The USAF Test Pilot School’s Test Management Projects Process:

Partnerships of Government, Industry and Academia for Test Projects

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Overview

- USAF Test Pilot School Structure
- Test Management Projects (TMPs)
  - Requirements / Scope
  - Recent TMPs
  - Costs / Benefits
  - Timeline
- Customers & Contacts for Future Opportunities, i.e. ....
  - How do I get my flight test project flown as a TMP?
Curriculum

- **48-week Program: Masters of Sci, Flight Test Engineering**
- **3 Curricula:**
  - Experimental Test Pilot
  - Experimental Test CSO/RPA Pilot
  - Flight Test Engineer
- **4 Major Subdisciplines**
  - Performance
  - Flying Qualities
  - Systems
  - Test Management
- **13 Academic Courses = 50 sem-hrs total**
  - 2500 Graduate hrs Average (+300 Ancillary Training hrs)
  - 21 Scored Academic Exams
    - 19 Individual Academic Exams
    - Comprehensive Written & Oral Exams
  - 85 Flights (or Airborne Laboratories)
  - 38 Graded Reports (31 written + 7 oral)
    - Capstone Test Management Project (Report + Defense)
Phase / Course Layout

AN  =  Ancillary Training
CF  =  Check Flights
PF  =  Performance Subdiscipline
FQ  =  Flying Qualities Subdiscipline
SY  =  Systems Subdiscipline
TM  =  Test Management Subdiscipline
TMP =  Test Management Project
QE  =  Qualitative-Evaluation Program
Curriculum Aircraft

F-16

T-38

C-12

ASK-21
Curriculum Aircraft

NF-16D VISTA
• **FQ Sim:** Flying and Handling qualities Simulator
  – Robust, programmable, and modular - simulate any calculable model in real-time

• **Variable Stability Surrogate RPA (name TBD!)**
  – Calspan’s Variable stability Learjet, operated from FQ Simulator
    • Able to model UAV controls, schemes, links

• **VISTA** – Variable stability Inflight Systems Testing Aircraft
  – Highly modified F-16 capable of replicating numerous aircraft flight control and systems models

• **RASCAL** – Reconfigurable Airborne Sensor Comm and Laser pod
  – Modified, instrumented, certified store for SUT captive carry
TMP Objective

- TMPs exist to give Test Pilot School students a chance to learn the Test Management Process
  - Test Planning
  - Resource Planning/Coordination
  - Safety Planning
  - Test Execution
  - Reporting

Real research, unknown answers.
Test Management Projects

• **What are TMPs?**
  - End-to-End Staff/Student *Real-World* Flight Test Opportunities
  - Conduct ~ 8 Projects/Year (4 in Spring, 4 in Fall)
  - Peer-Reviewed, *Published Written Report* & Oral Defense

• **Customer Provides:**
  - Cutting edge research concept to be flight tested
  - Funding for any specialized support or major acft mods

• **TPS Provides:**
  - *Test Aircraft* - Usually flown on AFTC Assets
  - *Dedicated Test Team* of Pilots/Engineers (4-6 individuals)
  - *Resources* – range, clearances, mission support
  - *Flight Test Data, Data Reduction, Data Analysis*
Have TROn 11

General Layout

Pave Swift

Spinal Tap

Have Posit

Avoidance Trajectory (with uncertainties) (varies with time)

Desired Separation Distance (fixed size)

Aircraft Location Sphere (Wing Span and Nav/Datalink Uncertainties) (varies)

Source: Lockheed Martin Advanced Development Programs
HAVE RPA

OBJECTIVE
Evaluate the ability of the Calspan Learjet to function as a surrogate Remotely Piloted Aircraft (RPA) for future test utility

CONCEPT / CONDUCT
Determine datalink performance, autopilot response to Ground Control Station inputs, observe and evaluate Pilot-Vehicle Interface

Demonstrate remotely-piloted approach

IMPACT
• Demo autonomous landing control
• Ability to do cutting edge RPA testing without airspace control issues
• Significant risk, cost reductions in developing future RPA capability

CUSTOMER
USAF Test Pilot School
HAVE HAL

OBJECTIVE
Evaluate enhancements to the Calspan Learjet functioning as a surrogate Remotely Piloted Aircraft (RPA)

CONCEPT / CONDUCT
Determine upgraded datalink performance, autopilot (including autothrottle) response to Ground Control Station inputs, observe and evaluate Pilot-Vehicle Interface improvements

IMPACT
• Improve ability to do cutting edge RPA testing without airspace control issues
• Significant risk, cost reductions in developing future RPA capability

CUSTOMER
AFMC/A3
HAVE PAIN

OBJECTIVE
Limited comparison of legacy and full coverage g-suits

CONCEPT / CONDUCT
• Gather physiological response data on response to G
  • Compare each of the g-suits in prescribed high-g profiles in flight and centrifuge

IMPACT
• Improved pilot protection against G-induced Loss of Consciousness (GLOC)
  • Provide additional data (including physiological data) to allow usage across DoD of full coverage suits

CUSTOMER
USAF Test Pilot School
HAVE RAVEN

OBJECTIVE
Determine the detection and track range of small, low flying aircraft

CONCEPT / CONDUCT
• Various aircraft/sensors executing level radar intercepts against small, nontraditional single target aircraft
  • Buildup to attempt detection of small rotorcraft over mountainous terrain

IMPACT
• Improved capability to detect LO incursions into CONUS
• First in a series of cooperative efforts between TPS and external Government Agencies

CUSTOMER
Department of Homeland Security
Scope and Limitations

• Project Must:
  – Be early
    • Staff works 9-18 months from execution, students 4 months
  – Be executable in a 2 week fly window (10-25 flight hours)
    • Fixed by academic calendar, March and September
    • NO ABILITY TO SLIDE !!!
    • 4-6 Students in a busy program--may need to “descope”
  – Accept programmatic risk
    • If the asset is unavailable, gets weathered out, etc., there is a chance to lose the opportunity completely (great track record, through…)
  – Must have a required data analysis element
  – Accept “training in progress”
  – Prefer to have Publically Releasable Component
Costs / Benefits

- TPS provides partial funding towards the program
  - Majority of Flying hour costs are covered TPS
  - Customer funds unique modification
- Data analysis and reporting can be completely covered by students or collaborative
- Customers provides new technology / capability
- TPS provides instrumentation, checkout flights, range time, program management, test and safety planning, oral presentation & final written report
Ex: HAVE RAVEN

- F-16: 13.5 Hrs / 8 sorties (Test)
- F-16: 8.4 Hours / 6 Sorties (Training)
- CJ-550: 15 Hours / 7 Sorties
- Light Sport A/C: 7 Hours / 4 Sorties
- R-22 Helicopter: 13 Hours / 6 Sorties
- C-172/182: 7.5 Hours / 3 Sorties
- Cessna 414: 6 Hours / 2 Sorties
- All project management, multimedia, range, frequency management, test plans, reports, briefs

Total cost to customer: $124K

Approximate Fully Burdened Rate:

- F-16: $216K + $134K = $350K
- CJ-550: $110K
- LSA: $2K
- R-22: $5K
- C-172/182: $2K
- Cessna 414: $21K
- Other Support Costs: $120K

*Approximations based upon market rates for similar aircraft

Approximate Total: $610K

This is only an example, actual funding may vary
TMP Timeline

• For the A class
  – Concept/Exploration Jan-Feb
  – Student Test And Safety Planning Jun-Aug
  – SUT Validation Jul-Aug
  – Flight Test Sep
  – Analyze and Reporting Oct-Nov

• For the B Class
  – Concept/Exploration Jul-Aug
  – Student Test And Safety Planning Dec-Feb
  – SUT Validation Jan-Feb
  – Flight Test Mar
  – Analyze and Reporting Apr-May
Where do TPS get the projects?

- SPO
- Private Industry (CRDA, SBIR)
- Non-DoD Agencies (NASA, DHS)
- Military (AFRL, AFRCO)
- Academic Institutions (AFIT, MIT)

AND ....

- YOU !!!
Who To Contact

- **TMP Master Instructor** – Lynn McNeely
  - 661-277-7476
  - mary.mcneely@edwards.af.mil

- **TMP Program Control** – Major Spencer Rasmussen
  - 661-277-3046
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- **TMP Program Analyst** – Lilly Aguilar
  - 661-277-6254
  - lillian.aguilar@edwards.af.mil

- **TPS Front Office**
  - 661-277-3000
USAF Test Pilot School’s Test Management Projects are:

The students end-to-end test projects

and

A means for customers to partner with TPS for flight testing your ideas
Questions?
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Definitions

• PI:
  – Program Introduction Document. Provided by the customer outlining requirements and specific test objectives

• SUT:
  – System Under Test. The asset(s) under test, which can also include logistics, scheduling, modification, ground and flight test

• TPWG:
  – Test Plan Working Group. A logistics, scheduling and technical meeting conducted by the student test team. The students present their draft test matrix and test and safety plan approach.