Project/Activity Title: Outdoor Unmanned Aerial Systems (UAS) Flights and Weather Balloons Inside LANL Restricted Airspace and Use of Sealed Sources	**Accession No**: 13082 and 19749 **LAN No:** 14-21 **PRID No:** 14P-0166 and 15P-0189 V1	**Date**: June 21, 2016

Purpose: The Department of Energy (DOE)/National Nuclear Security Administration (NNSA) proposes to increase the operational efficiency and effectiveness of the Tier V Unmanned Aerial Systems (UAS) program at Los Alamos National Laboratory (LANL). This would be accomplished by expanding the routine use of various UAS, such as remote-controlled airplanes and helicopters and tethered aerostats and helikites (moored weather balloons) of various sizes and capabilities anywhere within the LANL restricted airspace boundary (Figure 1). UAS use increases operational efficiency, are cost efficient, and enhance safety. UAS are used for research and development, emergency management, sensor testing, training, security, and surveillance activities. Additionally, UAS current use of actinide and non-actinide sealed sources in support of the indoor radiation detection and monitoring program[1] would broaden to include outdoors sealed source detection and monitoring. Generally, weather balloons are used for atmospheric research.

Location: LANL restricted airspace	**Project Contact**: Brian Halladay, SEO-3, 7-2825, bho@lanl.gov and James Privette, sealed sources, 5-4943, **LANS-EPC-ES Contact:** Karla Sartor, 7-8719, ksartor@lanl.gov

NEPA Coverage: 10 Code of Federal Regulations (CFR) Part 1021—*National Environmental Policy Act Implementing Procedures, Appendix B to Subpart D of Part 1021—Categorical Exclusions Applicable to Specific Agency Actions*

B3.2 Aviation Activities
Aviation activities for survey, monitoring, or security purposes that comply with Federal Aviation Administration regulations.

B3.6 Small-Scale Research and Development, Laboratory Operations, and Pilot Projects
Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). For purposes of this category, "demonstration actions" means actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. Demonstration actions frequently follow research and development and pilot projects that are directed at establishing proof of concept.

[1] Sealed sources are radioactive materials typically placed within multiple stainless steel jackets and welded closed, or otherwise constructed to meet the Nuclear Regulatory Commission definition of a sealed source. The use of radioactive materials in sealed sources is a common practice where radiation is emitted while minimizing the potential for spread of the radioactive materials.

B3.11 Outdoor Tests and Experiments on Materials and Equipment Components
Outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment (including, but not limited to, weapon system components) under controlled conditions. Covered actions include, but are not limited to, burn tests (such as tests of electric cable fire resistance or the combustion characteristics of fuels), impact tests (such as pneumatic ejector tests using earthen embankments or concrete slabs designated and routinely used for that purpose), or drop, puncture, water-immersion, or thermal tests. Covered actions would not involve source, special nuclear, or byproduct materials, except that encapsulated sources that contain source, special nuclear, or byproduct materials may be used for nondestructive actions such as detector/sensor development and testing and first responder field training.

BACKGROUND

Currently, the NNSA Los Alamos Field Office conducts limited UAS airspace operations at LANL. Activities include air operations (flights), testing, evaluation, and routine use of various types of UAS and weather balloons. These activities include support for research and development, sensor testing, training, security, surveillance, and radiation source detection. LANL's restricted airspace (R-5101) has a defined boundary over the LANL site and extends from the ground surface level to 12,000 feet mean sea level as defined by the Federal Aviation Administration (FAA).

The DOE/NNSA uses UAS for security purposes and emergency management (e.g., wildfires) within LANL restricted airspace. UAS security surveillance flights are conducted at a maximum altitude of 12,000 feet within the restricted airspace. All UAS used at LANL are powered, unmanned aircraft with a gross weight under 50 pounds and battery operated ([DOE Tier V] see Figures 2, 3, and 4 for representative UAS). Currently, personnel from LANL, other DOE facilities, and other Federal and state agencies are trained in radiation detection and monitoring using UAS at the indoor UAS user facility. The UAS radiation detection and monitoring program includes the use of actinide and non-actinide sealed sources within the indoor UAS user facility.

LANL operations has and/or expects to support research utilizing tethered weather balloons of the following types: Helikites (Figure 5) with helium fill volume ranging from 16 m^3 to 34 m^3 and aerostats (Figure 6) with helium fill volume ranging from 74 m^3 to 79 m^3. All of the weather balloons have a gross weight less than 50 pounds, including the payload.

In 2008, DOE issued a categorical exclusion approving construction of two short access roads, a 16-foot-high observation tower, and a concrete UAS runway in Technical Area (TA) 49. The categorical exclusion did not address UAS types, the UAS flight area, or any areas outside of TA-49 intended for flights. A 2016 determination covered indoor use of UAS under Categorical Exclusion B 3.6 *Aviation Activities*.

Detector, monitoring, and sensor testing performed at LANL using UAS is also covered in the 2016 determination. This determination uses the 2008 Site-Wide Environmental Impact Statement (SWEIS), Appendix L, Radiation Detection and Monitoring Training (page L-2); Atmospheric, Climate, and Environmental Dynamics (L-4); and Space and Atmospheric Instrumentation (L-8) to provide National Environmental Policy Act (NEPA) coverage for use of radiological sealed sources. Sealed sources are routinely used at LANL for a variety of projects including detector training.

DESCRIPTION OF PROPOSED ACTION

The DOE/NNSA proposes to expand the routine use of UAS to anywhere within LANL's restricted airspace (Figure 1) to enhance the LANL radiation detection and monitoring program. Additionally, UAS current use of actinide and non-actinide sealed sources in support of the indoor radiation detection and monitoring program would broaden to include outdoors sealed source detection and monitoring. UAS would be used to detect sealed sources on the ground. Certain aircraft may be flown at night, but no aircraft will be intentionally flown in bad weather ("bad weather" refers to instrument flight rules [IFR] conditions as defined by the FAA).

A tethered weather balloon is a weather balloon that is restrained by a cable attached to the ground or a vehicle and therefore cannot float freely. The tether is attached to an electric winch system used to raise and lower the weather balloon. Two tethers would be attached to each weather balloon. The secondary tether is a back-up system in case the primary tether fails. No tethered weather balloon will be intentionally flown in bad weather or at night.

LANL's aviation request process is illustrated in Figure 7. Outside of LANL's airspace the LANL Aviation Safety Officer approval would be required but the land/air governing agency's procedures would be the regulating specifications for flight operations. Inside LANL's airspace (R-5101), no less than 24 hours prior to any routine flight, program personnel would notify the FAA Albuquerque Center via email with the date and time of the proposed flight. This would be followed by a phone call to the Center 30 minutes prior to launch and concluded with a phone call when the action is complete. The FAA, upon receipt of the flight information, would prohibit air traffic flying under IFR within a 3-mile buffer of the LANL activity site. LANL UAS and balloon flight notifications, with the exception of security flights, would include the NNSA public relations office, Los Alamos County, and Los Alamos airport.

PROJECT AND SITE-SPECIFIC CONSIDERATIONS

Table 1 is a synopsis of the evaluation of potential effects to the human environment from implementation of the proposed project.

Table 1. Environmental Factors Checklist

Environmental Factor	Analysis
Land Use	UAS use would be expanded to all LANL restricted air space (as approved by the aviation safety officer). UAS takeoff and landing sites would be identified through use of the Integrated Review Tool to ensure compatibility with other land users. Existing roads, runways, and parking lots would primarily be used for takeoff and landing.
Visual	UAS operations are intermittent activities with negligible effects to workers and the public. Effects would be temporary.
Geology and Soils (geologic hazards, soil productivity, capability, erodibility, and mass failure)	No change to current conditions.

Environmental Factor	Analysis
Water (surface and groundwater quality and quantity, groundwater recharge, streamflow regimes)	No change to current conditions.
Non-radiological Air Quality	No change to current conditions.
Radiological Air Quality	No change to current conditions.
Noise	Noise associated with UAS activities would be intermittent. Noise levels may be raised by no more than 6 decibels above background in Mexican Spotted Owl core habitat during their breeding season.
Ecological (floodplains, wetlands, threatened or endangered species and habitat, migratory birds, exotic organisms)	Activities at LANL are subject to restrictions defined in the LANL Habitat Management Plan. Restrictions associated with the federally-listed Mexican Spotted Owl within the LANL boundary require noise levels to be less than 6 decibels above background in core habitat during breeding season. To prevent disturbance to nesting owls, UAS flights will maintain a minimum of 300 meters (984 feet) above core habitat between March 1 and August 31 each year. Los Alamos National Security, LLC (LANS) biologists conduct nest surveys in March and April and lift noise restrictions if an area is unoccupied. Areas that are occupied have noise restrictions until August 31
Human Health – Radiological Impacts on the Public	No change to current conditions.
Human Health – Chemical Impacts on the Public	No change to current conditions.

Environmental Factor	Analysis
Worker Health and Safety	LANL procedure *Unmanned Aerial Vehicle Flight Testing* outlines safety requirements associated with UAS flights. All proposed projects will be required to comply with FAA regulations. There are fewer safety issues in restricted airspace than in unrestricted airspace because there are no manned aircraft in the vicinity. Operations using radioactive sealed sources require the use of administrative controls and procedures to keep exposures from radiation and radioactive materials as low as reasonably achievable (ALARA). Projects must comply with policy P121 *Radiation Protection* and 10 CFR 835 *Occupational Radiation Protection*. Inventory and storage of radioactive sealed sources is covered by LANL Policy 121 *Radiation Protection*. ALARA is achieved through the use of shielding, safe work practices, procedures, and personal protective equipment. Annual worker radiation exposure is 5,000 millirem (10 CFR Part 835). Involved LANL radiological worker doses are regulated by DOE worker exposure limits that are set at 2,000 millirem (2 rem). LANL established action levels to identify and manage workers that receive a higher level dose. For the whole body dose, the action level is triggered at one rem per year. During the four-year period of 2011 through 2014, no LANL worker received a dose of one rem or higher. The average dose to an involved LANL worker was projected to be 139 millirem in the 2008 SWEIS, and the actual average dose in 2013 was 81 millirem.
Cultural Resources (archeological and historical)	There are approximately 2000 cultural sites at LANL. All LANL activities are subject to restrictions and requirements as defined in the LANL Cultural Resources Management Plan. To avoid impacts, project personnel will use the Integrated Review Tool and work with LANS cultural resources subject matter experts to identify appropriate flight landing and take-off areas to avoid impacts to archaeological sites and historic buildings. Additionally, all activities (placement) involving sealed sources will also avoid impacts to archaeological sites.
Socioeconomics	No change to current conditions.
Infrastructure (roads, utility corridors, communications systems, energy & fuels, distribution systems, and water)	No change to current conditions.

Environmental Factor	Analysis
Waste Management	The proposed action would not generate regulated or miscellaneous wastes. If rechargeable lithium batteries are used, the batteries will be managed and disposed of following established procedures. If batteries are intact and not contaminated, they can be recycled. Radioactive sealed sources are not expected to generate waste. Sealed sources to be used for UAS activities are from existing sealed source inventories. No new sealed sources will be acquired to support the proposed action.
Transportation	The 2008 SWEIS analyzed onsite shipments of radioactive materials between LANL technical areas. Onsite radioactive shipments constitute the majority of activities that are part of routine operations in support of various programs. Radioactive materials transported between technical areas mainly contain limited quantities and travel short distances, mostly on closed roads. Sealed sources are stored at TA-35. Once UAS operations are completed, sealed sources would be transported back to TA-35 and inventoried.
Environmental Justice	No change to current conditions.
Accident Considerations	**UAS:** All proposed UAS flights are required to comply with FAA regulations. There are fewer safety issues in restricted airspace than in unrestricted airspace because there are no manned aircraft in the vicinity. All UAS used at LANL are powered, unmanned aircraft with a gross weight under 50 pounds and battery operated. There would be no flammable fuels present. Each UAS flight would be controlled by a human operator so that if a problem did arise the response and situational control time would be prompt thus, minimizing potentially adverse effects. To date, there have been no accidents involving UAS at LANL. Of particular concern is the potential effect to nuclear facilities and materials at risk. The 2014 *Hazard Evaluation Unmanned Aircraft System Operations* overall conclusion is: The suite of existing controls are sufficient to reduce the risk to LANL nuclear facilities given the assumptions of random overflight across LANL as a whole. The probability of a UAS actually impacting a nuclear materials container was qualitatively determined to be improbable (on the order of 10^{-5}) and the probability of a UAS actually causing the release of nuclear materials in any impact event was qualitatively determined to be remote or beyond extremely unlikely (on the order of $\leq 10^{-6}$). When considering the identified administrative controls for the UAS overflights, in particular the controls for pilot training, flight restrictions based on weather conditions, and software programming for the behavior of the UAS upon loss-of-link conditions can collectively greatly reduce the probability of a UAS crashing into a nuclear facility.

Environmental Factor	Analysis
Accident Considerations (continued)	No further controls would be required to protect the worker or public from potential radiological consequences as a result of a hypothetical UAS crash and impact at LANL involving nuclear materials. Therefore, there appears to be no need to restrict UAS operations anywhere within the R-5101 restricted airspace over LANL as a whole, over any buildings or structures, or altitude of the UAS – with the exception of taking structure height into consideration, such as meteorological towers, buildings, or other objects that may interfere with the safe operation of the UAS. **Weather Balloons:** The January 2016 *Safety Basis Change Review for the Tethered Weather Balloon Over LANL's Restricted Airspace* concluded that the use of tethered weather balloons (i.e., Helikite or aerostats) within LANL's restrictive airspace R-5101 is safe because: • The tethered weather balloon activities will not introduce any new hazard scenarios as previously identified in the UAS hazard analysis that would require a Documented Safety Analysis update/revision. • The tethered weather balloon activities will not increase the probability of existing hazard scenarios at non-reactor nuclear facilities. • The consequences from scenarios that plausibly may be initiated by a tethered weather balloon impact are bounded by existing UAS hazard analysis. **Sealed Sources:** Sealed sources are radioactive materials typically placed within multiple stainless steel jackets and welded closed, or otherwise robustly constructed. The use of radioactive materials in sealed sources is a common practice where radiation is emitted while minimizing the potential for spread of the radioactive materials. Sealed sources would not be subject to conditions that would breach the jacket. Sealed sources are stored at TA-35 and once UAS operations are completed, sealed sources would be transported back to TA-35 and inventoried.

NEPA Determination

Based on my review of the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed UAS program as described herein, falls within the boundaries of 10 CFR Part 1021—*National Environmental Policy Act Implementing Procedures, Appendix B to Subpart D of Part 1021—Categorical Exclusions Applicable to Specific Agency Actions:*

- B3.2 Aviation Activities
- B3.6 Small-Scale Research and Development, Laboratory Operations, and Pilot Projects
- B3.11 Outdoor Tests and Experiments on Materials and Equipment Components

No additional NEPA analysis is required. If changes are made to the scope of the program so that it is no longer bounded by the enclosed description, or the program is changed to encompass other actions, NEPA requirements for the action will need to be reassessed at that time and further analysis may be required.

NA-LA Field Office NEPA Compliance Officer: Jane Summerson	**Date:**
Signature: 	6/22/16

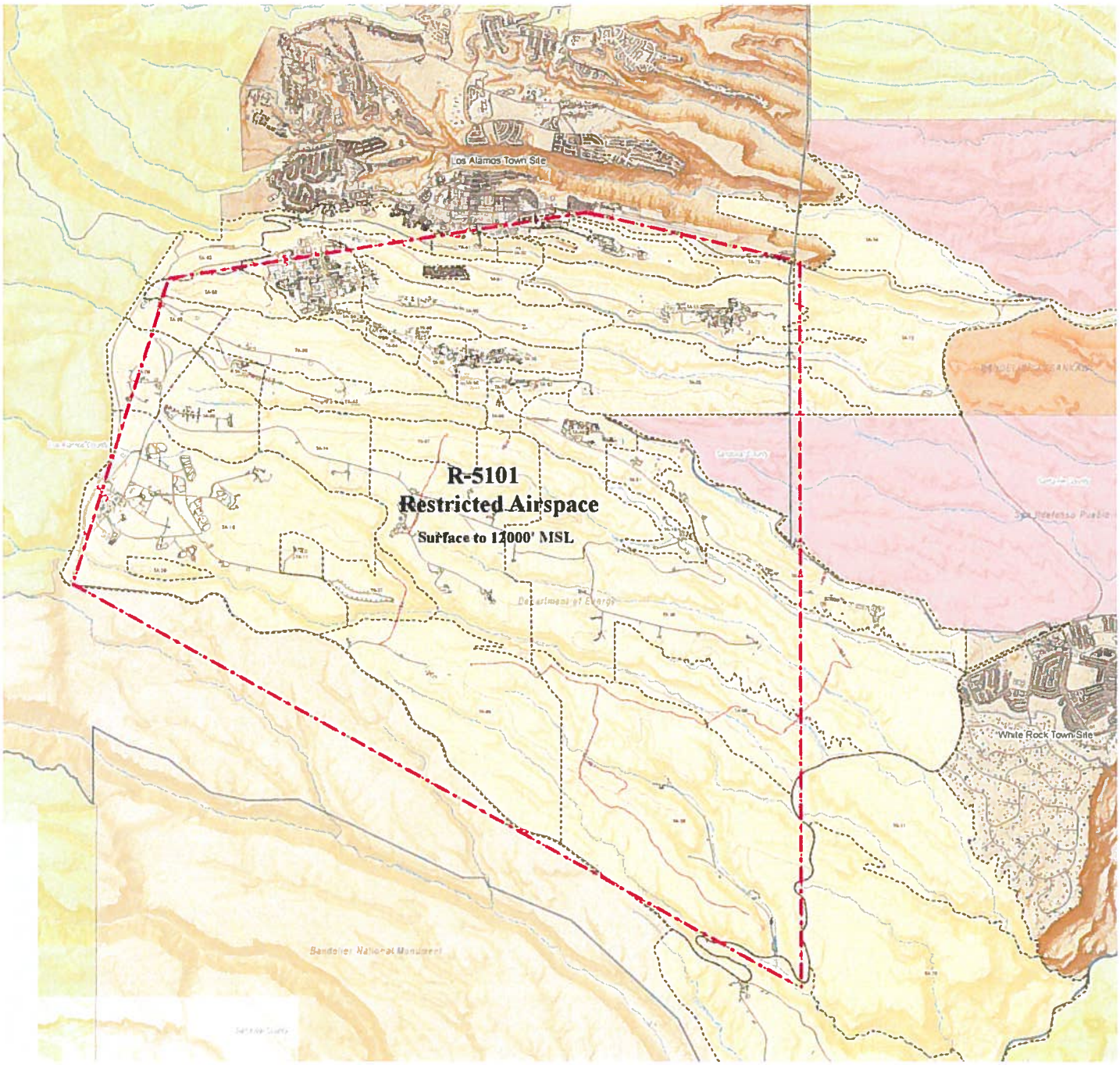

Figure 1. LANL restricted air space

Figure 2. Puma RQ-20A fixed-wing unmanned aircraft

Figure 3. Leptron helicopter

Figure 4. Inspire 1 quadcopter

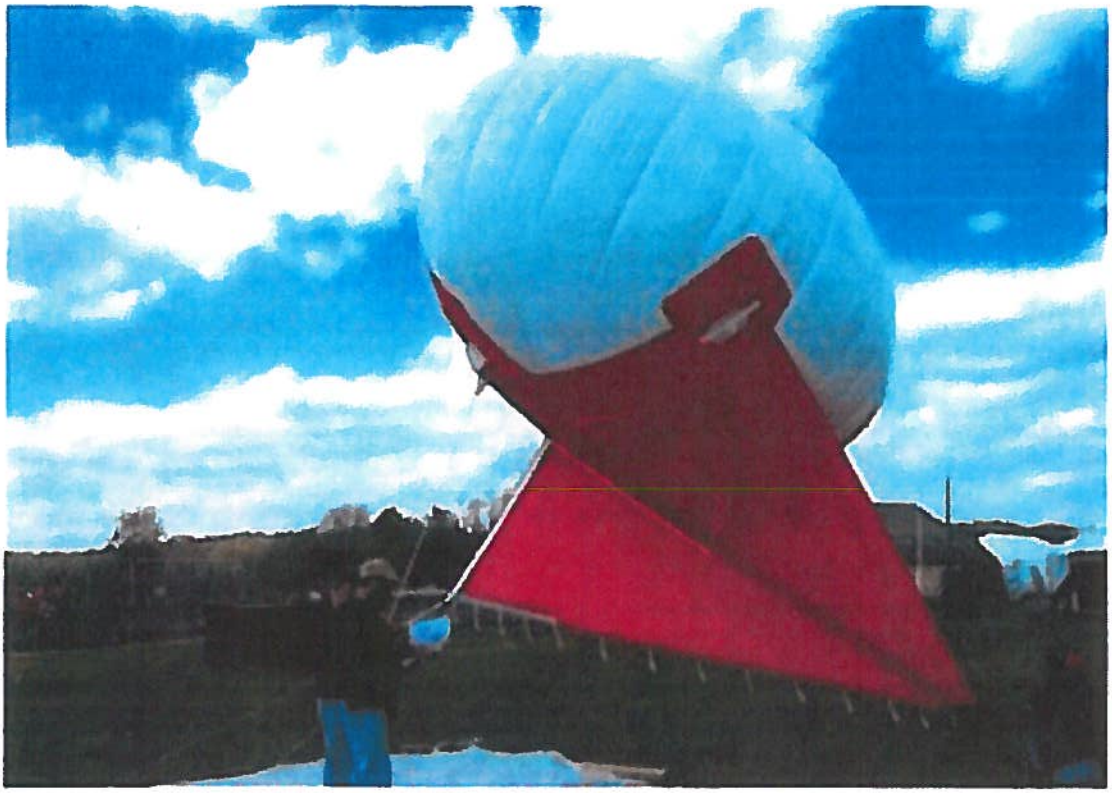

Figure 5: Helikite

Figure 6: Aerostat

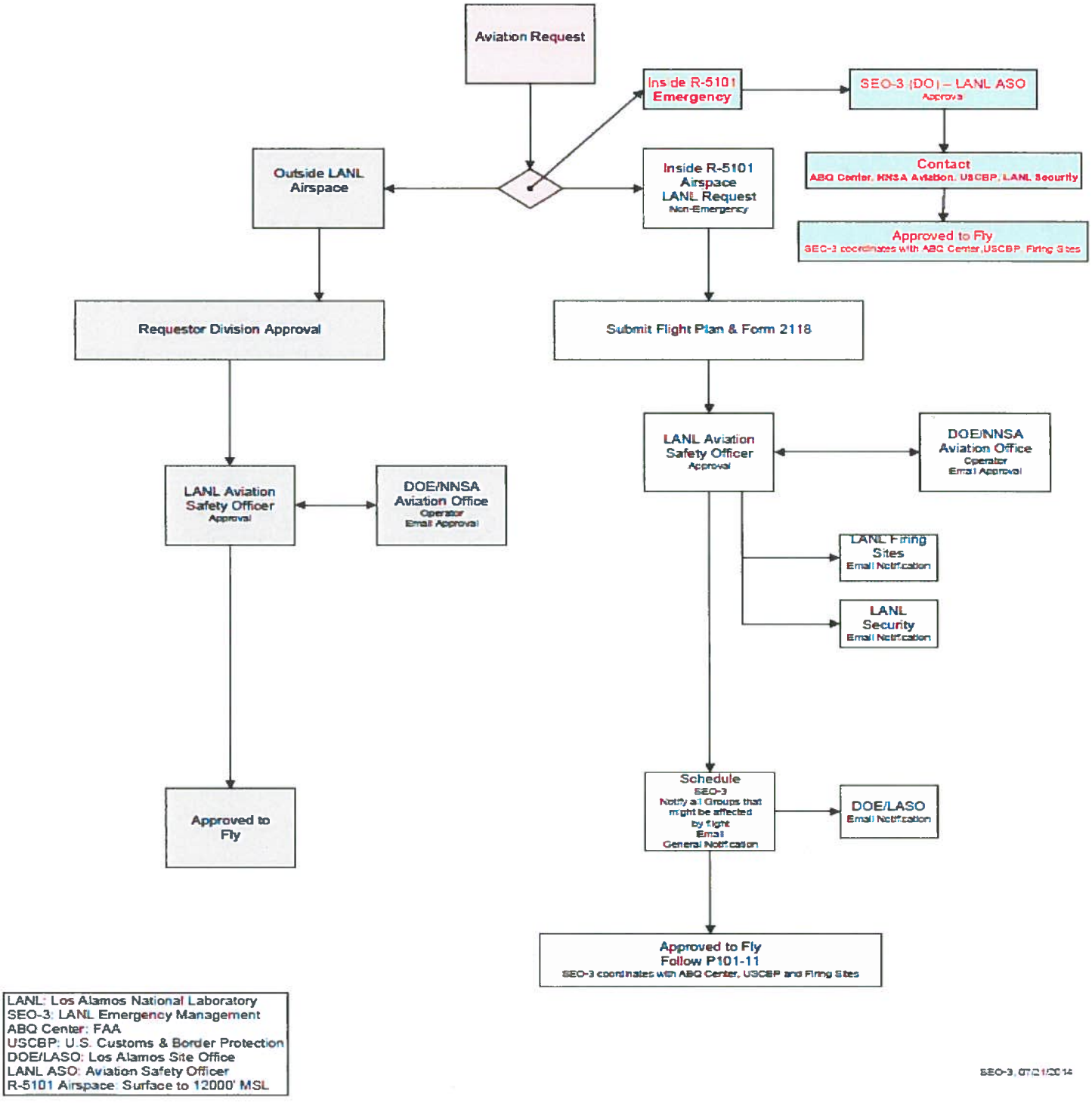

Figure 7: LANL Aviation Request Process