Mitigating Risk at the Edge of the Envelope

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40 FLTS, Eglin AFB
Bad things happen to good airplanes…
F-16 CSFDR Operational Employment

Altitude (1000’s ft MSL)

Mach

9%
14%
35%
32%
7%
0.0013%
0.0007%
0.0000%
0.0000%
0.0000%
0.02%
1.8%
0.04%
0.83%
Basic Aircraft Limit (BAL) Process Action Team (PAT)

**Charter:** Fundamentally examine and review how the 46 TW conducts BAL tests and identify the best test practices that meet ACC requirements while minimizing risk to aircraft and aircrew.
Stores Certification Process

Requirements

Analysis

Flight Test

Certification

ACC (User Need)

SEEK EAGLE

LM Aero

Flutter

Loads

CFP

S&C / HQ

Separation

40 FLTS

46 MX

F-16 Systems Group

BAL PAT Member
BAL Risk Mitigation Strategies

1) Eliminate the BAL certification requirement
2) Modify test design to reduce the number of BAL test points
3) Minimize BAL risk exposure by making BAL test points as efficient and safe as possible
MIL-HDBK-244A and MIL-HDBK-1763:

"...subject aircraft-store combination to maximum symmetrical and unsymmetrical load factors at max allowable airspeed."
Strategy 1

Eliminate BAL Requirement

Fighter Aircraft C2 Enhancement Pod (FACE)

BAL Certification
800 KCAS / 2.05 M
9/-3 g Symmetric
6/-1 g Unsymmetric

ACC (User Need)
SEEK EAGLE
40 FLTS
Revisiting CFPs

"...subject aircraft-store combination to maximum symmetrical and unsymmetrical load factors at max allowable airspeed."

<table>
<thead>
<tr>
<th>Airspeed / Altitude</th>
<th>Max Roll Rate (deg/sec)</th>
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</thead>
<tbody>
<tr>
<td>1-g</td>
<td>6-g</td>
</tr>
<tr>
<td>.9M / 15k</td>
<td>207 194</td>
</tr>
<tr>
<td>.9M / 30k</td>
<td>197 165</td>
</tr>
<tr>
<td>1.4M / 30k</td>
<td>187 182</td>
</tr>
<tr>
<td>1.8M / 30k</td>
<td>217 199</td>
</tr>
<tr>
<td>800 KCAS / 5k</td>
<td>137 137</td>
</tr>
</tbody>
</table>

Maneuver Set
- 9g WUT
- 6g Roll L/R
- -3g BSPO
- -1g Roll L/R
Wingtip Store Inertial Loads
(6g Right Roll)

Station 1

Station 9

n_z (g's)

n_y (g's)
Modified CFPs

Reduces BAL Exposure by a factor of 6!
Max Efficiency / Min Risk Exposure

- **Pre/Post-mission high-speed MX inspections**
  - New NDI procedures for key structural areas?

- **Test Aircraft Usage Review**
  - Airframe equivalent age analysis

- **High-speed test planning tools**
  - Flight Path Angle & Energy Height analysis
  - Energy height IADS plots in Control Room
  - Dive recovery analysis
BAL Risk Mitigation Strategies

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Conclusions & Lessons Learned

► BAL Risk Mitigation
► Periodic Review of Assumptions
► Process Action Team Make-up