Automatic Deployable Flight Recorders (ADFRs)

NTSB forum on Emerging Flight Data and Locator Technology on October 7, 2014

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Significant and Mitigating Crashes

AIR DISASTER	FDR RECOVERY	CVR RECOVERY	NOTES
Malaysia Air, MH-370, *Mar 8, 14*	**search underway**	**search underway**	
Asiana Airlines 991, *Jul 28, 11*	**not recovered**	**not recovered**	Crash into Korea Strait
Yemenia Airlines 626, *June 30, 09*	**59 days**	**60 days**	Sole Survivor Rescued
Air France 447 *Jun 1, 09*	**1 year 11 months**	**1 year 11 months 2 days**	Depth of 2.5 miles estm. $50m recovery
Adam Air KI 574 *Jan. 1, 07*	**7 months 27 days**	**7 months 28 days**	
Gol Airlines 190 *Sept. 29, 06*	**3 days**	**26 days**	CVR memory module embedded in 20cm of soil
Armavia Air 967 *May 3, 06*	**20 days**	**19 days**	Depth of approx. 1,640ft
Flash Airlines 504 *Jan. 3, 04*	**14 days**	**15 days**	
American Airlines 11 *Sept. 11, 01*	**not recovered**	**not recovered**	World Trade Center
United Airlines 17 *Sept. 11, 01*	**not recovered**	**not recovered**	
American Airlines 77 *Sept. 11, 01*	**3 days**	**3 days**	CVR damaged
Alaska Air 261 *Jan. 31, 00*	**3 days**	**2 days**	FDR pinger separated
Egypt Air 990 *Oct. 31, 99*	**9 days**	**13 days**	Depth of only 250 ft FDR/CVR pingers separated
Swissair 111 *Sept. 2, 98*	**4 days**	**9 days**	Depth of only 180 ft
Silk Air 185 *Dec. 19, 97*	**5 days**	**20 days**	
TWA 800 *July 17, 98*	**7 days**	**7 days**	
Value Jet 592 *May 11, 96*	**7 days**	**15 days**	Investigator while walking through swap

ICAO adopts new Dual-Combi rule

NTSB Recommendation 2 sets of combination CVR/FDR units

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Automatic Deployable Flight Recorders

Designed to Overcome Challenges of Over-Water and Remote Location Crash Circumstances - Complementary to Fixed Recorder in a Dual-Combi Installation

- Designed to survive a crash differently than a Fixed Black Box System—Seat Belt/Air Bag
- Separates from aircraft up crash impact or at point of mid-air explosion
- Avoids crash impact zone
- Floats on water indefinitely - No Underwater Recovery
- ELT is crash protected inside Deployable unit – Invaluable during catastrophic events
- Sends immediate alert to free, global search and rescue system—COSPAS-SARSAT providing:
    - Aircraft Tail Number,
    - Country of Origin,
    - Location of Aircraft at Separation, and
    - Location of the Deployable Black Box floating on water or on land (invaluable for ETOPS, Polar Routes, Free Flight Incidents (NEXTGEN)
- No perpetual Service Fees Required – Global COSPAS-SARSAT Infrastructure is free
- Preserves the integrity of the investigative process and public trust by keeping tangible, secure data in the hands of the NTSB

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What is a Automatic Deployable Flight Recorder?

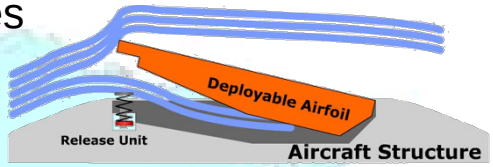
- **Deployable Unit <u>Combines Everything into One Box</u>:**
  - Digital Flight Data Recorder (DFDR) - records last 25 hrs of data
  - Cockpit Voice Recorder (CVR) - records last 2 hours of audio
  - Emergency Locator Transmitter (ELT) - 121.5 & 406 MHz signals
  - All Housed in a Single, Crash Survivable Deployable Beacon Airfoil Unit (BAU)
- **Deployable Systems are Crash Protected:**
  - ED-112A MOPS: *CVR: TSO-C123b / FDR: TSO-C124b / ELT: TSO-C126a - 406 MHz*
  - EASA Notice of Amendment NO. 2013-26: *Includes Deployables*
- **DRS Deployable Recorders:**
  - Approximately 4,000+ Systems delivered
  - Approximately 60+ Million combined flight hours
  - 100% Safe Separation since keeping records in 1967
- **Five Manufacturers of Deployable ELTs and/or Recorders:**
  - Caledonian (ELTs); DRS Technologies (Recorders & ELTs); EADS (Recorders); HR Smith (Recorders & ELTs); and Smiths Aerospace (Recorders)

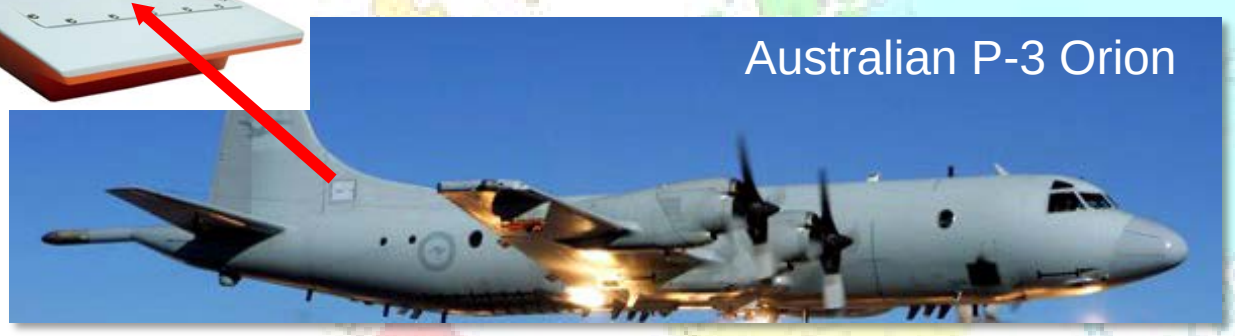
How a Deployable Works – Enables Quick Recovery

Takes the “Search” out of “Search and Rescue”

1. Sensors detect the start of a crash.

2. Deployable releases from aircraft.





3. Deployable lands safely away from crash site on land and in water – floats indefinitely enabling quick recovery.

4. ELT transmits location, ID of aircraft emergency beacon via satellite to SAR authorities.

5. Deployable acts as homing device for rescue crews, essential for accidents over water or in remote locations.

6. SAR personnel recover survivors and Deployable recorder quickly. Enables same day accident analysis.

Value to Air Transport Aviation

- **All of the Data, All of the Time**
  - Rapid Access to tangible FDR/CVR data Regardless of Crash Environment
    - Designed to survive catastrophic crashes over water, land and remote locations
  - Avoids concerns related to:
    - Loss of satellite connectivity (and/or disabling of system)
    - Events that have no warning or event-driven triggers
    - Limits in bandwidth capability (limits in number of parameters or audio capability)
    - Recurring Commercial cost-stream for data-use (telemetry)
- **Immediate Location of Aircraft & Survivors**
  - Crash Protected ELT Transmits COSPAS-SARSAT Alert in Minutes
    - Addresses long-standing problem with ELT survivability and operability
  - GPS Position Encoding Provides Aircraft Identification & Location w/in Meters
    - Having “Hot Start” GPS provides localization of downed aircraft to 100m on first Satellite “Alert”
    - Removes any ambiguity that an ELT “Hit” is a false alarm
  - Deployable Floats Providing Vital Drift Data to Assist SAR in Finding A/C Underwater
  - Directs SAR Operations to Save Passengers and Recover Recorder – Yemenia Air
  - Second Gen ELTs with Return Link Service “RLS” will provide Messaging Capability / Remote Control of ELT Duty-Cycle
- **Complimentary to Fixed Recorders in Dual-Combi Installation**
  - Using both types of recorders optimizes potential for full recovery of flight data
- **National Safety Boards Maintain Control of All Data**
  - Deployables are a tangible black box that will be controlled by NTSB or investigative team in charge
  - Eliminates concerns about manipulation of information / security breaches by 3rd Parties
  - Ensures security of data / integrity of investigative process paramount to maintain public trust
  - Mitigates issues related to Civil Liberties / Privacy concerns by Pilots and Crew