X-37 Flight Demonstrator

Approach & Landing Test Vehicle Flight Test Approach

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X-37 Project
NASA Marshall Space Flight Center
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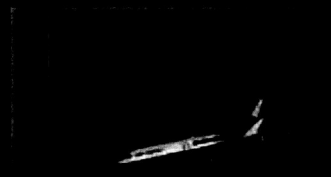
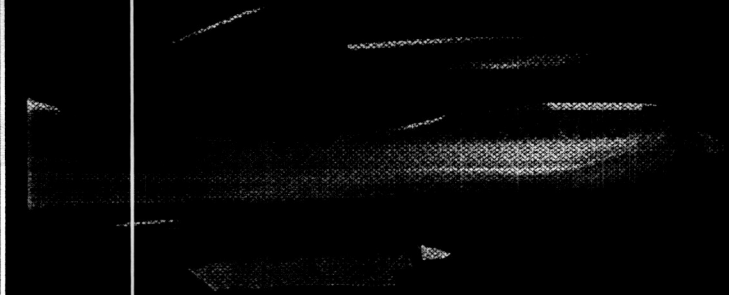
Phased Approach to Orbital Flight Demonstrations

X-40A Completed Seven Successful Flights in 2001

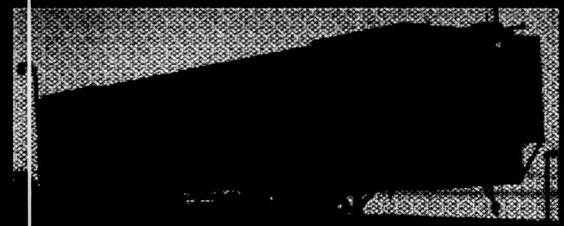


Drop Tests

Approach and Landing Test Vehicle Flies 2004

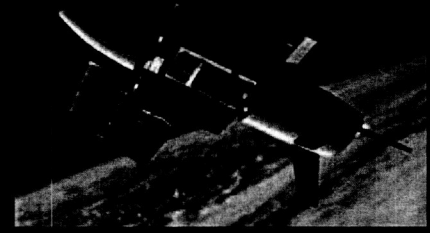


B-52 will carry ALTV up to 40,000 feet

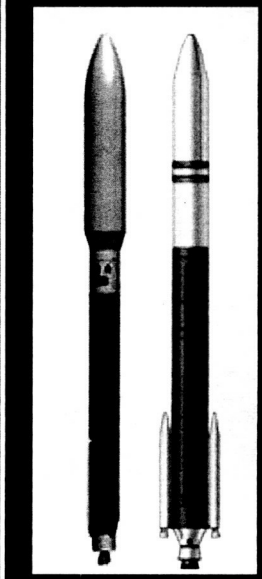


Streamlined Ground Operations

Orbital Vehicle Flies TBD



On Orbit



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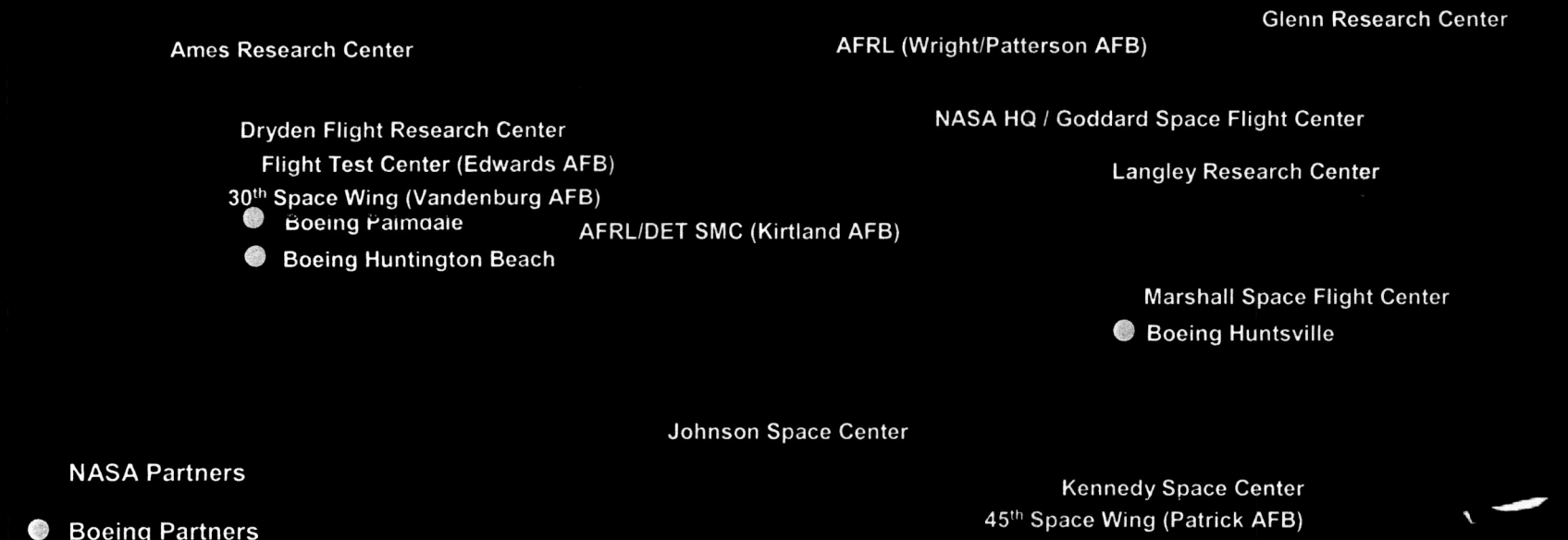
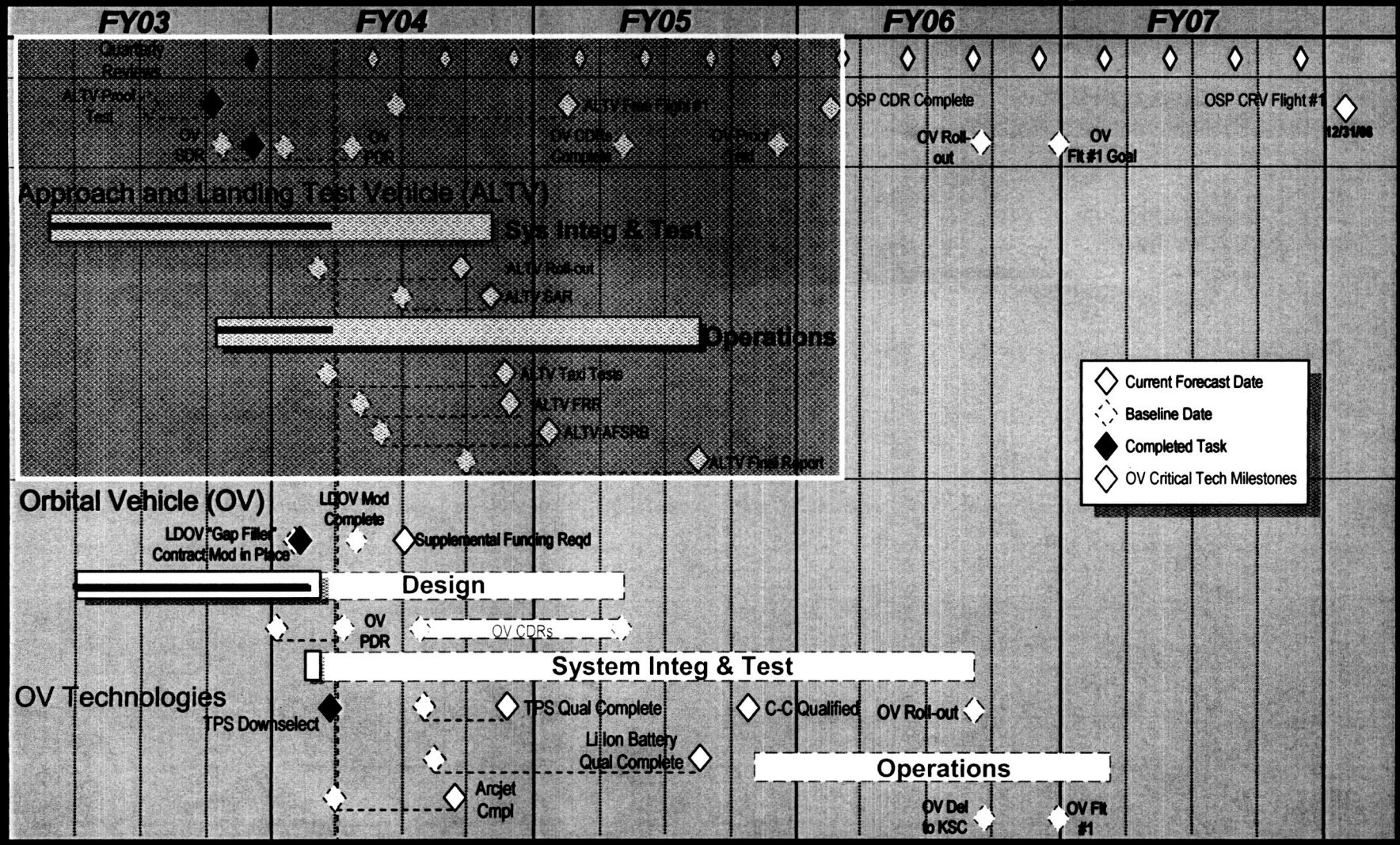
FLIGHT DEMONSTRATOR

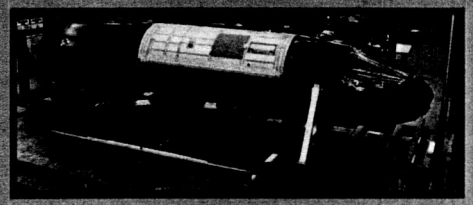
Partners


Glenn Research Center
Ames Research Center
AFRL (Wright/Patterson AFB)
NASA HQ / Goddard Space Flight Center
Dryden Flight Research Center
Flight Test Center (Edwards AFB)
Langley Research Center
30th Space Wing (Vandenburg AFB)
Boeing Palmdale
AFRL/DET SMC (Kirtland AFB)
Boeing Huntington Beach
Marshall Space Flight Center
Boeing Huntsville
Johnson Space Center
NASA Partners
Kennedy Space Center
Boeing Partners
45th Space Wing (Patrick AFB)
U.S. Air Force Partners

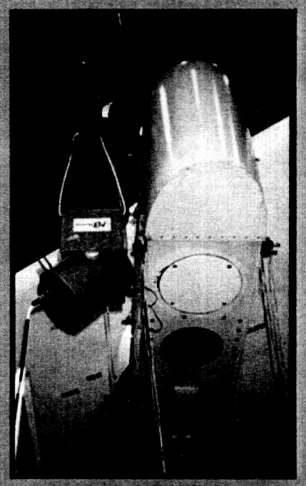
X-37 Summary Schedule



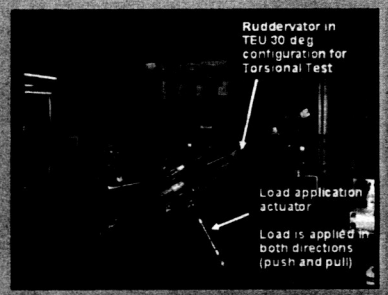
Vehicle Testing, Integration & Assembly in Progress



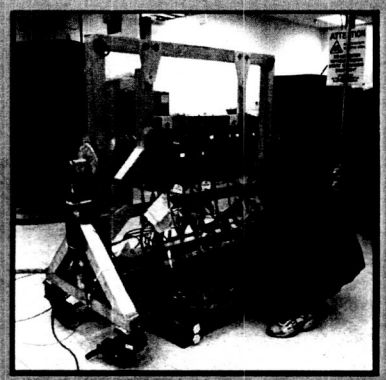
ALTV Assembly & Proof Testing



B-52 Pylon
Ground Vibration Test

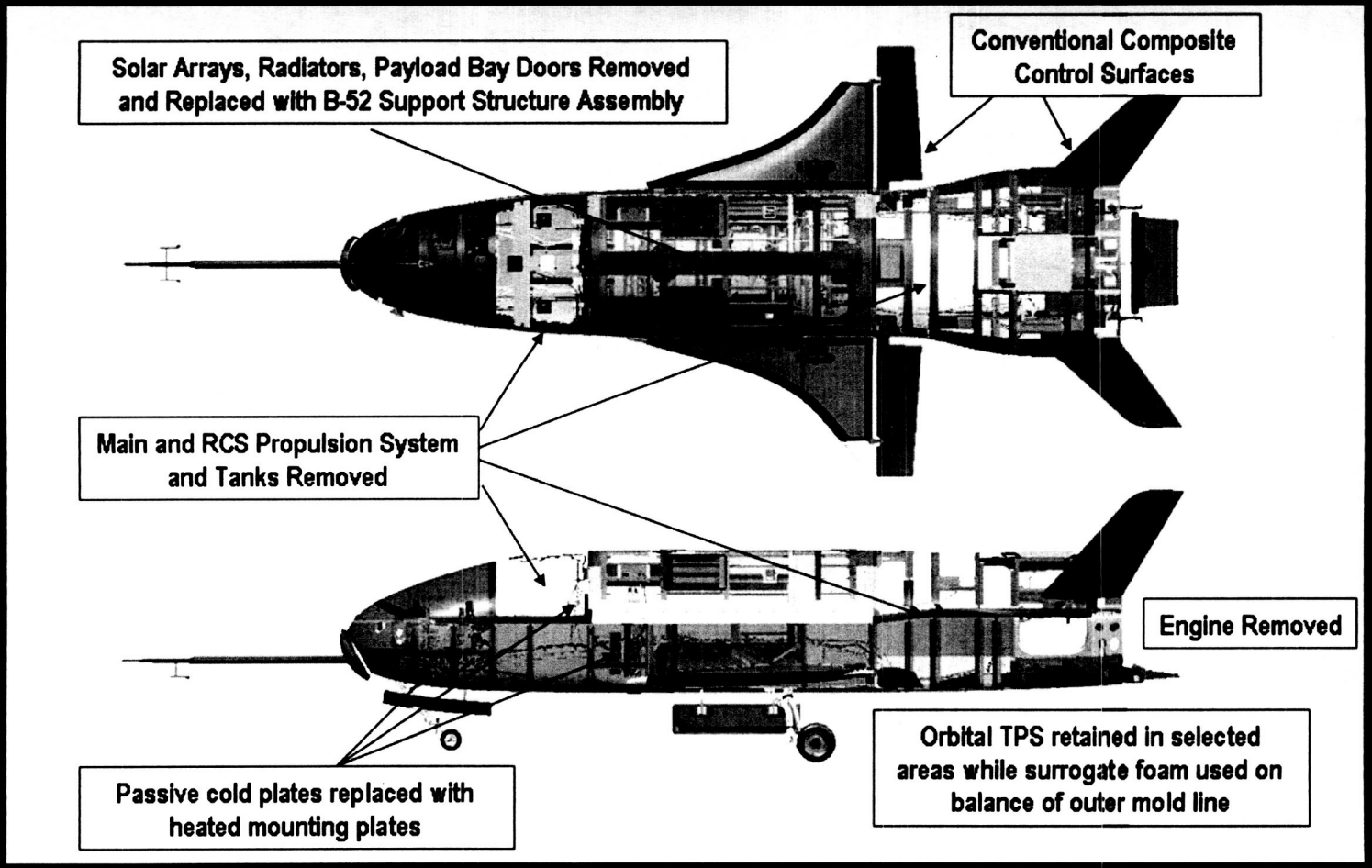


Ruddervator In Test Fixture



Navigation Pallet
Wirebird Testing

ALTV Expanded View



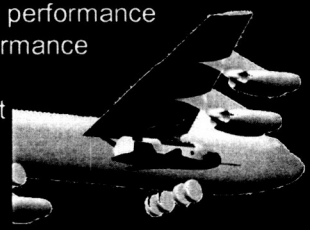
ALT Flight Test Philosophy Uses X-40A Proven Stepping Stone Approach

Main Objective: *Autonomous Approach & Landing*

FOCC Setup & Checkout
- FOCC system C/O
- Verify range interfaces

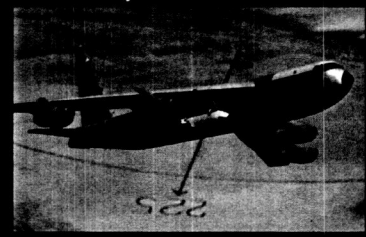
Hangar Tests
- Functional testing
- Calibrations
- Vehicle-in-Loop simulations
- Software & MDL validation

Ground Tests
- Verify uplink & downlink
- Evaluate Nav system performance
- Radar altimeter performance
- System checkout
- FTS system checkout



B-52 Integration
- Pylon fit check
- Drogue Chute Integration
- Mated GVT
- Combined Systems Test
- High-speed taxi
- Verify loads and environments

Captive Tow Taxi
- Incremental speed buildup
- Verify GN&C performance
- Systems checkout



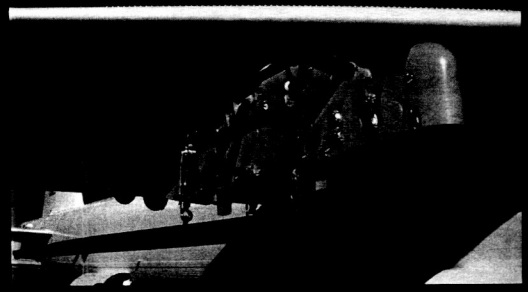
Captive Flight
- Incremental buildup to release conditions
- Verify navigation thru release box
- Verify system performance
- Verify loads and environments
- Ops rehearsal for free flight

Free Taxi
- Incremental speed buildup
- Verify closed-loop GN&C
- Verify autonomous ops
- Verify landing system models
- System evaluation

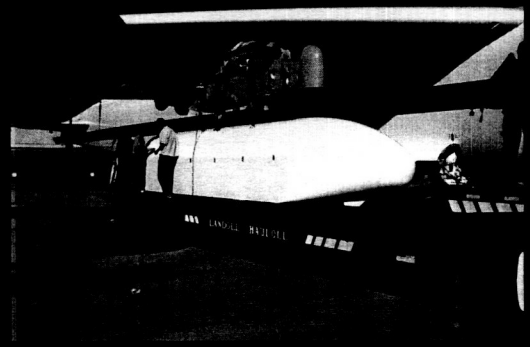
Free Flight
- Autonomous approach/landing
- Verify flight control algorithms
- Verify CADS performance
- Expand crosswind envelope
- Aerodynamic PID maneuvers

(Continuing hangar tests and maintenance)

B-52/Pylon/Drogue Chute Subsystem Integration



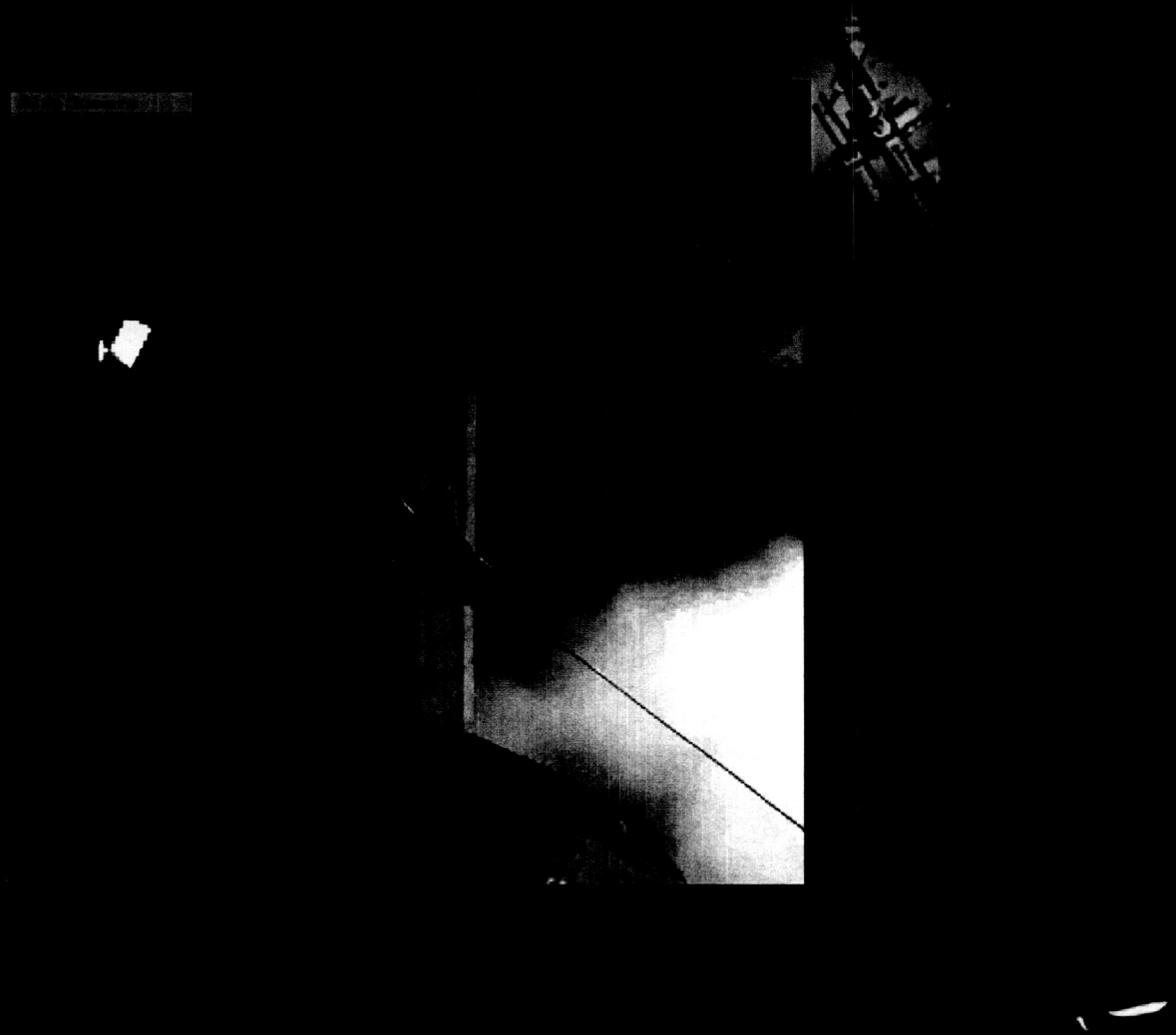
B-52 Pylon Assembly Installed



X-37 Simulator Used for Drogue Chute Integration Tests on B-52H Bomber

ALTV Drogue Chute Testing at NWS China Lake HIVAS Facility – Summer 2003

ALTV Free-Flight Profile



Summary

- Boeing / NASA team working toward Approach and Landing Test Vehicle flight tests in late 2004
- ALTV Reduces Risk to the X-37 Orbital Vehicle (OV) Flight Program by:
  - Testing a subset of OV technologies in a critical portion of the flight envelope
  - Validating the Calculated Air Data System (CADS) performance / Subsonic Aerodynamic Database
  - Demonstrating OV Approach & Landing Trajectory
  - Expanding the operational flight envelope of the OV – enabling more landing opportunities for orbital missions

For More Information