



OCE Status NAS TI&E Meeting

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27 January 2021



Major Accomplishments in FY20



Office of the Chief Engineer (OCE)

OCE, including the NESC, continued to support achievement of the Agency's major priorities, including the successful return to flight of US astronauts from US soil. Through Agency technical reviews, OCE ensured technical issues are fully vetted, and dissenting and divergent opinions were heard and appropriately considered. Engineering Technical Authority continued to support the Agency's most important programs, ensuring independent technical insight and assessment of programs at key programmatic milestones, such as:

- ARMD:
 - X-57 (Maxwell) Systems Test and Initial Flight-Testing Preparation;
 - X-59 (QueSST) Aircraft Fabrication and System-Level Integration;
- HEOMD:
 - International Space Station (ISS) -- Engineering support for Anomaly Resolution and Certification of Flight Readiness (COFR) Reviews for Crew and Logistics Visiting Vehicle Missions;
 - Commercial Crew Program (CCP)
 - Boeing OFT in-flight anomaly resolution
 - Space-X engineering support to Static Fire Anomaly resolution, successful In-Flight Abort Test,
 - Space-X Demo 2 CoFR and successful execution of Crewed Flight Test
 - Artemis
 - Orion/Service Module Thermal Vacuum Testing
 - SLS Core Stage Green-Run Testing
 - Orion SAR/DCR Complete
 - SLS Booster DCR Complete
 - Spacecraft Command and Control Software (SCCS) 6.3.0 system verification complete
- SCaN:
 - Operational Readiness Review for Artemis-required Network Enhancements Complete;
- SMD:
 - Mars 2020 – Completion of Safety and Mission Success Review Leading to Successful Launch;
 - James Webb Space Telescope (JWST)
 - Completion of pre-environmental test sunshield deploy and stow; and
 - Completion of environmental testing
- STMD:
 - Successful completion of the Green Propellant Infusion Mission (GPIM), demonstrating a new high-performance and cold-tolerant 'green' monopropellant propulsion system.
 - Successful completion of the Deep Space Atomic Clock (DSAC) spaceflight demonstration, satisfying the Level 1 requirements for a new high-precision timing and navigation standard, and initiation of extended demonstration operations.
 - Launch to Mars of four new technology demonstrations on the Mars2020/Perseverance mission: Mars EDL Instrumentation 2 (MEDLI2); Terrain Relative Navigation (TRN); Mars Oxygen ISRU Experiment (MOXIE); and Mars Environmental Dynamics Analyzer (MEDA).



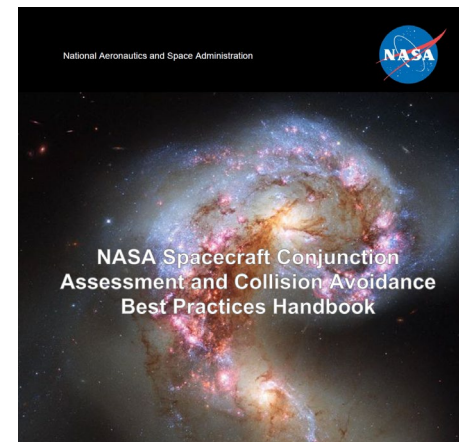
Major NESC Studies



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- The NESC initiated its **1000th** independent technical assessment of NASA's highest risk programs and projects since its inception in FY 2003. The NESC took on an unprecedented 84 new technical assessments in 2020, well above the historical average of 50 per year, maintaining prioritization of the ISS, Commercial Crew Program, Artemis I, Science Missions, and Space Technology efforts.
- Nearly 70-percent of NESC completed activities supported human exploration development and operations including the ISS, exploration programs aimed at returning US crews to the moon beginning with the Artemis mission, and Commercial Crew flights. Over 10 active and planned science missions were supported and several broad-Agency topics assessed including the purity and suitability of a widely used spacecraft propellant for future missions. The NESC also continued working with the Navy and Air Force to understand the harmful physiological effects suffered by pilots of high-performance aircraft.
- The NESC continued to perform independent Entry, Descent, and Landing (EDL) modeling and simulation for the CCP, and integrated ascent trajectory and separation analyses for the ESD SLS and Orion programs. In addition, work continued in the development of a Launch Vehicle Aerodynamic Buffet Flight Test to reduce uncertainties in SLS launch vehicle design loads.
- Key efforts included:
 - Assessed the compatibility between high pressure propellants and titanium materials commonly used in the new spacecraft being developed by or for the Agency
 - Assessed multiple issues with composite overwrapped pressure vessels
 - Incorporating Lessons Learned into Artemis from recent software issues experienced by CCP
 - Understanding the recurring factors that have caused mishaps in human space flight
 - Advancing the state-of-the-art for modeling in hypergolic engines and launch vehicle structures
 - Assessed the health of the US industrial base of critical, spacecraft propulsion system valves
 - Released eight new Technical Bulletins to the NASA and commercial engineering communities
 - Improved orbital debris modeling and orbital debris reduction
 - A maturity analysis of nuclear thermal/electric propulsion for a potential Mars 2035 mission

- Beginning capability area development in system security engineering, with the intended outcome of explicitly including cybersecurity concerns into the NASA engineering process
- Developing conjunction assessment policy and guidance (NID, HBK, future STD) both for NASA-internal use as well as helping focus the industry as a whole on working to manage a complex area of challenges (CY20 is the first version, CY21 is the next revision)
- Continue to evolve the NASA protection approach with the Mission Resilience and Protection Program (MRPP)
 - CY20 - updated STD-1006 and various support material; also unclassified threat briefing
 - CY21 - plans to expand engagement across NASA and help missions through the transition to fully adopt STD-1006

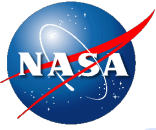


 NASA TECHNICAL STANDARD Office of the NASA Chief Engineer	NOT MEASUREMENT SENSITIVE
	NASA-STD-1006
	Approved: 2019-10-29
SPACE SYSTEM PROTECTION STANDARD	



OCE will continue ensuring independent technical insight and assessment of these programs at key programmatic milestones, such as:

- HEOMD:
 - CCP - Space-X DCR/COFR preparation for first Crew-1 mission to ISS
 - Artemis - SLS Core Stage Green Run Hot-Fire Testing at SSC
 - Gateway - xEMU Delta PDR and HALO PDR
- SCan:
 - Network upgrades for Lunar missions including Deep Space Station-36 (DSS-36)
 - Complete SGSS and ensure successful SGSS SN IT Security integration; SGSS ORR and FAR in April 2021
 - Optical Comm (O2O) delivery in June 2021
 - Lunar Comm & Navigation architecture definition and implementation underway
- SMD:
 - Mars 2020 Landing and surface operations
 - JWST - Final assembly, integration and test; and Safety and Mission Success Review
- STMD
 - Completion of spacecraft integration and launch of Laser Communications Relay Demonstration
 - Flight payload delivery for Deep Space Optical Communications demonstration
 - Launch of the Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment (CAPSTONE) demonstration to the Moon
- The NESC plans to:
 - Conduct over 50 independent assessments of NASA's highest risk challenges maintaining prioritization of the ISS, CCP, Orion/SLS, Science Missions, and Space Technology, and is on a new assessment pace that will be well above the historical average.



Concluding Remarks



Office of the Chief Engineer (OCE)

The Office of the Chief Engineer is focused on the technical and programmatic readiness of the Agency's programs and projects

- Executes Engineering Technical Authority
- Provides “value added” independent assessment across all of NASA's missions
- Maintains Program/Project Management Policy, Guidance and Engineering Standards
- Shares best practices and Lessons Learned
- Supports the workforce with training and knowledge services