FINDING OF NO SIGNIFICANT IMPACT (FONSI)

ENVIRONMENTAL ASSESSMENT FOR THE DEMONSTRATION ROCKET FOR AGILE CISLUNAR OPERATIONS (DRACO) MISSION

Pursuant to the provisions of the National Environmental Policy Act (NEPA), as amended (*United States Code* [U.S.C.] Title 42, Sections 4321 through 4347), the Council on Environmental Quality's (CEQ's) implementing regulations (*Code of Federal Regulations* [CFR] Title 40, Parts 1500 through 1508), and the Environmental Impact Analysis Process (EIAP) (32 CFR Part 989), the U.S. Space Force (USSF) and the Defense Advanced Research Projects Agency (DARPA) assessed the potential impacts on the natural and human environment for the DRACO Mission.

Purpose of and Need for Proposed Action

The goal of the DRACO program is to demonstrate an operable nuclear thermal propulsion (NTP) system. NTP uses a nuclear reactor to heat propellant to temperatures in the range of 3,600 to 5,400 degrees Fahrenheit and then expels the hot propellant through a nozzle, thereby producing thrust. Compared to chemical space propulsion technologies, NTP offers two-to-five times greater efficiency at comparable thrust.

The project is needed for the U.S. Department of Defense (DOD) to provide space-based assets to deter strategic attack by adversaries and execute United States (U.S.) national strategy. While movement and maneuver are core tenants of modern operations on land, at sea, and in the air, rapid maneuver in the space domain has traditionally been challenging because electric and chemical space propulsion systems have drawbacks in thrust-to-weight and propellent efficiency, respectively.

As the commercial space economy grows, NTP could be a linchpin technology that would provide a variety of benefits. The unique combination of impulse and propellent efficiency of nuclear propulsion provides an elevated dimension to space transportation and spacecraft maneuverability over conventional chemical rockets. From its high impulse and propellent efficiency, NTP capability would enable spacecraft to more rapidly traverse and maneuver through space, including enhancing cis-lunar space mobility. Demonstrating NTP in cis-lunar space and evolving its performance capability into an operational system could establish a reliable transportation system for a growing lunar economy. NTP could reduce mission staging, duration, and risk for an eventual moon-to-Mars human exploration mission. NTP would facilitate the development of the nascent, but rapidly developing, international commercial space economy; there is interest in advancing this technology for satellite placement and servicing, as well as in NASA's Artemis program. Beyond being a key capability that could allow increased space mobility, sustainable lunar settlements, and a commercial lunar economy, NTP would significantly reduce the transit time between the Moon and Mars, thereby reducing an astronaut's exposure to solar radiation. Therefore, NTP would bolster other deep space exploration missions through gains in power, efficiency, and endurance.

The purpose of the project is to provide a system that has the potential to achieve high thrust-to-weight ratios similar to in-space chemical propulsion with two-to-three times greater efficiency. This combination, which would be provided by NTP, would give spacecraft a greater ability to rapidly traverse and maneuver in space and assist the U.S.'s position as the global leader for development of a secure and robust space-based economy.

Description of the Proposed Action

Under the Proposed Action, DOD would launch a DRACO spacecraft into orbit. The demonstration of the DRACO spacecraft consists of four distinct phases, including pre-launch, launch, demonstration, and decommissioning.

The pre-launch phase consists of the assembly, testing, and delivery of the DRACO spacecraft to the launch site. The location of the reactor assembly site has not yet been determined; however, it would be a location where the assembly activities have been previously evaluated under NEPA. The spacecraft components would be delivered to the Cape Canaveral Space Force Station (CCSFS) or Kennedy Space Center (KSC) launch complex in Brevard County, Florida, via highway or rail transport. Once the reactor is received at KSC or CCSFS, it would be secured within a building engineered to meet fire safety standards to mitigate the risk of potentially releasing radioactive material in the case of a fire.

The DRACO launch is expected to occur no earlier than 2027 at either CCSFS or KSC in Brevard County, Florida, though the launch timing is subject to change and may be delayed. Launching at a later date would not affect the objectives or the potential environmental effects of the DRACO program. The launch vehicle for DRACO has not been formally chosen; however, DARPA intends to select a launch vehicle for which potential environmental effects from a launch at CCSFS or KSC have already been analyzed and are understood.

The demonstration phase would occur at or above low Earth orbit (2,000-kilometer) and in an orbit at or above the "sufficiently high orbit" as defined by United Nations Resolution 47/68, *Principles Relevant to the Use of Nuclear Power Sources in Outer Space*. Using a sufficiently high orbit would remove the possibility of the reactor's reentering Earth's atmosphere for hundreds of years and before the fission products adequately decay to levels similar to the low levels of radioactivity that were in the reactor core at the time of the launch. Once the spacecraft reaches a sufficiently high orbit, the reactor would be properly oriented, turned on, and used to demonstrate the spacecraft's propulsion. The demonstration orbit would be chosen to mitigate the potential of colliding with another spacecraft or space debris.

The final project phase, referred to as in-space decommissioning, would occur after the demonstration phase and would be conducted in accordance with Presidential Memorandum on the National Strategy for Space Nuclear Power and Propulsion Space Policy Directive – 6. In-space decommissioning would ensure the reactor is left in the sufficiently high orbit chosen for the demonstration phase or a higher.

Alternatives Eliminated from Further Consideration

Alternative launch locations were considered in this EA. However, the only other U.S. launch site with facilities to support nuclear-enabled payloads is Vandenberg Space Force Base in California. A launch from Vandenberg Space Force Base would need to be targeted toward the east, which makes this location infeasible. Therefore, an alternative launch location was eliminated from further analysis.

Description of the No Action Alternative

CEQ regulation 40 CFR Subpart 1502.14(d) requires the inclusion of a No Action Alternative in the NEPA analysis. Under the No Action Alternative, DARPA would discontinue preparations for DRACO, and the spacecraft would not be launched. DOD and NASA would not benefit from the demonstration of the performance capability of NTP to be an operational system in cis-lunar space. In accordance with 32 CFR Subpart 989.8(d), the No Action Alternative is analyzed to describe the anticipated future condition if the Proposed Action is not implemented.

Summary of Environmental Findings

Based on the findings of the EA, the Proposed Action would not affect the following resources: visual resources; noise and noise-compatible land use; utilities, buildings, and transportation infrastructure; environmental justice; children's environmental health and safety risks; geology and soils; air quality and climate; socioeconomics; coastal zones; or floodplains. No significant adverse impacts would result to the following resources: nuclear radiation exposure, land use, water resources, biological resources, hazardous materials and waste, or cultural resources. No significant adverse cumulative impacts would result from activities associated with the Proposed Action when considered with past, present, or reasonably foreseeable future projects.

Finding of No Significant Impact

Based on my review of the facts and analyses in the attached EA, which is hereby incorporated by reference, conducted under the provisions of NEPA, CEQ's implementing regulations, and the EIAP, I conclude that the Proposed Action would have no significant environmental impact, either by itself or cumulatively with other known projects. Accordingly, an Environmental Impact Statement is not required. This analysis fulfills the requirements of NEPA, the CEQ's implementing regulations (40 CFR Parts 1500 through 1508), and the Air Force EIAP (32 CFR Part 989). The signing of this Finding of No Significant Impact completes the EIAP.

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Dr. Tabitha Dodson, PhD — Date
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Paul G. Filcek, Col, USAF — Date
Director, Space Force Mission Sustainment
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