notifications
- ✓ Real-time ATC Activation or Reset “Over-The-Air”/ Satellite Comm due to Distress Call, Missing Aircraft or Lost Communication
- ✓ Works in concert with existing ELT, Smart ELT™, Smart FDR™ and Smart ADS-B™
- ✓ Self-powered which may be Hardware / Software or Software only
- ✓ May be connected to existing Avionics or InFlight Labs Smart Avionics

Automatic Activation of **Smart ELT**™ Activated And Reset by ATC



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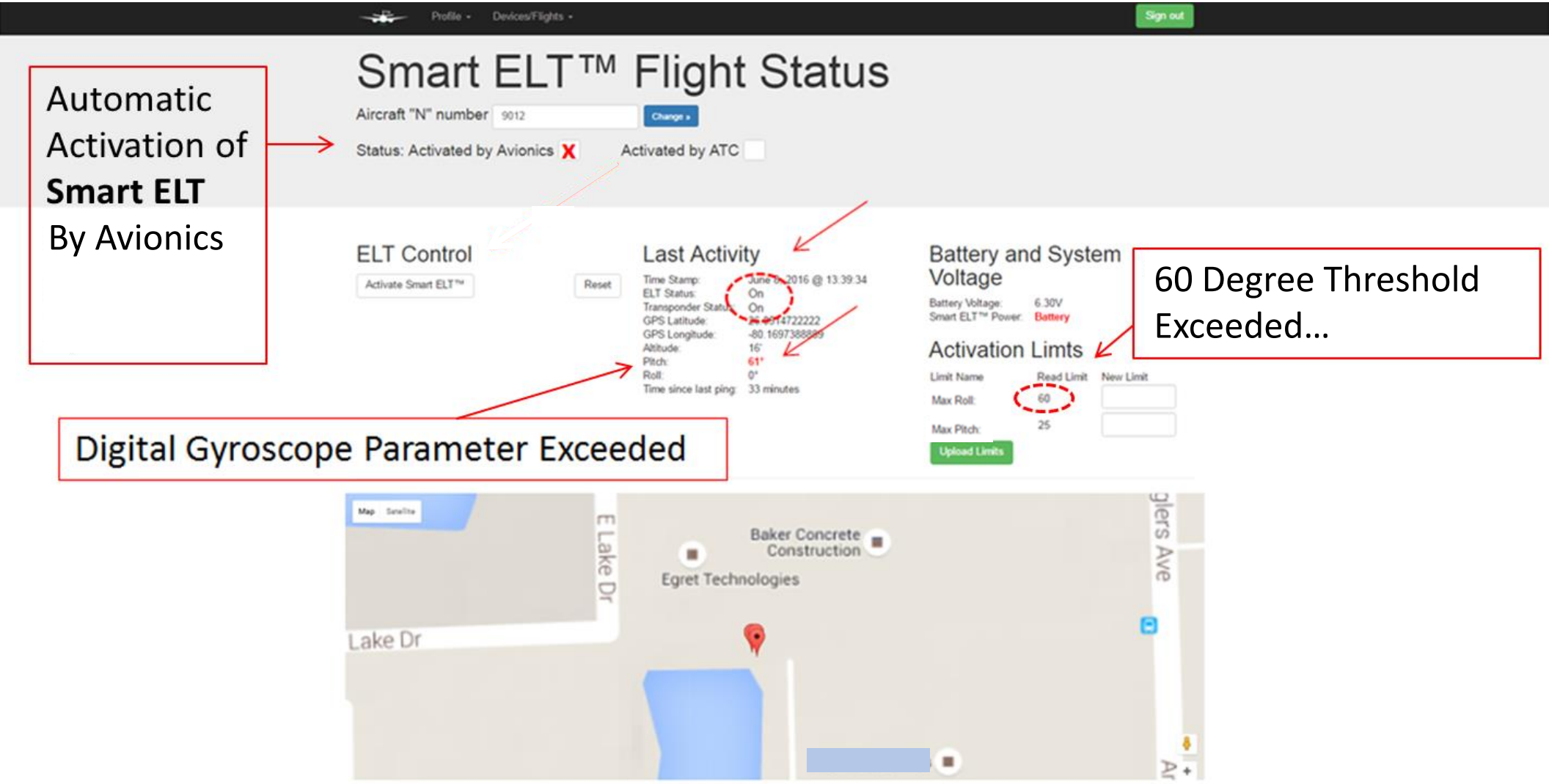

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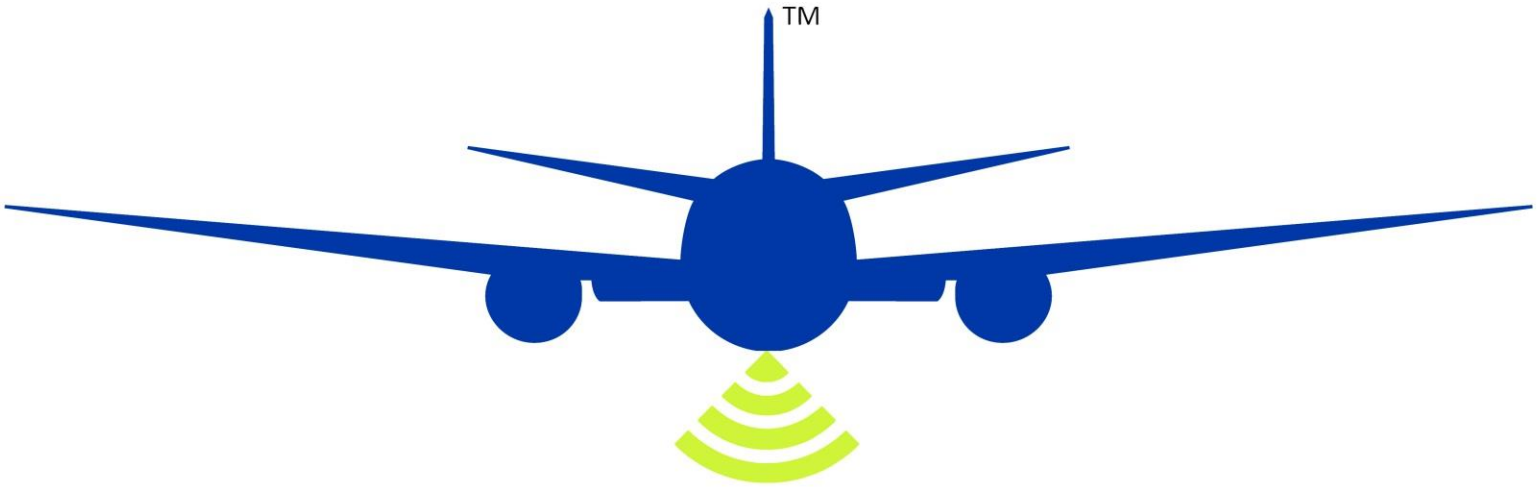


InFlight Labs, LLC

Additional Supporting Content


Distress Aircraft
Being Tracked Real Time By Smart GADSS™...
ULB
GNSS

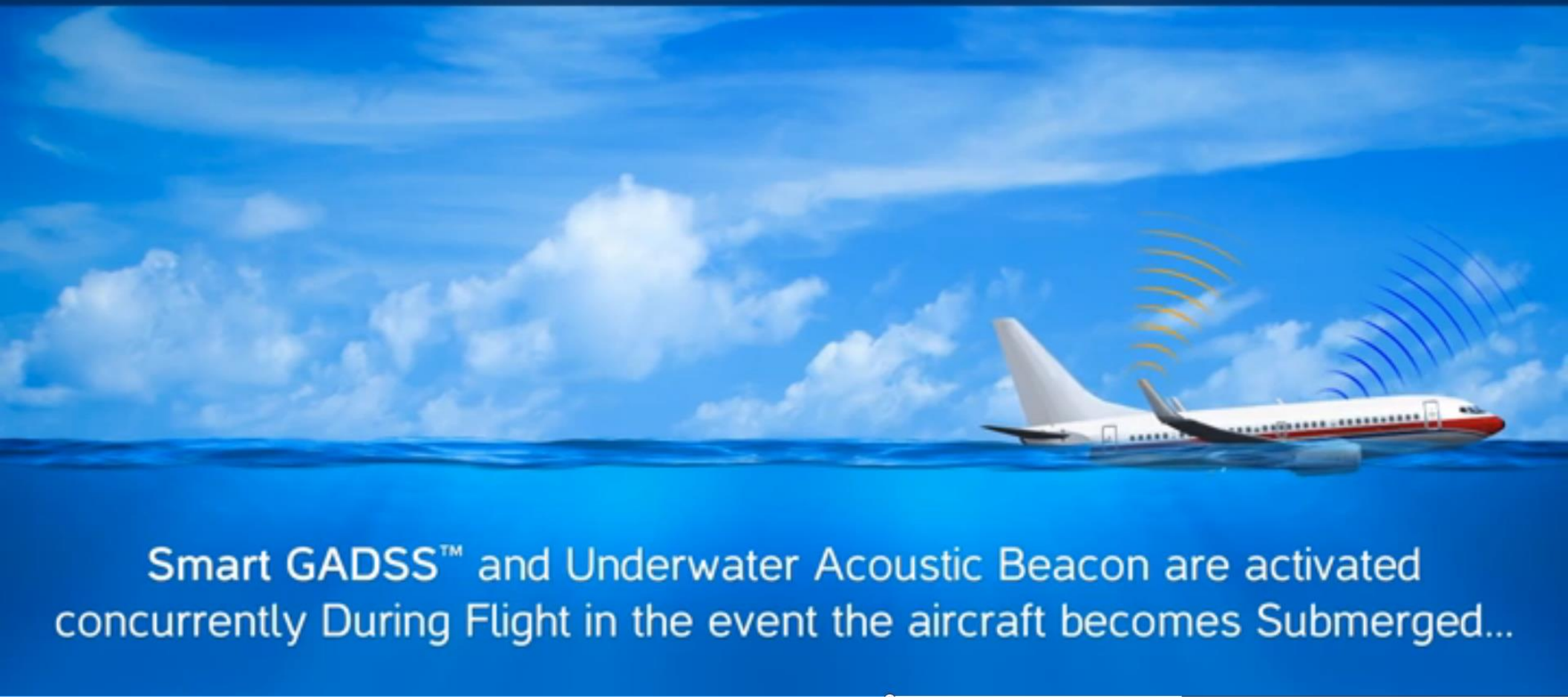
Distress Aircraft

Being Tracked Real Time By Smart GADSS™...

Smart GADSS™ and Underwater Acoustic Beacon are activated concurrently During Flight in the event the aircraft becomes Submerged...

Distress Aircraft

Being Tracked Real Time By Smart GADSS™...



Smart GADSS™ and Underwater Acoustic Beacon are activated concurrently During Flight in the event the aircraft becomes Submerged...

Smart PLB™

Smart EPIRB™

100% Global Coverage

Pro-Active Search and Rescue using PLBs and EPIRBs

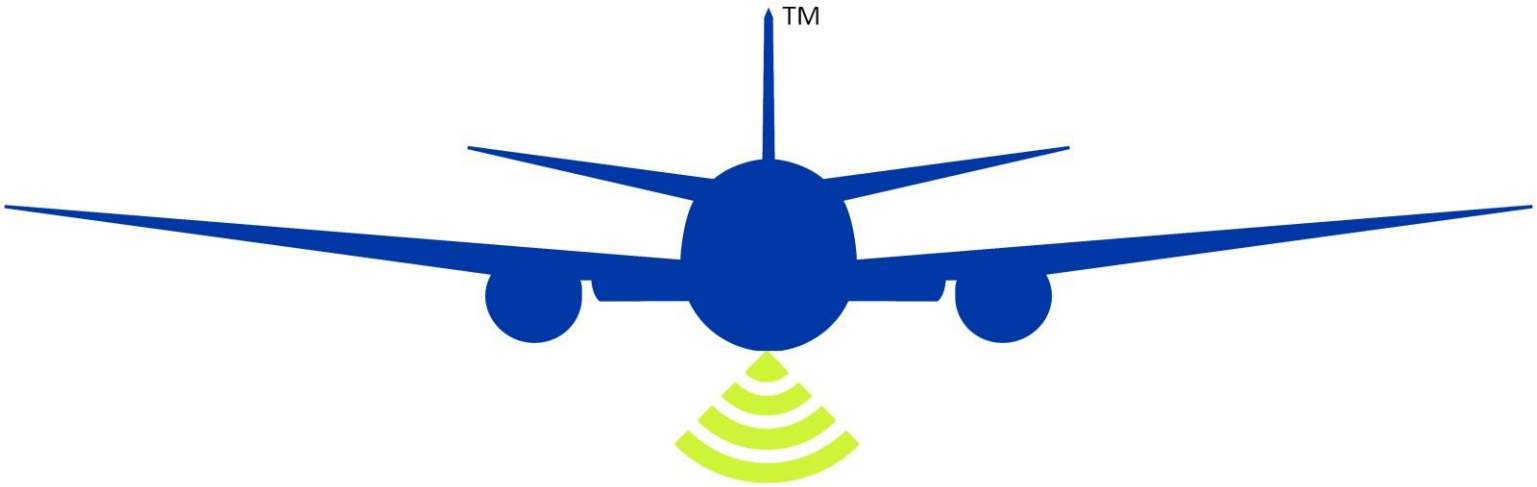
PRO-ACTIVE SEARCH and RESCUE

Smart PLB™

REMOTE ACTIVATION/RESET OF Smart PLB™ ANYWHERE IN THE WORLD…

Smart ADS-B™

Smart ADS-B™ Automatically Deploys when an anomaly is detected...



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