

# Tightening the Safety Net in a Multi-Dimensional Flight Test Organization

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Airbus Experimental Test Pilot

# Toulouse, 30 June 1994, A330 F-WWKH



- TOGA Thrust, 42% cg, 2.2 units nose up trim, alt capture set at 2000'
  - AP engaged, Eng 1 cut, hydraulics cut with CB.
  - AP captures 2000' and increases pitch attitude to 32 degrees
  - Airspeed decreases to 100 knots, 18 knots below Vmca
- 
- **7 Fatalities**

# Airbus Flight Multi-Dimensional and Multi-National

- 5 Significantly different aircraft types



- 4 Widely separated flight test sites: Toulouse, Hamburg, Seville, Tianjin
- 7 Nationalities among the Pilot/FTE/TFE group



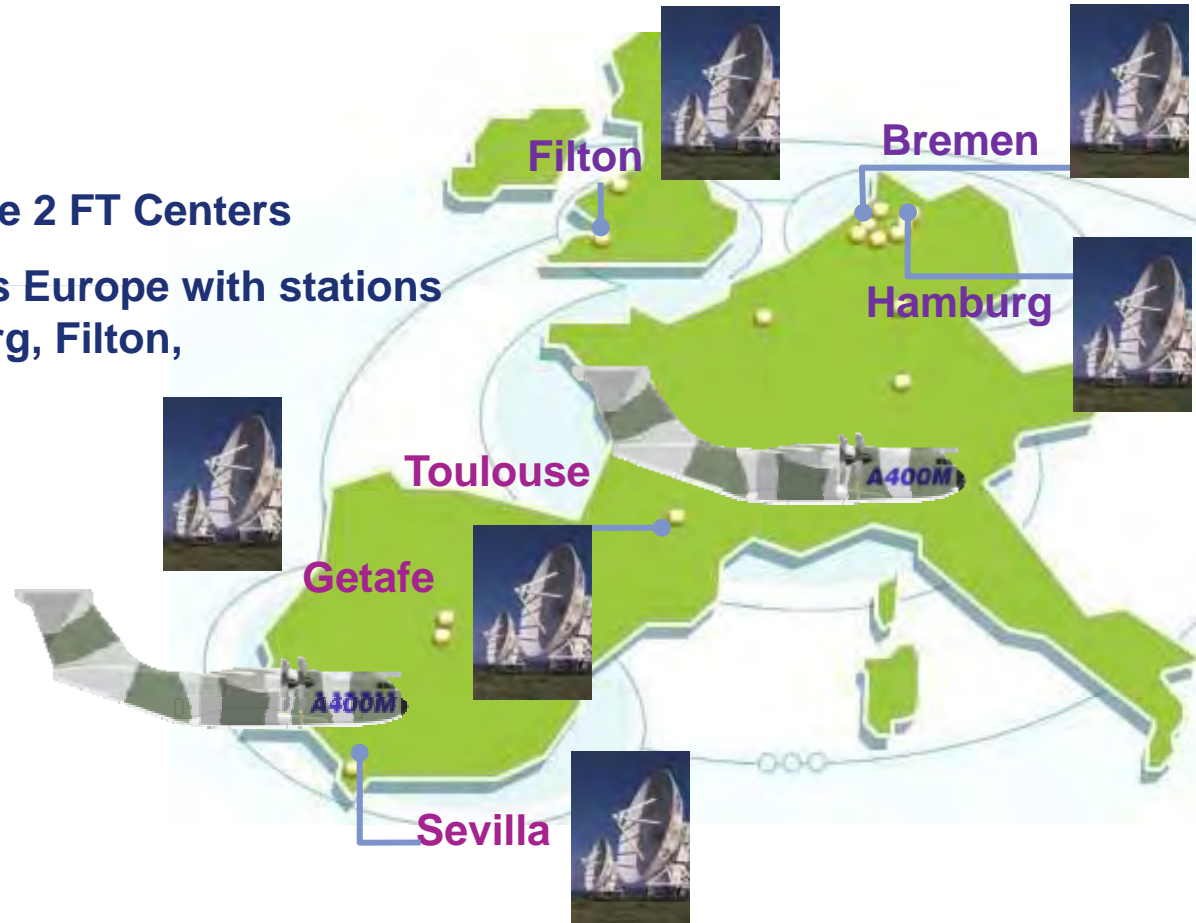
# For Example: A400M Flight Testing

## 2 Flight Test Centers

- Toulouse, FRANCE
- Sevilla, SPAIN

Interoperability between the 2 FT Centers

Telemetry capability across Europe with stations in Getafe, Bremen, Hamburg, Filton, Toulouse and Sevilla



# The Basic Safety Net

- A concept with origins at EPNER  
**Ecole Personnel Navigant Essais et Reception**
- The Flight **Test** Engineer – **Test Team Leader**
  - Receives the Flight Test Request
  - Generates the Test Order
  - Briefs the flight and acts as test director in flight
  - Completes the Post Flight Report
- The Pilots
  - Participate in development simulation before flight
  - Coordinate weather, airspace, brief the Flight Test Controllers
  - Fly the airplane precisely to gain the data required
  - Provide input to the Post Flight Report



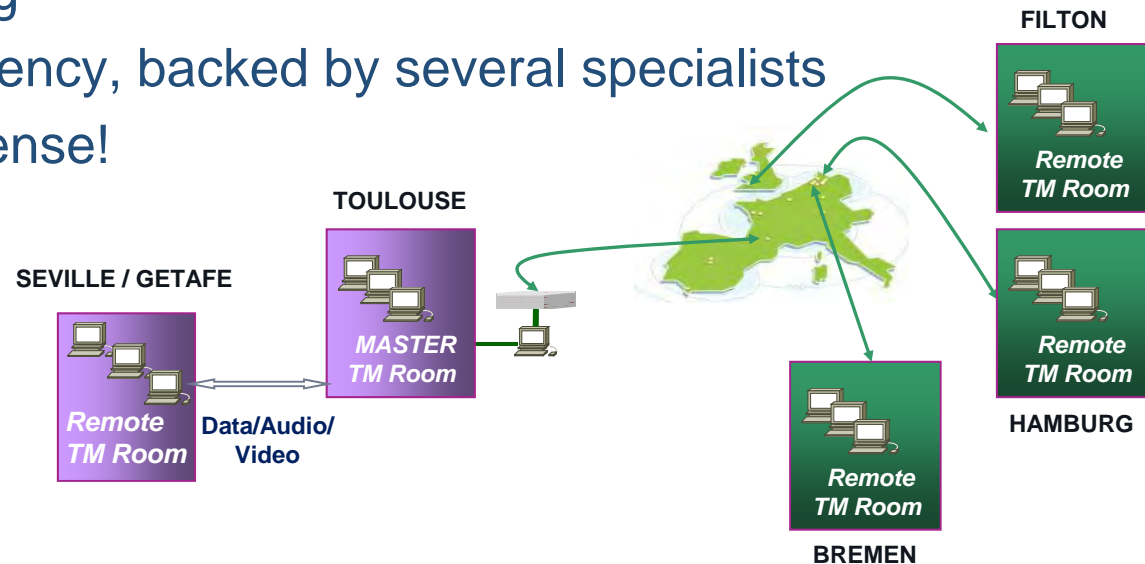
# Additional Key Players With EPNER Training

- The **Test** Flight Engineer
  - Prepares all aspects of the airplane
  - Manages installation and checkout of the FTI
  - Authorized to taxi for engine runs and systems checks
  - Assists pilots to set specific thrust requirements as required
  - Back-up for all procedural tasks on the flight deck
- The Flight Test Controller
  - Receives the airspace requirements from the pilots
    - Position, altitude, speed, maneuvers, in terms of time
  - Coordinates airspace with other test regions
  - Coordinates airspace with GAT controllers
  - The Concept: One airplane, One controller, One frequency

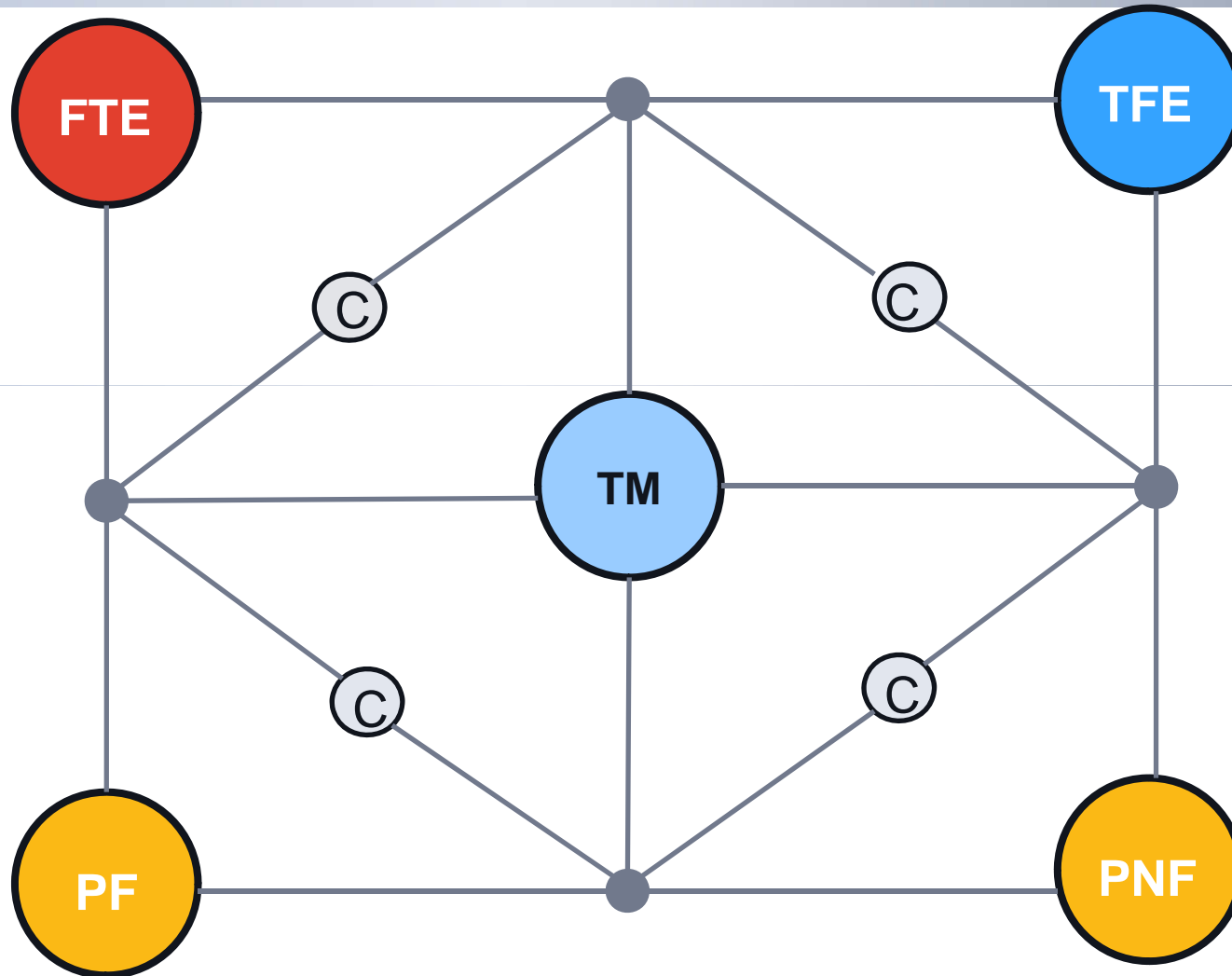
# Specialist Support Through Telemetry

- Telemetry – “Tango Mike”

- Flight monitoring in Toulouse, Sevilla, and remote sites in Europe
- Specialists for each test event are involved with:
  - Mission planning
  - Flight briefing
  - Flight monitoring
- One voice on frequency, backed by several specialists
- The last line of defense!



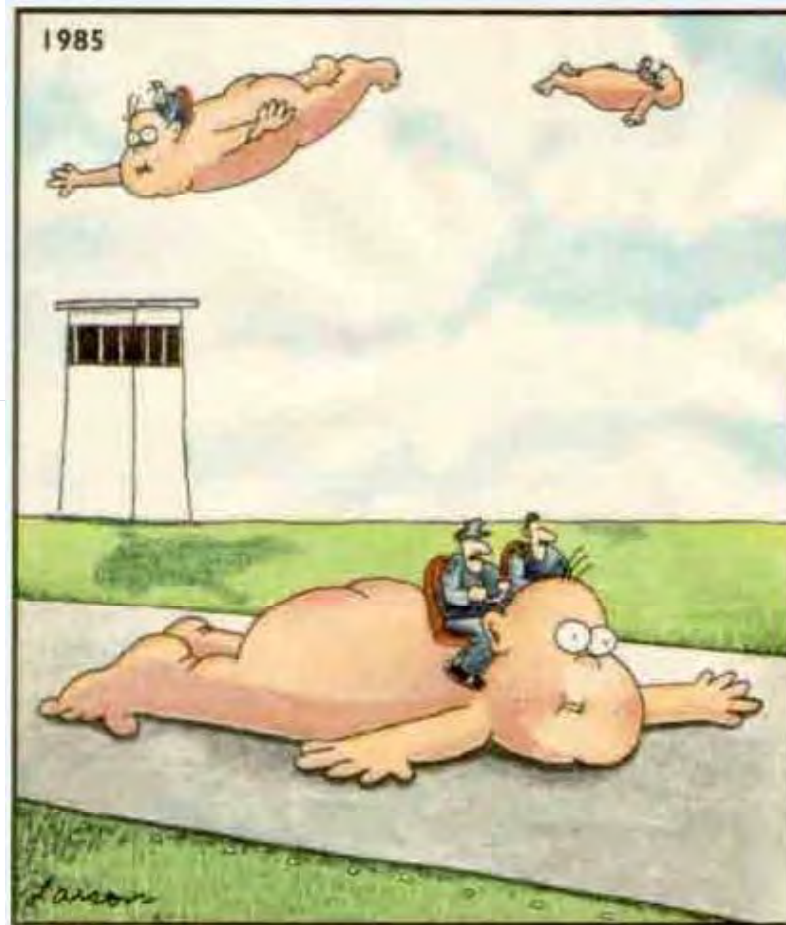
# The Safety Net Webbing







# Flight Test Safety In Normal Operations



"Fuel ... check. Lights ... check. Oil pressure ... check. We've got clearance. OK, Jack—let's get this baby off the ground."

## EV “Ice Bucket” Meetings – Each Week

- Soooo, how long can you hold your hand in that ice bucket, anyway??
- Chaired by the Chief Test Pilot
- Attended by SVP of Test and VP of Flight Test Engineering
- Dedicated VideoConference links to Germany, Spain, and Tianjin, China
- A well-attended, open invitation to put safety topics on the table, or debrief recent safety events







# The Connection To Product Safety

- Necessary when failures/events occur in flight test that can also happen in the operational fleet:
- Example:
  - Broken flap control rod



View All Site Content

Site Hierarchy

- 03 - EVR work area
- 06 - EVCO work area
- 13 - Airbus Documents
- Search
- 00 - Weather
- 01 - Flight Schedule
- 02 - EVT work area
- 04 - EVC work area
- 05 - EVCG work area
- 11 - EV Internal Documents
- 12 - Administrative Documents
- 13 - Operations & Safety
- Operational Events
- Mig\_root\_files
- Shared Documents
- Pictures
- Shared Picture Library
- Announcements
- Calendar

Recycle Bin

welcome message

## WELCOME in the Flight Test Ishare!

You will find very useful data in this collaborative area. Are you new here? Get familiar with iShares and [click here](#)

- Be informed of what is going on in EV: the **Depeche**
- Know the flights scheduled today and tomorrow: [Flight Schedule](#) and [EV Planning tool](#) or find out about the [weather](#)
- Participate actively in your group work area: [EVT](#) [EVR](#) [EVCO](#) [EVCG](#) [EV Quality](#)
- Find **EV reference documents**  
(DPM, FOM, FTG, GOM, GTG)
- and **Airbus reference documents**



**Reference Documents**

### Welcome to iShare

Please note that **Collaborative Space** has a **limited size**. Over this limit, you would not be able to add any new information. So please, when the collaborative work on files is finished, **move** (to shared folders, DMS etc. as appropriate) or **delete** them.

If it is your first time in this **Collaborative Site**, please read the [Start Here](#) note first and if you are a beginner, access the [Help](#) menu on top of this page

**EVT Ops and Safety Event Database**



### Flight Test > 13 - Operations & Safety 13 - Operations & Safety

- View All Site Content
- Site Hierarchy**
- 03 - EVR work area
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  - Calendar

| Name                          | Aircraft Family | Title |
|-------------------------------|-----------------|-------|
| Videos                        |                 |       |
| Report Templates              |                 |       |
| Hot topics                    |                 |       |
| OpsSafety01April12 TLZ(3)     | A330/A340       |       |
| OpsSafety01March12            | A330/A340       |       |
| OpsSafety01Jan12              | A320 Family     |       |
| OpsSafety01December11docx     | A400M           |       |
| OpsSafety02Dec11              | A380            |       |
| OpsSafety03Dec11VF1.0         | A320 Family     |       |
| OpsSafety03Oct11              | A330/A340       |       |
| OpsSafety02November11         | A400M           |       |
| OpsSafety01November11         | A400M           |       |
| OpsSafety03November11         | A400M           |       |
| OpsSafety06Oct11              | A400M           |       |
| OpsSafety05Oct11v2            | A320 Family     |       |
| OpsSafety04October11          | A400M           |       |
| OpsSafetySmoke02October11Iss2 | A400M           |       |
| OpsSafety01October11v1.0      | A400M           |       |
| OpsSafety04September11        | A320 Family     |       |
| OpsSafety02September11        | A400M           |       |
| OpsSafety03September11        | A400M           |       |
| OpsSafety03August11           | A320 Family     |       |
| OpsSafety02August11           | A400M           |       |
| OpsSafety01August11           | A330/A340       |       |
| OpsSafety05July11             | A320 Family     |       |
| OpsSafety04July11             | A400M           |       |
| OpsSafety03July11             | A320 Family     |       |

**Quick Information**

**Links to the Flight Test Guide**

**45 Ops & Safety Events in 13 months:  
3.5/mo**

**Special Access Req'd**

| Incident date | Modified         | FTG Chapter   |
|---------------|------------------|---|
| 21/11/2011    | 15:46            |   |
| 16/12/2011    | 11:37            |   |
| 28/02/2012    | 15:42            |   |
| 04/04/2012    | 17/04/2012 09:53 | 12 - Braking  |
| 30/03/2012    | 18/04/2012 16:33 | 21 - First Flight of Production Aircraft            |
| 20/01/2012    | 08/02/2012 11:44 | 21 - First Flight of Production Aircraft            |
| 20/12/2011    | 04/01/2012 18:31 | 21 - First Flight of Production Aircraft            |
| 20/12/2011    | 03/02/2012 15:52 |   |
| 06/12/2011    | 16/04/2012 14:34 | 06 - Tuning of High AoA Protections on FBW Aircraft |
| 24/11/2011    | 22/11/2011 09:49 |   |
| 17/11/2011    | 18/04/2012 18:04 | 00 - Miscellaneous                                  |
| 10/11/2011    | 05/12/2011 14:18 | 00 - Miscellaneous                                  |
| 04/11/2011    | 09/03/2012 15:18 | 00 - Miscellaneous                                  |
| 28/10/2011    | 25/01/2012 17:31 | 01 - Test Safety and Risk Assessment Guidelines     |
| 27/10/2011    | 10/01/2012 16:56 | 06 - Tuning of High AoA Protections on FBW Aircraft |
| 26/10/2011    | 28/11/2011 07:41 | 07 - Minimum Control Speeds (VMC)                   |
| 13/10/2011    | 08/12/2011 15:04 |   |
| 10/10/2011    | 22/11/2011 09:51 |   |
| 30/09/2011    | 24/11/2011 17:44 | 00 - Miscellaneous                                  |
| 28/09/2011    | 22/11/2011 09:52 |   |
| 23/09/2011    | 22/11/2011 09:54 |   |
| 03/08/2011    | 22/11/2011 09:54 | 12 - Braking  |
| 02/08/2011    | 21/11/2011 15:02 | 05 - Stalls   |
| 01/08/2011    | 24/11/2011 17:43 | 00 - Miscellaneous                                  |
| 05/07/2011    | 30/11/2011 09:58 | 21 - First Flight of Production Aircraft            |
| 04/07/2011    | 07/10/2011 14:12 |   |
| 03/07/2011    | 21/11/2011 15:43 | 00 - Miscellaneous                                  |

| AIRBUS                           |  | EV FLT OPS EVENT REPORT        |                              |                                    |                                | MSN No.                           |                                |  |
|----------------------------------|--|--------------------------------|------------------------------|------------------------------------|--------------------------------|-----------------------------------|--------------------------------|--|
| DATE:                            |  | Locatio                        |                              | POB :                              |                                | REG                               |                                |  |
| TIME: (UTC)                      |  | a:                             |                              |                                    |                                | Flight No. :                      |                                |  |
| <b>Event Type</b>                |  |                                |                              |                                    |                                |                                   |                                |  |
| <input type="checkbox"/> WEATHER |  | <input type="checkbox"/> BIRDS |                              | <input type="checkbox"/> ATC       |                                | <input type="checkbox"/> OTHER:   |                                |  |
|                                  |  |                                |                              | <input type="checkbox"/> TCAS-RA   |                                | <input type="checkbox"/> SYSTEMS: |                                |  |
| Effect of the Event on Flight:   |  |                                |                              |                                    |                                |                                   |                                |  |
| <b>Event Description</b>         |  |                                |                              |                                    |                                |                                   |                                |  |
|                                  |  |                                |                              |                                    |                                |                                   |                                |  |
| <b>Weather</b>                   |  |                                |                              |                                    |                                |                                   |                                |  |
| <b>Nature of Flight:</b>         |  | <input type="checkbox"/> 1st   | <input type="checkbox"/> CAF | <input type="checkbox"/> Check     | <input type="checkbox"/> Ferry | <input type="checkbox"/> Demo     | <input type="checkbox"/> Other |  |
| <b>Operational Phase:</b>        |  | <input type="checkbox"/> LDG   | <input type="checkbox"/> RTO | <input type="checkbox"/> T/O       | <input type="checkbox"/> DEP   | <input type="checkbox"/> CLB      | <input type="checkbox"/> BLK   |  |
|                                  |  | <input type="checkbox"/> CRS   | <input type="checkbox"/> APP | <input type="checkbox"/> Ramp/Taxi |                                |                                   |                                |  |
| <b>Wind Speed</b>                |  | <b>TEMP</b>                    |                              | <b>QNH</b>                         |                                | <b>VIS</b>                        |                                |  |
| <b>Cloud</b>                     |  | <b>PRECIP</b>                  |                              | <b>Lightning</b>                   |                                | <b>HAIL</b>                       |                                |  |
| <b>Icing</b>                     |  | <b>Cloud Ceiling</b>           |                              | <b>Day/Night</b>                   |                                | <b>Turbulence</b>                 |                                |  |
| <b>Flight Operations Details</b> |  |                                |                              |                                    |                                |                                   |                                |  |
| <b>CM1</b>                       |  | <b>Runway</b>                  |                              | <b>Condition</b>                   |                                |                                   |                                |  |
| <b>CM2</b>                       |  | <b>ALT</b>                     |                              | <b>IAS</b>                         |                                | <b>Mach</b>                       |                                |  |
| <b>FTE</b>                       |  | <b>WGT</b>                     |                              | <b>A/P</b>                         |                                | <b>ATS</b>                        |                                |  |
| <b>GTE</b>                       |  | <b>ATC</b>                     |                              | <b>FREQ</b>                        |                                | <b>P.O.B</b>                      |                                |  |
| <b>Date:</b>                     |  |                                |                              | <b>Name:</b>                       |                                |                                   |                                |  |

## EVR Online Report Form

- Used mainly for production test flights

[Click here to send report to EVR](#)  
Macros may need to be enabled



| Quick Operations and Safety Event Report |    |  |  |
|--|----|--|--|
| Month*                                   |    | MSN                                      | <small>year from drop-down lists</small> |
| Year*                                    | 20 | Flight                                   |  |
| <b>Event Description</b>                 |    |  |  |
|  |    |  |  |
| <b>Analysis</b>                          |    |  |  |
|  |    |  |  |
| <b>Lessons Learnt</b>                    |    |  |  |
|  |    |  |  |
| Clear form                               |    | Click here to send to FT Safety Advisors |  |


## EVT Ops and Safety Event Form

- Used mainly for experimental and developmental test flights

# Example Events

1. Rapid Depressurization at FL410
2. Loss of Emergency Buss Bar in EMER ELEC

## Rapid Depressurization at FL410

- Customer Acceptance Flight Profile
  - 10 people on board
  - 3 crew + 1 obs seated in the cockpit
  - 1 obs standing in the cockpit doorway
- CPC checked in Sys 2, then switched to Sys 1
- Sys 1 failed internally and both OVFs went full open
- Pilots and FTE went immediately on oxygen
- FTE initially tried to control the cabin in Manual mode
- Cabin rate peaked at 18,000 fpm 
- Emergency descent initiated in 1 min, but cabin climbed to FL300
- 2 observers in the cockpit suffered LOC
- 4 additional with LOC in cabin – PSUs in test mode

## Lessons Learned – Rapid Depressurization

- CPC switching check and depressurization now done at FL310
- Maintain CPC in auto to utilize safety feature of OFVs
- Limit cockpit occupants to the number of oxygen systems
- Non-crewmembers must be seated with oxygen readily available
- PSUs in that area to be operated in Normal mode

# Loss of Emergency Buss Bar During RAT Testing

- Purpose of the flight:
  - FQI performance and fuel pump restart in EMER ELEC configuration
  - All 4 Gens switched OFF
  - Briefing included switching Gens ON with any electrical anomaly
- In EMER ELEC, alerts for F/CTL and WHEEL were missing
  - FWS 1+2 were reset and alerts were recovered
- After 30 min in EMER ELEC, TM advised:
  - Bus powering DC ESS is lost and DC ESS powered by BAT EMER  
⇒ No FWS warning to crew (included in the next SW cycle)
- Bus powering DC ESS is recovered by cycling CBs
- Post flight analysis:
  - Had CB reset been delayed by 3-4 min, voltage drop would have inhibited recovery of all 4 generators

# Lessons Learned Following Emer Buss Bar Loss

- Improve briefings to include:
  - Better risk analysis of specific failures
  - Status of current warning systems
  - Emphasis on restoring generators with buss bar failures
- Flights requiring entry to EMER ELEC must be followed by TM

# One Final Thought About Flight Test Safety

“An error doesn’t become a mistake until we refuse to correct it”

- *John F. Kennedy*