NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTICE (94- )

National Environmental Policy Act; Lidar In-space Technology Experiment

AGENCY: National Aeronautics and Space Administration (NASA).

ACTION: Finding of No Significant Impact

SUMMARY: Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500 - 1508), and NASA policy and regulations (14 CFR Part 1216 Subpart 1216.3), NASA has made a Finding of No Significant Impact (FONSI) with respect to the proposed Lidar In-space Technology Experiment (LITE) to be managed by the NASA Langley Research Center, Hampton, VA. LITE involves testing the capabilities of a lidar (LIght Detection And Ranging) system to monitor atmospheric conditions from space. LITE hardware would be carried into orbit by a Space Shuttle mission launched from the Kennedy Space Center in Florida.

DATE: Comments on the FONSI must be provided in writing to NASA on or before (insert date 30 days from date of publication in the Federal Register).

ADDRESS: Comments should be submitted to Tricia Romanowski, Environmental Engineer, Environmental Engineering Branch, SSQRD, M/S 429, 5 Hunsaker Loop, NASA/Langley Research Center, Hampton, VA 23681.

The Environmental Assessment (EA) prepared for the proposed LITE which supports this FONSI may be examined by contacting the Freedom of Information Act Office at any of the following locations:

(a) NASA, Headquarters, Washington, DC 20546 (202-358-1764).

(b) NASA, Ames Research Center, Moffett Field, CA 94035 (415-604-4191).

(c) NASA, Goddard Space Flight Center, Greenbelt, MD 20771 (301-286-0730).

(d) Jet Propulsion Laboratory, NASA Resident Office, 4800 Oak Grove Drive, Pasadena, CA 91109 (818-354-5359).

(e) NASA, Johnson Space Center, Houston, TX 77058 (713-483-8612).

(f) NASA, Kennedy Space Center, FL 32899 (407-867-2622).

(g) NASA, Langley Research Center, Hampton, VA 23665 (804-864-6125).

(h) NASA, Lewis Research Center, 21000 Brookpark Road, Cleveland, OH 44135 (216-433-2902).

(i) NASA, Marshall Space Flight Center, AL 35812 (205-544-4523).

(j) NASA, Stennis Space Center, MS 39529 (601-688-2164).

A limited number of copies of the EA are available by contacting Tricia Romanowski, Environmental Engineer, at the address or telephone number indicated herein.

FOR FURTHER INFORMATION CONTACT: Tricia Romanowski, 804-864-7020.

SUPPLEMENTARY INFORMATION: NASA has reviewed the EA prepared for the proposed LITE and has determined that it represents an accurate and adequate analysis of the scope and level of associated environmental impacts. The EA is incorporated by reference in this FONSI.

NASA is proposing to test a lidar system in space for use in a global atmospheric monitoring program. The principal components of a lidar system are the laser transmitter module (LTM) and the telescope-receiver. The LTM shoots a pulsed laser beam into the atmosphere where much of the laser energy is absorbed by the atmosphere. Some of the energy is reflected back toward the telescope-receiver, while a small fraction passes through the atmosphere and reaches the Earth's surface. The energy reflected toward the telescope-receiver is used to assess meteorological conditions (e.g., cloud conditions) and atmospheric aerosols (e.g., atmospheric contaminants), and to monitor the ozone layer. NASA proposes to fly a lidar system as an attached payload on the Space Shuttle. The first flight is scheduled for the fall of 1994 as a 9-day mission to gain experience in operating a lidar system in a space environment and to evaluate the sensitivity of the lidar instrument for monitoring atmospheric conditions.

The proposed action and the No-Action Alternative (i.e., no space-based testing of a lidar system) were considered in the EA. The No-Action Alternative will not fulfill NASA's objective to advance atmospheric monitoring capabilities. Under the No-Action Alternative, it will not be possible to develop the technology

for a space-based lidar atmospheric monitoring system, and it will be necessary to continue to rely on existing passive monitoring instruments which have limitations in assessing the vertical distribution of atmospheric constituents.

The proposed action is the normal operation of the LITE payload from within the Space Shuttle cargo bay. The LITE payload will remain in the Shuttle cargo bay and will not produce any effluent which could escape the cargo bay during mission operations. The only feature of the LITE payload which will emerge from the cargo bay will be the laser beam.

The LITE LTM will produce laser energy in three wavelengths, one of which will be visible (pale green). The portion of the laser energy which will pass through the atmosphere will reach the Earth's surface in a series of circular "laser spots" as the Shuttle moves across the Earth's surface. The diameter of the spots will vary from 265 meters (870 feet) to 483 meters (1,585 feet). Exposure will occur only to persons who are within a laser spot. Each laser pulse will last for 20 nanoseconds. The planned mission orbits will be between 57 degrees north latitude and 57 degrees south latitude. Given the laser pulse rate and the Shuttle's orbiting velocity, a person cannot be within two consecutive laser spots.

A comprehensive safety analysis performed for the proposed LITE found minimal risk of skin or eye injury from operation of the LITE LTM. The maximum Radiant Exposure (RE) to a person within a laser spot was calculated to be more than a million times lower

than the Maximum Permissible Exposure (MPE) for skin exposure and at least two orders of magnitude lower than the MPE for eye exposure for each of the three laser energy wavelengths. The cumulative effect of simultaneous exposure to multiple wavelengths was calculated to be at least two orders of magnitude lower than the MPE. RE to persons using binoculars to view the Shuttle from within a laser spot was calculated to be lower than the MPE. While RE to persons using a 165-mm (6.5-inch) telescope to view the Shuttle from within a laser spot was calculated to be equal to the MPE, there is still considerable safety factor in the MPE, since MPE's are established at exposures which are one to two orders of magnitude lower than the level of any known hazard.

A Phase I Flight Safety Review found that the LITE LTM lasers will not be hazardous to persons in aircraft and will not interfere with microwave, very-high-frequency, or ultra-high-frequency communications. A review by the U.S. Space Command Laser Clearinghouse found that the LITE lasers will not exceed the damage threshold to space systems.

No other potential environmental impacts were identified as a result of the environmental assessment. On the basis of the LITE EA and underlying reference documents, NASA has determined that the environmental impacts associated with this project will not individually or cumulatively have a significant effect on the quality of the environment. NASA will take no final action prior to the expiration of the 30-day comment period.

Gregory M. Reck

Acting Associate Administrator

for Advanced Concepts and Technology