NASA Dryden Status

Aerospace Control & Guidance Sub-committee
Boulder, CO
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Autonomous Airborne Refueling Demonstration (AARD)

- Sierra-Nevada Corp. working more robust algorithms with 2 of 3 successful with 100% miss recognition
- Took fuel with autonomous disconnect
- Successfully demonstrated plugging with rendezvous
  - 2 mi dist, 60 deg off centerline
- Soon will demonstrate refueling in a turn

- Autonomous probe and drogue airborne refueling
- F/A-18 configured as autonomous testbed
- Pallet on tanker, otherwise unmodified
- Relative GPS/INS navigation
- Monocular camera tracking system
Ikhana Project Update

- Flying 3-4 flights per day for pilot training at Grey Butte
- Preparing for Western State Fire Mission this summer
  - Ames
  - USFS
- ARTS III research controller hardware is ready. Software is being developed
  - Combined aircraft and payload commands
  - Sensor fusion (IVHM)
  - Intelligent mission management
- GA is developing software to accept “ground station” commands from the on-board ARTS III research controller
  - Mission plans
  - Autopilot hold commands
  - Stick, Rudder and throttle commands
February 2007

Quiet Spike

• Flight Test Completed
  - No SMI extended or retracted (despite ground test predictions)
  - Envelope cleared to M 1.8
    - Small effects on stability, CAS on
    - Damping derivatives reduced significantly
      - $C_{mq}$ near zero at M 1.8
      - Marginally acceptable CAS Off HQ predicted

• Joint program with NASA & Gulfstream

AIAA 2005-1015
F-15 Intelligent Flight Control System

- Completed space-based range testing
- Completed Quiet Spike probing flights
- Returning to IFCS flights in March
  - Larger canard multipliers
  - HQ metrics for asymmetries
- Working improved direct adaptive neural network

Coupling Metric Developed for Rotocraft
F-15 Intelligent Flight Control System

- Investigating PIO tendency
- Driven by roll-to-pitch weight
- Errors due to PIO not large enough to move roll weights
- Trade off between dead zone and sensitivity
C-20A Precision Autopilot Development

Unmanned Aerial Vehicle Synthetic Aperture Radar (UAVSAR)

- Goal: Fly for up to 200 km within a 10 meter tube with light turbulence
- Status
  - Flight Readiness Review Board briefed December 2006
  - Formal Software Qualification completed February 2007
  - Precision Autopilot Demonstration flight early 2007

Monte Carlo Simulation Results

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<tr>
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<th>Nominal Run</th>
<th>Monte Carlo Run</th>
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<td>CrossTrack Error (m)</td>
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<td>Altitude Error (m)</td>
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Mach 0.8 – 40,000 ft (12,192 m.)

February 2007
X-48 Blended Wing Body

- Low speed taxi tests completed in Dec 2006
- Verification and validation of flight software is 75% complete
- Flight readiness review scheduled for mid Mar 2007

- Potential testbed for future ARMD work
To Fly What Others Imagine …