



Air Force Test Center



Reliability: an Air Force Executive and a Tester's Perspective

Dr. Betta Jerome
AFTC/CZ

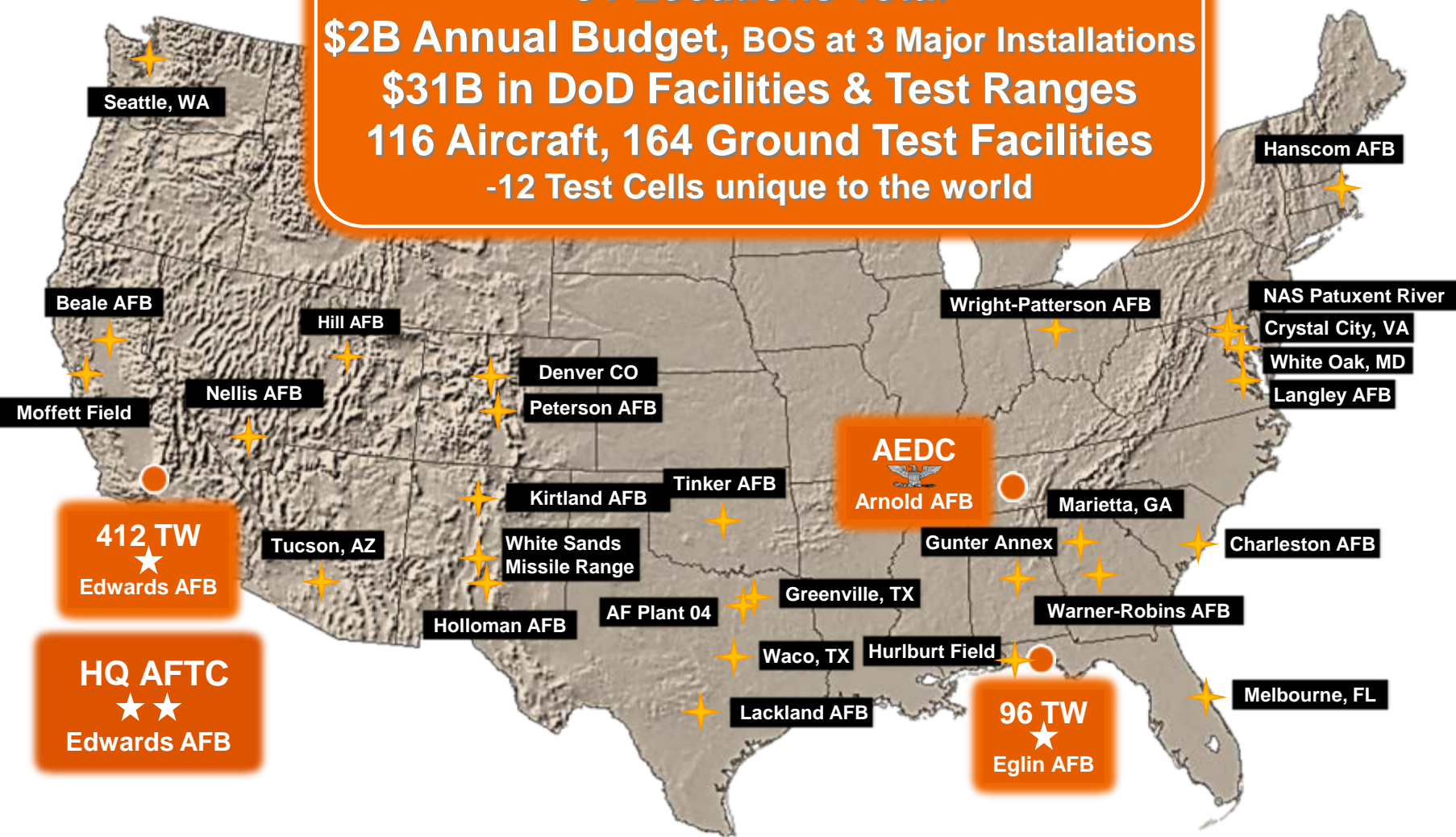
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Integrity ★ Service ★ Excellence



AFTC Span of Operations

31 Locations Total
\$2B Annual Budget, BOS at 3 Major Installations
\$31B in DoD Facilities & Test Ranges
116 Aircraft, 164 Ground Test Facilities
-12 Test Cells unique to the world



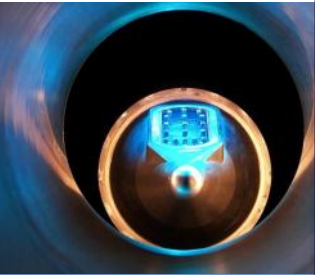


Our Mission and Our Vision

Conduct Developmental Test and Evaluation of air, space, & cyber systems to provide timely, objective, and accurate information to decision makers



Tester of Choice... Today and Tomorrow





AFTC Leadership



Commander
Maj Gen David Harris

Executive Director
Mr. David Robertson



Technical Advisor
Dr. Elisabetta Jerome



Technical Advisor
Dr. Ed Kraft



Technical Advisor
Dr. Joe Nichols



Individual Mobilization Augmentee to AFTC/CC
Brig Gen Russ Reimer



Vice Commander
Col Todd Copeland



Command Chief
CMSgt Chris Lantagne



96 Test Wing Commander
Brig Gen Christopher Azzano



412 Test Wing Commander
Brig Gen Carl Schaefer



AEDC Commander
Col Rodney Todaro



BLUF

- **Operational Testers (DOT&E) have been consistently finding serious problems with the reliability and effectiveness of many defense systems**
- **Developmental Testers have the responsibility and the ability to find system's problems. However, there are many reasons why deficiencies still exist**
- **Better requirement definition, more government organic expertise and more use of modeling and simulation tools are key to solving this decades long problem**



AFI 99-103

3.17.1. Provide technical expertise on DT&E matters to the program's CDT or Test Manager as appropriate. (T-0)

3.17.2. Conduct DT&E activities as coordinated with the program's CDT. (T-0)

3.17.3. Assist the CDT in providing oversight of program contractors and in reaching technically informed and objective judgments about contractor DT&E results. (T-0)

3.17.4. As required, work collaboratively to help the CDT establish, coordinate, and oversee a confederation of government DT&E organizations that plan and conduct DT&E according to the integrated testing strategy in the TES and TEMP. (T-1)

3.17.5. Assist the requirements, acquisition, IA communities, and the CDT in developing studies, analyses, and program documentation IAW AFI 10-601, AFI 63-101/20-101, and AFI 33-210. (T-1)

3.17.6. Plan, manage, and conduct government DT&E, LFT&E, and integrated testing according to the strategy for T&E, TES, TEMP, and DT&E and LFT&E strategies and plans.(T-1)

3.17.7. Participate in ITTs as they are being formed and assist TIPTs as required. (T-1)

3.17.8. Provide government DT&E results and final reports to the PM, PEO, and other stakeholders in support of decision reviews and certification of readiness for dedicated operational testing. Provide results and reports to the program's common T&E database (see paragraph 5.16). (T-0)

3.17.9. Report, validate, and initially prioritize DRs IAW TO 00-35D-54, Chapter 2. (T-1)

We are in charge of the Testing but not in charge of the Program



What is the problem?

- **Almost 1/3 of all defense programs going through IOT&E or FOT&E in FY15 FAILED to meet requirements!**
- **The majority of programs on the DOT&E oversight list (FY15-17) had serious problems that affected the system effectiveness, suitability or survivability**
- **40% of discovered problems were unknown prior to OT**



This is NOT a new problem

From the 2008 *Report of the Defense Science Board Task Force on Developmental Test & Evaluation:*

- ***“Reliability, availability and maintainability (RAM) shortfalls are frequently identified during DT, but program constraints (schedule and funding) often preclude incorporating fixes and delaying IOT&E”***



This is NOT a new problem

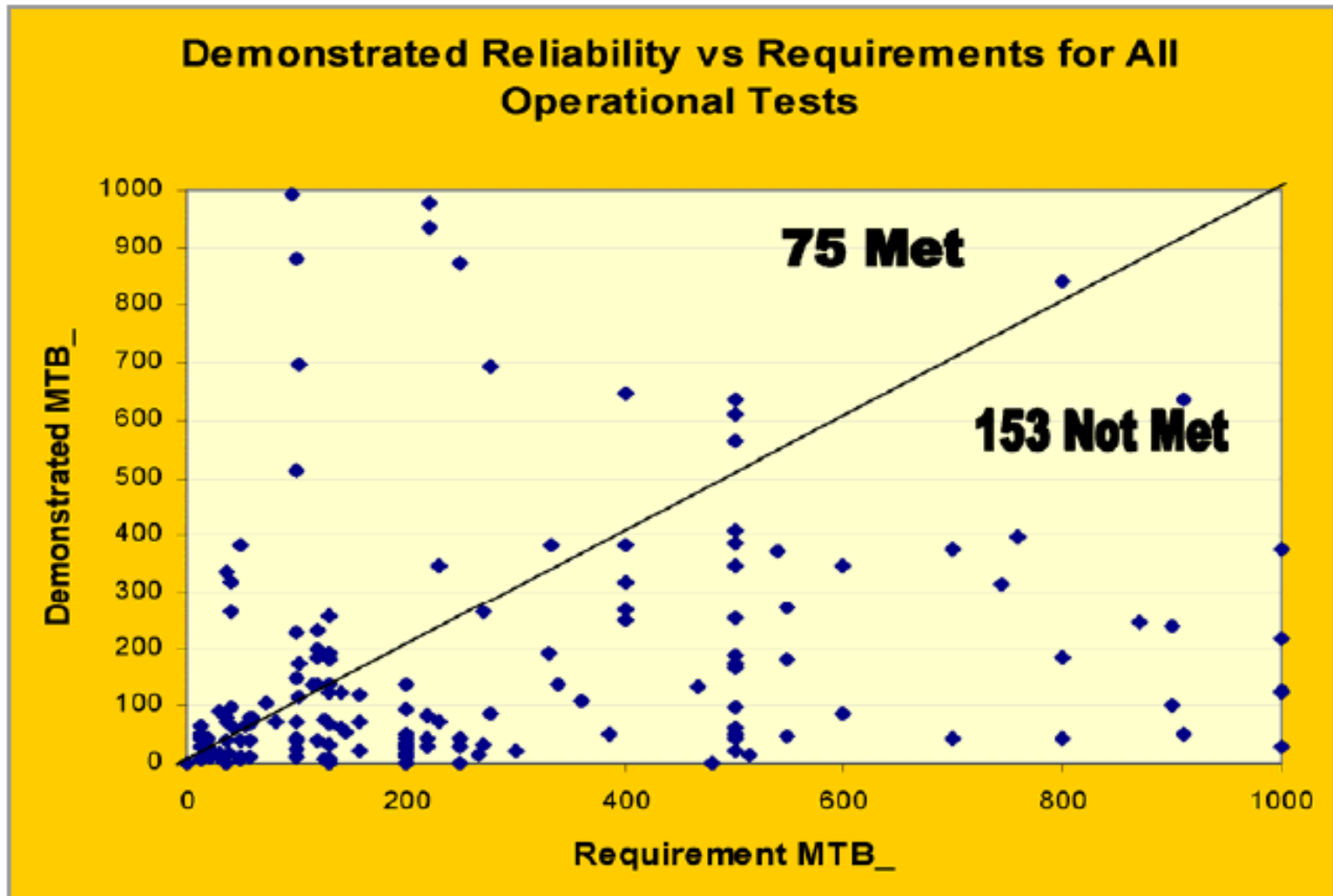


Figure 4: Army Systems Failing Reliability during Operational Testing (1997-2006).



(From Dr. Gilmore FY15 DOT&E Report)

Common reasons why programs fail reliability:

- Did not design for reliability from the beginning**
- Unrealistic requirements**
- Insufficient DT time/\$ to identify and correct failure modes**
- No/disagreement on reliability scoring procedures**
- Failure to correct reliability problems discovered in DT prior to operational testing**



Three Biggest Reasons for these Trends – my perspective

- **Bad requirements**
- **Bogus, doctored, reliability curves and calculations**
- **Not enough expertise within the government workforce**



Bad Requirements

Unrealistic, unachievable, inadequate, missing, ambiguous, or conflicting

- **Example of a Radar requirements**
 - 720-hour MTBCF and availability requirement of .947. These two things are disconnected! And in conflict with each other!
- **Example of a new weapon's requirements**
 - Lethality and collateral damage requirements completely disconnected from reality
- **Examples of unrealistic reliability requirements**
 - 99% reliability would be really nice but is it achievable? Not to mention measurable?



Failures and Reliability Calculations

- **Ambiguous reliability calculations and mathematical gyrations to make the data look good**
- **Calling failures “anomalies”**
- **No closed loop in the failure reporting, analysis and corrective action system**
- **Reliability growth planning models based on overly optimistic and never changed after failures during testing**
- **No root cause analysis; many times we just fix the symptom and move on**



KEY ISSUES that we CAN address

- **REQUIREMENTS DEFINITION**
- **ROLES AND RESPONSIBILITIES**
- **GOVERNMENT ORGANIC EXPERTISE**
- **DIGITAL THREAD**
 - **Modeling and Simulation**
 - **DOE and Statistical Rigor in our tests**
 - **Searchable Databases with Data, Lessons Learned, and Tool**



Summary/Conclusions

- **Early tester involvement in all programs**
- **Statistical rigor in all our tests – DOE**
- **Judicious use of Modeling and Simulation**
- **Joint tests (to save \$)**
- **Digital Thread**
- **Government organic capability (vs reliance on contractors)**

Questions?

