National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, MD 20771

Reply to Attn of: 425

MEMORANDUM FOR THE RECORD

The National Environmental Policy Act (NEPA) Compliance for Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2)

1.0 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 (Ref: *Environmental Assessment (Final) for Launch of NASA Routine Payloads*, November 2011). The 2011 NASA Routine Payload EA (NRPEA) assesses the environmental impacts of missions launched with spacecraft that are considered routine payloads from existing launch facilities at Cape Canaveral Air Force Station (CCAFS), Florida, Vandenberg Air Force Base (VAFB), California, the United States Army Kwajalein Atoll/Reagan Test Site (USAKA/RTS) in the Republic of the Marshall Islands (RMI), NASA's Wallops Flight Facility (WFF), Virginia, and the Kodiak Launch Complex (KLC), Alaska.

Spacecraft defined as routine payloads utilize materials, quantities of materials, launch vehicles, launch sites, and operational characteristics that are consistent with normal and routine spacecraft preparation and flight activities at VAFB, CCAFS, USAKA/RTS, WFF, KLC, and the Kennedy Space Center. The environmental impacts of launching routine payloads from these sites fall within the range of routine, ongoing and previously documented impacts that have been determined not to be significant. Spacecraft within the scope of 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 mission, the mission is evaluated against the criteria defined in the EA using the Routine Payload Checklist (RPC).

2.0 Mission Description

ICESat-2 is a follow-on mission to the original ICESat mission. ICESat was the benchmark Earth Observing System mission for measuring ice sheet mass balance, cloud and aerosol heights, as well as land topography and vegetation characteristics. From 2003 to 2009, the ICESat mission provided multi-year elevation data needed to determine ice sheet mass balance, as well as, cloud property information, especially for stratospheric clouds common over polar areas. It also provided topography and vegetation data around the globe, in addition to the polar-specific coverage over the Greenland and Antarctic ice sheets. ICESat-2 will continue the measurements taken by ICESat.

The ICESat-2 observatory is comprised of one instrument, an improved laser altimeter called ATLAS (Advanced Topographic Laser Altimeter System) and a spacecraft procured through the Rapid Spacecraft Development Office at Goddard Space Flight Center (GSFC). ATLAS is a laser altimeter designed to measure ice-sheet topography and associated temporal changes, as well as cloud/atmospheric properties and land surface topography.

GSFC is responsible for overall implementation of the ICESat-2 Mission. GSFC provides: project management, mission systems engineering, in-house instrument development and management, science support, spacecraft and associated ground support equipment, procurement of the observatory, integration and test, launch support, and post launch checkout. Orbital Science Corporation (OSC) provides the spacecraft, as well as integration of the ATLAS instrument to the spacecraft, environmental testing of the combined observatory and launch site activities. GSFC is responsible for mission operations, with OSC as the prime contractor for the Mission Operations Center (MOC). GSFC will develop the ICESat-2 Science Investigator-led Processing System, the Instrument Support Facility and procure the MOC. The Kennedy Space Center is responsible for launch services.

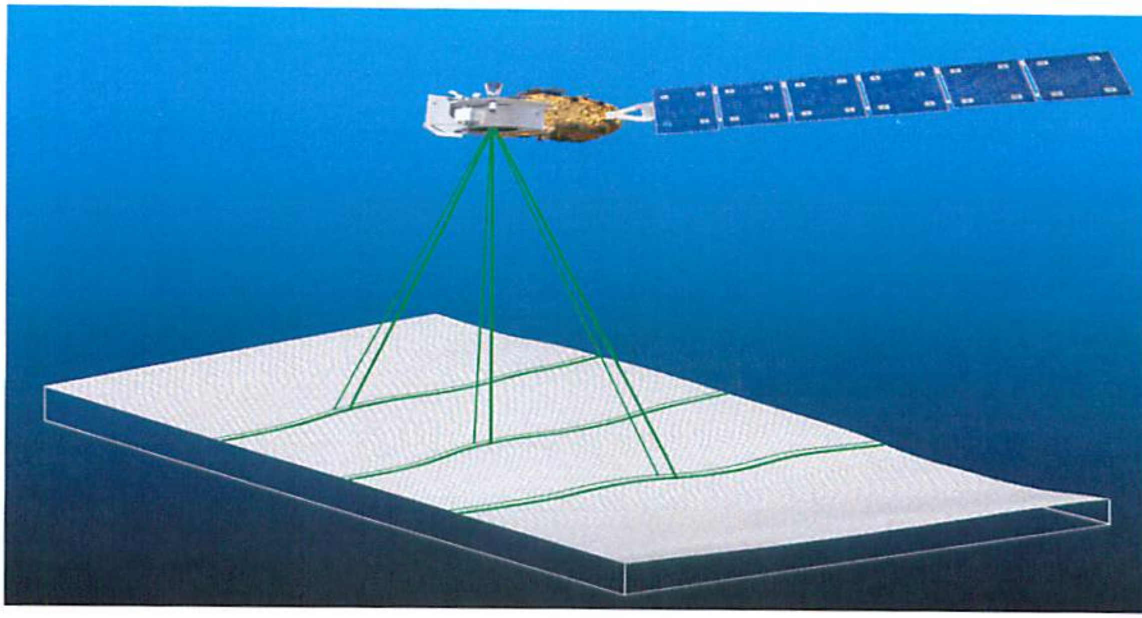
ICESat-2 is a 3-year science mission. The science objectives of ICESat-2 are:

- Determine polar ice sheet mass balance; understand controlling mechanisms; examine how ice sheets will impact global sea level and ocean circulation in a changing climate.

- Measure sea-ice thickness to understand ice/ocean/atmosphere exchanges of energy, mass and moisture.

- Vegetation cover surface height and global biomass measurement.

ICESat-2 is scheduled to be launched from VAFB in early 2016. Launch vehicle selection has not been made, but will be one of the launch vehicle/launch site combinations addressed in the 2011 NRPEA.



3.0 NASA Routine Payload Determination

The components utilized in the ICESat-2 spacecraft are made of materials normally encountered in the space industry. The ICESat-2 mission will not utilize radioactive sources, will not carry any pathogenic organisms and will not return samples to Earth. ICESat-2 will utilize an earth-pointing laser in the ATLAS instrument. The laser meets the requirements for safe operation in accordance with ANSI Z136.1 and ANSI Z136.6. There is no requirement to notify the Federal Aviation Administration of the on-orbit laser operations however, laser operations will be coordinated with the Department of Defense Laser Clearinghouse. A controlled reentry is planned for the ICESat-2 spacecraft.

The ICESat-2 mission has been evaluated against the 2011 NRPEA, using the RPC (see enclosed Evaluation Recommendation Package). The site specific impacts of the potential ICESat-2 launch vehicle/launch site combination are addressed in the EA. Based on the analyses set forth in the 2011 NRPEA, NASA has determined that the environmental impacts associated with the ICESat-2 will not individually or cumulatively have a significant impact on the quality of the human environment and that a routine payload classification for the ICESat-2 mission is applicable.

D M[...] for
George W. Morrow
Director of Flight Projects

9/20/12
Date

C. J. S[...]
Christopher J. Scolese
Director

2 October 2012
Date

Enclosure

EVALUATION RECOMMENDATION PACKAGE

Record of Environmental Consideration
Routine Payload Checklist
NEPA Environmental Checklist

Enclosure

RECORD OF ENVIRONMENTAL CONSIDERATION

1. Project Name: Ice, Clouds, and Land Elevation Satellite-2 (ICESat-2)

2. Description/location of proposed action: Mission to measure ice-sheet topography and associated temporal changes, as well as cloud/atmospheric properties and land surface topography

   Date and/or Duration of project: Launch – Early 2016

3. It has been determined that the above action:

X a. Is adequately covered in an existing EA or EIS.
Title: *Environmental Assessment (Final) for Launch of NASA Routine Payloads*
Date: November 2011

___ 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 [signature] — Beth Montgomery, NEPA ~~Program~~ Manager, Code 250 — Date: 8/27/12

Doug McLennan [signature] — Doug McLennan, Project Manager, Code 425 — Date: 9/12/12

APPENDIX C.
NASA ROUTINE PAYLOAD EVALUATION AND DETERMINATION PROCESS AND CHECKLIST

After a proposed spacecraft mission is sufficiently well formulated (usually the Phase B design study), the Sponsoring Entity, in coordination with the local Environmental Management Office (EMO), will prepare an environmental evaluation. An environmental evaluation is a *preliminary* review that determines what aspects of the proposal are of potential environmental concern. The environmental evaluation also assists in determining the appropriate level of National Environmental Policy Act (NEPA) documentation (i.e., environmental assessment [EA], or environmental impact statement [EIS]) for the proposal. The local EMO uses a comprehensive checklist to provide a level of rigor to this early evaluation of the proposal, helping to ensure that pertinent considerations are not overlooked. Local EMO review of the Routine Payload Checklist (RPC, below) forms the basis for evaluating the applicability of a NASA Routine Payload (NRP) spacecraft classification for a proposed mission.

The local EMO uses the completed RPC (and required attachments) to evaluate the proposed mission against the NRP EA criteria. If the EMO evaluation of the RPC indicates that a NRP categorization may be appropriate, the Sponsoring Entity documents this in an Evaluation Recommendation Package (ERP). The ERP is then processed for review and approval in accordance with established National Aeronautics and Space Administration (NASA) procedures and guidelines. If approved, the ERP would be attached to a Record of Environmental Consideration (REC).

The Sponsoring Entity can then proceed with the proposal while monitoring the project activities, for changes or circumstances during implementation that could affect classification of the proposed mission as a NRP spacecraft. If a NRP spacecraft categorization is determined to be inappropriate, the local EMO will initiate plans for preparation of additional NEPA documentation.

NASA Routine Payload Checklist (1 of 2)

PROJECT NAME: ICESAT-2 DATE OF LAUNCH: 4/2016
PROJECT CONTACT: JOHN LEON PHONE NUMBER: 301-286-5962 MAILSTOP:425
PROJECT START DATE: FEB 2010 PROJECT LOCATION: BUILDING 23 ROOM C130
PROJECT DESCRIPTION: LASER ALTIMETER TO MEASURE ICE HEIGHT

	YES	NO
A. SAMPLE RETURN:	YES	NO
1. Would the candidate mission return a sample from an extraterrestrial body?		**NO**
B. RADIOACTIVE MATERIALS:	YES	NO
1. Would the candidate spacecraft carry radioactive materials in quantities that produce an A2 mission multiple value of 10 or more?		**NO**
Provide a copy of the Radioactive Materials On Board Report as per NPR 8715.3 with the ERP submittal		
C. LAUNCH AND LAUNCH VEHICLES:	YES	NO
1. Would the candidate spacecraft be launched on a vehicle and launch site combination other than those listed in Table C–1 below?		**NO**
2. Would launch of the proposed mission exceed the approved or permitted annual launch rate for the particular launch vehicle or launch site?		**NO**
Comments:		
D. FACILITIES:	YES	NO
1. Would the candidate mission require the construction of any new facilities or substantial modification of existing facilities?		**NO**
Provide a brief description of the construction or modification required, including whether ground disturbance and/or excavation would occur:		
E. HEALTH AND SAFETY:	YES	NO
1. Would the candidate spacecraft utilize batteries, ordnance, hazardous propellant, radiofrequency transmitter power, or other subsystem components in quantities or levels exceeding the EPCs in Table C–2 below?		**NO**
2. Would the expected risk of human casualty from spacecraft planned orbital reentry exceed the criteria specified by NASA Standard 8719.14?		**NO**
3. 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 Characteristics?		**NO**
4. Would the candidate mission, under nominal conditions, release material other than propulsion system exhaust or inert gases into the Earth's atmosphere or space?		**NO**
5. Are there changes in the preparation, launch or operation of the candidate spacecraft from the standard practices described in Chapter 3 of this EA?		**NO**
6. Would the candidate spacecraft utilize an Earth-pointing laser system that does not meet the requirements for safe operation (ANSI Z136.1-2007 and ANSI Z136.6-2005)?		**NO**
7. Would the candidate spacecraft contain, by design (e.g., a scientific payload) pathogenic microorganisms (including bacteria, protozoa, and viruses) which can produce disease or toxins hazardous to human health or the environment beyond Biosafety Level 1 (BSL 1)[1]?		**NO**
Comments:		

Continued on next page

[1] The use of biological agents on payloads is limited to materials with a safety rating of "Biosafety Level 1." This classification includes defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy human adults. Personnel working with Biosafety Level 1 agents follow standard microbiological practices including the use of mechanical pipetting devices, no eating drinking, or smoking in the laboratory, and required hand-washing after working with agents or leaving a lab where agents are stored. Personal protective equipment such as gloves and eye protection is also recommended when working with biological agents.

NASA Routine Payload Checklist (2 of 2)

PROJECT NAME: ICESAT-2 DATE OF LAUNCH: 4/2016
PROJECT CONTACT: JOHN LEON PHONE NUMBER: 301-286-5962 MAILSTOP: 425
PROJECT START DATE: FEB 2010 PROJECT LOCATION: BUILDING 23 ROOM C130
PROJECT DESCRIPTION: LASER ALTIMETER TO MEASURE ICE HEIGHT

F. OTHER ENVIRONMENTAL ISSUES:	YES	NO
1. Would the candidate spacecraft have the potential for substantial effects on the environment outside the United States?		NO
2. Would launch and operation of the candidate spacecraft have the potential to create substantial public controversy related to environmental issues?		NO
3. Would any aspect of the candidate spacecraft that is not addressed by the EPCs have the potential for substantial effects on the environment (i.e., previously unused materials, configurations or material not included in the checklist)?		NO
Comments:		

Table C–1. Launch Vehicles and Launch Sites

Launch Vehicle and Launch Vehicle Family	Space Launch Complexes and Pads				
	Eastern Range (CCAFS)	Western Range (VAFB)	USAKA/RTS	WFF	KLC
Athena I, IIc, III[a]	LC-46	CA Spaceport (SLC-8)	N/A	Pad 0	LP-1[a]
Atlas V Family	LC-41	SLC-3	N/A	N/A	N/A
Delta II Family	LC-17	SLC-2	N/A	N/A	N/A
Delta IV Family	LC-37	SLC-6	N/A	N/A	N/A
Falcon 1/1e	LC-36	SLC-4W	Omelek Island	Pad 0	LP-3[b]
Falcon 9	LC-40	SLC-4E	Omelek	Pad 0	LP-3[b]
Minotaur I	LC-20 and/or LC-46	SLC-8	N/A	Pad 0	LP-1
Minotaur II-III	LC-20 and/or LC-46	SLC-8	N/A	Pad 0	LP-1
Minotaur IV	LC-20 and/or LC-46	SLC-8	N/A	Pad 0	LP-1
Minotaur V	LC-20 and/or LC-46	SLC-8	N/A	Pad 0	LP-1
Pegasus XL	CCAFS skidstrip KSC SLF	VAFB Airfield	Kwajalein Island	WFF Airfield	N/A
Taurus	LC-46 and/or LC-20	SLC-576E	N/A	Pad 0	LP-1
Taurus II	NA	NA	N/A	Pad 0	LP-3[b]
Any other launch vehicle/launch site combination for which NASA has completed or cooperated on the NEPA compliance					

a. Athena III and LP-3 are currently under design.

b While not explicitly listed in this table, the Minotaur IV includes all configurations of this launch vehicle, including the Minotaur IV+, which is a Minotaur IV with a Star 48V 4th stage.

Key: CA=California; CCAFS=Cape Canaveral Air Force Station; KSC=Kennedy Space Center; LC=Launch Complex; LP=Launch Pad; MARS=Mid-Atlantic Regional Spaceport; SLC=Space Launch Complex; SLF=Shuttle Landing Facility; USAKA/RTS=United States Army Kwajalein Atoll/Reagan Test Site; VAFB=Vandenberg Air Force Base; WFF=Wallops Flight Facility.

Table C–2. Summary of Envelope Payload Characteristics by Spacecraft Subsystems

Structure	• Unlimited: aluminum, beryllium, carbon resin composites, magnesium, titanium, and other materials unless specified as limited.
Propulsion[a]	• Liquid propellant(s); 3,200 kg (7,055 lb) combined hydrazine, monomethyhydrazine and/or nitrogen tetroxide. • Solid Rocket Motor (SRM) propellant; 3,000 kg (6,614 lb) Ammonium Perchlorate (AP)-based solid propellant (examples of SRM propellant that might be on a spacecraft are a Star-48 kick stage, descent engines, an extra-terrestrial ascent vehicle, etc.)
Communications	• Various 10-100 Watt (RF) transmitters
Power	• Unlimited Solar cells; 5 kilowatt-Hour (kW-hr) Nickel-Hydrogen (NiH_2) or Lithium ion (Li-ion) battery, 300 Ampere-hour (A-hr) Lithium-Thionyl Chloride (LiSOCl), or 150 A-hr Hydrogen, Nickel-Cadmium (NiCd), or Nickel-hydrogen ($Ni\text{-}H_2$) battery.
Science Instruments	• 10 kilowatt radar • American National Standards Institute safe lasers (see Section 4.1.2.1)
Other	• U. S. Department of Transportation (DoT) Class 1.4 Electro-Explosive Devices (EEDs) for mechanical systems deployment • Radioactive materials in quantities that produce an A2 mission multiple value of less than 10 • Propulsion system exhaust and inert gas venting • Sample returns are considered outside of the scope of this environmental assessment

[a]. Propellant limits are subject to range safety requirements.
Key: kg=kilograms; lb=pounds.

Goddard Space Flight Center
FLIGHT PROJECT ENVIRONMENTAL CHECKLIST

1. PROJECT/PROGRAM ICESat-2	Date: 5/7/2012

2. SCHEDULE

PDR/CDR: Mission PDR- Oct 2012, Mission CDR - 7/2013	Launch Date: 7/2016

3. CURRENT STATUS

Atlas Instrument held PDR 11/2011, Spacecraft Systems Requirement Review(SRR) held 1/2012, Mission Operations Center SRR held 4/2012
Working towards spacecraft PDR of 9/2012, a mission PDR of 10/2012, a Ground System PDR of 11/2012, and Instrument CDR 2/2013

4. PROJECT DESCRIPTION

a. Purpose:
The science objectives of ICESat-2 are:
- Determine polar ice sheet mass balance; understand controlling mechanisms; examine how ice sheets will impact global sea level and ocean circulation in a changing climate.
- Measure sea-ice thickness to understand ice/ocean/atmosphere exchanges of energy, mass and moisture.
- Measure vegetation cover and global biomass.

b. Spacecraft:
The ICESat-2 observatory consists of an Orbital Science Corp. spacecraft bus + the GSFC developed ATLAS Instrument. Its orbit is 481 km x 94 degrees. It is a three axis stabilized nardir pointing s/c with a single two gimble solar array and a 150 Ahr Li-Ion battery. S-band communications are used for TT&C and X-band science data. The observatory mass is 1350 kg including 110 kg of hydrazine propellant.

c. Instruments:
The ATLAS (Advanced Topographic Laser Altimeter System) instrument is a multiple-beam laser altimeter. It illuminates 6 spots on the ground simultaneously with light from a single laser pulse that last approximately 1 nanosecond, at a repetition rate of 10 kHz. ATLAS includes an advanced Laser Reference System (LRS) which supports the altimeter measurement by using a star camera for precision laser pointing

d. Launch Vehicle:
The observatory is being design to be launch on a Delta II, Atlas 5, Delta 4, or Falcon 9 launch vehicle. Currently a down selection of these launch vehicle has not been made.

e. Launch Site:
Vandenberg Air Force Base.

f. NASAs Involvement/Responsibility:
GSFC is responsible for overall management of the ICESat-2 project and also responsible for the design, fabrication, and devilery of the ATLAS instrument to the spacecraft vendor.

g. Participants/Locations:
NASA GSFC/Greenblelt MD (Alt
Orbital Science Corporation/ S/C bus management- Dulles, VA, s/c bus fabrication and observatory integration - Gilbert, AZ

h. End-of-Mission Plan: Planned Re-entry (controlled/uncontrolled?)
The s/c will perform a controlled re-entry using on-board hydrazine propulsion system.

5. Is there anything controversial or unique about the mission, spacecraft or instruments? If yes, Explain. Yes ☐ No ☑

6. Is the mission compliant with NASA requirements for limiting orbital debris (NPR 8715.6, and NASA Standard 8719.14? Explain non-compliances. Yes ☑ No ☐

7. During any phase, does the mission/project include or involve: Check yes for all that apply. If uncertain, check the corresponding box. For all that apply, provide an explanation. Use the additional space below if needed.	Yes	No	Uncertain
A. Fuels	☑	☐	☐
B. Ionizing Radiation Devices/Sources	☐	☑	☐
C. Explosives	☐	☑	☐
D. Hazardous Materials/Substances/Chemicals	☑	☐	☐
E. Lasers (Class, Earth Pointing)	☑	☐	☐
F. Disease Producing Pathogenic Microorganisms/Biological Agents	☐	☑	☐
G. Discharges/Venting of any Substances into Air, Water, or Soil	☐	☑	☐
H. Hazardous Waste Generation	☐	☑	☐
I. High Noise Levels	☐	☑	☐
J. Sample Return to Earth	☐	☑	☐
K. Radio Frequency Communications	☑	☐	☐
L. Construction/Modification/Demolition of a Facility/Lab (onsite - offsite)	☐	☑	☐
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 (Increase in 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. Environmental Permits	☐	☑	☐

Additional Information

A. Hydrazine fuel in propulsion system
D. Hydrazine fuel in propulsion system
E. ATLAS instrument laser
F. S and X band space to ground communications

8. What Safety hazards are associated with the mission?

- Pressurized Hydrazine Propulsion Subsystem
- 134 Ahr Li-Ion Battery
- Laser in ATLAS instruments
- RF transmitters on spacecraft

9. Summary of Subsystem Components	
Propulsion (Include fuel type, amount, tank size, materials, dimensions	28 in diameter spherical titanium diaphragm propellant tank. 400 psia Maximum Expected Operating Pressure. 16.6 x 21.6" Titanium lined composite over wrapped pressurant tank (3137 in3) operating at 400 p psia.
Communications	S-band communications are used for TT&C and X-band science data. The S band system has two fixed hemispherical antennas. The X band system has a single high gain antenna.
Structural Materials	Al support structure, attachment rings, equipment panels AL honeycomb panels, composite facesheet Al honeycomb solar array panels, Titanium payload attachment flexures.
Power	Single solar array which enables a power system capability of 1560 W. An eight cell 134 Ahr Li-Ion battery nominally 28 V.
Science Instruments	Single ATLAS instrument as described above
Hazardous Components (radioactive materials, lasers, chemicals, etc.)	Laser - 250-900 microJ pulse engery, 532 nm center wavelength, 10 kHz pulse rate, 1.5 ns pulse width.
Other (include dimensions and weight of s/c)	The observatory mass is 1350 kg including 110 kg of hydrazine propellant. In stowed configuration the s/c is 2.5m x 3.7m x 1.9m. The deployed array is 9m. x 1.8 m.

Goddard Space Flight Center

FLIGHT PROJECT ENVIRONMENTAL CHECKLIST

Project Manager Printed Name: Doug McLennan	Project Manager Signature: Doug J. McLe		
Project Name: ICESat-2	Date: 9/12/12	Phone Number: 301 286-8484	Org. Code: 425

Comments:

DATE: June 15, 2011

TO: 321.0/ Shandy Mcmillian, Project Safety Manager, ICESat-2/ATLAS

FROM: 350.2/Ted Simmons, GSFC Laser Safety Officer

THRU: 350.2/Dan Simpson, GSFC Radiation Safety Officer DAS
350.0/Pat Hancock, Chairman, Non-Ionizing Radiation Safety Committee AHH

SUBJECT: FAA Laser Free Zone Analysis for ICESat-2

The Goddard Space Flight Center's (GSFC) Non-Ionizing Radiation Safety Committee (NIRSC) has reviewed ICESat-2's laser operation. The Committee has concluded there is no requirement for ICESat-2 personnel to notify the FAA of the on orbit laser emissions.

During the February 10, 2011 NIRSC meeting Committee members discussed the issue of the FAA laser-free zone (LFZ) restriction on lasers used outdoors and in navigable air space (NAS). They reviewed the ICESat-2 project engineer and the GSFC's Laser Safety Officer (LSO) Visual Interference Level (VIL) calculations and agreed the energy density will be below the ANSI Z136.6-2005 Standard for outdoor lasers found in table 5 page 36. The Nominal Ocular Hazard Distance (NOHD) for unaided *viewing* is ~ 8.2 miles and aided viewing is ~57.5 miles and the ICESat-2 orbit altitude will be ~ 311 miles (500 km). The VIL for a FAA laser-free zone is 12.5 nJ/cm^2 and calculated values are ~3.5 nJ/cm^2 by the project engineer and ~2.7 nJ/cm^2 by the LSO. See the attached documents for the project engineer and the LSO calculations.

Definition of "outdoors" from the ANSI Z136.6-2005:
"In this standard, a location for a laser where the insertion of a mirror into the output beam path could create a specular reflection that extends indefinitely. However, if the reflected beam thus created does not exceed the MPE anywhere along the beam path that is outside of a building, or one of the *visual interference levels* within the corresponding visual interference zone, the location need not be considered as outdoors".

Committee members concluded since the ICESat-2 laser energy density level will be below those established in the ANSI Z136.6 standard for "outdoor" lasers there would be no requirement to notify the FAA.

Ted Simmons

Enclosure(s)