Airbag Deployable Data Recorder for Aircraft

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DESIGN CENTER COLORADO

Background and Motivation

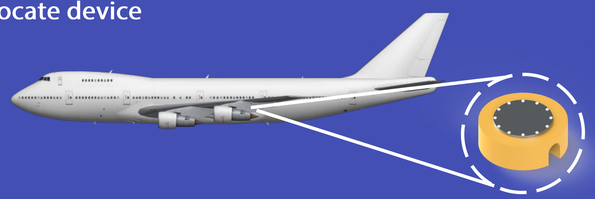
- Malaysia Airlines flight 370 and other related aircraft losses is the driving force for development of ABDDR, which is a flight data recording device
- Reduce the cost and time associated with search and recovery of flight data
- Develop a redundant means of preserving flight data secondary to a Blackbox

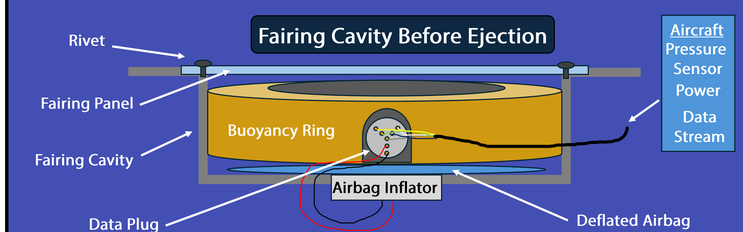
Specifications

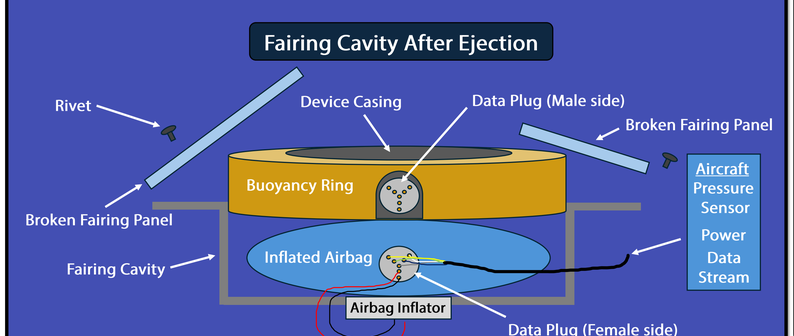
✓	IPX8 waterproof rating
✓	Positive buoyancy at surface
✓	Weight is less than or equal to 17.64 lbs
✓	Casing size 6-8″ OD x 3″ height
✓	Ejection at 9.84ft (3m)
✓	Ejection force less than or equal to 1010 lbf
✓	Battery life greater than or equal to 72 hours

Design Overview

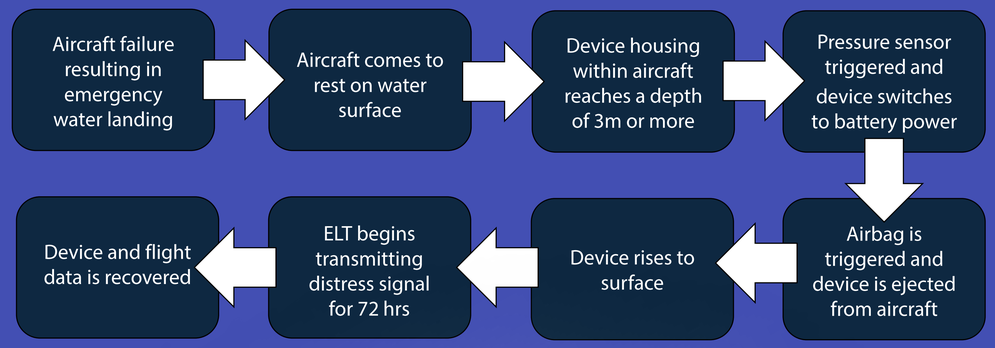
- Flight data recorder similar to a Blackbox
- Connection to flight data stream via magnetic data plug
- Airbag ejects device through fairing panel
- Buoyancy foam enables device to float to surface
- Emergency location transponder (ELT) signal used to locate device



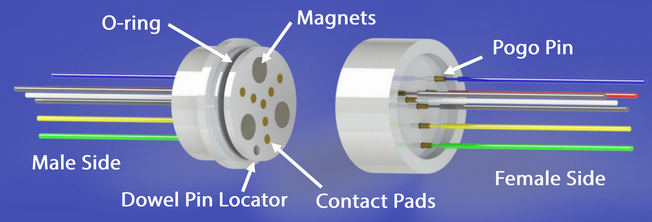




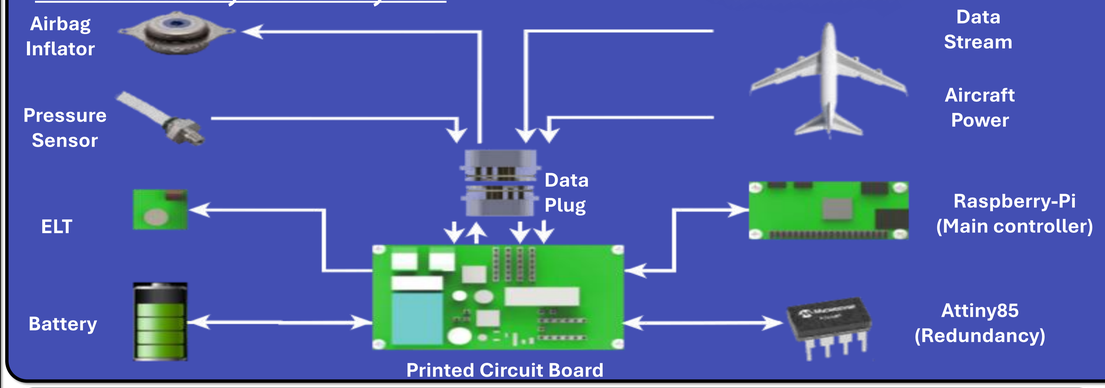
Order of Operations



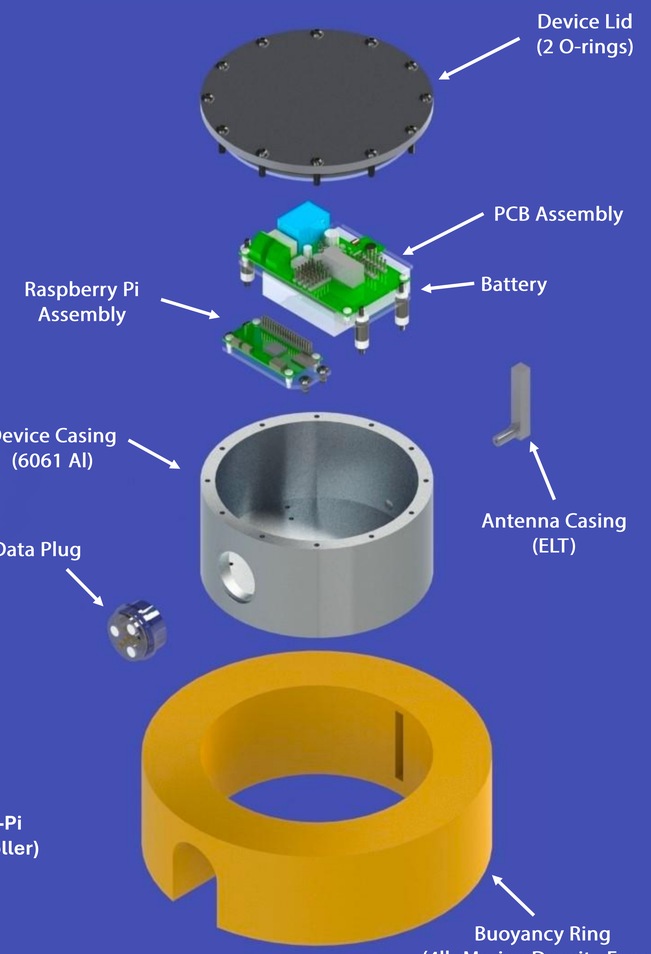
Data Plug



Electronic System Layout



Full Device Exploded View



Testing

Design Testing

Spec	Test	Result
IPX8 waterproof rating	Held at depth of 5 feet for 30 minutes	Leaks through cracks in data plug (IPX7)
Positive buoyancy at surface	Device placed underwater and left to rise to surface for 60 minutes	Device rose to surface with no displacement in depth once at surface

Ejection Testing

Ejection Specs	Test	Result
Airbag ejection	Test frame used to eject device with automotive airbag	Broke ¼” representative panel - casing undamaged
Pressure sensor triggered	Pump used to simulate 3m depth pressure reading	Voltage spike detected at 3m depth
Aircraft to battery power	Switch from power supply to internal battery power	Stable voltage detected when triggered – circuit acts as expected
Constant voltage across electronics	Check voltage at each component	Constant voltage detected across components

Future Work

- Material choice considerations; such as titanium, injection mold foam, and a more robust material for the data plug
- Single use functionality via hermetic sealing
- Refine case and foam shape for improved ejection and orientation
- Custom airbag that only contacts metal case during ejection

Impact

- Multiple units incorporated into aircraft increases chances of recovering flight data
- Timely and cost effective flight data recovery
- Improve aircraft safety by increasing the reliable recovery of flight data in emergency water landings