National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

November 22, 2010

Reply to Attn of: 460

MEMORANDUM FOR THE RECORD

The National Environmental Policy Act (NEPA) Compliance for Interface Region Imaging Spectrograph (IRIS)

Introduction

The NEPA of 1969, as amended (42 U.S.C. 4321, *et seq.*), requires Federal agencies to consider the environmental impacts of a project in their decision making process. To comply with NEPA and associated regulations (the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA [40 CFR Parts 1500-1508] and NASA policy and procedures [14 CFR, Part 1216, Subpart 1216.3]), NASA has prepared an Environmental Assessment (EA) for routine payloads launched on Expendable Launch Vehicles (ELVs) from Cape Canaveral Air Force Station (CCAFS) and Vandenberg Air Force Base (VAFB) (Ref: *Final Environmental Assessment for Launch of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station, Florida, and Vandenberg Air Force Base, California*, June 2002). The EA assesses the environmental impacts of missions launched from CCAFS and VAFB with spacecraft that are considered routine payloads.

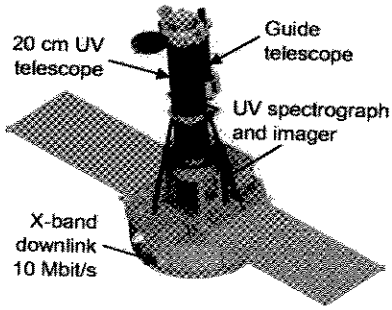
Spacecraft defined as routine payloads utilize materials, quantities of materials, launch vehicles and operational characteristics that are consistent with normal and routine spacecraft preparation and flight activities at VAFB, CCAFS, and the Kennedy Space Center. The environmental impacts of launching routine payloads from VAFB and CCAFS fall within the range of routine, ongoing and previously documented impacts that have been determined not to be significant. Spacecraft covered by this EA meet specific criteria ensuring that the spacecraft, its operation and decommissioning, do not present any new or substantial environmental or safety concerns.

To determine the applicability of a routine payload classification for a spacecraft launched from VAFB and CCAFS, the mission is evaluated against the criteria defined in the EA using the Routine Payload Checklist (RPC).

Mission Description

The IRIS mission will fill a crucial gap in our current operational capabilities to aid in our understanding of the energy transport of the sun. Understanding the interface between the photosphere and corona remains a fundamental challenge in solar and heliospheric science. The IRIS mission opens a window of discovery into this crucial region by tracing the flow of energy and plasma through the chromosphere and transition region into the corona using spectrometry and imaging. IRIS is designed to provide significant new information to increase our understanding of energy transport into the corona and solar wind and provide an archetype for all stellar atmospheres. The unique instrument capabilities, coupled with state of the art 3-D modeling, will fill a large gap in our knowledge of this dynamic region of the solar atmosphere. The mission will extend the scientific output of existing heliophysics spacecraft that follow the effects of energy release processes from the sun to Earth. IRIS will provide key insights into all these processes, and thereby advance our understanding of the solar drivers of space weather from the corona to the far heliosphere, by combining high-resolution imaging and spectroscopy for the entire chromosphere and adjacent regions. IRIS will resolve in space, time, and wavelength the dynamic geometry from the chromosphere to the low-temperature corona to shed much-needed light on the physics of this magnetic interface region.[1]

The IRIS spacecraft will fly in a Sun-synchronous polar orbit for continuous solar observations on a two year mission. The IRIS instrument is a multi-channel imaging spectrograph with a 20 cm UV telescope. It will obtain ultraviolet spectra and images with high resolution (1/3 arcsec) with a cadence of as little as one second apart focused on the chromospheres and the transition region.[2] IRIS will be launched on a Pegasus XL from VAFB into a Sun-synchronous orbit.



The components utilized in the IRIS spacecraft are made of materials normally encountered in the space industry. IRIS will not use any radioactive materials, lasers or propellants. IRIS will not carry any pathogenic organisms, nor will IRIS return samples to Earth. The IRIS mission will not pose any substantial hazards or environmental concerns.

NASA Routine Payload Determination

The proposed IRIS mission has been reviewed in accordance with the routine payload criteria (see enclosure) established in the "*Final Environmental Assessment for Launch of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station, Florida, and Vandenberg Air Force Base, California*," dated June 2002 and the Finding of No Significant Impact (FONSI), dated June 18, 2002. Based on this review, it is determined that the IRIS mission falls within the scope of the reference EA and the mission is hereby designated as a NASA Routine Payload. The IRIS mission will have no significant impact, individually or cumulatively, on the quality of the human environment. No additional NEPA action or documentation is required.

for

11-22-10

George W. Morrow
Director of Flight Projects

Date

4/2/10

Robert Strain
Director

Date

Enclosure

References

1 - http://science.nasa.gov/missions/iris/
2 - http://www.lockheedmartin.com/data/assets/ms2/MonitorSum08.pdf
Lockheed Martin "The Monitor" Summer 2008 Volume 4 No. 3

EVALUATION RECOMMENDATION PACKAGE

Record of Environmental Consideration
Routine Payload Checklist
NEPA Environmental Checklist

Enclosure

RECORD OF ENVIRONMENTAL CONSIDERATION

1. Project Name: Interface Region Imaging Spectrograph (IRIS)

2. Description/location of proposed action: Mission to observe the solar photosphere-corona interface

   Date and/or Duration of project: December 2012

3. It has been determined that the above action:

__X__ a. Is adequately covered in an existing EA or EIS.
   Title: *Final Environmental Assessment for Launch of NASA Routine Payloads on ELVs from CCAFS, Florida and VAFB, California*
   Date: June 2002

___ b. Qualifies for Categorical Exclusion and has no special circumstances which would suggest a need for and Environmental Assessment.
   Categorical Exclusion:

___ c. Is exempt from NEPA requirements under the provisions of:

___ d. Is covered under EO 12114, not NEPA.

___ e. Has no significant environmental impacts as indicated by the results of an environmental checklist and/or detailed environmental analysis.
   (Attach checklist or analysis as applicable)

___ f. Will require the preparation of an Environmental Assessment.

___ g. Will require the preparation of an Environmental Impact Statement.

___ h. Is not federalized sufficiently to qualify as a major federal action.

Beth Montgomery — NEPA Program Manager, Code 250 — 11/4/2010
Beth Montgomery — Date

John Loiacono — Project Manager, Code 460 — 11/8/2010
John Loiacono — Date

GSFC Routine Payload Checklist

PROJECT NAME: Interface Region Imaging Spectrograph (IRIS)		DATE OF LAUNCH: 12-1-2012
PROJECT CONTACT: JOHN LOIACONO	PHONE NUMBER: 301-286-8562	MAILSTOP: CODE 460
PROJECT START DATE: OCTOBER 1, 2009	PROJECT LOCATION: LOCKHEED MARTIN, ATC, PALO ALTO, CA	
PROJECT DESCRIPTION: SUN OBSERVING MISSION TAKING VISIBLE AND INFARED SPECTRUM		

A. SAMPLE RETURN:	YES	NO
1. Would the candidate mission return a sample from an extraterrestrial body?	☐	☒

B. RADIOACTIVE SOURCES:	YES	NO
1. Would the candidate spacecraft carry radioactive materials?	☐	☒
2. If yes, would the amount of radioactive sources require launch approval at the NASA Associate Administrator level or higher according to NPG 8715.3 (NASA Safety Manual)?	☐	☐
Provide a copy of the Radioactive Materials Report as per NPG 8715.3 Section 5.5.2.		

C. LAUNCH AND LAUNCH VEHICLES:	YES	NO
1. Would the candidate spacecraft be launched using a launch vehicle/launch complex combination other than those indicated in Table 1 below?	☐	☒
2. Would the proposed mission cause the annual launch rate for a particular launch vehicle to exceed the launch rate approved or permitted for the affected launch site?	☐	☒
Comments:		

D. FACILITIES:	YES	NO
1. Would the candidate mission require the construction of any new facilities or substantial modification of existing facilities?	☐	☒
2. If yes, has the facility to be modified been listed as eligible or listed as historically significant?	☐	☐
Provide a brief description of the construction or modification required:		

E. HEALTH AND SAFETY:	YES	NO
1. Would the candidate spacecraft utilize any hazardous propellants, batteries, ordnance, radio frequency transmitter power, or other subsystem components in quantities or levels exceeding the Envelope Payload Characteristics (EPC's) in Table 2 below?	☐	☒
2. Would the candidate spacecraft utilize any potentially hazardous material as part of a flight system whose type or amount precludes acquisition of the necessary permits prior to its use or is not included within the definition of the Envelope Payload (EP)?	☐	☒
3. Would the candidate mission release material other than propulsion system exhaust or inert gases into the Earth's atmosphere or space?	☐	☒
4. Would launch of the candidate spacecraft suggest the potential for any substantial impact on public health and safety?	☐	☒
5. Would the candidate spacecraft utilize a laser system that does not meet the requirements for safe operation (ANSI Z136.1-2000 and ANSI Z136.6-2000)? For Class III-B and IV laser operations, provide a copy of the hazard evaluation and written safety precautions (NPG	☐	☒

8715.3).		
6. Would the candidate spacecraft contain pathogenic microorganisms (including bacteria, protozoa, and viruses) which can produce disease or toxins hazardous to human health?	☐	☒
Comments:		

F. OTHER ENVIRONMENTAL ISSUES:	YES	NO
1. Would the candidate spacecraft have the potential for substantial effects on the environment outside the United States?	☐	☒
2. Would launch and operation of the candidate spacecraft have the potential to create substantial public controversy related to environmental issues?	☐	☒
Comments:		

Table 1: Launch Vehicles and Launch Pads

Launch Vehicle	Eastern Range (CCAFS Launch Complexes)	Western Range (VAFB Space Launch Complexes)
Atlas IIA & AS	LC-36	SLC-3
Atlas IIIA & B	LC-36	SLC-3
Atlas V Family	LC-41	SLC-3
Delta II Family	LC-17	SLC-2
Delta III	LC-17	N/A
Delta IV Family	LC-37	SLC-6
Athena I & II	LC-46 or -20	California Spaceport
Taurus	LC-46 0r -20	SLC-576E
Titan II	N/A	SLC-4W
Pegasus XL	CCAFS skidstrip KSC SLF	VAFB airfield

Table 2: Summary of Envelope Spacecraft Subsystems and Envelope Payload Characteristics (EPC)

Structure	**Unlimited:** aluminum, magnesium, carbon resin composites, and titanium **Limited:** beryllium [50 kg (110 lb)]
Propulsion	Mono- and bipropellant fuel; 1000 kg (2200 lb) (hydrazine); 1000 kg (2200 lb) (monomethyhydrazine) Bipropellant oxidizer; 1200 kg (2640 lb) (nitrogen tetroxide) Ion-electric fuel; 500 kg (1100 lb) (Xenon) SRM; 600 kg (1320 lb) (AP)-based solid propellant
Communications	Various 10-100 W (RF) transmitters
Power	Solar cells; 150 A-Hr (Ni-H_2) battery; 300 A-Hr (LiSOC) battery; 150 A-Hr (NiCd) battery
Science instruments	10 kW radar ANSI safe lasers (Section 4.1.2.1.3)
Other	Class C EEDs for mechanical systems deployment Radioisotopes limited to quantities that are approved for launch by NASA Nuclear Flight Safety Assurance Manager Propulsion system exhaust and inert gas venting

GODDARD SPACE FLIGHT CENTER
ENVIRONMENTAL CHECKLIST
FOR FLIGHT PROJECTS

1. PROJECT/PROGRAM: Interface Region Imaging Spectrograph (IRIS)

2. POINTS OF CONTACT

Name:	Code:	Phone No.:
John Loiacono	460	6-8562

3. SCHEDULE

PDR/CDR:	Launch Date:
5/2010 & 12/2010	12/2012

4. CURRENT STATUS

- pre-KDP-C meeting at GSFC approves mission to proceed
- KDP-C July, 2010

5. PROJECT DESCRIPTION

a. Purpose: Solar photosphere-corona interface observations

b. Spacecraft: 77 kg, 300 watts, no propellant

c. Instruments: 90 kg, Imaging & infrared spectrograph (1 instrument)

d. Launch Vehicle: Pegasus

e. Launch Site: VAFB

f. NASA's Involvement/Responsibility: Explorer (SMEX) Mission Management

g. Participants/Locations: Lockheed Martin, ATC, Palo Alto, CA (see #12 below)

h. End of Mission, Re-entry: LRD 12/2012, 2 year mission + 25 years = 2039

6. Is there anything controversial about the mission?

N/A

7. Is there anything unique, unusual, or exotic about the mission, spacecraft, and instruments?

N/A

8. Is there any environmental documentation for spacecraft, launch vehicle (NEPA or EO12114)?

N/A

9. Is the mission (s/c and LV) compliant with NASA policy and guidelines for orbital debris (NPD 8710.3 and NSS 1740.14)? Explain non –compliances.

No. However, a more refined ORSAT analysis will be performed for CDR. GSFC, JSC and HQ believe, because IRIS is small, has no propulsion tank, nor large quantities of titanium, berillium, etc that IRIS should meet the requirements.

10. Has an Air Force Form 813 been completed? *(Please attach copy)*

☐ YES
☑ NO

	11. During any phase, does the mission/project include or involve: Check all that apply. If uncertain, indicate with a "?" For all that apply, provide an explanation. Use the additional space below if needed.
	A. Fuels
	B. Ionizing Radiation Devices/Sources
	C. Explosives
	D. Hazardous Materials/Substances/Chemicals
	E. Lasers (Class, Earth Pointing)
	F. Disease Producing Pathogenic Microorganisms
	G. Discharges of any Substances into Air, Water, or Soil
	H. Hazardous Wastes
	I. High Noise Levels
	J. Sample Return to Earth
✓	K. Radio Frequency Communications
	L. Construction/Modification/Demolition of a Facility
	M. Land Disturbance, Tree Clearing, Removal of Vegetation
	N. Impact on Threatened or Endangered Species
	O. Impact/Destruction of Sensitive Wildlife Habitat
	P. Impact on/near Areas of Cultural Significance
	Q. Impact on Local Social or Economic Conditions (Traffic, Employment, etc.)
	R. Impact on Minority or Low Income Populations
	S. New or Foreign Launch Vehicle
	T. Other Issues of Potential Environmental Impact
	U. Require any Environmental Permit

Additional Information

from item #5g: ARC is performing mission operations for IRIS. Norwegian Space Agency is receiving mission data through its ground antenna at no cost.

12. What Safety hazards are associated with the mission?

N/A

13. Summary of Subsystem Components

Structural Materials	Spacecraft bus is aluminum honeycomb. 20 cm telescope tube is composite.
Propulsion	None
Communications	x-band and s-band
Power	300 watts
Science Instruments	one imaging and infrared telescope
Hazardous Components (radioactive materials, tasers, chemicals, etc.)	none
Other (include dimensions and weight of s/c)	1.8 meters tall, 1 meter diameter, 77 kg bus, 200 kg for observatory

Project Manager Name: John Loiacono	Date: July 26, 2010
Project Manager Signature: