



X-37 Project Office
Marshall Space Flight Center



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X-37 Project

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X-37 Project Unveils New Website

The new [X-37 Net](#) internal Web site is now online. This site is an information portal for viewing and retrieving current and archived X-37 Project information that is not under configuration control or export control.

The X-37 Net is available to all NASA Government and contractor personnel and stakeholders at MSFC and participating NASA Centers. Team members and stakeholders can access current and archived Project news articles and information such as organizational charts, schedules, recent accomplishments, and calendars.

For more information contact site content manager [Bill Ledbetter](#).

Next Month

- Project Lessons Learned
- ALTV Assembly and Test Status
- OV TPS Status

To The Team,

First, I want to remind everyone that Headquarters has advised us to continue working the plan to build and fly the Approach and Landing Test Vehicle (ALTV), as well to advance critical Orbital Vehicle (OV) technologies. It is more important than ever that we meet our commitments — technical, schedule, and cost. We will keep everyone informed as we receive new input and guidance from Headquarters.

At the Joint Army, Navy, NASA, and Air Force Chemical Propulsion conference, I had the opportunity to discuss a tactical view of space transportation, as well as a strategic view of America's missions — not the least of which are economic benefits. While referencing [NASA's Vision of Exploration](#), the Federal Aviation Administration's recently released [Report](#) on the Economic Impact of Commercial Space Transportation on the U.S. Economy was used as a prime source. It assessed the benefits of our industry by using 2002 data. From 1999, when the last report was issued, to 2002, the economic impact rose from \$61 billion to more than \$95 billion. Employment rose by 80,000 jobs, to over 500,000 workers involved in space transportation and enabled industries.

This important information needs to be communicated to those who believe that diverting funds from America's space initiatives would solve other domestic issues. It also underscores the simple fact that every dollar invested in space is spent right here on Earth. I encourage you to look for opportunities to share this good news, especially to students who are making career decisions.

I want to thank everyone again for the excellent work and your continuous efforts to execute the X-37 plan. We are making great progress on ALTV assembly and integration, and have started systems testing, as well as TPS installation and flight operations preparation. Everyone should be proud of the Team's accomplishments!

Dan

ALTV System Test Making Progress

System testing is under way at the Boeing High Desert Assembly Integration and Test (HDAIT) facility in Palmdale, CA. A Test Readiness Review (TRR) for System Test Position 1A was completed prior to testing. The TRR covered Unit Under Test (UUT) configuration, documentation, facility readiness, roles and responsibilities, and safety.

This is a first in a series of three major system test phases planned for the X-37 ALTV. Successful systems test leads to the roll-out of the vehicle for ground and flight testing.

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Who's Who

Tony Lindeman recently received the Professional of the Year award from the North Alabama Chapter of the Project Management Institute (PMI). Lindeman, who has served as local PMI Chapter President for 3 years, is a Senior Systems Engineer for the X-37 Project's Systems Engineering and Integration Group.



Lindeman says "Using my skills and expertise in project and systems engineering management has had a positive impact on the Project's output."

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ALTV System Test (cont.)

System testing verifies requirements at the subsystem level in a phased approach prior to final assembly and testing of the overall system. Avionics, software, and wiring assemblies are placed on pallets for testing. All of the pallets and harnesses complete checkout tests, which verify the continuity and high potential limits of wiring assemblies and connections.

System test uses sequential test positions in parallel with vehicle assembly. Test position 1 includes test positions, 1A, 1B, and 1C, which are primarily focused on verifying avionics requirements. The test position configurations are defined as follows:

- Test Position 1A is conducted outside of the vehicle using pallets 1-3
 - Pallet 1 — Computers
 - Pallet 2 — Sensors
 - Pallet 3 — Navigation
- Test Position 1B is conducted outside of the vehicle with pallets 1-3 and adds pallets 4 and 5
 - Pallet 4 — Batteries and power distribution control unit
 - Pallet 5 — S-band communications transmit components
- Test Position 1C entails placing all five pallets inside the vehicle for mission simulation testing

This “build-up” process facilitates subsystem requirements verification of major components in a streamlined fashion prior to overall system verification, allows for continued assembly of the vehicle during testing, and provides better access to avionics for troubleshooting and repair if required.



System Test Position 1A

Hot Structures Status

Carbon-Silicon Carbide (C-SiC) and Carbon-Carbon (C-C) composites are being developed and qualified in parallel as potential materials for the X-37 Orbital Vehicle (OV) hot structure control surfaces — flaperons and ruddervators.

The goal of this research is to mitigate risk by qualifying the lightest possible components that meet the stringent X-37 OV weight and performance requirements, including Shuttle-type reentry environments with peak temperatures of 2800 °F.

Boeing is the prime contractor for hot structures work. GE and MR&D are the subcontractors for C-SiC. SAIC and C-CAT are the subcontractors for C-C.

C-SiC Subcomponent Testing

Phase 1 — which is mechanical 50% design limit load, room temperature testing — was successfully completed at DFRC on April 20. The Technical Readiness Review (TRR) for phase 2 — which is geo-mechanical load up to 2400 °F in gaseous nitrogen — was conducted on April 29. The C-SiC notched tube test, a representative element, was tested on April 30 at DFRC. The element failed at 103% design limit load at room temperature.



C-SiC flapperon subcomponent installed in the test setup at DFRC

C-C Detailed Design Review

The C-C Detailed Design Review was conducted on April 27 at Boeing’s facility in Dallas. Subsystems Manager Joan Funk said that the work “highlighted the significant progress made since the Preliminary Design Review in January.” Follow-on actions include decisions about random vibration and frequency requirements, as well as the material properties databook. The C-C ruddervator TRR for the 100% design limit load was conducted at the U.S. Air Force Research Laboratory the first week in May.

Who's Who (Cont.)

Under his leadership, the local PMI chapter membership has grown 150 percent and the chapter is well on its way to doubling its membership to 200 members by the end of the year. Additionally, he has helped develop standards that include the Organizational Project Management Maturity Model (OPM3), which provides an assessment tool to evaluate an organization’s project management maturity based on generally accepted best practices and capabilities. Prior to joining NASA through a contract with ELMCO, Lindeman served 20 years as a Naval Aviator and Acquisition Officer with the U.S. Marine Corps, where he piloted CH-46 helicopters. Prior to his retirement, he served as an Assistant Program Manager assigned to the Army-led joint Infrared Missile Warning System program in Huntsville.

Lindeman has a B.S. in Biology from Wesleyan College and an M.S. in Electrical Engineering from the Naval Post Graduate School. He completed the Advanced Program Management course from the Defense Systems Management College and received his Project Management Professional (PMP) certification in 1998.

Tony, an active jogger, is a member of the City of Madison Rotary Club and supports his church’s Boy Scout Troop.

X-37 Team Reaches Out

The X-37 Team participates in public outreach to help the public understand the value of their investment, as well as encourage young people to pursue science and technical subjects.

Operations Lead LTC Chris Smith put on his "Joe NASA" hat when he visited his daughter's 5th grade class. His statement "Isn't it amazing that our minds can travel much faster and farther than our machines or bodies can when it comes to space travel!" was met with the question "Do you think one of us could be on a mission to the Moon or Mars?"



The X-37 Model on Display at the National Space Symposium

Technical Assistant Dave Jacobson gave an overview of the Project at the [Chattanooga Engineers Club](#) and volunteered at [NASA's Great Moonbuggy Race](#), held annually at the Alabama Space and Rocket Center. An X-37 scale model was the focal point of NASA's exhibit at the National Space Symposium, at which Administrator O'Keefe made the [keynote speech](#).

Export Control Tips

X-37 Export Control Representative Scotty Stewart reminds Team members "When it comes to sharing NASA information in public forums, it is better to be safe than sorry. NASA has placed increased emphasis on the correct handling and distribution of potentially sensitive materials to foreign nationals." Accordingly, the X-37 Project asks each Team member to adhere to the Export Control procedure established by each NASA Center. The [MSFC Export Control procedure](#) is listed on the Project's intranet.

ALTV Assembly

90% of the ALTV hardware has been delivered to Boeing's Palmdale facility for assembly. Vehicle assembly and system testing is progressing in parallel as the X-37 Team prepares for vehicle "roll-out."



Technicians Install Wiring Harnesses in the ALTV Mid-Section

Assembly Status:

- Assembled and installed 95% of the right and left hand door rigging
- Installed brackets — 52 forward, 33 mid, and 28 aft
- Installed nose landing gear (NLG) uplock guide tubes, spare actuator and wheels — NLG door installation 98% complete
- Installed main landing gear (MLG) uplock guide tubes — MLG installation is 90% complete
- Installed reaction control system thrusters
- Completed B-52 interface fit check
- Installed 60 of 280 vehicle wire harnesses
- Installed 25 of 29 ground plane brackets
- Completed System Test position 1A
- Completed pallets 1, 2, 3, 4, and 5 buildup for test position 1B
- Gear pneumatic welding in work with 42 of 87 production welds complete
- CADS installation in work

Assembly Look-Aheads:

- Complete wire harness and click bond assembly and installation
- Finish installing aft brackets — awaiting speed break installation
- Install antenna coax support bracket
- Complete DFI strain gauge and RTD installation to gear, fuselage, and wing
- Complete installation of avionics pallets - waiting on completion of system test 1B
- Install control surface
- Install TPS
- Close out nose and main landing gear and hinge installation
- Install FTS structure