Office of the County Attorney

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December 10, 2020

Kelie Moore
Georgia Department of Natural Resources
Coastal Resources Division
One Conservation Way
Brunswick, Georgia 31520

RE: Spaceport Camden Coastal Federal Consistency Determination

Dear Ms. Moore:

Please find attached a redacted copy of the Spaceport Camden Launch Site Operator's License application. This document contains certain information which Camden County contends is exempt from the requirement of public dissemination under O.C.G.A. § 50-18-70, *et seq.*, the Georgia Open Records Act (GORA). This document is provided for review to the Department in connection with the coastal federal consistency determination and may be disseminated for public review or use only as redacted. I have provided a privilege matrix specifying the statutory authority for the claimed redactions pursuant to O.C.G.A. § 50-18-72, *inter alia*. Please do not hesitate to contact this office if you require any further information or documentation.

Sincerely,

/s/JOHN S. MYERS
County Attorney

JSM/
enc.
cc: S. Howard
A. Nelson
E. Mize
K. Floyd

Spaceport Camden Launch Site Operator License (LSOL) Application Redactions as per the Georgia Open Records Act (GORA)

LSOL Location	Section Number	Section Title	Page Number	GORA Exemption (50-18-72(a) …)
Attachment 2 – Launch Site Location Review	4.2.1	Methodology	20-21 of 28	…(1) Federal statute forbids release pursuant to AECA/ITAR *
	4.3	Overflight Exclusion Zones / No Public Presence	24 of 28	
	7.1	Methodology – Individual Risk	27-28 of 28	
Attachment 5 – Access Control Plan	3.2.3	Typical Operational Checkpoints	13-14 of 31	…(25)(A)(i)-(v) Security plans, protection from terrorist acts, damage by sabotage, etc.
	3.2.4	Checkpoint Staffing by Scenario Type	15 of 31	
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	3.2.6	Operations – Wet Dress Rehearsals / Static Firings Access Control	17 of 31	
	3.2.7	Operations – Launch	18 of 31	
	3.3.1	Perimeter Fencing	19 of 31	
	3.3.2	Clear Zones Along Fencing	20 of 31	
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	3.3.4	Road to Main Gate & Speed Reduction	20 or 31	
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Attachment 6 – Explosive Site Plan	3.1	Propellant Types at Spaceport	10-11 of 23	…(25)(A)(i)-(v) Security plans, protection from terrorist acts, damage by sabotage, etc.
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Attachment 9 – Comprehensive Launch Plan – Example	9.3.2	ROLE – Site & Perimeter Monitoring and Security / Intervention	7 of 12	…(25)(A)(i)-(v) Security plans, protection from terrorist acts, damage by sabotage, etc.
	9.6.2	County Radio Frequency Plan …	10 of 12	
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	Undisclosed	Undisclosed	11 of 12	

NOTES:

* Arms Export Control Act (AECA) 22 U.S.C. 2778, International Traffic in Arms Regulations (ITAR) 22 CFR §§ 120-130

Launch Site Operator License Application

Submitted to the

Federal Aviation Administration

Associate Administrator for Commercial Space Transportation

AST-200, Room 331

800 Independence Avenue, SW, Washington, D.C. 20591

Attention: Licensing and Safety Division, Application Review

Submitted by, and on behalf of

The Camden County Board of Commissioners

by

Mr. James H. Starline, Chairman
200 East 4th Street
PO Box 99
Woodbine, Georgia 31569
Office Phone: +1-912-510-0464

Signed this day, 14 January 2020, by:

James H. Starline, Chairman, Camden County Board of Commissioners

REVISION HISTORY

25 January 2019	Initial Submittal
14 January 2020	Revised based on feedback from FAA/AST during application consultation after submission in January 2019 through December 2019. Revised based on changes in scope of the intended Spaceport Camden operations driven by perceived market demand. Principally, the reference to medium-large launch vehicles has been removed, with small launch vehicles as the sole remaining vehicle class.

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1.0 General Information

This launch site operator license (LSOL) application is submitted to the Federal Aviation Administration (FAA) Office of Commercial Space Transportation (FAA/AST) in accordance with the requirements of the Code of Federal Regulations (CFR) Section 14 CFR Part 420, specifically the requirements of Subpart B (Criteria and Information Requirements for Obtaining a License), § 420.15 (Information requirements).

The Camden County Board of Commissioners (the County) is proposing to construct and operate a commercial space launch site, called Spaceport Camden, on the Atlantic seaboard in Camden County, Georgia. The County could offer the commercial space launch site to vertical launch vehicle operators for the orbital and suborbital launch of small liquid propulsion launch vehicles. Launch vehicles are classified by FAA regulations[1] based on payload weight in pounds according to orbital inclination. Table 1 of 14 CFR § 420.19 provides payload weights for both 28 degree and 90 degrees inclinations; at 28-degrees inclination *small* is less than or equal to 4,400 pounds. Launch operations include preparatory activities to ready and test up to 12 annual launches (one at night) of small launchers, including mission rehearsals and static tests.

1.1 Launch Site Operator

Within 14 CFR § 420.15(a)(1) it states the LSOL application must contain the following:

> *"Launch site operator. An applicant shall identify the name and address of the applicant, and the name, address, and telephone number of any person to whom inquiries and correspondence should be directed."*

The LSOL applicant and contact details are:

Launch Site Operator Applicant:

Camden County Board of Commissioners
200 East 4th Street
PO Box 99
Woodbine, GA 31569

Point of Contact for Inquiries and Correspondence:

Steve Howard
County Administrator, Camden County
200 East 4th Street
PO Box 99
Woodbine, GA 31569
Office Phone: +1-912-510-0464

[1] 14 CFR § 420.19, Table 1.

1.2 Launch Site

Within 14 CFR § 420.15(a)(2) it states the LSOL applicant must provide the following information about the proposed launch site:

> *"Launch site. An applicant shall provide the name and location of the proposed launch site and include the following information:*
> *(i) A list of downrange equipment;*
> *(ii) A description of the layout of the launch site, including launch points;*
> *(iii) The types of launch vehicles to be supported at each launch point;*
> *(iv) The range of launch azimuths planned from each launch point; and*
> *(v) The scheduled operational date."*

This proposed launch site information is provided in the subparagraphs of this section 1.2, after an introduction below.

Camden County has identified the development and operation of a commercial launch site as a desirable means to support its local economic growth. Camden County's Strategic Plan 2019, 2024, 2034, which addresses its long-range planning, mission, and vision, identifies a launch site, or "spaceport," as one of four pillars of economic growth and sustainment. In developing its plan for a spaceport, the County undertook a search for a suitable location for a launch site and identified the property shown in Exhibit 1, a former industrial site that is currently used for tree-farming in discrete areas.

The site is located in southeast Georgia, in an unincorporated area of Camden County, Georgia, approximately 11.5 miles east of the city of Woodbine, at the mouth of the Satilla and Crooked Rivers and west of Cumberland River and Cumberland Island (see Exhibit 1). The property, on which two plantations and a ship-building enterprise operated in the 1800s, was first redeveloped in 1927 as a hunting preserve. In the early 1940s, the property was used as a tree farm and source of fiber for a local paper mill. During the 1960s, the Thiokol Chemical Company produced and tested solid rocket motors for the National Aeronautics and Space Administration (NASA). When NASA decided to focus on liquid-fueled rockets, the site was converted to manufacture military hardware and supplies, including mortar ammunition, illuminating ordnance devices (trip flares), tear gas, and assorted chemicals. From the mid-1970s to 2012, the property was the site of a pesticide manufacturing facility.

The entire project site is currently owned by two companies, the Union Carbide Corporation (UCC) and Bayer CropScience. The County has entered into an option agreement to purchase most of the UCC property (about 4,000 acres) and is considering an option to purchase the Bayer CropScience property[2] (an additional 7,800 acres). The former industrial site is a combination of uplands and marshlands. Spaceport Camden is proposed to be primarily constructed on approximately 100 noncontiguous acres of the approximately 1,200 acres of uplands on the UCC property. The four facilities that would be built to support spaceport operations would be constructed on upland portions of the former industrial site, three would be located fully within the UCC property and one, the Alternate Control Center / Visitors Center, would be constructed on either UCC property or on the Bayer CropScience property in the same general vicinity near the main gate that is shared by both properties.

[2] Bayer CropScience has indicated a willingness to sell the property to Camden County, should the County pursue the purchase.

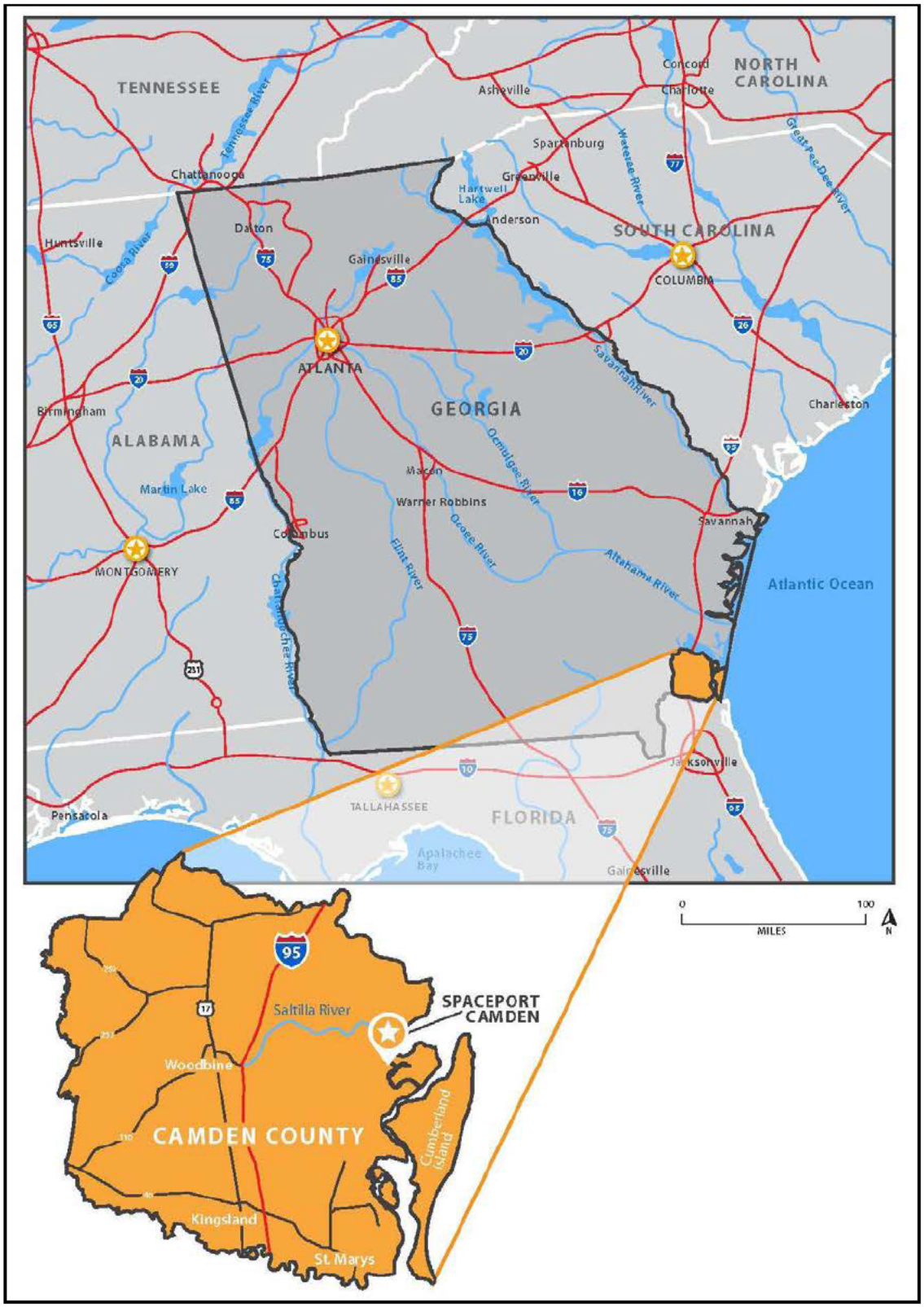


Exhibit 1. Southeast United States, Georgia, Camden County and Spaceport Location

1.2.1 List of Downrange Equipment

It is the primary plan to require all launch operators from Spaceport Camden to utilize FAA-approved fully autonomous flight safety system (AFSS) equipment, thereby greatly reducing the need for downrange tracking equipment. Currently, there is no downrange equipment owned or operated by Spaceport Camden. As an augmentation to future operations with AFSS, traditional fixed base and mobile tracking systems (radar, telemetry, and optical trackers) are under evaluation. Primary radar is probably not going to be used; however, other solutions are possible such as a combination of S-Band telemetry and GPS metric tracking systems / algorithms (as currently utilized on Electron, Atlas, and Delta launchers) with other sensors such as optical trackers and highly reliable and secure communication links (such as satellite based communications links). Utilization of government owned and contracted tracking services may also be employed.

1.2.2 Launch Site Points and Launch Site Layout Description

The four facilities of the proposed Spaceport Camden are as shown in Exhibit 2. They are the: Launch Control Center Complex, Vertical Launch Facility, Mission Preparation Area, and Alternate Control Center / Visitor Center (shown in this Exhibit to be just inside the Bayer CropScience property line, but may also be just across the road on the UCC property). Related infrastructure (e.g., roads and utilities) would also be improved within the existing industrial site. The facilities are further described later in this section as individual subsections.

Each of the launch site facilities and the western property boundary of the site would be fenced to provide security and access control. The Spaceport Camden upland property boundary on the UCC side of the property is shown in yellow on Exhibit 2. The four facilities and their fence lines are shown as heavy black lined boxes. The proposed official Spaceport Camden 14 CFR § 401.5 compliant "Launch Site" border where FAA/AST regulated 14 CFR § 417.3 defined "Launch Processing" would occur is shown as a heavy yellow lined box that mirrors the upland property boundary.[3] The remainder of the UCC and Bayer CropScience property, much of which is marshland, would be used as tactical buffer on launch and test days. Control of marshland for hazardous operations shall be pursuant to agreements with the United States Coast Guard (USCG) for the implementation of an appropriate Safety Zone in accordance with 33 CFR 165.20 and the Letter of Agreement (LOA) found as Attachment 3.

[3] Updates to the launch site boundary wording reflects the agreed upon revision between FAA/AST (Randal Maday & Karen Perez) and Spaceport Camden (Andrew Nelson).

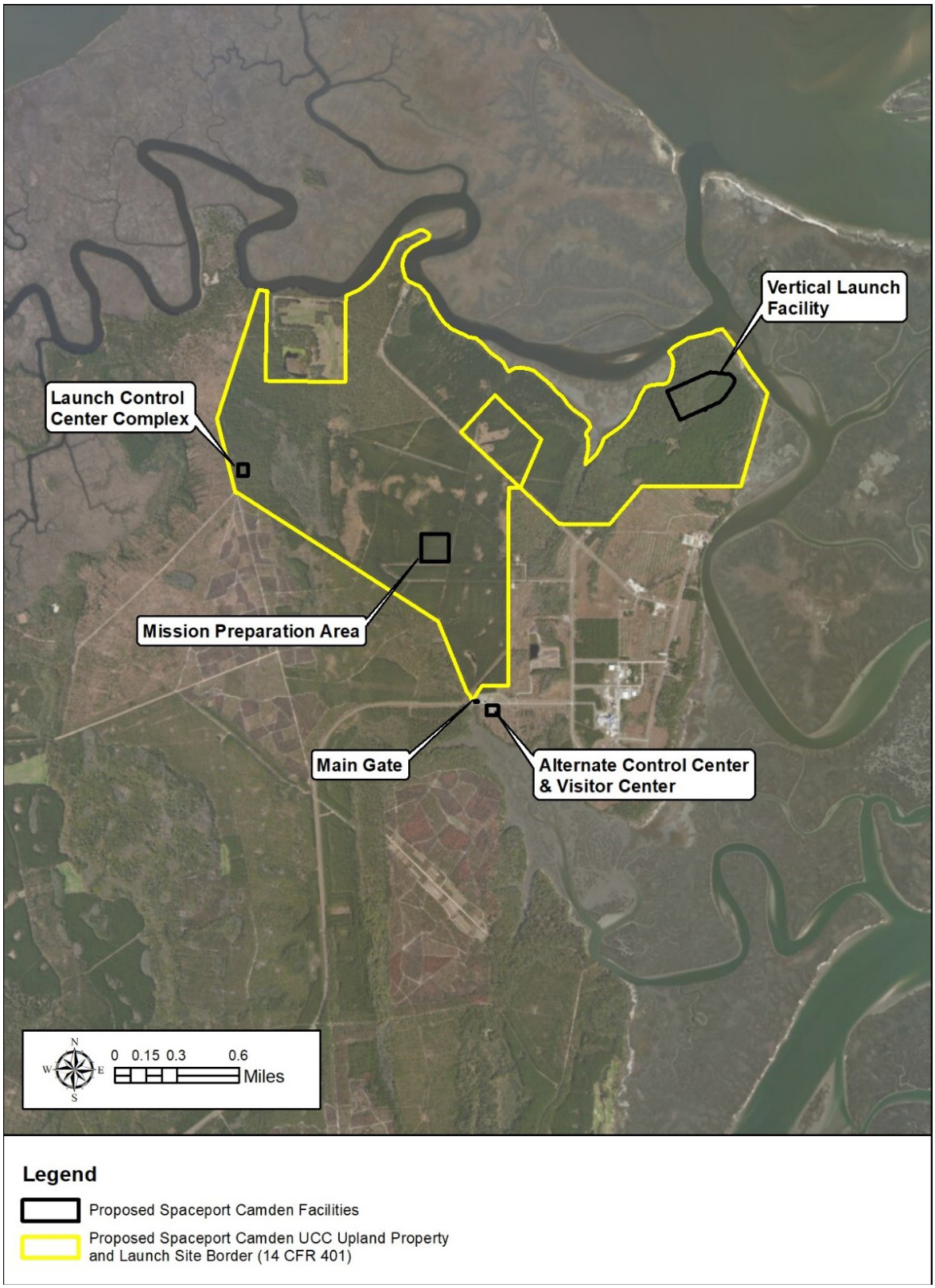


Exhibit 2. Proposed Spaceport Camden Facilities and "Launch Site" Borders per 14 CFR part 401

As can be seen in Exhibit 2, the Alternate Control Center / Visitors Center facility is located near the shared main gate of the two properties. Should the County not purchase or secure a long term lease of the Bayer CropScience property, this facility would be relocated about 100+ yards to the north, just north-northeast of the main gate, on UCC property. Also, there is an existing dock with deep water access on Bayer CropScience property that could be utilized in the future during operation of the spaceport, given that repairs are performed and updated permitting by Georgia authorities is provided; but use of the dock is not currently planned.

1.2.2.1 Vertical Launch Facility

Exhibit 3 includes an artist's rendering of a Vertical Launch Facility and a schematic of the facility layout. The Vertical Launch Facility would be approximately 29 acres in size and, as indicated in Exhibit 2, would be located in the northeastern portion of the spaceport.

The Vertical Launch Facility, depending on lunch customer needs, could include a launch pad and its associated structures, storage tanks, and handling areas; vehicle and payload integration facilities; a lightning protection system; deluge water systems and associated water capture tank; water tower; and other launch-related facilities and systems including shops, office facilities, and storm water retention ponds (also referred to simply as 'retention ponds').

There would also be lightning warning systems installed at Spaceport Camden, pursuant to 14 CFR § 420.71(a)(3), that would enable the termination of operations at or near an explosive hazard facility and withdrawal of any public to, or beyond, the public area distance prior to an electrical storm. There are several off the shelf solutions available (e.g., Campbell Scientific, Logan, Utah). Typically, these systems continuously monitor local electric fields and trigger warnings when there is the potential for lightning. These systems usually base their predictions on electric field measurements instead of lightning strikes; therefore, the system should detect lightning danger even when no other strikes have occurred. When a defined electric field threshold is met, a warning is issued and energizes aural warnings on the site.[4]

Depending on launch operator needs, the launch pad may include a pile-supported concrete platform with a steel gantry framing in addition to a concrete launcher track (supported by up to 3-feet-diameter piers), a flame trench, and a water retention tank that would be the principal supporting features for launch activities. Four lightning towers up to 250 feet tall each would be the major components of the lightning protection system.

Liquid oxygen and rocket propellant-1 (RP-1) would be stored in dedicated propellant storage areas at the Vertical Launch Facility. Liquid oxygen tanks would store up to 50,000 to 100,000 gallons each and would be approximately 14 feet in diameter and 50 to 100 feet long. RP-1 tanks could be up to 50,000-gallon capacity each, approximately 12 feet in diameter and 60 feet long. Depending on the size of the tanks, up to six tanks for liquid oxygen and up to four tanks for RP-1 could be installed at the Vertical Launch Facility. Additional storage tanks would be provided for helium and nitrogen (both gaseous and liquefied), which are used as purge gases and tank pressurants. A total of approximately 10,000 to 15,000 gallons of helium could be stored in high-pressure tube banks, and a total of 25,000 to 50,000 gallons of nitrogen could be stored in up to two liquefied nitrogen storage tanks and four gaseous nitrogen storage tanks, each up to approximately 10 feet in diameter and 44 feet long. In addition to

[4] Lightning warning system information (14 CFR 420.71) was added pursuant to FAA/AST (Randal Maday) request to Spaceport Camden (Andrew Nelson).

these materials, ordnance may be stored at this facility for a short time before being inserted into the launch vehicle. Launch vehicles use ordnance as part of the flight termination system (see Section 1.2.1, Downrange Equipment) and often use explosive bolts to ensure that components would separate when needed. The ordnance supplies the explosive force for these bolts.

The Vehicle Integration Building would be used for the inspection and assembly of the component parts (e.g., first stage, second stage) of the launch vehicle and payload mating (attachment of the payload to the launch vehicle) and could house a machine shop and storage facilities. This building would be certified to meet National Fire Protection Association (NFPA) requirements for electrical systems and equipment. This structure may be up to approximately 65 feet tall, and consist of a pre-engineered metal building on a concrete foundation with a metal roof and siding. The Vehicle Integration Building could include a high bay and a multistory work area and could contain overhead bridge and jib cranes for operational support. Two support buildings housing machine shops, offices, integration facilities, and a warehouse could be either pre-engineered metal buildings or cinder block masonry buildings on concrete foundations with metal roofs and interior offices and work areas. Like the Vehicle Integration Building, the building housing machine shops and a warehouse could have a high bay. These support buildings may be up to approximately 45 feet tall.

The deluge and sound suppression system would provide local sound and vibration suppression during launches. This system would include a water retention tank to collect any water not vaporized during a launch and a water tower up to approximately 250-feet-tall with a capacity of up to approximately 250,000 gallons.

Other Vertical Launch Facility features may include associated roads, a parking lot, a perimeter road, fencing, gates, a guard shack, a diesel generator system (including fuel storage tanks), a septic system, and area lighting. As shown in Exhibit 3, three retention ponds for storm water runoff control could be installed at the Vertical Launch Facility.

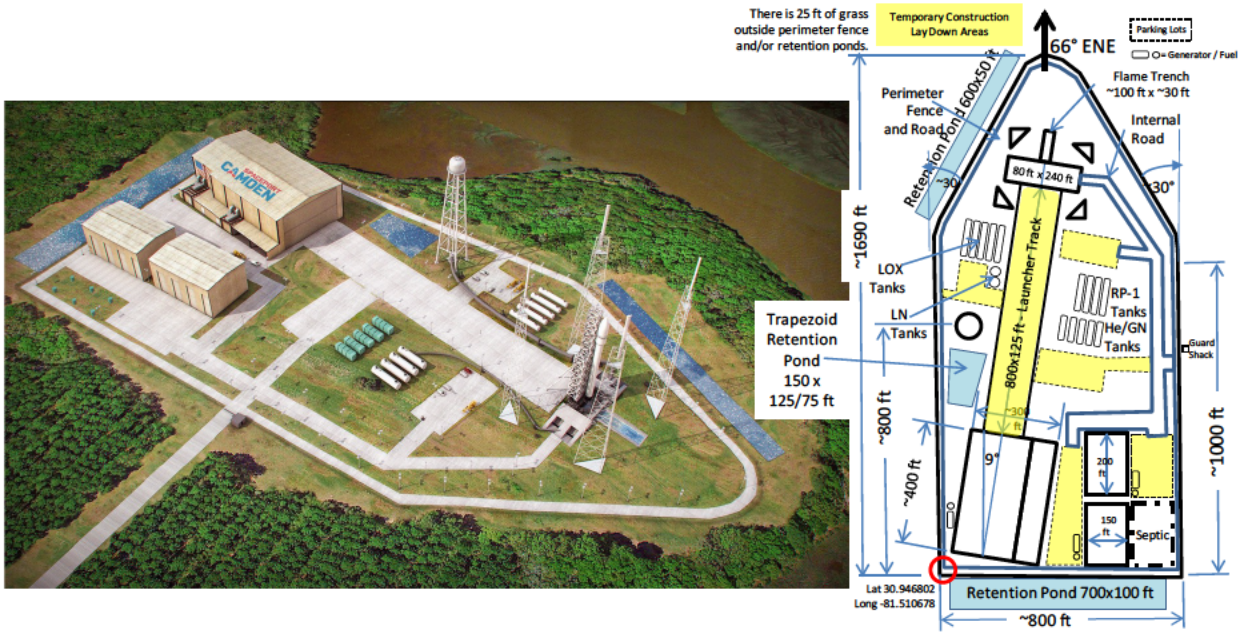


Exhibit 3. Vertical Launch Facility (Artist Rendering & Layout Schematic)

1.2.2.2 Launch Control Center Complex

The Launch Control Center Complex is to be constructed on approximately 2.4 acres (see Exhibit 4). As indicated in Exhibit 2, the Launch Control Center Complex would be located on an uplands area in the extreme western portion of the property approximately 2.3 miles from the launch pad at the Vertical Launch Facility and approximately 1 mile from the Mission Preparation Area.

The Launch Control Center Complex would include a Launch Control Center Building housing a control room and related equipment and a Payload Processing Building. The Launch Control Center Building would be the control hub for launches and related operations. The Payload Processing Building would be the location for satellite and other related payload processing activities prior to integration onto launch vehicles. A first responder facility would be located within the Launch Control Center Building or the Payload Processing Building.

In addition to these two structures, the Launch Control Center Complex could include two small storage buildings for payload propellants (satellite and special fuels) and miscellaneous maintenance equipment. Additional space for up to 1,000 cubic feet of helium storage and 3,000 cubic feet of nitrogen storage may be provided at the Launch Control Center Complex. Typically, these gases would be stored in six to eight tube banks or tanks, the tanks being approximately 2 feet in diameter and 40 feet long. In addition to these materials, ordnance may be stored at this facility for a short time before being inserted into the launch vehicle or payload, and/or transferred to the Vertical Launch Facility.

The Launch Control Center Building and Payload Processing Building (the main buildings in this complex) would be up to 150 feet by 50 feet and 40 to 45 feet tall, with a high bay and/or a second floor for offices and conference spaces. The smaller storage buildings (20 feet by 20 feet and 15 feet tall), if used for storage of hazardous materials such as hydrazine (used sometimes as satellite fuel), would have appropriate environmental and safety equipment. The main buildings would be of environmentally controlled, pre-engineered metal construction on concrete foundations with footers. The smaller storage buildings would be of pre-engineered metal or cinder block construction.

Both main buildings would be served by a backup generator with a fuel source (fuel storage tanks, up to 5,000 gallons each). Other features at the Launch Control Center Complex could include a parking lot, fencing, guard shack, gates, a septic system, and area lighting. Two retention ponds for storm water runoff control could be installed at the Launch Control Center Complex.

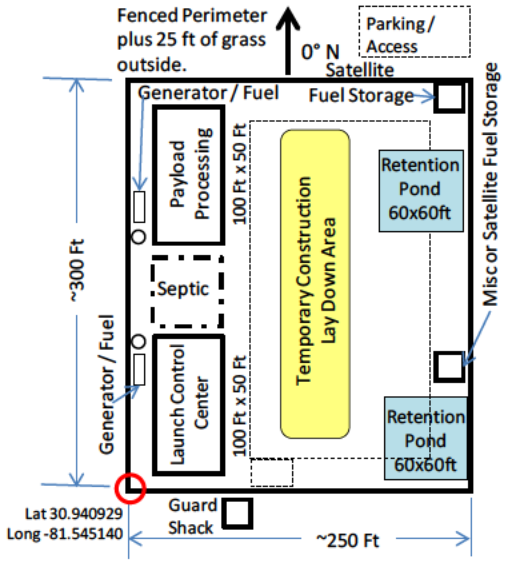


Exhibit 4. Launch Control Center Complex (Artist Rendering and Schematic Layout)

1.2.2.3 Alternate Control Center / Visitors Center

Exhibit 5 shows an artist concept for the Alternate Control Center / Visitor Center and a potential footprint for this facility. This facility would be similar in size and design to the Launch Control Center Complex and would serve as administration and conference headquarters for Spaceport Camden. It would be constructed on the south side of the spaceport site, as indicated in Exhibit 2, near the main entrance to the property. The Alternate Control Center would mirror the Launch Control Center in facility construction and would provide a backup launch control capability. This facility would also include a Visitor Center that would house informational displays for visitors and have accommodations for viewing launches.

The Alternate Control Center and Visitor Center buildings would be 40 to 45 feet tall. The two main buildings would be environmentally controlled, pre-engineered metal construction on concrete foundations with footers. The building would have a high-bay capability and/or second floor with offices and conference spaces. The storage buildings would be pre-engineered metal building or cinder block construction.

In addition to the buildings, the facility would include a parking lot, fencing, a septic system, area lighting and a guard shack. The complex would have backup generators with a fuel source (fuel storage tanks, up to 5,000 gallons each) and two 20-feet by 20-feet storage buildings. Two retention ponds for storm water runoff control could be installed at the Alternate Control Center and Visitor Center.

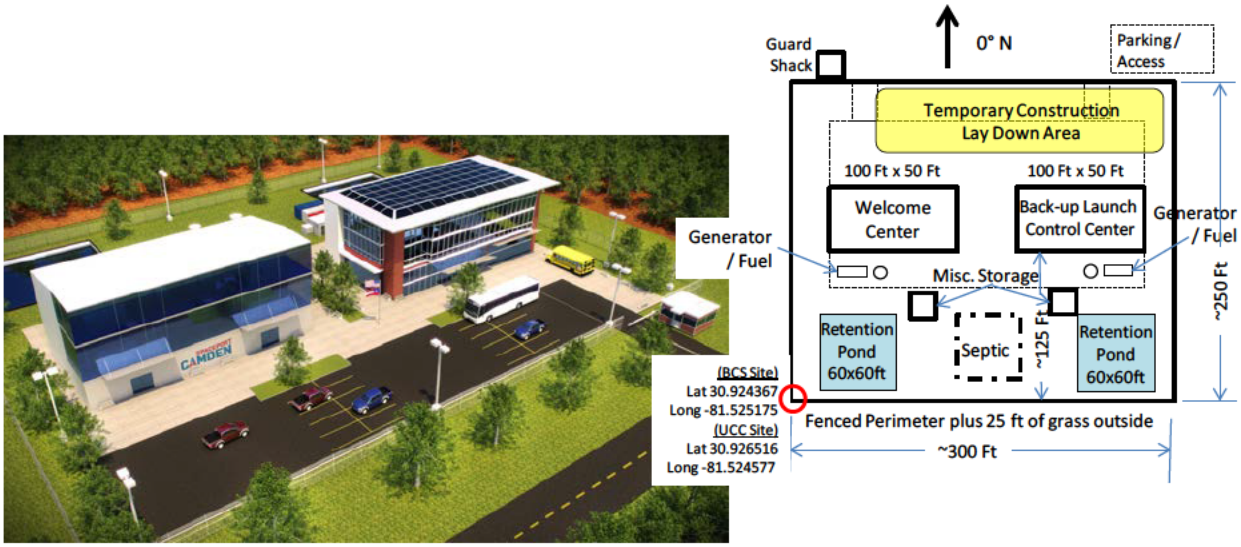


Exhibit 5. Alternate Control Center and Visitor Center (artist concept and layout schematic).

1.2.2.4 Mission Preparation Area

Exhibit 6 is an artist's rendering of the Mission Preparation Area with a layout schematic. The Mission Preparation Area would be used for vehicle processing, tests.[5] It would occupy approximately 13 acres located in the center of the uplands portion of the spaceport, as indicated in Exhibit 2. The Mission Preparation Area would primarily be a concrete pad located roughly in the center of the area. The Mission Preparation Area could also have a building for operations and storage, and fuel and oxidizer tanks.

The up to 400-feet by 400-feet concrete Mission Preparation Area would be supported by up to 3-feet-diameter concrete piers driven into the ground. There could be up to 100-feet-wide concrete side wings (concrete pads similar to the Mission Preparation Area but not designed to support as heavy of operations as the main pad) for parking and storage of mobile propellant tanks and other support equipment such as mobile cranes or forklifts. The Mission Preparation Area could have a building for operations and storage (50 feet by 50 feet by 20 feet tall) housing office space and storage areas.

The building for operations and storage would be constructed of either pre-engineered metal or cinder block and would be environmentally controlled. The Mission Preparation Area would be fenced for security, and could have a septic system, and a guard shack at the entrance. Two retention ponds for storm water runoff control could be installed at the Mission Preparation Area.

[5] 'Mission Preparation Area's a new term used pursuant to Spaceport Camden request to remove medium-large launcher landing operations from consideration.

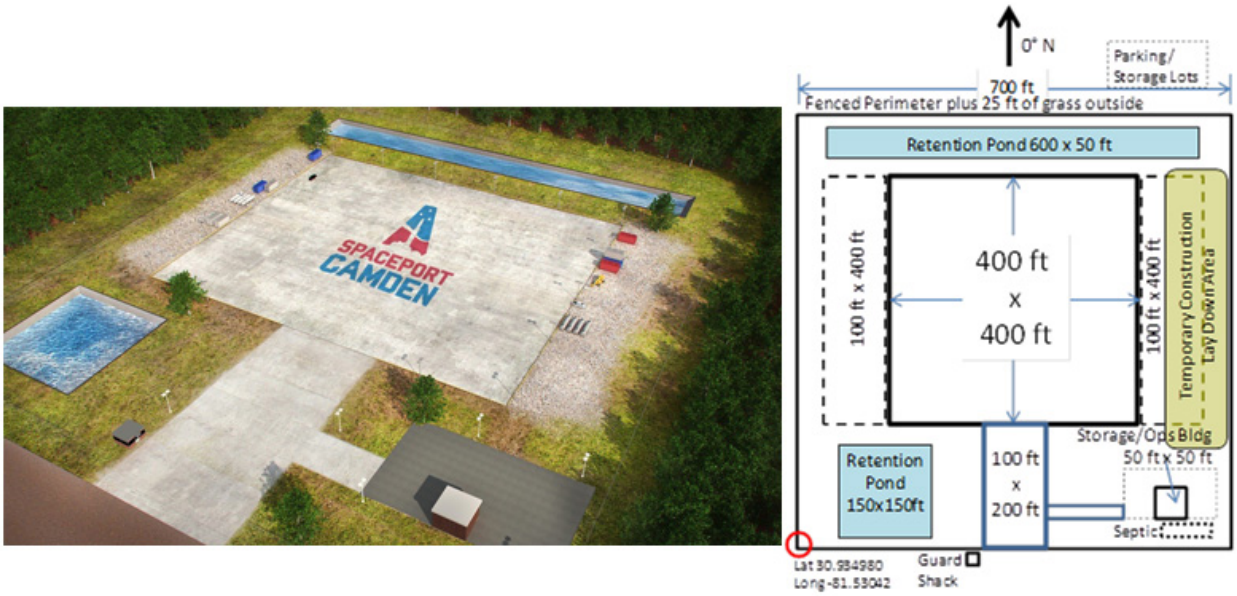


Exhibit 6. Mission Preparation Area (Artist concept and layout schematic)

1.2.3 Types of Launch Vehicles at Each Launch Point

Spaceport Camden is envisaged to have one primary launch point (the Vertical Launch Complex) as shown in Exhibit 2 and Exhibit 3. The primary launch point may accommodate small launch vehicles (e.g., RocketLab Electron, Vector R, ABL Launch Systems, FireFly Launch Systems, etc.).

1.2.4 Range of Launch Azimuths Planned from Each Launch Point

As proposed, Spaceport Camden would accommodate up to 12 vertical launches per year. All vehicles would launch from the Launch Complex, generally to the east over the Intracoastal Waterway, Cumberland Island National Seashore, and the Atlantic Ocean. In addition, in support of the launches there would be up to 12 wet dress rehearsals and up to 12 static fire engine tests per year. The anticipated range of launch azimuths is from 83 degrees to 115 degrees. For the Vertical Launch Facility this is shown in Exhibit 7.

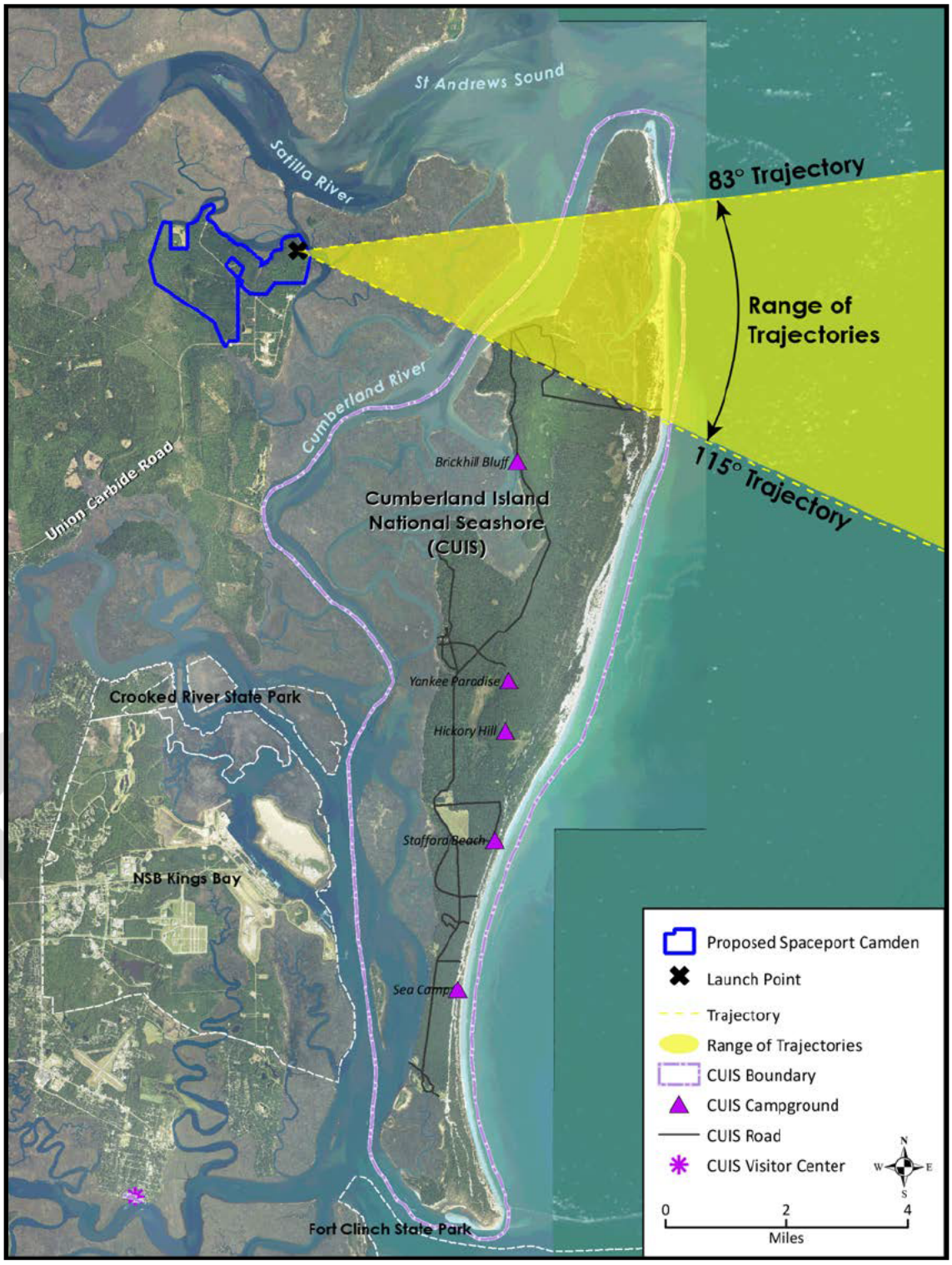


Exhibit 7. Anticipated Range of Launch Azimuths From Primary Vertical Launch Facility.

1.2.5 Scheduled Operational Date

Spaceport Camden aims to hold its first licensed launch in 2020 based on customer statements and indicated demand.

1.3 Foreign Ownership

Within 14 CFR § 420.15(a)(3) it states the LSOL application must contain the following information regarding potential foreign ownership:

> *"Foreign ownership. Identify foreign ownership of the applicant, as follows:*
> *(i) For a sole proprietorship or partnership, all foreign owners or partners;*
> *(ii) For a corporation, any foreign ownership interest of 10 percent or more; and*
> *(iii) For a joint venture, association, or other entity, any foreign entities participating in the entity."*

Spaceport Camden has no foreign ownership; therefore, these questions are not applicable.

2.0 Environmental

Within 14 CFR § 420.15(b) it states the LSOL application must contain the following information regarding environmental analysis:

> *"(b) Environmental. An applicant shall provide the FAA with information for the FAA to analyze the environmental impacts associated with the operation of the proposed launch site. The information provided by an applicant must be sufficient to enable the FAA to comply with the requirements of the National Environment Policy Act, 42 U.S.C. 4321et seq. (NEPA), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA, 40 CFR parts 1500- 1508, and the FAA's Procedures for Considering Environmental Impacts, FAA Order 1050.1F. An applicant shall submit environmental information concerning a proposed launch site not covered by existing environmental documentation, and other factors as determined by the FAA."*

This environmental analysis prepared by FAA/AST for Spaceport Camden is found as Attachment 1 and meets the full requirements of 14 CFR § 420.15(b).

3.0 Launch Site Location

Within 14 CFR § 420.15(c) it states the LSOL application must contain the following information regarding the launch site location review:

> *"(c) Launch site location.*
> *(1) Except as provided by paragraph (c)(2) of this section, an applicant shall provide the information necessary to demonstrate compliance with §§ 420.19-420.29.*
> *(2) An applicant who is proposing to locate a launch site at an existing launch point at a federal launch range is not required to comply with paragraph (c)(1) of this section if a*

launch vehicle of the same type and class as proposed for the launch point has been safely launched from the launch point."

The launch site location review analysis for Spaceport Camden is found as Attachment 2 and meets the full requirements of 14 CFR § 420.15(c).

4.0 Explosive Site Plan

Within 14 CFR § 420.15(d) it states the LSOL application must contain the following information regarding explosive site planning:

(d) Explosive site plan.

(1) Except as provided by paragraph (d)(2) of this section, an applicant shall submit an explosive site plan that complies with §§ 420.63, 420.65, 420.67, and 420.69.

(2) If an applicant plans to operate a launch site located on a federal launch range, and if the applicant is required by the federal launch range to comply with the federal launch range's explosive safety requirements, the applicant shall submit the explosive site plan submitted to the federal launch range.

The explosive site plan (and analysis) for Spaceport Camden is found as Attachment 6 and meets the full requirements of 14 CFR § 420.15(d) as it applies to planned operations at Spaceport Camden.

5.0 Launch Site Operations

Within 14 CFR § 420.15(e) it states the LSOL application must contain the following information regarding launch site operations:

(e) Launch site operations. An applicant shall provide the information necessary to demonstrate compliance with the requirements of §§ 420.53, 420.55, 420.57, 420.59, 420.61, and 420.71.

These paragraphs are addressed below and in the following Attachments and meet the full requirements of 14 CFR § 420.15(e) as it applies to planned operations at Spaceport Camden.

§ 420.53 – Control of public access is addressed in Attachment 5.

§ 420.55 – Spaceport Camden requires that spaceport customers coordinate proposed hazardous operations with the Launch Facility Operations Director (or designee). The Scheduling and Notification Plan is found as Attachment 12. An example of the Spaceport Camden Comprehensive Launch Plan (CLP) is provided in Attachment 9. The CLP development process is performed for each launch and ensures thorough coordination across the stakeholder community. The CLP process is also ICS-201 compliant (Incident Command System Form 201) and further conforms to the overarching Camden County Emergency Operations Procedures (Attachment 8).[6]

[6] Modifications to the text addressing the requirements of § 420.55and the inclusion of Attachment 12 originate from two principle inquiries from FAA/AST to Spaceport Camden and are reflected within the revised text and the new Attachment 12. The first was an inquiry from FAA/AST (Karen Perez) regarding the Spaceport Camden

§ 420.57 – Notifications are addressed in Attachment 12 (Scheduling and Notification Plan) and others referenced in Attachment 12.

§ 420.59 – Launch site accident investigation plan (AIP) is found as Attachment 7, with supporting information in Attachment 8 (enables the powers discussed in the AIP).

§ 420.61 – Records retention requirements are addressed as an integral part of the launch site accident investigation plan found as Attachment 7 and the supporting information in Attachment 8. With this application, it is confirmed that records shall be retained for a minimum of three (3) years, and these will made available to federal officials for inspection and copying as per federal regulations.

§ 420.71 – Lightning protection has been addressed in the core design practice of the Spaceport Camden project, including, but not exclusive of, provisions in explosive siting (Attachment 6) where no power lines are above or near fuel / pressurants tanks, meeting local code for buildings as it pertains to lightning protection / surge protection, and the inclusion of robust lightning protection at the Vertical Launch Facility (see Section 1.2.2.1 above). In addition to lightning protection systems, Spaceport Camden would utilize a lightning warning system to permit termination of operations and withdrawal of the public to the public area distance prior to an electrical storm, or for an explosive hazard facility containing explosives that cannot be initiated by lightning. The lightning warning system is described herein (see Section 1.2.2.1 above).[7]

N/A Population Monitoring and Management Plan – In addition to the requirements of 14 CFR § 420.53, FAA/AST has requested a population monitoring and management plan by Spaceport Camden for areas that currently are non-hazard areas, but are population dependent when it comes to their determination of being a potential future hazard area. This Population Monitoring and Management Plan is found as Attachment 10.[8]

Comprehensive Launch Plan (CLP) process and the USCG participation in the implementation of Safety Zones. Redlines proposed by Spaceport Camden were agreed with FAA/AST during a call and these redlines were subsequently delivered to FAA/AST by Spaceport Camden. The second set of revisions to this paragraph originated with an email from FAA/AST (Randy Maday) inquiring as to "the scheduling of hazardous activities at the site regardless of whether it's a launch or routine ground activity." Spaceport Camden (Andrew Nelson) initially responded with a follow up by FAA/AST, and a final proposed revision by Spaceport Camden that was accepted by FAA/AST. These two final accepted revisions are reflected in the revised response addressing § 420.55.

[7] References to lightning warning systems included based on FAA/AST (Randal Maday) discussions with Spaceport Camden (Andrew Nelson).

[8] The Population Monitoring and Management Plan (PMMP) originated from a verbal inquiry during a technical interchange meeting between FAA/AST and Spaceport Camden and a further inquiry by FAA/AST (Kenneth Wong) to Spaceport Camden. Through multiple evolving requests by FAA/AST for population related data a final set of estimated population data and a PMMP was prepared for FAA/AST by Spaceport Camden. FAA/AST (Kenneth Wong) sent further inquiries to Spaceport Camden about "Zone 4" of the PMMP and potential road monitoring and management in non-hazard areas of the County that may experience inconvenient traffic volumes by potential spectators (non-safety related impacts). Spaceport Camden (C N White) responded to FAA/AST (Kenneth Wong) addressing these inquiries.

N/A Little Cumberland Island Fire Mitigation Plan – In addition to the requirements of 14 CFR part 420, FAA/AST has requested a fire mitigation plan for Little Cumberland Island, to the east of Spaceport Camden. This Little Cumberland Island Fire Mitigation Plan is found as Attachment 11.[9]

# # # # #

[9] The Little Cumberland Island Fire Mitigation Plan (LCIFMP) originated from an inquiry by FAA/AST (Kenneth Wong). The LCIFMP (Attachment 11) was provided to FAA/AST (Kenneth Wong) by Spaceport Camden (Steve Howard and C N White). FAA/AST (Katherine Branham) had follow up inquiries about who prepared, reviewed, and approved the LCIFMP, their qualifications, and the standard used to prepare the LCIFMP. Full responses were provided by the County (Chairman James Starline) to FAA/AST (Kenneth Wong).

Attachment 1

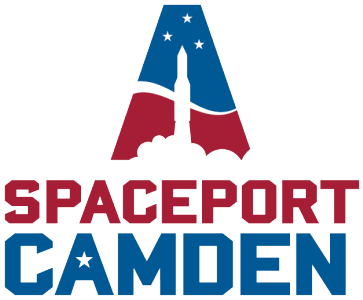
Spaceport Camden Draft Environmental Impact Statement

DRAFT

Environmental Impact Statement

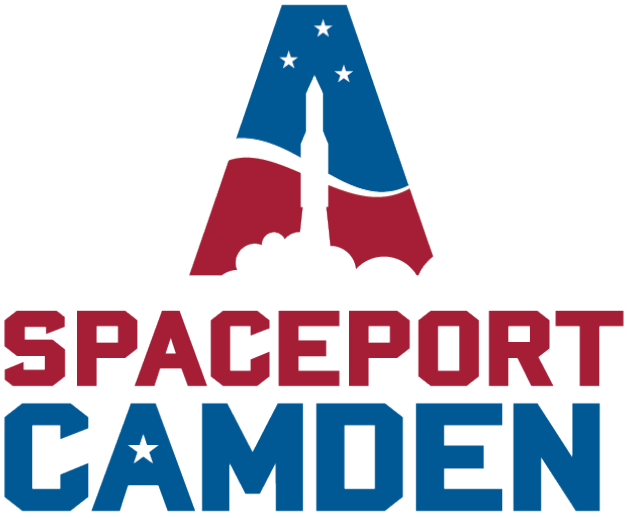
On File with FAA

As of March 2018



Attachment 2

Spaceport Camden Launch Site Location Review



Launch Site Location Review

As of 14 January 2020

FOIA EXEMPT – PROPRIETARY DATA

GORA EXEMPT – FEDERAL GOVERNMENT CONTROLLED DATA, SECURITY PLANNING INFORMATION, REAL PROPERTY ACQUISITION ANALYSIS DOCUMENT, CONTAINS TRADE SECRETS

ITAR RESTRICTED
MAY CONTAIN ITAR TECHNICAL DATA OR CONTENTS MAY BE CONSIDERED A DEFENSE SERVICE
NO THIRD PARTY DISTRIBUTION ALLOWED

Contents

Revision History:

1/25/19 Initial Submittal.

01/14/20 Revisions include removal of medium-large launcher (only small launcher remains), inclusion of enhanced (additional) population considerations, and additional minor edits. Changes agreed with FAA/AST between January – December 2019 also included.

ATTACHMENT 2 – LAUNCH SITE LOCATION REVIEW

This Launch Site Location Review (LSLR) for the Spaceport Camden Launch Site Operator License (LSOL) application is provided in accordance with the requirements of 14 CFR § 420.15(c)(1) (Information requirements, Launch site location) and 14 CFR § 420.17(a)(3) (Basis for issuance of a license), as amended. The last known amendment was published in the Federal Register, Volume 81, Number 139, on Wednesday, July 20, 2016 in the Rules and Regulations section, starting on page 47017, and became effective on 19 September 2016.[1] Regarding the LSLR requirements, 14 CFR § 420.17(a)(3) states that:

> *(a) The FAA will issue a license under this part when the FAA determines that:*
> *…*
> *(3) The launch site location meets the requirements of §§420.19, 420.21, 420.23, 420.25, 420.27, and 420.29;*

As such, this LSLR provides supporting information that is required by the referenced subparagraphs of 14 CFR part 420 for a representative small launch vehicle intended for small satellite launches.

This LSLR is augmented by an analysis of individual risk (also referred to as "P_{ind}" or individual probability) per 14 CFR § 417.107(b)(2) (Flight safety, Public risk criteria, Individual risk). The individual risk analysis is provided in Section 7.

1 14 CFR § 420.19 – Launch site location review—general.

Paragraph 420.19 states the following:

> *(a) To gain approval for a launch site location, an applicant shall demonstrate that for each launch point proposed for the launch site, at least one type of expendable or reusable launch vehicle can be flown from the launch point safely. For purposes of the launch site location review:*
>
> > *(1) A safe launch must possess a risk level estimated, in accordance with the requirements of this part, not to exceed an expected number of 1 x 10^{-4} casualties (Ec) to the collective member of the public exposed to hazards from the flight.*
> >
> > *(2) Types of launch vehicles include orbital expendable launch vehicles, guided suborbital expendable launch vehicles, unguided sub-orbital expendable launch vehicles, and reusable launch vehicles. Orbital expendable launch vehicles are further classified by weight class, based on the weight of payload the launch vehicle can place in a 100-nm orbit, as defined in table 1.*

[1] Federal Register, Vol. 81, No. 139, 20 July 2016, page 47017, "DEPARTMENT OF TRANSPORTATION, Federal Aviation Administration; 14 CFR Parts 417, 420, 431, and 435; [Docket No.: FAA–2014–0418; Amdt. Nos. 417–4, 420–7, 431–4 and 435–3]; RIN 2120–AK06; *Changing the Collective Risk Limits for Launches and Reentries and Clarifying the Risk Limit Used To Establish Hazard Areas for Ships and Aircraft.*"

(b) If an applicant proposes to have more than one type of launch vehicle flown from a launch point, the applicant shall demonstrate that each type of expendable or reusable launch vehicle planned to be flown from the launch point can be flown from the launch point safely.

(c) If an applicant proposes to have more than one weight class of orbital expendable launch vehicles flown from a launch point, the applicant shall demonstrate that the heaviest weight class planned to be flown from the launch point can be flown from the launch point safely.

Therefore, this Section 1 describes the launch site(s), launch vehicle(s), range of azimuths the launch vehicles may travel, and the heaviest weight class anticipated for the launch point.

The Aerospace Corporation of El Segundo, California performed an extensive analysis of the expected casualty (Ec), also referred to as "cumulative risk", and individual risk (P_{ind}) from launches emanating from Spaceport Camden. There were trajectories evaluated from Spaceport Camden between 85 degrees and 120 degrees azimuth for a representative small launcher. All trajectories passed the Ec requirements of 14 CFR part 420 and individual risk requirements of 14 CFR part 417, given the assumptions within this report, including enhanced (additional) population stress test cases for Ec that went well beyond the anticipated worst case population on Little Cumberland and Cumberland Islands.

Pursuant to the requirements of 14 CFR § 420.19, this document principally focuses on one reference trajectory, 100 degrees from true north, from the sole launch point planned for the site. This trajectory, with the assumptions described in this document, was significantly under the required Ec (cumulative risk) threshold of 14 CFR § 420.19. A stress test analysis for enhanced population scenarios also demonstrated the 100-degree trajectory to be resilient to added populations under the trajectory and nearby, both inside and just outside impact limit lines, while still meeting the cumulative risk (Ec) requirements of the CFR.

Population data assumptions are pursuant to 14 CFR part 420 Appendix C requirements, utilizing the latest Camden County U.S. census and the worldwide LandScan / Oak Ridge National Laboratory (ORNL) database extrapolated forward to 2020. Additional local population on nearby barrier islands was added that are above and beyond the two referenced databases to reflect potential worst case (and beyond) conditions. For the 100-degree reference trajectory, this included population scenarios that are well beyond what is experienced today, or anticipated in the future, and are considered stress test cases.

The analysis performed by The Aerospace Corporation is considered conservative for a number of reasons, including, among other conservative analysis parameters, the use of launch failure rates greater than required by Part 420. It is noted that anticipated public viewing areas for Spaceport Camden launches are outside the first stage analysis area of impacts, and hence do not impact Ec results, but are included in cumulative risk analysis for the enhanced population stress test analysis, as are "maximum" anticipated visitors to Cumberland Island National Seashore and greatly enlarged visitor populations to private habitable structures on Cumberland and Little Cumberland Island. Currently, the proposed Welcome Center at Spaceport Camden will not host visitors during launch operations. Further information regarding the analysis is found in this LSLR.

1.1 Launch Site

The proposed Spaceport Camden property is located in unincorporated Woodbine, in Camden County, approximately 11.5 miles due east of the town of Woodbine, Georgia. Access to the site is at the eastern terminus of Union Carbide Road, an extension of Harriett's Bluff Road (Exit 7 from I-95). The site is on the water, surrounded by salt marshes to the east and south, and the Satilla River to the north. The

property comprises uplands, salt marshes and fresh water wetlands. The site was previously used for the manufacture of various chemicals. Most of the buildings, including all of the manufacturing facilities, have been demolished. Existing roads and other existing infrastructure – fiber optic communications, water, sewer and electrical power – may be reused, and potentially improved or extended. The remainder of the site, much of which is marshland, would be used as buffer. Offshore ship traffic is typical of the eastern seaboard; Andrews Sound has minimal traffic, while the Intracoastal Waterway and its various alternative pathways have some barge traffic. There is also recreational boating in the area but minimal impact due to the very low population density in the area. Exhibit 1 below shows the general location of the spaceport. Exhibit 2 shows a more detailed view of the proposed site.

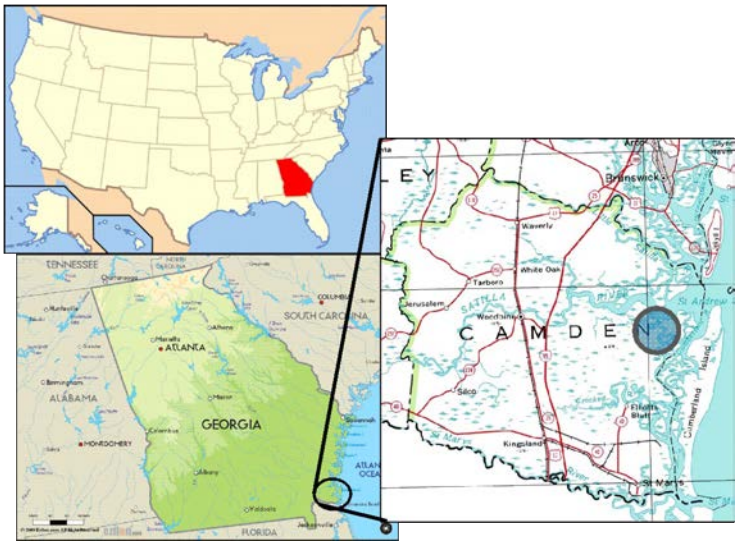


Exhibit 1. General Location – Spaceport Camden County

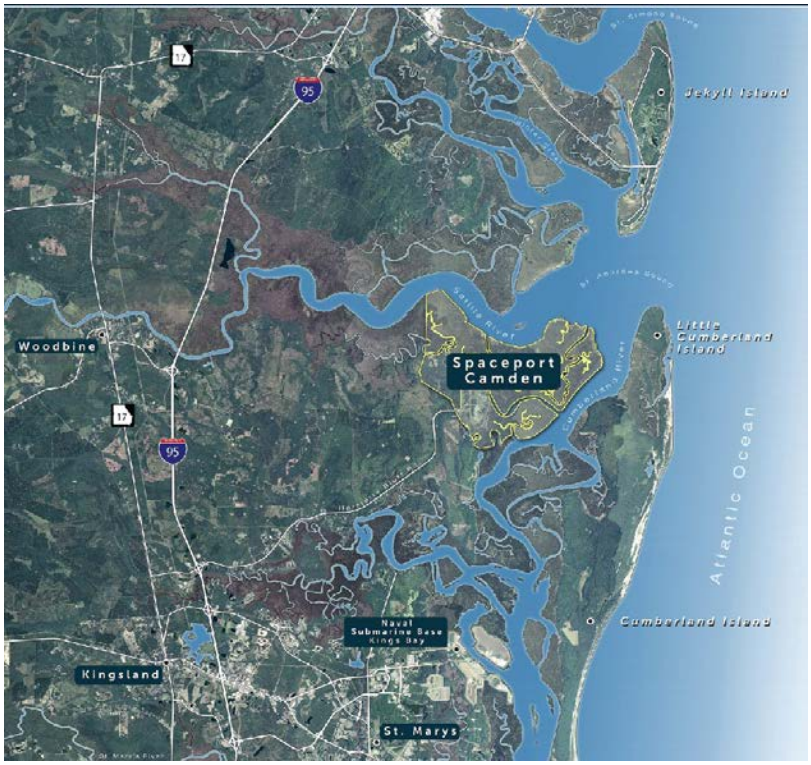


Exhibit 2. Spaceport Camden County Location and Local Surroundings

The proposed layout of Spaceport Camden has been developed to best use the geographical features of the site, considering the past uses, FAA requirements for rocket related operations, potential growth in the future, and lessons learned from other spaceport operations.

Spaceport Camden includes a vertical launch site complex, a mission preparation area, a control center / payload integration complex and a welcome center / back up control center complex. Approximately 100 non-contiguous upland acres would be used for the four sets of facilities. Security and access control plans for these facilities and the 4,000 acres of uplands are provided in the Spaceport Camden Access Control Plan. An artist's rendering of the site layout and launch and other facilities (with high level schematics) are shown in Exhibits 3 through 8. The distance between the Launch Pad Complex and the Main Gate / Welcome Center is over 2.2 miles, while the Launch Control Center / Payload Processing facility is approximately 2.3 miles. The distance between the Launch Control Center / Payload Processing facility and the Mission Preparation Area is about 1.3 miles, while the distance to the Main Gate / Welcome Center from the Mission Preparation Area is about 0.75 miles (~4,000 feet). At this time, the Welcome Center will not host the general public during launch operations. It is noted that Exhibit 3 through Exhibit 8 contain artist renderings. All explosive safety analysis has been performed and documented elsewhere in this LSOL application.

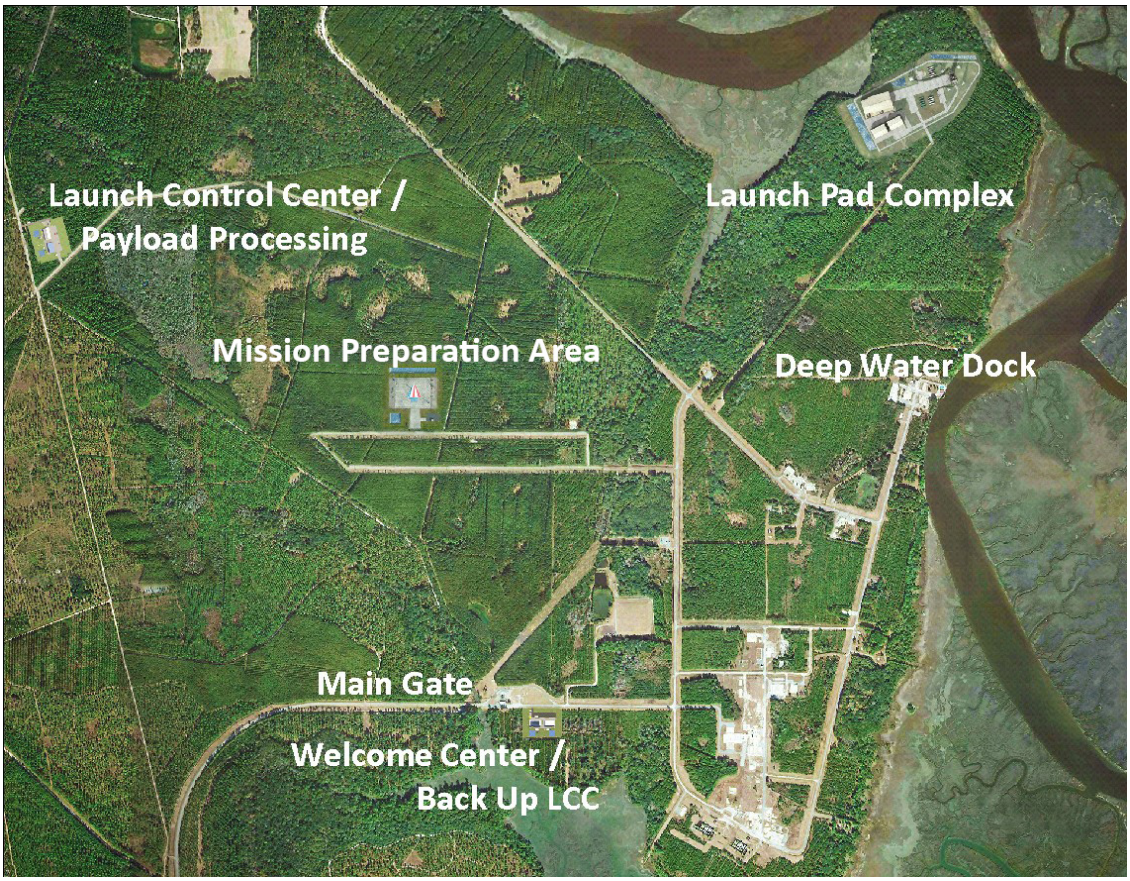


Exhibit 3. Proposed Site Plan – Spaceport Camden County

Exhibit 4. Proposed Site Plan – Spaceport Camden County – View from East

Exhibit 5. Proposed Site Plan – Artist Rendering - Aerial View of Launch Pad Complex

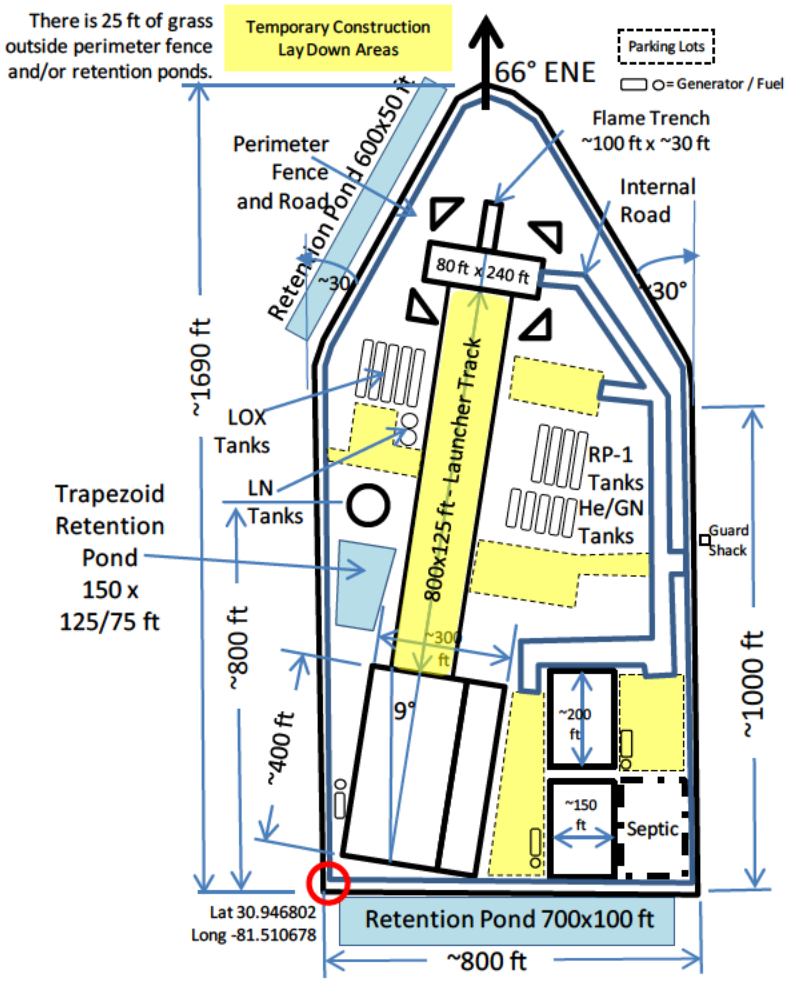


Exhibit 6. Proposed Launch Pad Complex Site Plan – Overhead Schematic

Exhibit 7. Proposed Site Plan – Artist Rendering – Aerial View of Mission Preparation Area

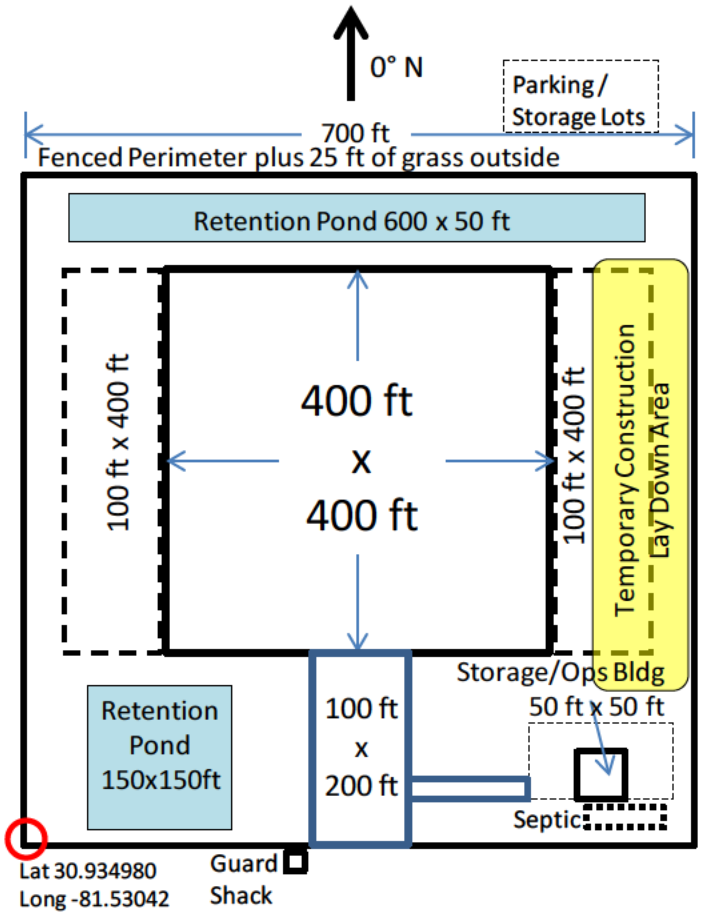


Exhibit 8. Proposed Mission Preparation Area Site Plan – Overhead Schematic

1.2 Launch Vehicle

Spaceport Camden is proposing to launch small launch vehicles. The small representative launch vehicle used for this analysis is a two stage, liquid fueled (liquid oxygen and kerosene or propylene) launch vehicle with approximately 18,500 lbf of thrust at lift off, carrying a small (100-300 lbm) payload / satellite to low Earth orbit at approximately 32 degrees angle of inclination. The small representative launch vehicle is considered to be quite similar in design and performance to an ABL RS0, Vector-R launcher, or a Rocket Lab Electron launch vehicle. The small representative launch vehicle used for this analysis is anticipated to carry approximately 1,000 gallons of LOX and 750 gallons of fuel and is anticipated to be between 40-60 feet tall.

1.3 Range of Azimuths

It is anticipated that most trajectories flown from Spaceport Camden would be to the east or southeast; however, in order to ensure an appropriately wide range of azimuths are explored, for the purposes of this analysis Ec evaluations were performed for trajectories between 85 degrees from true north to 120 degrees from true north.

Exhibit 9 shows the trajectory azimuths evaluated for this study. The primary trajectory azimuth that will be presented throughout this analysis will be the 100-degree reference trajectory that coincides with the trajectory used in the Spaceport Camden Environmental Impact Statement (EIS) noise analysis.

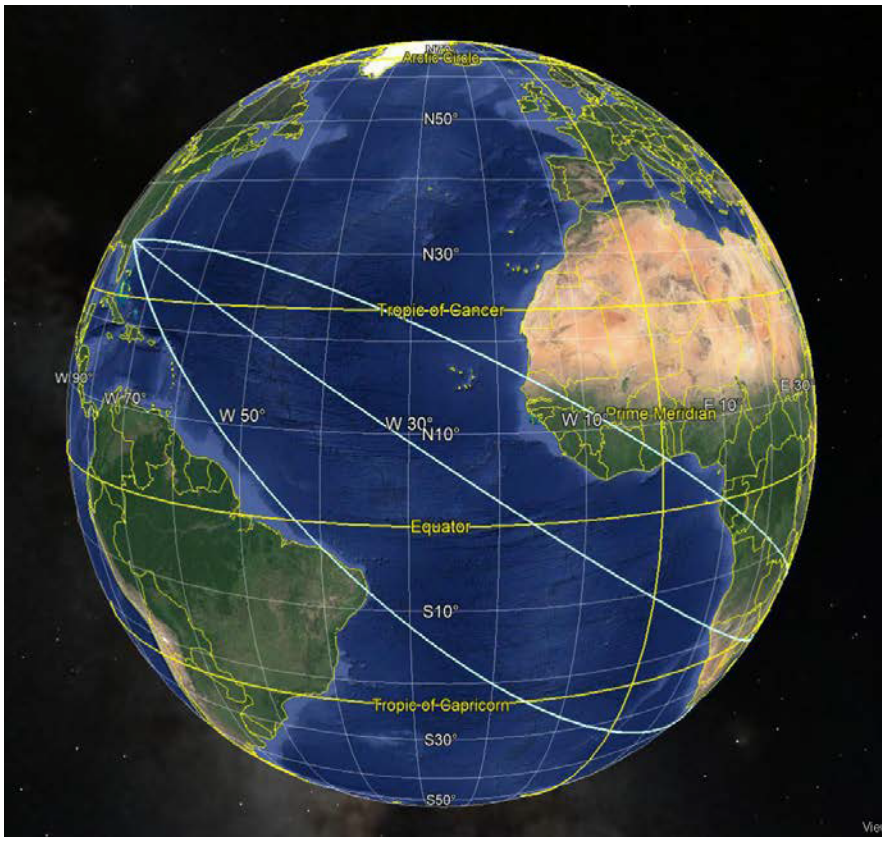


Exhibit 9. Range of Launch Azimuths Evaluated

1.4 Heaviest Weight Class

Pursuant to the requirements of 14 CFR § 420.19(c) the small launch vehicle weight class is proposed for orbital expendable launch vehicles from Spaceport Camden. A representative vehicle within this weight class was analyzed as part of this study.

2 14 CFR § 420.21 – Launch site location review—launch site boundary.

Paragraph 420.21 establishes the launch site boundary for proposed launch points on a spaceport. The requirements of 14 CFR §420.21 are found below:

(a) The distance from any proposed launch point to the closest launch site boundary must be at least as great as the debris dispersion radius of the largest launch vehicle type and weight class proposed for the launch point.

(b) For a launch site supporting any expendable launch vehicle, an applicant shall use the largest distance provided by table 2 for the type and weight class of any launch vehicle proposed for the launch point.

(c) For a launch site supporting any reusable launch vehicle, an applicant shall determine the debris dispersion radius that represents the maximum distance from a launch point that debris travels given a worst-case launch vehicle failure in the launch area. An applicant must clearly and convincingly demonstrate the validity of its proposed debris dispersion radius.

In accordance with 14 CFR § 420.21, Table 2 minimum distance from the launch point to the launch site boundary, is 7,300 feet, unless an alternative method demonstrates another appropriate distance. Spaceport Camden will use the CFR defined minimum distance from launch point to launch site boundary as shown in Exhibit 10.

Exhibit 10. Minimum Distance to Launch Site Boundary (7,300 feet) for Small Representative Launch Vehicle (14 CFR 420.21, Table 2)

The Spaceport Camden layout is such that the majority of the 7,300 feet radius circle is contained within the launch site boundary, or in the case of the Satilla River, controllable using USCG Safety Zone establishment procedures identified within the Access Control Plan and the Letter of Agreement (LOA) with the USCG and the County. This is shown in Exhibit 11 below.

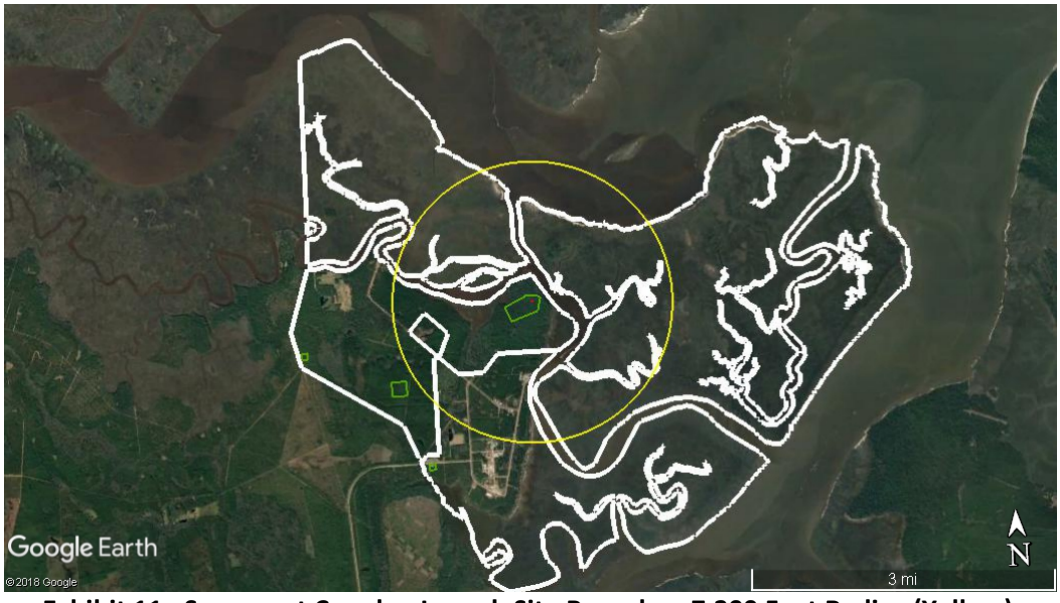


Exhibit 11. Spaceport Camden Launch Site Boundary 7,300 Feet Radius (Yellow) Pursuant to 14 CFR §§420.21, Table 2 versus Property Boundary Lines (White)

3 14 CFR § 420.23 – Launch site location review—flight corridor.

Paragraph 14 CFR **§** 420.23 requires the LSOL applicant to define a flight corridor that meets various requirements for a guided orbital expendable launch vehicle (14 CFR § 420.23(a)), reusable launch vehicle (14 CFR § 420.23(d)), and sub-orbital (guided and unguided) launch vehicles (14 CFR § 420.23(b) and § 420.23(c), respectively). This LSOL application principally addresses the representative guided orbital expendable first stage and second stage launch vehicle defined earlier in this LSLR; hence compliance with 14 CFR § 420.23(a) is demonstrated.

3.1 Guided Orbital Expendable Launch Vehicle Flight Corridor [14 CFR §420.23(a)]

Section 420.23(a) requires the LSOL applicant to define a flight corridor that meets various requirements for a guided orbital expendable launch vehicle. Specifically, 14 CFR §420.23(a) states the following:

(a) Guided orbital expendable launch vehicle. For a guided orbital expendable launch vehicle, an applicant shall define a flight corridor that:

(1) Encompasses an area that the applicant estimates, in accordance with the requirements of this part, to contain debris with a ballistic coefficient of ≥ 3 pounds per square foot, from any non-nominal flight of a guided orbital expendable launch vehicle from the launch point to a point 5000 nm downrange, or where the IIP leaves the surface of the Earth, whichever is shorter;

(2) Includes an overflight exclusion zone where the public risk criteria of 1×10^{-4} would be exceeded if one person were present in the open; and

(3) Uses one of the methodologies provided in appendix A or B of this part. The FAA will approve an alternate method if an applicant provides a clear and convincing demonstration that its proposed method provides an equivalent level of safety to that required by appendix A or B of this part.

Using the general methodologies of Appendix A and B of Part 420, as interpreted in The Aerospace Corporation's Ec Tool / trajectory modeling software, the various trajectories with their overflight exclusion zones (OEZs) were evaluated for the Spaceport Camden site. The trajectory data is described in more detail in Section 4.1.1 and the OEZ, developed per 14 CFR §420.23(a)(2), is described in more detail in Section 4.3.

3.2 Guided Sub-Orbital Expendable Launch Vehicle Flight Corridor [14 CFR §420.23(b)]

Paragraph 420.23(b) requires the LSOL applicant to define a flight corridor that meets various requirements for a guided sub-orbital expendable launch vehicle. These requirements are found below:

(b) Guided sub-orbital expendable launch vehicle. For a guided sub-orbital expendable launch vehicle, an applicant shall define a flight corridor that:

(1) Encompasses an area that the applicant estimates, in accordance with the requirements of this part, to contain debris with a ballistic coefficient of ≥ 3 pounds per square foot, from any non-nominal flight of a guided sub-orbital expendable launch vehicle from the launch point to impact with the earth's surface;

(2) Includes an impact dispersion area for the launch vehicle's last stage;

(3) Includes an overflight exclusion zone where the public risk criteria of 1 x 10^{-4} would be exceeded if one person were present in the open; and

(4) Uses one of the methodologies provided in appendices A or B to this part. The FAA will approve an alternate method if an applicant provides a clear and convincing demonstration that its proposed method provides an equivalent level of safety to that required by appendix A or B of this part.

Spaceport Camden is not requesting permissions for guided suborbital operations at this time; therefore, no analysis was performed. However, should such operations be requested in the future, Spaceport Camden is familiar with the processes and procedures for applying for such permissions.

3.3 Unguided Sub-Orbital Expendable Launch Vehicle Flight Corridor [14 CFR § 420.23(c)]

Paragraph 420.23(c) requires the LSOL applicant to define a flight corridor that meets various requirements for an unguided sub-orbital expendable launch vehicle. These requirements are found below:

(c) Unguided sub-orbital expendable launch vehicle.

(1) For an unguided sub-orbital expendable launch vehicle, an applicant shall define the following using the methodology provided by appendix D of this part:

(i) Impact dispersion areas that the applicant estimates, in accordance with the requirements of this part, to contain the impact of launch vehicle stages from nominal flight of an unguided sub-orbital expendable launch vehicle from the launch point to impact with the earth's surface; and

(ii) An overflight exclusion zone where the public risk criteria of 1 x 10^{-4} would be exceeded if one person were present in the open.

(2) The FAA will approve an alternate method if an applicant provides a clear and convincing demonstration that its proposed method provides an equivalent level of safety to that required by appendix D of this part.

(3) An applicant shall base its analysis on an unguided suborbital launch vehicle whose final launch vehicle stage apogee represents the intended use of the launch point.

Spaceport Camden is not requesting unguided suborbital operations at this time; therefore, no analysis was performed. However, should this type of operation be requested in the future, Spaceport Camden is familiar with the processes and procedures for applying for such permissions.

3.4 Reusable Launch Vehicle Flight Corridor [14 CFR § 420.23(d)]

Paragraph 420.23(d) requires the LSOL applicant to define a flight corridor that meets various requirements for a reusable launch vehicle; as noted earlier, for the case of Spaceport Camden the reusable launch vehicle is a reusable first stage guided orbital launch vehicle with a guided expendable second stage and payload. Specifically, 14 CFR §420.23(d) states the following:

(d) Reusable launch vehicle. For a reusable launch vehicle, an applicant shall define a flight corridor that contains the hazardous debris from nominal and non-nominal flight of a reusable launch vehicle. The applicant must provide a clear and convincing demonstration of the validity of its flight corridor.

Spaceport Camden is not requesting reusable operations at this time; therefore, no analysis was performed. However, should this type of operation be requested in the future, Spaceport Camden is familiar with the processes and procedures for applying for such permissions.

4 14 CFR § 420.25 – Launch site location review—risk analysis.

Paragraph 420.25 defines the risk analysis requirements for a flight corridor that contains a populated area in terms of casualty expectation associated with the flight corridor or impact dispersion area. The specific requirements are:

(a) If a flight corridor or impact dispersion area defined by section 420.23 contains a populated area, the applicant shall estimate the casualty expectation associated with the flight corridor or impact dispersion area. An applicant shall use the methodology provided in appendix C to this part for guided orbital or suborbital expendable launch vehicles and appendix D for unguided suborbital launch vehicles. The FAA will approve an alternate method if an applicant provides a clear and convincing demonstration that its proposed method provides an equivalent level of safety to that required by appendix C or D of this part. For a reusable launch vehicle, an applicant must provide a clear and convincing demonstration of the validity of its risk analysis.

(b) For licensed launches, the FAA will not approve the location of the proposed launch point if the estimated expected casualty exceeds 1×10^{-4}.

The Aerospace Corporation analyzed the various trajectories from the Spaceport Camden launch point using their proprietary and trade secret algorithms that have been used in prior FAA, USAF and international analysis efforts of expected casualty for expendable and reusable launch vehicle operations and that conform to 14 CFR 420, Appendix C for guided orbital or suborbital expendable and reusable launch vehicles. Assumption for the risk analysis are provided in Section 4.4.1. For all small launch vehicle trajectories, The Aerospace Corporation analyzed from Spaceport Camden all trajectories had an estimated Ec that was significantly less than $1x10^{-4}$. Enhanced population cases of cumulative risk analysis (Ec) for the 100 degree azimuth (from true north) representative trajectory of a small launch vehicle demonstrated up to 40 people per structure could be accommodated. The results of these analyses are summarized below in Exhibit 12 and Exhibit 13.

Trajectory Azimuth	Mission Total (two phases of flight) Ec (x 10^{-4})*
85	0.01
100†	0.004
120	0.01

** These results are shown as two significant figures for clarity; however, 14 CFR Part 420 specifies Ec requirements with one significant figure.*

† *The 100-degree azimuth trajectory has de minimis 2nd stage Ec contribution due to the entire 2nd stage trajectory being flown over water.*

Exhibit 12. Spaceport Camden Small Trajectory Ec Analyses

Camden County with Added Population			Expected Casualty (/10,000)		
Persons per CI/LCI Structure	CI Campers & Visitors	Launch Viewers	Stage 1	Stage 2	Total
0	0	0	0.001	0.01	0.01
0	0	5350	0.014	0.01	0.02
0	380	0	0.016	0.01	0.03
2	0	0	0.068	0.01	0.08
2	380	5350	0.098	0.01	0.11
10	380	5350	0.37	0.01	0.38
20	380	5350	0.71	0.01	0.72
40	380	5350	1.39	0.01	1.40

Exhibit 13. Spaceport Camden Small Launcher Enhanced Population 100-Degree Azimuth Ec Analysis

4.1 Assumptions

The Aerospace Corporation's analysis methodology of Ec included the assumptions summarized in Exhibit 14 and additional assumptions pursuant to 14 CFR part 420 and its appendices.

Parameter	Value	Notes
Total Probability of Failure (Pf)	20%	
First Stage Probability of Failure	10%	
Second Stage Probability of Failure	10%	
Catastrophic On-Trajectory (OT) Failure	30%	
Loss of Thrust (LOT) Failure	30%	50% intact and 50% explosive
Malfunction Turn (MFT)	40%	
First Stage Casualty Area (Ac)	3,800 ft^2	90 fragments
Second Stage Ac	250 ft^2	20 fragments
OEZ Effective Casualty Area	3,800 ft^2	Same as first stage casualty area
Total Angle of Attach (Qα)	>10,000 psf-deg	
Total Monte Carlo Simulations	300,000	100,000 per failure mode
Impact Limit Line (ILL) delay	0.2 to 0.4 seconds	
Reference Launch Azimuth	100-degree	
Trajectory Data	Varies	See Section 4.1.2
Wind Data	Varies	See Section 4.1.2
Population Data	Varies	See Section 4.1.3

Exhibit 14. Summary of Key Assumptions for Ec Analysis

4.1.1 Trajectory Data & Maps

For the small representative launch vehicle's 100-degree reference trajectory, the flight corridor that encompasses an area that is estimated to contain debris with a ballistic coefficient of ≥ 3 pounds per square foot, from any non-nominal flight of the guided orbital reusable launch vehicle, from the launch point to a point 5,000 nm downrange, or where the IIP leaves the surface of the Earth, whichever is shorter, was defined by The Aerospace Corporation as shown in Exhibit 15.

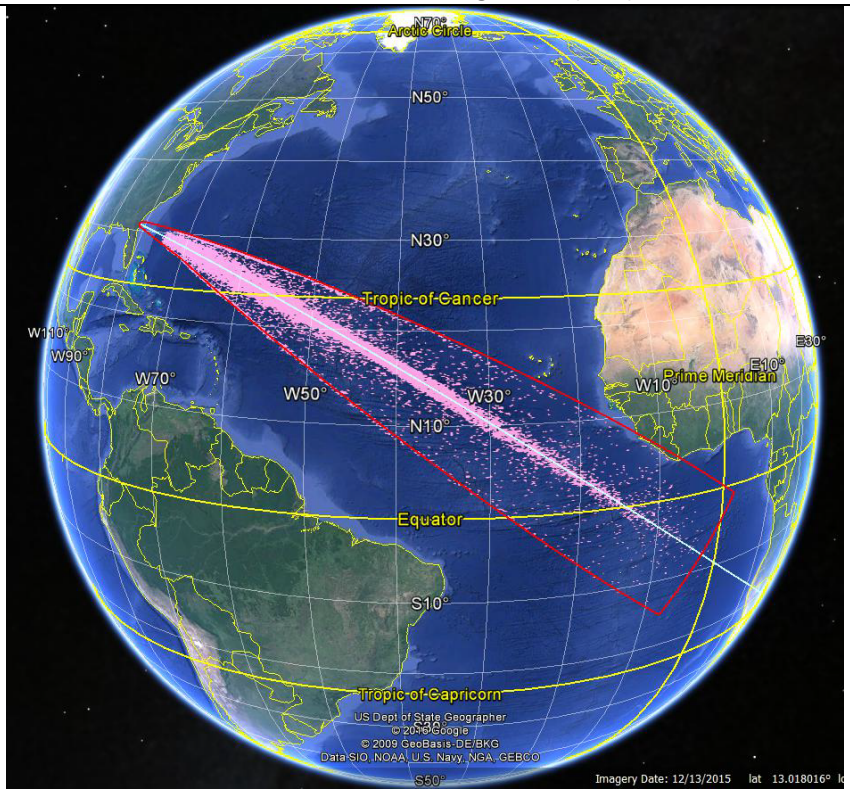


Exhibit 15. Flight Corridor (as per § 420.23(a)(1)) for Small Representative Reusable Launch Vehicle – 100-Degree (From True North) Azimuth Trajectory from Spaceport Camden

The trajectory and dispersion data that defines the flight paths and corridors of the representative launch vehicle used for this analysis were developed by The Aerospace Corporation based on representative small launch vehicles such as the RocketLab Electron, Vector R, and ABL RS0 launch vehicles, and is found in the Excel files included with the delivery of this report as part of the overall LSOL application. The mapping of the trajectories is shown in Exhibit 9. These data in the Excel files are considered proprietary and typically are ITAR controlled technical data.

4.1.2 Winds Data

The winds data used by The Aerospace Corporation for this analysis are representative of coastal winds present in Southeastern Georgia and the Florida coastal community. The winds data is found in the Excel files included with this LSLR.

4.1.3 Population Data

Population data used by The Aerospace Corporation for this analysis included three principle sources: the 14 CFR Part 420 recommended LandScan database from Oak Ridge National Laboratory (ORNL), with 0.5 x 0.5 arc-minute^2 grid size extrapolated to 2020 for downrange overflight, the 2010 Camden County census tracks for local data, and assumed presence of persons at habitable structures on Cumberland Island and Little Cumberland Island that were close to potential flight corridors, but are not represented in the two official population databases. For the Ec analysis performed by The Aerospace Corporation, it was assumed that all population found in the population databases (LandScan / ORNL and Camden

[2] It is noted that 14 CFR Part 420 requires 1 arc minute by 1 arc minute grid size, so this approach is more rigorous.

County U.S. Census), a full sold out crowd at Cumberland Island National Seashore, a full staff / house at the Greyfield Inn (60 people), and up to 40 additional persons at each of the 55 habitable structures on Little Cumberland Island and Cumberland Island (2,200 in total) that were close to the proposed flight corridors, would be present outdoors (unsheltered) for the entire launch.[3] To ensure a conservative approach to the analysis it was also assumed that the 40 persons per habitable structure in the analysis would be present all 365 days per year and be outside (unsheltered) for the entire launch.

The population density for the County and surrounding areas is shown in Exhibit 16 as per the Camden County U.S. Census data.

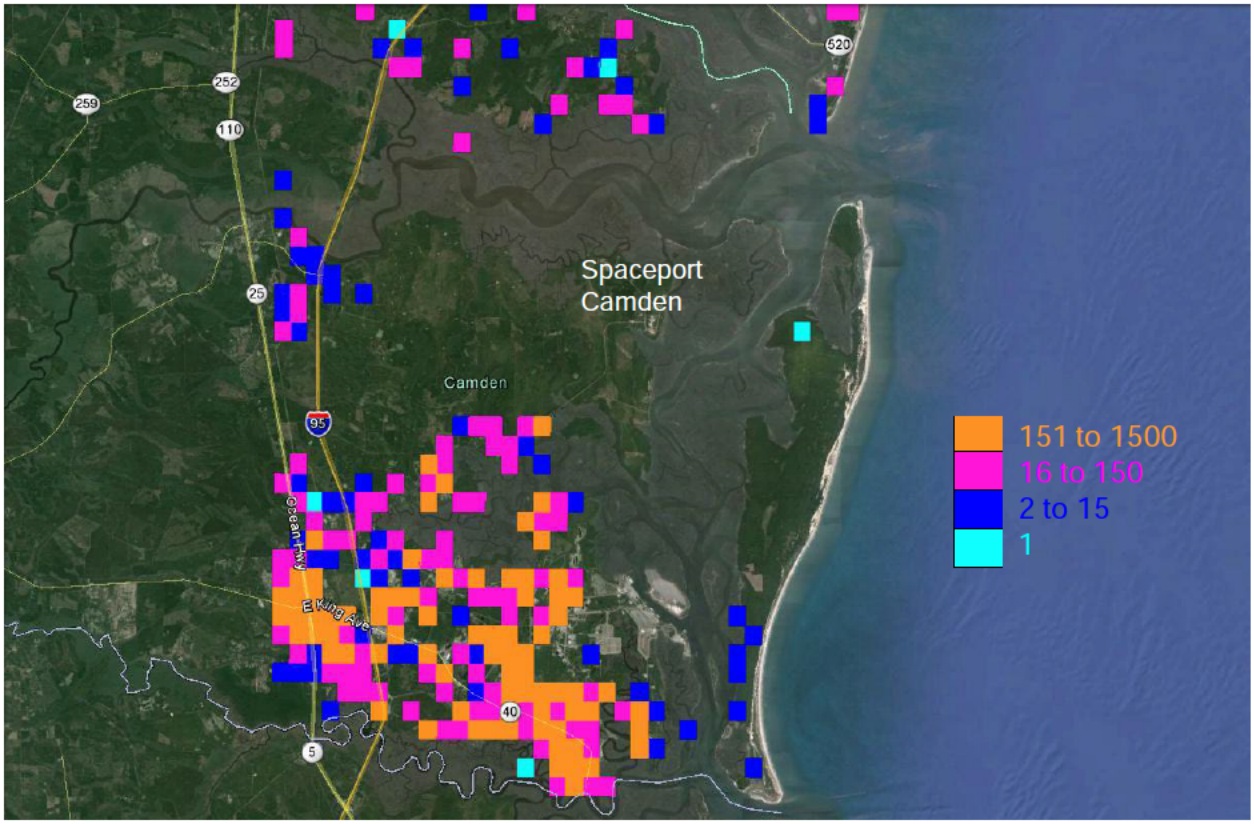


Exhibit 16. Camden County US Census Data Converted To 0.5 x 0.5 Arc-Minute Grid

The list of habitable structures and the latitude and longitude of each structure is found in Exhibit 17 below. The data is from the Camden County Assessor Office's public database.[4]

[3] The additional analysis documented within, considers up to 2,200 residents and guests visiting the 55 habitable structures on Little Cumberland and Cumberland Islands, plus a fully sold out day on Cumberland Island National Seashore (300 people), a fully sold out Greyfield Inn plus staff (60 people), and full CUIS and local first responder staffing (20), for a total assumed population of 2,580 people. According to to testimony by the Little Cumberland Island Home Owners Association at a Georgia Senate Spaceport Committee hearing on 20 October 2016 when LCI/HOA board members defined the peak level of visitors to the LCI and CI structures occurred during Thanksgiving weekend and was about 100 persons in total. The population assumptions used go well beyond even an exaggerated "worst case" scenario.

[4] http://www.qpublic.net/ga/camden/

		MAP COORDINATES				MAP COORDINATES	
Location	Description	LAT	LONG	Location	Description	LAT	LONG
CI-N	Ruckdeschel	30.923151	-81.434920	LCI	Smith 184-031	30.959588	-81.408918
CI-N	Candler 1	30.915841	-81.423959	LCI	Webb 184-030a	30.960641	-81.408777
CI-N	Candler 2	30.915217	-81.421911	LCI	Pallas 184-030	30.961146	-81.408714
CI-N	Candler 3	30.915294	-81.421352	LCI	Borkent 184-029a	30.961699	-81.408644
CI-N	Candler 4	30.914682	-81.421976	LCI	Makemson 184-028	30.962804	-81.408502
CI-N	Candler 5	30.914452	-81.422087	LCI	Ramsey 184-024	30.965430	-81.408459
CI-N	Candler 6	30.914377	-81.421352	LCI	Glidden 184-023	30.965993	-81.408434
CI-N	Candler 7	30.913687	-81.422522	LCI	Emmons 184-021	30.967200	-81.408308
CI-Squaw	Harlech Partnership	30.885857	-81.440805	LCI	Barry 184-027	30.967910	-81.409224
CI-Plum	Hauser	30.858354	-81.464451	LCI	Childs 184-025	30.969231	-81.409235
CI-Plum	Butler	30.856840	-81.464146	LCI	Root 183-022	30.970929	-81.409132
LCI	Latimer 185-005	30.935385	-81.411939	LCI	Benoit 183-021	30.971518	-81.409089
LCI	Roberts 185-004	30.936563	-81.411612	LCI	Johnston 183-014	30.975303	-81.410425
LCI	Hunter 185-003	30.937367	-81.411612	LCI	Claussen-K 183-010	30.976592	-81.413984
LCI	Morawetz 185-002	30.938154	-81.411665	LCI	Claussen-P 183-009	30.976596	-81.414407
LCI	Ike 184-061	30.939695	-81.411706	LCI	Mapstone 183-007	30.976231	-81.415448
LCI	Parker 184-058	30.941663	-81.412573	LCI	Irvin 183-003	30.974417	-81.417607
LCI	Schweers 184-056	30.940332	-81.412268	LCI	Whitley 183-002	30.973679	-81.418136
LCI	Wilson 184-054	30.943897	-81.410521	LCI	McRae 184-001	30.968283	-81.421575
LCI	Everett 184-052	30.945062	-81.410467	LCI	Heard 184-002	30.967466	-81.421863
LCI	Amis 184-049	30.947809	-81.411245	LCI	Johnson 184-003	30.966668	-81.422144
LCI	Thomas 184-048	30.948867	-81.411192	LCI	McMillen 184-006	30.964370	-81.422874
LCI	Klauder 184-046	30.950146	-81.411301	LCI	Fleetwood 184-010	30.960533	-81.422338
LCI	Werner 184-043	30.952968	-81.410685	LCI	Kanes 184-014	30.959531	-81.419684
LCI	Chelton 184-045	30.952090	-81.411169	LCI	Eubanks 184-017	30.958626	-81.418465
LCI	Dopson 184-047	30.954345	-81.410762	LCI	Mills 184-020	30.957483	-81.416002
LCI	Bell 184-036	30.956168	-81.408802	LCI	Porter Camp 184-06	30.949274	-81.421499
LCI	Regenery 184-033	30.959002	-81.408834				

Notes: *LCI = Little Cumberland Island* *CI-N = North End, Cumberland Island*
CI-Squaw = Squaw Point, Cumberland Island *CI-Plum = Plum Orchard, Cumberland Island*

Exhibit 17. Habitable Structures on Cumberland Island and Little Cumberland Island Near the Flight Corridors Emanating from Spaceport Camden

The mapping of these habitable structures is shown in Exhibit 18 with a random example flyout (outbound) trace. Enhanced population assumptions for the 100-degree reference trajectory are shown in Exhibit 19 (table form) and Exhibit 20 (map form with notes).

Exhibit 18. Mapping of 55 Added Habitable Structures to Population Database (Base Case - 40 per Structure) Shown with Example Outbound Trajectory Line

CI Campers & Visitors

Location	Number	LAT	LONG
Brickhill Bluff	24	30.8967	-81.4444
Yankee Paradise	24	30.8500	-81.4467
Hickory Hill	24	30.8328	-81.4512
Stafford Beach Campground	38	30.8060	-81.4521
Sea Camp Beach Campground	88	30.7639	-81.4636
Plum Orchard Area	60	30.8558	-81.4651
Greyfield Inn	60	30.7798	-81.4686
Dungeness Ruins Area	32	30.7486	-81.4709
Dungeness Dock Area	10	30.7542	-81.4740
Sea Camp Dock Area	10	30.7641	-81.4709
The Settlement (1st ABC)	10	30.9245	-81.4298
Total	380		

Launch Viewers

Location	Number	LAT	LONG
St Marys Old Airport	1000	30.7516	-81.5599
Crooked River State Park	1000	30.8440	-81.5528
Naval Submarine Base Kings Bay	1500	30.7976	-81.5513
Jekyll Island (Sounthern Tip)	1500	31.0128	-81.4277
Andrew Sound (North)	100	31.0124	-81.4413
Satilla River (Back Channel)	50	30.9782	-81.5607
Crooked River / Harietts Bluff	100	30.8598	-81.5634
Cumberland River (Southern pinch)	100	30.8431	-81.4808
Total	5350		

Exhibit 19. Enhanced Population Distributions and Latitude / Longitude Locations

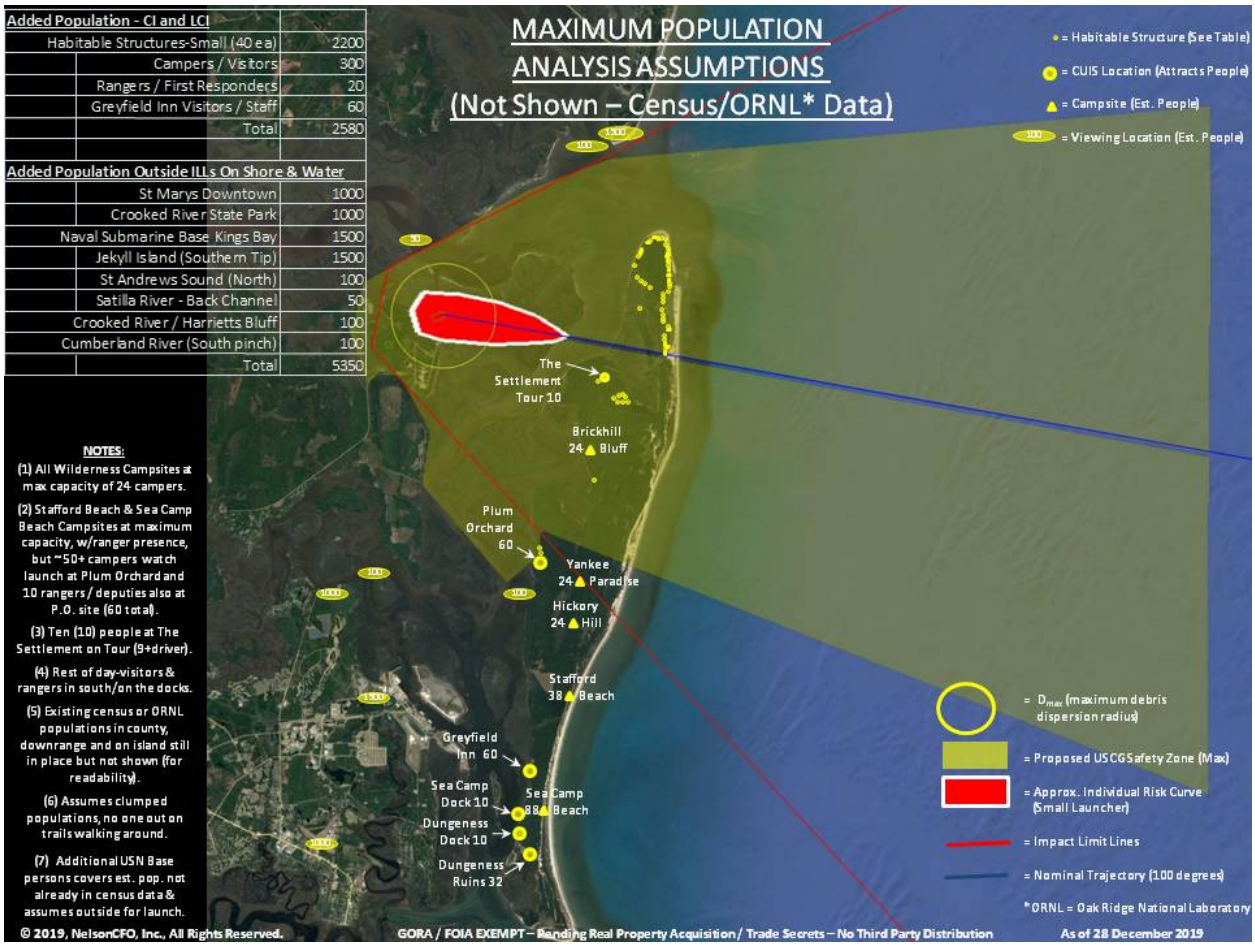


Exhibit 20. Map of Enhanced Population Distributions and Latitude / Longitude Locations

4.2 Expected Casualty (Ec) Data

The Ec analysis methodology used by The Aerospace Corporation contains trade secrets, is proprietary to Aerospace, is believed to contain ITAR controlled Technical Data, is considered to constitute a Defense Service under ITAR, and was performed in accordance with 14 CFR 420 and its appendices. The analysis is summarized in the following sub-sections: Assumptions, Operations, and Ec Results. The small representative launcher is presented.

4.2.1 Methodology

The Aerospace Corporation methodology for calculating Ec is implemented by multiplying the probability of impact (P_I) by the casualty area (A_C) of the debris, multiplied by the population density (D_P) of the region of interest. The Aerospace Corporation's Ec Tool utilizes gridded world population data (and other population sources and assumptions as appropriate) and sums the Ec over all the grid cells at risk and multiplies by the failure probability (P_F).

(b) (4) [redacted]

The Aerospace Corporation's Ec Tool uses as its base case the population density grid (as noted earlier in 4.3) of the LandScan database from Oak Ridge National Laboratory, with 0.5 x 0.5 arc-minute grid size. The Aerospace Corporation Ec Tool may be easily modified to reflect other population databases to enhance the analysis, as deemed appropriate. In the case of this Spaceport Camden analysis, the latest local Camden County U.S. census track data was used for local population density and it was assumed in the base case that additional visitors to permanent structures on Little Cumberland and Cumberland Island in the vicinity of the flight corridor were present (40 each at 55 habitable structures). For the enhanced population cases for the 100-degree reference trajectory additional populations were added, as described in paragraph 4.3, including the maximum allowable number of visitors, staff and campers to Cumberland Island (both CUIS and the Greyfield Inn), first responder populations, spectator populations, and additional guests at the habitable structures on Little Cumberland Island and Cumberland Island. In total between the two islands there were 2,580 people added near or underneath the flight trajectories. This is well beyond, by a factor of 5-times, any reasonable expectation of population anticipated on the two islands.

It was assumed that the launch vehicle uses a highly-reliable, autonomous flight termination system (AFTS) using ordinance. The AFTS will be activated when the vehicle instantaneous impact point (IIP) crosses a limit line constructed to protect the surrounding region.[5] The inert debris casualty area is the sum of the fragment areas with a human border. The probability of failure for Stage 1, and the failure mode allocation are scalable parameters; a conservative 10% failure rate was used to calculate Ec results per stage and phase of flight (i.e., for the small representative vehicle, Stage 1 is assumed to have a 10% failure rate and a 10% failure rate for the 2nd Stage, resulting in a 20% assumed failure rate for the entire mission).[6]

The impact distribution and analysis methodology used by The Aerospace Corporation (b) (4) [redacted]

[5] This condition is considered more conservative than in actual use, as certain anomalous conditions sensed by a typical AFTS would also terminate flight before its IIP reaches a limit line, thereby minimizing even further, debris distribution.

[6] The failure rate used in the analysis is conservative given the mission failure rate requirement of 10% given in Appendix C to Part 420, paragraph (b)(3) and Table C-1.

(b) (4)

The casualty area methodology employed by The Aerospace Corporation applied a debris fragmentation model (b) (4)

(b) (4)

4.2.2 Operations – Outbound 1st stage and 2nd stage

The Aerospace Corporation's analysis of Ec considered outbound trajectory operations that conform to current practice for expendable first stage and second stage small representative orbital launch vehicles.

The approximate launch tracks for the evaluated trajectories were shown earlier in Exhibit 9. An additional representation of the 100-degree reference trajectory is found in Exhibit 21 below.

(b) (4)

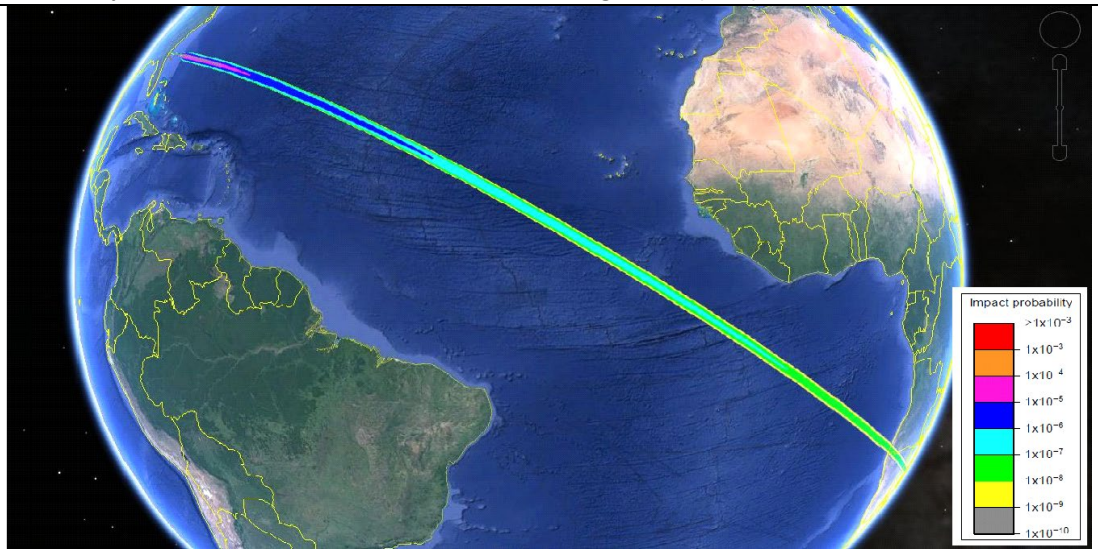


Exhibit 21. Spaceport Camden 100 Degree Azimuth Trajectory – 2nd Stage Ascent to Orbit With Impact Probability Estimates (de minimis Ec Due to Over Water Flight)

4.2.3 Ec Results

The detailed Ec results for the small launcher trajectories are provided in Exhibit 22 and Exhibit 23, with additional details on second stage Ec calculations included.

Trajectory Azimuth	Mission Total (all three phases of flight) Ec (x 10^{-4})*
85	0.01 (rounds to 0)
100†	0.004 (rounds to 0)
120	0.01 (rounds to 0)

** These results are shown as two significant figures for clarity; however, 14 CFR Part 420 specifies Ec requirements with one significant figure.*

† The 100-degree azimuth trajectory has de minimis 2nd stage Ec contribution due to the entire 2nd stage trajectory being flown over water.

Exhibit 22. Spaceport Camden Small Trajectory Ec Analyses

Camden County with Added Population			Expected Casualty (/10,000)		
Persons per CI/LCI Structure	CI Campers & Visitors	Launch Viewers	Stage 1	Stage 2	Total
0	0	0	0.001	0.01	0.01
0	0	5350	0.014	0.01	0.02
0	380	0	0.016	0.01	0.03
2	0	0	0.068	0.01	0.08
2	380	5350	0.098	0.01	0.11
10	380	5350	0.37	0.01	0.38
20	380	5350	0.71	0.01	0.72
40	380	5350	1.39	0.01	1.40

Exhibit 23. Spaceport Camden Small Launcher Enhanced Population 100 Degree Azimuth Ec Analysis

The 100-degree trajectory reference case is further defined in Exhibit 24.

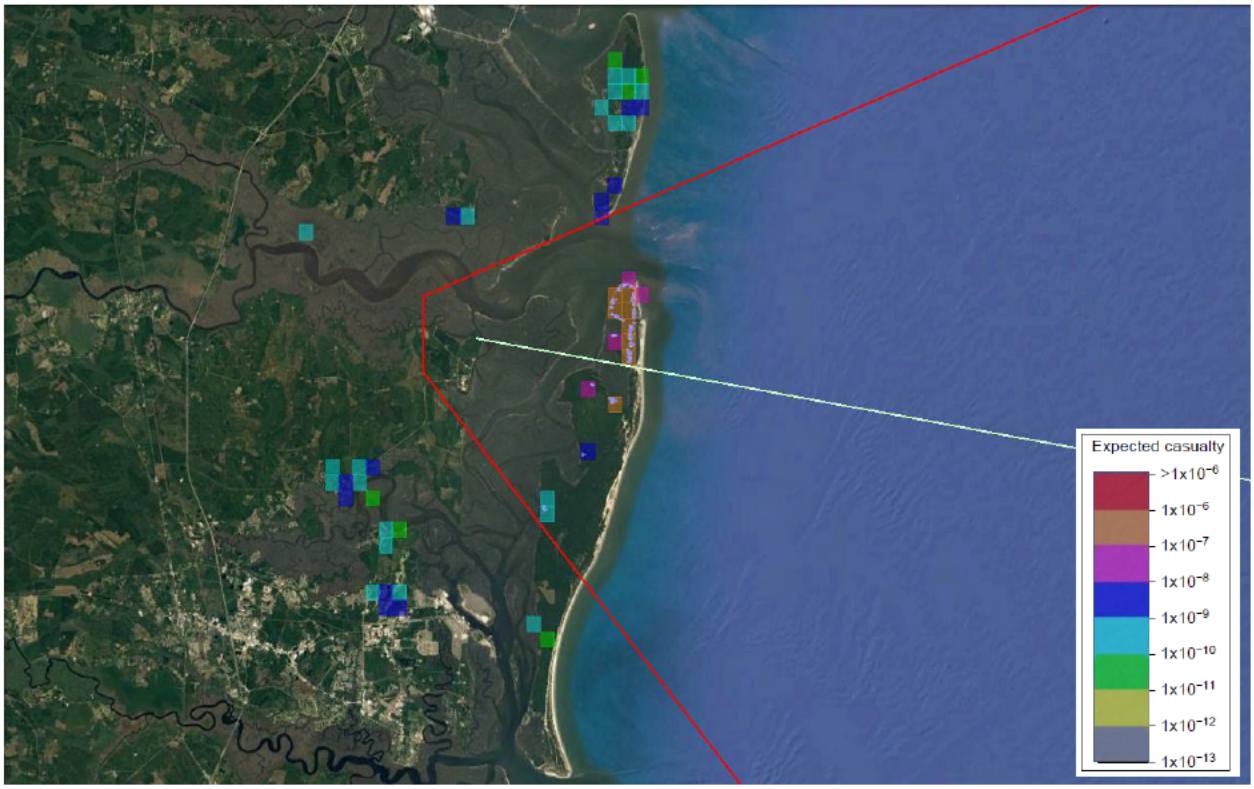


Exhibit 24. Spaceport Camden 100 Degree Azimuth Launch Trajectory with AFTS Limit Lines – First Stage Estimated Ec Represented as Colored Population Grid Squares

4.3 Overflight Exclusion Zones / No Public Presence

Based on the population data and location of camp sites, vacation homes and structures around the Spaceport Camden site, Cumberland and Little Cumberland Island, there is no anticipated presence of the public in the OEZs associated with trajectories emanating from Spaceport Camden. In particular, The Aerospace Corporation estimated OEZ for the representative 100-degree (from true north) trajectory emanating from Spaceport Camden for the small representative launch vehicle is shown in Exhibit 25 and Exhibit 26. This OEZ shape (the red squares in the exhibit) will generally stay the same for all trajectories; however, it will rotate for a specific trajectory.

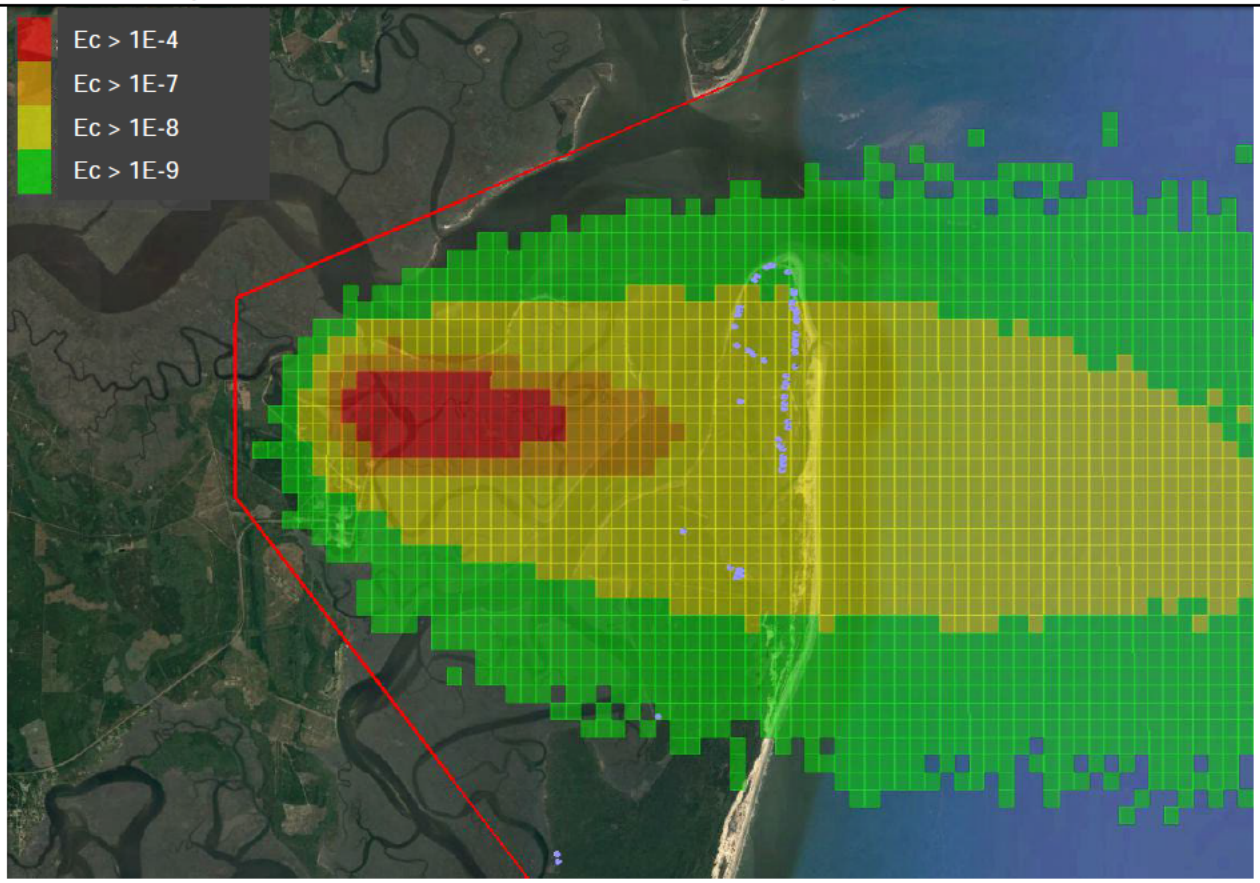


Exhibit 25. Spaceport Camden Small Launch Vehicle OEZ for the 100-Degree (from True North) Trajectory

The methodology used to develop the OEZ follows the requirements in 14 CFR §420.23(a)(2). (b)(4) [redacted] From the analysis, all of the red grids were identified as the OEZ in Exhibit 25, and collectively, these became the OEZ pursuant to the requirements of Part 420. A simplified representation of the OEZ is provided in Exhibit 26.