GOVERNMENT OF PUERTO RICO
PORTS AUTHORITY

March 28, 2023

REQUEST FOR PROPOSALS FOR THE LEASING, DEVELOPMENT, CONSTRUCTION, OPERATION, MARKETING, AND MAINTENANCE OF A SPACEPORT AT JOSÉ APONTE DE LA TORRE (JAT) AIRPORT, CEIBA, PUERTO RICO

ADDENDUM NO. 1
NOTICE OF CHANGE

The RFP for the leasing, development, construction, operation, marketing, and maintenance of a spaceport at José Aponte De La Torre Airport, Ceiba, Puerto Rico (the "RFP") was issued on February 22, 2023, by the Puerto Rico Ports Authority (the "Authority").

According to the provisions of the RFP, **the RFP can be modified from time to time, at the sole discretion of PRPA, in order to obtain comprehensive proposals.**

Proponents are hereby notified of the modification of the referenced RFP document, which is included as an Attachment to this Addendum and replaces in its entirety the document originally published.

For the Proponent's benefit new RFP timeline is as follows:

Description	**Date***
Issuance of RFP	02/22/2023
Deadline for Submission of Proponent Registration Form	**04/07/2023**
Period for Site Visits	**From: 04//10/2023**
	Up to: 04/14/2023
Deadline for Questions on the RFP	**04/21/2023**
Deadline for Responses to Questions	**05/04//2023**
Proposal Deadline	**05/22/2023**
Finalist Meetings (if any)	**06/05/2023 to 06/16/2023**
Announcement of Preferred Proponent and Commencement of Negotiations	**06/30/2023**
Execute Binding Agreement	**08/31/2023**

The Authority reserves the right to make future changes to the RFP schedule. It is the sole responsibility of proponents to periodically check for updates to this RFP on the Authority's website, https://www.prpa.pr.gov/documentos .

RPS

Romel Pedraza, P.E.
Assistant Executive Director for
Planning, Engineering, and Construction

GOVERNMENT OF PUERTO RICO
PORTS AUTHORITY

REQUEST FOR PROPOSALS

FOR THE LEASING, DEVELOPMENT, CONSTRUCTION, OPERATION, MARKETING, AND MAINTENANCE OF A SPACEPORT AT JOSE APONTE DE LA TORRE (JAT) AIRPORT, CEIBA, PUERTO RICO

Issued Date: February 22, 2023

Submission Deadline: May 22, 2023, at 4:30 p.m. AST

Issued by the Puerto Rico Ports Authority (PRPA)

REQUEST FOR PROPOSALS FOR THE LEASING, DEVELOPMENT, CONSTRUCTION, OPERATIONS, MARKETING AND MAINTENANCE OF A SPACEPORT AT JOSÉ APONTE DE LA TORRE (JAT) AIRPORT, CEIBA, PUERTO RICO

The Puerto Rico Ports Authority, in accordance with the faculties granted by Act No.125 of May 7, 1942, as amended, and Regulation Number 8981 for Bids and Request of Proposals, is seeking Proposals from highly qualified developers and operators for the leasing, development, construction, operations, marketing, and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba, Puerto Rico. The complete RFP documents can be downloaded at http://www.prpa.pr.gov/.

Proponents interested in providing the requested services shall submit one USB Pen or Flash Drive with an electronic PDF file and three (3) hard copies of their Proposal in accordance with the instructions included in this Request for Proposals (RFP), **no later than May 22, 2023, at 4:30 PM (AST).**

Cordially,

Joel A. Pizá Batiz, Esq.
Executive Director

1 INTRODUCTION

The Puerto Rico Ports Authority (the "Authority" or "PRPA"), a public corporation and governmental instrumentality of the Government of Puerto Rico ("Government") is issuing this Request for Proposals (as the same may be from time to time amended, modified or canceled, the "RFP") to obtain comprehensive proposals ("Proposals") from highly qualified developers and operators ("Proponents") for the leasing, development, construction, operations, marketing, and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba, Puerto Rico.

Prospective Proponents should review the following documents, which are available for download on the Authority's website at http://www.prpa.pr.gov/AVISOS.

a) The Puerto Rico Ports Authority Act, Act Number 125 of May 7, 1942, as amended;
b) The Puerto Rico Ports Authority Regulation for Request for Auctions and Request for Proposal, Regulation Number 8981, dated July 7, 2017, as amended; and
c) The Professional Service Act, Act Number 237 of August 31, 2004, as amended.

In addition, the Government's Financial Information and Operating Data Report is accessible at http://www.aafaf.pr.gov/.

1.1 Definitions

- **Addenda-** refers to a written or graphic document issued by the Authority before the Proposal Due Date which modifies or interprets the RFP by means of additions, deletions, clarifications, or corrections.
- **Authority-** refers to the Puerto Rico Ports Authority.
- **Bid Appeals Board-** refers to the administrative body in charge of resolving any dispute arising from the process whereby a Proponent / Bidder disputes the award of an Auction/ RFP.
- **Bid Bond**- refer to Section 4.7 of this RFP.
- **Conceptual Plan**- refers to the plan to be submitted by the Proposer, illustrating how the project would be configured in accordance with Section 5.1 of the RFP.
- **Designated Contact Person**- means the person designated for Proponents to limit their contacts with the Authority regarding the project and the RFP, and to proceed only through this person, via the designated e-mail or mailing address.
- **Eligible Proponents**- refers to those Registered Proponents who, at the Authority's sole discretion, have demonstrated their eligibility, according to Section 4.10.
- **Evaluation Committee**- refers to the body designated by the Executive Director to receive, process, analyze, evaluate, and recommend RFP processes initiated in connection with the contracting of professional services, the establishment of concessions and leasing of Authority property, or rental of equipment or services. The Committee shall be composed of at least five (5) members, which shall include: one (1) representative of the petitioning area; one (1) representative of the organizational component affected by what is requested in the proposals; one (1) representative of the Assistant Executive Director for

Economic Development; one (1) representative of the Executive Director; and one (1) representative of the Office of the General Counsel.

- **FEMA**- refers to the Federal Emergency Management Agency.
- **Government**- refers to the Government of Puerto Rico.
- **Performance Bond**- refer to Section 4.8 of this RFP
- **Preferred Proponent**- means a responsive and responsible Proponent whose Proposal meets the requirements of this RFP, was awarded the highest score, and will be selected to negotiate a potential contract with the Authority.
- **Project**- refers to the leasing, development, construction, operations, marketing and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba.
- **Proponents**-means a(n) (i) legal person, (ii) joint venture, or (iii) partnership, or (iv) consortium of partnerships, and/or companies or other entities that submit a response to this RFP that is not currently debarred.
- **Proposal Validity Period**- refer to Section 6.3 of this RFP.
- **Proposals**- refers to the response(s) submitted by Proponent(s) for this RFP.
- **Registered Proponent**- refers to the Proponent that completed and submitted the attached registration form **(Exhibit C)** to the Authority. Only Potential Proponents who have registered with the Authority will be eligible to participate in the RFP.
- **Regulation**- refers to PRPA's Regulation No. 8981.
- **RFP**- refers to the Request for Proposal and Addenda issued by the Authority.
- **Site**- José Aponte de la Torre Airport, Ceiba, Puerto Rico (JAT).

2 RFP BACKGROUND

2.1 Jose Aponte de la Torre Airport, Ceiba, Puerto Rico (JAT)

The closure of the Naval Station Roosevelt Roads (NSRR) by the US Navy in 2004 created economic hardship for the local communities. In 2008, the US Navy began the Public Benefit Conveyance process of certain facilities that ended with PRPA controlling the JAT Airport. JAT is a public use airport located 2.3 mi (3.7 km) from Ceiba, a coastal town in Puerto Rico. It is included in the National Plan of Integrated Airport Systems and categorized as a general aviation airport. The airport currently offers scheduled passenger service via three commercial airlines to the islands of Vieques and Culebra, Puerto Rico.

The airport covers an area of 1,646 acres (666 ha) at an elevation of 38 ft (12 m) above mean sea level. It has one operating runway designated 7/25 with asphalt and concrete surface measuring 11,000 ft × 150 ft (3,353 m × 46 m). There is also a closed runway designated 18/36 which measures 5,800 ft × 100 ft (1,768 m × 30 m).

The geographic location and configuration of JAT as a commercial launch site offers a significant range of safe launch inclinations from polar and sun synchronous orbit to equatorial orbits for launch vehicle types that take off and land horizontally. The FAA Office of Commercial Space Transportation requirements established the following licenses:

- Licensing a spaceport under CFR Part 420
- Licensing a space launch under CFR Part 450

The PRPA wishes to select a Spaceport operator to achive the following public policy goals:

- *Sustainable job creation and economic redevelopment* for the region focused on space-related activities and international cargo hub ecosystems; and
- *Sustainable design principles* which encourage smart growth and best practices for airport redevelopment that will reduce environmental impacts, realize economic benefits, and improve community relations.

2.2 Fiscal Matters

In June 2015, the Government created a working group tasked with analyzing the fiscal and economic situation of Puerto Rico. After a series of studies and analyses, this working group estimated Puerto Rico's consolidated budget and financing gap (including required pension payments and debt service on tax-supported debt) to be approximately $59 billion between fiscal years 2017 and 2026.

The Government's balance sheet deterioration, coupled with continued structural budget imbalances, and a lack of continuity and execution capacity in fiscal and economic plans led to the loss of capital markets access in 2015, limited the Government's ability to make necessary infrastructure maintenance and improvements investments, and meet scheduled debt service payments. Governor Ricardo A. Rosselló took office on January 2, 2017, and delivered a ten (10) year fiscal plan that as a central tenet seeks to attract private investment and spur Puerto Rico's economic development. The current Administration of Governor Pedro R. Pierluisi continues with a public policy consistent with attracting private investment to strengthen and further develop Puerto Rico's economy.

2.3 Hurricanes and Recovery Efforts

Two devastating hurricanes, Irma, and Maria struck Puerto Rico in 2017. They left much of the infrastructure in Puerto Rico damaged or unusable. The National Oceanic and Atmospheric Administration's Office for Coastal Management approximated that Hurricane Irma and Maria caused damages of roughly $50 billion to $90 billion, respectively.

As Puerto Rico moves forward, it sees the recovery effort as not just an opportunity to rebuild what was damaged, but to use recovery investments to transform Puerto Rico by implementing solutions that: (i) are cost-effective and forward-looking; (ii) harness innovative thinking and best practices from around the world; and (iii) contribute to greater economic development, revitalization, and growth (in alignment with broader Government efforts to achieve fiscal and economic stability) as well as enhanced human capital.

Puerto Rico will move forward in its economic and disaster recovery by investing in infrastructure, people, and the environment. Federal funds from the Federal Emergency Management Agency ("FEMA") will go some of the ways to achieving this vision. But to fully deliver upon all of the economic, infrastructure, and societal goals identified by the Government, private sector creativity and resources will need to be harnessed. Hence the Authority is exploring the development of the Project as a means to achieve these goals sooner than would be possible with public financing and management.

2.4 The Puerto Rico Ports Authority

The Authority was created pursuant to Act Number 125 of May 7, 1942, as amended, known as the "Puerto Rico Ports Authority Act" (the "Act"). The Act establishes that the Authority is a public corporation and governmental instrumentality of the Government of Puerto Rico governed by a Board of Directors.

The Authority was created with the purpose to develop, improve, own, operate, and manage any and all types of air and/or maritime transportation facilities and services, as well as establishing and managing systems of mass marine transportation by itself, or in coordination with other governmental, corporate or municipal entities, to and from the Government, to provide the most economic method, the benefits of the same, and encourage thereby, the general welfare of the citizens of Puerto Rico in order to increase trade and prosperity.

The Act grants the Authority all rights and powers that are necessary or desirable to give effect to the above-referenced purpose. The Authority is legally entitled to issue this RFP pursuant to the Act and Regulation Number 8981, as amended, dated July 7, 2017 (the "Regulation").

3 PROJECT DESCRIPTION AND SCOPE OF WORK

3.1 The Site

Exhibit A displays an overview of the JAT Area.

3.2 Scope of the Project

The Scope of the Project involves the leasing, development, construction, operation, marketing and maintenance of a spaceport facility for horizontal launches in JAT, Ceiba, Puerto Rico. While the government of Puerto Rico pursues a Launch Site Operator License Application (LSOL); the Environmental Assessment Proces (EA); and an update of the Airport Layout Plan (ALP), pursuant to the Federal Aviation Administration (FAA) regulations, PRPA wants to procure and select in advance a Spaceport operator for the following purposes:

1. Engage in energetic, effective, and diligent marketing, public relations, and industry outreach initiatives, with the purpose to achieve contracts and tangible business relations with launch services providers, and space-related commercial activities and creating a space economic ecosystem in JAT.

2. Design and build all the infrastructure needed for horizontal launches in JAT, using private capital, equity, and investment.

3. Operate the Spaceport for several years (subject to negotiation) and to provide maintenance to all the Spaceport facilities and assets. The envisioned financial model is a concession contract, and not an operation and maintenance (O&M) contract.

4. Vertical launches in Puerto Rico are challenging, considering the population density, among others. However, we want to do a feasibility study for vertical launches in Puerto Rico, with an emphasis on the use of barges and launches in high seas.

5. Develop a business plan for the integration of biosciences and biomanufacturing in the Spaceport in Ceiba, with an emphasis on reentry and retrieval operations of highly sophisticated cargo.

The creation of joint ventures is highly recommended for the participation of this RFP, considering the extent and amplitude of the scope of this RFP.

For the Proponents' benefit, a Feasibility Study performed in 2019 is included as **Exhibit B.** However, PRPA clarifies that the study is included for technical reference purposes and the economic terms during the contracting process will be subject to the requirements of this RFP and negotiations conducted between the parties.

LEASING, DEVELOPMENT, CONSTRUCTION, OPERATION, MARKETING, AND MAINTENANCE

4 GENERAL RFP PROCESS

4.1 Contact Person

The Designated Contact Person for the RFP is:

Romel Pedraza, P.E.
Assistant Executive Director for
Planning, Engineering, and Construction

Puerto Rico Ports Authority

E-mails : rpedraza@prpa.pr.gov, with copy to rfpspaceportceiba@prpa.pr.gov

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Proponents are to limit their contact with the Authority regarding the Project and to proceed only through the Designated Contact Person via the designated email or postal addresses, except as provided in Section 4.4 of the RFP regarding site visits to be coordinated. Please do not contact any other officials, advisors, or related parties of the Authority via any means other than as provided hereunder. **Such contact may serve as grounds for disqualification**.

4.2 Registration

Only Potential Proponents that are registered with the Authority will be permitted to participate in the RFP ("Registered Proponent"). Please note that by registering to participate in this RFP, each Registered Proponent agrees to and shall be bound by all the terms and conditions of this RFP. To be considered a Registered Proponent, the Proponent must complete and file with the Authority the registration form attached hereto as **Exhibit C ("Registration Form")**. Registered

Proponents will also be permitted to direct to the Authority questions or requests for clarification regarding the RFP. Non-Registered Proponents will not be permitted to participate in this RFP.

4.3 Schedule of RFP Process

The attached **Exhibit E** provides the preliminary Schedule of the RFP process. Please note that this Schedule is subject to changes, including, but not limited to, extending the deadline when the Authority may receive Proposals, as per Section 8.11(viii) of this RFP.

4.4 Site Visits

Prospective Proponents shall coordinate with the Authority to visit the Project site, investigate, examine, and become fully familiar with the conditions of the Project. Site visits shall be coordinated with the PRPA and under no circumstances shall prospective Proponents be allowed to visit the facilities without the express written consent and authorization of the Authority. The coordination of these visits will be coordinated through Mr. Romel Pedraza through the following e-mail address: rpedraza@prpa.pr.gov, with a copy to rfpspaceportceiba@prpa.pr.gov according to the Schedule set forth in **Exhibit E**.

Failure or omission of any Proponent to receive or examine the RFP documentation or to visit the Project site and become familiar with the conditions therein shall not relieve it of its obligations with respect to its Proposal or the Contract. No additional awards will be made for lack of familiarity with such conditions. Submission of a Proposal shall be considered prima facie evidence of compliance with this section.

4.5 Addenda

Addenda issued by the Authority are the only means of amending, clarifying, interpreting, or correcting this RFP. Once addenda are made available, no further need to reissue or restate the RFP will be required. Amendments, deletions or additions, clarifications, interpretations, or corrections to this RFP made in any manner other than addenda will not be binding upon any party.

Any addenda to the RFP will be posted on the Authority's website at www.prpa.pr.gov/AVISOS. In such case, the Authority intends to send an email to the identified contact for each Registered Proponent notifying them that a new addendum has been issued. However, Proponents are responsible for periodically reviewing the Authority's website and appraising each document therein. The Authority assumes no obligation for notifying Proponents of document uploads to the website. Proponents are fully responsible for ensuring that the identified contact information provided for communications under this RFP will be valid, current, and functional throughout the process. The Authority shall not be responsible for any delay or failure in communications with Proponents due to malfunctions, technological or otherwise, or incorrect contact information provided to the Authority.

4.6 Requests for Clarification

Any questions, requests for clarification, and general information requests must be sent by e-mail to the Designated Contact Person at **rpedraza@prpa.pr.gov**, with a copy to r rfpspaceportceiba@prpa.pr.gov, in accordance with the deadlines set forth in **Exhibit E,** and **Exhibit F** format, respectively, no telephone inquiries will be accepted. The Authority will compile a summary of all questions submitted, and all responses, and send one consolidated response document to all Registered Proponents. The Authority reserves, at its sole discretion, the right to respond or not to any such questions or request for clarification, or general information request. Such information will be posted on the Authority website at www.prpa.pr.gov/AVISOS on a rolling basis. Only written responses posted on the website will be considered official responses.

4.7 Bid Bond or Other Form of Security from the Preferred Proponent

As security for the selected Registered Proponent's good faith negotiation of an agreement with the Authority pursuant to its Proposal, once the Registered Proponent has been selected ("Preferred Proponent"), it must furnish a bid bond from a corporate surety licensed to do business in Puerto Rico in the amount of TWO HUNDRED FIFTY THOUSAND DOLLARS ($250,000) in favor of the Authority. The Preferred Proponent must deliver the bid bond within ten (10) days of being notified by the Authority of its selection. The condition of the bid bond shall be that the Preferred Proponent shall not withdraw its Proposal and shall execute a contract with the Authority, if so offered and negotiated in good faith. The Preferred Proponent shall be released from the bid bond once the contract with the Authority has been signed or the Authority and Preferred Proponent have not signed a definitive agreement, notwithstanding good faith efforts to negotiate and execute the same, on or before the date set forth in **Exhibit E**.

If the Preferred Proponent withdraws the Proposal, fails to negotiate in good faith with the Authority, or if after the Authority and the Preferred Proponent agree on terms of a contract but the Preferred Proponent fails to sign a contract, the amount of the bid bond will be automatically forfeited and retained by the Authority as liquidated damages, after providing written notice to the Preferred Proponent. The Authority reserves the right to terminate negotiations at any time, with or without cause, and return the bid bond to the Preferred Proponent.

In lieu of a bid bond, the Preferred Proponent may tender a certified check or bank draft drawn on a solvent bank or trust company, acceptable to the Authority and with its principal place of business in Puerto Rico, payable to the "Puerto Rico Ports Authority" or other forms of financial security acceptable to the Authority The certified check or bank draft shall be deposited in a bank account of the Authority and may be commingled with other funds of the Authority.

4.8 Security Payment and Performance

Each Proposal must be accompanied by a letter of intent from a surety company licensed to do business in Puerto Rico, which letter shall state that, if awarded the contract, the Registered Proponent will be able to secure the required Payment and Performance Bonds in the full amount of the total project cost.

4.9 Tours of the Site

Registered Proponents may tour the Site by appointment only to be coordinated with the Authority on or before the period set forth in **Exhibit E.** Any questions arising from such tour must be submitted in writing by the Registered Proponents to the Authority. Any such questions and the answers by the Authority to any such questions shall be made available to the other Registered Proponents by the Authority. Appointments must be scheduled with at least three (3) days prior notice.

4.10 Eligibility of Proponents (Minimum Requirements)

Registered Proponents must demonstrate their eligibility for the Project, and as a minimum requirement must demonstrate or submit the following:

1. Demonstrate **professional and technical expertise** in spaceports operations, and applicable federal and state regulations, according to Section 5.2(iii)(A).

2. Demonstrate **economic and financial ability** to undertake the Project, according to Section 5.2(iii)(A).

3. Furnish the following documents and certifications, as applicable, in compliance with state regulations:

    a) Articles of incorporation, certificate of formation, partnership agreement, or other formation documents.
    b) By-laws, operating or joint venture agreements, or any other governing documents.
    c) Certificate of Good Standing, Puerto Rico Department of State.
    d) Resolution of the Board of Directors or governing organization, as the case may be, authorizing participation in the RFP process.
    e) Last Five (5) Years of Income Tax Form Filing, Puerto Rico Internal Revenue (Hacienda) Department certification
    f) Debt Certificate issued by the Internal Revenue Area of the Puerto Rico Treasury Department or evidence of a complying payment plan.
    g) Sales Tax Form Filing, Puerto Rico Internal Revenue (Hacienda) Department.
    h) Tax Return Submission Certificate issued by the Center for the Collection of Municipal Income.
    i) Debt Certificate for all concepts, issued by the Center for the Collection of Municipal Income or evidence of a complying payment plan.
    j) Debt Certificates issued by the Puerto Rico Labor Department for Unemployment Insurance, Temporary Non-occupational Disability Taxes, and Chauffeurs Insurance, or evidence of a complying payment plan.
    k) In-effect policy certificate from the State Insurance Fund Corporation (CFSE).
    l) Debt Certificate from the State Insurance Fund Corporation.
    m) Debt Certificate from Administration of Child Support Enforcement (ASUME).
    n) Sworn Statement Under Act 2-2018, duly completed and notarized.

4. In addition, submit the following certifications, in compliance with federal regulations.
    a) Limited Denial/ Debarment Affidavit **(Exhibit G)**
    b)Non-Collusion Affidavit **(Exhibit H)**
    c) Sworn Statement Act 2-2018 **(Exhibit I)**
    d)Lobbying Certification **(Exhibit J)**
    e)MBE/ WBE Efforts Certification **(Exhibit K)**

The Authority will only consider those Proposals from Registered Proponents who, at the Authority's sole discretion, have demonstrated their eligibility (hereinafter "Eligible Proponents"). The determination by the Authority that a Proponent is an Eligible Proponent should not be construed or interpreted by any Proponent as having been awarded with or favored to be awarded the RPF, but rather as a threshold screening process by the Authority to ensure that the Authority only receives, analyzes, and entertains Proposals from Registered Proponents that meet at least the minimum requirements to participate in this RFP.

It is an essential condition to participate in this RFP and each Proponent by registering to participate in this RFP covenants and agrees with the Authority that the Authority and its advisors are not responsible for any costs, expenses or damages incurred by Proponents, subcontractors, or other interested parties in connection with the RFP process, including but not limited to, the costs associated directly or indirectly with the preparation of Proposals, the participation in any meeting or any other activities directly or indirectly associated with this RFP. All such costs, expenses, and damages are the sole responsibility of each Proponent.

5. PROPOSAL CONTENTS AND FORMAT REQUIREMENTS

5.1 Contents

Registered Proponents are to present written and comprehensive proposals for the leasing, development, construction, operations, marketing, and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba, Puerto Rico. The Proposals should include at least the following:

1. Narrative on the Registered Proponent’s background and experience in the spaceport industry.

2. All funding sources intended to defray the undertaking of the Project.

3. A Conceptual Plan (phased if applicable) illustrating how the Project would be configured.

4. The Conceptual Plan should show the landside facilities and structures, which would be necessary to support the Project, and the area necessary for the physical layout of the conceptual plan, including any proposed new construction and/or development.

5. Conceptual Plan shall include:

    a. Description of landside improvements required.
    b. Total investment proposed by Proponent and proposed financing plan to fund the improvements noted in its Proposal, including any contingencies associated with a said financing plan.
    c. Identification of any special terms or conditions that would be expected from the Authority.
    d. Timeline for completion of proposed Project, including development and commencement of operations.
    e. Proposed agreement terms. Currently, the Authority generally envisions that the Project will be structured as a (i) *triple net lease agreement* on an "as-is, where is and with all faults basis", with annual payments in advance of rent for the Site, rental escalator, assignment and change of control only permitted with the Authority's consent, provisions typically included in leases with a governmental entity, it will be subject to the rules and regulations issued by the Authority with respect to its airports facilities, title to any improvements, at the Authority's options, to pass to the Authority at the end of the term, without any payment to the tenant, adequate assurances to the Authority of the future performance of its obligations under the lease agreement, in the form of guaranties and/or any other credit support; or (ii) a *triple net concession agreement on* "as-is, where is and with all faults basis", with annual payments in advance of fees for the Site, fees escalator, assignment and change of control only permitted with the Authority's consent, provisions typically included in concession agreements with a governmental entity, it will be subject to the rules and regulations issued by the Authority with respect to its airports facilities, title to any improvements, at the Authority's options, to pass to the Authority at the end of the term, without any payment to the beneficiary of the concession, adequate assurances to the Authority of the future performance of its obligations under the concession agreement, in the form of guaranties and/or any other credit support. Both type of agreements will provide that the tenant and/or beneficiary of the concession must charge, collect and remit to the Authority all the applicable tariffs, charges and/or fees that from time to time the Authority may impose on the activities carried out at the Project.
    f. Please note that the Authority at this juncture does not necessarily favor nor it is inclined to (A) lease and concession terms in excess of 20 years; and/or (B) provide any financing, credit enhancement, guaranty, and/or equity contribution by the Authority or any other entity any and/or all of the items set forth in items (A) and/or (B) of this subparagraph of the Government. Notwithstanding the foregoing, the Authority may consider a change in its current position and negotiating and extending 5(f) in the event that the Registered Proponents offer to the Authority in consideration of negotiating and/or extending the same, matching economic concessions in favor of the Authority, that may include, but are not limited to, additional capital investment to justify the extended term of the lease and/or concession, increase in rental rates and/or profit sharing with the

Authority, incentives to the clients and customers of the Project to engage in touristic activities in Puerto Rico, incentives for the use of the Project as a Home Port by its clients and customers, among others. Any determination of the Authority to change its current position shall be at its sole and absolute discretion and will take into account the best interests of the Government and any other factors that the Authority deems necessary or convenient to ensure that any such decision is a sound public policy determination.

6. Provide a description of the economic impact.

7. Provide an estimated number of direct and indirect jobs and payroll to be created during the term of the agreement, with a yearly breakdown.

8. Provide a description of the envisioned use and the scope of participation of the local labor force and local companies in the undertaking and operation of the Project.

9. Provide how the Proposal complies with the current zoning, licensing, and permitting required for the Project.

10. The Proposal must demonstrate sufficient financial resources of the Registered Proponent to meet all requirements outlined in this RFP. The Proposal shall include a representation by a surety licensed to do business in Puerto Rico and acceptable to the Authority that the Registered Proponent has sufficient bonding capacity to meet payment and performance bond requirements specified in the RFP and that it will issue such bonds if the Registered Proponent is selected.

5.2 Format

To ensure consistency, Proposals must conform to the following format:

i. Cover Letter

Provide a cover letter describing the Proponent's interest and commitment to developing a full Proposal for the leasing, development, construction, operations, marketing, and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba, Puerto Rico, as requested in this RFP, and which includes a certification that the information submitted and the Proposal is true and accurate, and that the person signing the cover letter is authorized to submit the Proposal on behalf of the Proponent and Team Member(s). Clearly identify the Proponent's designated official representative for the engagement, including the following information:

a. Name of Proponents' official representative
b. Title
c. Name of company
d. Address
e. Telephone number
f. Fax number

g. E-mail address of the Proponents' representative
(If there are multiple offices of the Proponent, indicate which one will be primarily responsible for the contract. Indicate which other offices are also involved.)

The cover letter shall also include the full, legal names of all subcontractors or Team Members involved in the Proponent's Proposal.

ii. Table of Contents

Provide a table of contents that clearly identifies the location of all material within the Proposal by section and page number.

iii. Sections

A. Experience of Entity and Qualifications of Personnel
B. Financial Capacity
C. Proposal
D. Revenue
E. Credit References
F. Operational References
G. Financial Statements
H. Physical Requirements
I. Special Conditions or Considerations

The following is what is necessary to be included in each of the above sections:

A. Experience and Qualifications of Personnel

It is necessary that the Proponent demonstrates the technical expertise and experience in spaceports operations and applicable federal and state regulations, as well as any other type of operations being proposed and how the entity will maintain a high standard of appearance and operation. Include a current list of names and qualifications of officers and key personnel of the corporation or entity.

B. Financial Capacity of Entity

The Proponent shall include an introduction and the background of the entity and/or its controlling entities, demonstrated financial status (including gross annual sales for the current year and net earnings or loss for the most current year), and the ability to finance the undertaking of the Project, by providing the following documents to the Authority for evaluation:

a) Original of three (3) commercial recommendation letters, including one (1) from a banking institution.

b) Audited financial statements for the last three (3) years.

c) Income tax returns for the last three (3) years.

Consideration will be given to the Proponent's financial capacity to comply with all requirements imposed by or as a result of the contract to be awarded pursuant to this RFP, including but not limited to the ability to pay employees and subcontractors. **This section should also include a statement making a firm commitment that the Proponent will pay its employees and sub-contractors without regard to the timing of payment by the Authority and the Government of Puerto Rico.**

C. Proposal

This section should contain the proposed Conceptual Plan, according to Section 5.1, including the structure's quality, size, theme, personnel or concept, and planned configurations for the operation of the spaceport. The list and detailed explanation of all of the terms and conditions of the agreement proposed to the Authority for the Project. When evaluating the Proposals consideration will be given to the proposed level of services to be offered once the operation of the Project commences. It shall also include the environmental impact of the Project and the Registered Proponents' plans to mitigate the same as well as compliance with all safety requirements in accordance with applicable laws and regulations.

D. Revenue

This section should contain projected revenues to the Registered Proponent, the Authority, and the Government. Provide five (5) and ten (10) years-projected revenues for the agreement period.

E. Credit References

This section should contain the names, addresses, and phone numbers of three credit references that the Authority may contact to obtain information on your credit standing.

F. Operational References

This section should contain a list of clients, for whom you have conducted a similar service within the past five (5) years. Include the entity name, contact person, telephone number, and a brief description of the services provided.

G. Financial Statements

This section should contain at least the past five (5) years of audited financial statements, including, but not limited to, a company balance sheet and income statement.

H. Physical Requirements

This section should describe other physical needs above and beyond the premises described in this RFP. Examples of other needs may include, parking space requirements, refuse disposal

needs, exterior signage requirements or any other extraordinary need that cannot be met within the described premises.

I. Identify Any Special Conditions or Considerations

This section should describe any special conditions or considerations beyond the physical requirements that the Proponent would request the Authority to consider. Any request for the Authority to consider the matters set forth in Section 5.1(5)(f) and the justifications for the same.

iv. Commitment to Complying with all Applicable Laws

Proponents shall explain their adherence to complying with all Applicable Federal or State Laws. Respondents shall also indicate what characteristics of the team set them apart in terms of commitment to comply with all laws and requirements. Indicate what specific trainings and expertise the team has that reinforces the commitment to compliance.

A Proponent's failure to comply with Applicable Laws due to negligence, error or any other cause that affects the provision of the services requested shall not be cause for relief from responsibility.

Proponents acknowledge that this RFP may be withdrawn or amended in response to changes in Applicable Laws or otherwise. Proponents are obligated to remain fully informed of all circumstances, information, laws, rules, and regulations that arise in connection with the services requested in this RFP, and any other matters that might, in any way, affect Proponent's roles and responsibilities in the engagement. Each Proponent agrees at its own cost and expense, to modify any aspect of the Proposal to comply with any law or regulation applicable to the services requested in this RFP or that may become applicable in the future.

6. INSTRUCTIONS FOR THE SUBMISSION OF PROPOSALS

6.1 Proposal Copies and Submission Address

Proposals may be delivered in person or by postal mail. Submit one original and two (2) copies in three ring binders on 8x11 paper. Please include only one copy of the financial statements in a separate envelope marked Confidential. Include a USB flash drive of the entire submission in electronic file format (*PDF) (please note financial statements should not be included on the flash drive).

These items should be delivered in a sealed package clearly marked "Request for Proposals for leasing, development, construction, operations, marketing, and maintenance of a Spaceport at José Aponte de la Torre (JAT) airport, Ceiba, Puerto Rico." at one of (but not both of) the following addresses:

Post Office Box (via express mail—at least second day delivery)
Puerto Rico Ports Authority
Romel Pedraza, P.E.

Assistant Executive Director for
Planning, Engineering, and Construction
P.O. Box 362829
San Juan, Puerto Rico 00936-2829

Physical Address (via courier—at least second-day delivery)

Puerto Rico Ports Authority
Romel Pedraza, P.E.
Assistant Executive Director for
Planning, Engineering, and Construction
64 Lindbergh Street
Former Miramar Naval Base
San Juan, Puerto Rico 00907

Proponents should not submit promotional materials as part of their proposal submissions and are strongly encouraged not to submit the information that is not required by this RFP. Proponents are strongly encouraged to be succinct in their Proposals. To the extent there may be applicable page limits set out in this RFP, a Proponent shall limit such element of its submission to the respective maximum number of pages indicated.

6.2 Proposal Submission Deadline

Proposal submissions must be received or postmarked no later than **May 22, 2023, at 4:30 pm, AST** ("Proposal Submission Deadline"). Proposal submissions delivered via postal mail or courier shall be postmarked by the Proposal Submission Deadline and received no later than **May 25, 2023**.

Proposals delivered in person must be received **no later than the Proposal Submission Deadline.**

Proposals received on or before the due date set in this RFP will be stamped (date and time of receipt) and will be kept in the custody of the Authority. Such Proposals will not be opened until the Proposal Submission Deadline.

The determination of whether a mailed Proposal is submitted by or before the Proposal Submission Deadline will be based on the postmark (or proof of pick-up by the courier) no later than the Proposal Submission Deadline. Proponents are encouraged to submit Proposals using a trackable shipping method and retain the proof of time and date of shipment and delivery as provided by the courier.

Proposals shipped after the Proposal Submission Deadline or received after **May 25, 2023**, will be rejected and returned to Proponents unopened.

6.3 Proposal Irrevocability & Validity Period

Proposals must be valid for at least one hundred and eighty (180) days from the Proposal Submission Deadline, until which time Proposals are binding, irrevocable, and open for acceptance by the Authority ("Proposal Validity Period").

6.4 Modification or Withdrawal of Proposal

A Proposal that is in possession of the Authority may be withdrawn or altered by the Proponent by letter including the signature and name of the person authorized to submit the Proposal, only if the revocation is received prior to the time and date of the Proposal Submission Deadline. The withdrawal must be submitted in writing and directed to the Designated Contact Person.

6.5 Clarification of Proposals

Proposals are to be completed and will be reviewed as submitted. However, during the Proposal evaluation process, the Authority may request that a Proponent provide clarification or supplementary information regarding any aspect of its Proposal.

All such clarification requests by the Authority will be made in writing, and transmitted by email, to the Proponent's official representative, and must be returned, in writing by email, to the Authority's Designated Contact Person. Proponents are to make appropriate arrangements so that these clarification questions can be responded to in an expeditious manner (generally within one (1) to three (3) business days).

6.6 Errors in Proposals

Proponents are responsible for errors and omissions on their Proposals, and any such errors and omissions will not reduce a Proponent's obligation to the Authority and will not constitute grounds for an adjustment to the financial proposal.

7.0 PROPOSAL EVALUATION AND SELECTION

7.1 Evaluation Process

The Authority will examine all Proposals in a proper and timely manner to determine if they meet the proposal submission requirements. Proposals that are materially deficient in meeting the submission requirements or have omitted material documents, in the sole opinion of the Authority, may be rejected. All Proposals meeting the proposal submission requirements will be evaluated.

Each Proposal meeting all submission requirements will be independently evaluated by the Evaluation Committee, which will assign a score for each evaluation criterion listed below in this section up to the maximum points allowed.

The Authority may request further clarification to assist the Evaluation Committee in gaining additional understanding of a Proposal. A response to a clarification request must be to clarify or

explain portions of the already submitted Proposal and may not contain new information not included in the original Proposal.

7.2 Selection Criteria

A Proposal should include all those items as specified in Section 5 of this RFP. Proposals will be evaluated pursuant to the RFP Regulation and based on the following criteria:

Evaluation Criteria	Point Scale
Technical Expertise, Qualifications and Experience	**0-30**
Financial Capability	**0-20**
Project Approach and Conceptual Plan	**0-30**
Achievement of the goals and objectives for the Project, considering the overall economic return to the Authority and the Government, including without limitation: (i)Rents, Revenues and Fees. (ii)Capital investment by the Registered Proponent and; (iii)Other direct and indirect benefits on the general economic development of Puerto Rico.	**0-20**
Total Points	**100**

7.3 Finalist Meetings

Following the submission of proposals, the Authority may (but is not obligated to) select one or more Proponents to be invited to one or more finalist meetings. The purpose of such meetings will be to clarify any aspects of the Proponent's Proposal, clarify any doubts as to the requirements of the RFP, and/or confirm that the terms of the envisioned contract are understood by the Proponent to ensure compliance with the specifications. No statement made or action taken by the Authority during these discussions or negotiations shall bind the Authority in any manner. After each interview or meeting with any Proponent, the Evaluation Committee may require the Proponent to submit a written confirmation of any clarification of the Proposal discussed at the meeting.

The Authority will keep confidential all such discussions and negotiations. Prior to the award of the RFP, information related to a Proposal, or its evaluation will not be discussed with anyone other than the Proponent who submitted it and the personnel involved in the evaluation and selection process. Confidentiality warranties are subject to the conditions described in Section 8.6 below.

The Evaluation Committee may alter the scoring of a Proposal based on the finalist meeting(s). Proponents are responsible for all costs or expenses incurred to attend such meeting(s). The Authority may select a Preferred Proponent without conducting any post-proposal meetings.

7.4 Selection of Preferred Proponent and Contract Execution

Following the completion of the evaluation process, the Evaluation Committee will make a recommendation to the Executive Director for the selection of a Preferred Proponent. The Authority's decision is final. The Authority will notify the Preferred Proponent and the parties will proceed to negotiate a written agreement for the provision of the services requested in this RFP and such written agreements as may be required and mutually acceptable to the parties (collectively, the "Definitive Agreements"), subject to compliance with all applicable laws and regulations.

The Preferred Proponent shall indemnify, hold harmless and release the Authority from and against any and all claims resulting from the provision of services requested in this RFP. As such, the Preferred Proponent agrees to execute an indemnity agreement acceptable to the Authority as part of the Definitive Agreements.

The execution of a contract will be subject to final approval by the Authority's Board of Directors, as well as any other approvals required by law, including the Puerto Rico Fiscal Agency and Financial Advisory Authority (known as AAFAF in Spanish) and the Financial Oversight and Management Board for Puerto Rico (FOMB).

Issuance of this RFP does not constitute a commitment by the Authority to award a contract. None of the participants in this RFP process have any acquired proprietary rights. **The Authority will not have any binding obligation, duties, or commitments to the Preferred Proponent until and unless the Agreement has been duly executed and delivered by Authority after approval by the appropriate governmental authorities**. If the Authority is unable to negotiate a mutually satisfactory agreement with the Preferred Proponent, it may, in its sole discretion, negotiate with the next highest-ranked Proponent or cancel and reissue a new RFP.

8.0 MISCELLANEOUS TERMS AND CONDITIONS APPLICABLE TO ALL PROPONENTS

8.1 Legal Requirements

Proponents are responsible for complying with all applicable legal requirements relating to contracting with governmental agencies of the Government, including without limitation those set forth in **Exhibit D**, and procuring and securing all licenses and permits required to develop, construct and operate the Project.

8.2 Reference Documents

To assist Proponents in preparing to respond to this RFP, the Authority has set up a website at www.prpa.pr.gov/AVISOS. The website will contain all exhibits and other documents which will be of assistance in the development of the Proposals.

8.3 Authorizations by Submission of a Proposal

Any and all information provided by a Proponent and its team members may be used by the Authority to conduct credit and background checks. The Proponent agrees to execute any additional documentation requested by the Authority to evidence this consent. At its discretion, the Authority's staff may contact references and industry sources, investigate previous projects and current commitments, interview some or all of the proposed development team members, and take any other information into account in its evaluation of the responses. The Authority reserves the right to request clarifications or additional information and to request that Proponents make presentations to the Authority, community groups, or others.

8.4 Teaming Arrangements and Special Purpose Entities

Multiple Proponents may form a joint venture for the purpose of submitting a Proposal in response to this RFP. A special purpose entity may be created for the purpose of submitting a Proposal. The Authority may require that financial and performance guarantees and/or any other credit enhancement be provided by these and other Proponents as well as team members. (Note: the Authority will not be involved in facilitating partnering or teaming arrangements.) When a joint venture will be utilized, please present information for both entities and include with your Proposal a copy of the legal documentation establishing the joint venture. **No person or legal entity may join or participate with, directly or indirectly, as a team member in more than one joint venture with the purpose of submitting various separate Proposals in response to this RFP**.

8.5 Hold Harmless

By participating in this RFP process, each Proponent agrees to indemnify and hold harmless the Authority and its officers, employees, contractors and advisors from and against any and all real estate and other brokerage fees or commissions, finder's fees, and any other forms of compensation related in any way to activities undertaken by any person as a result of such person's efforts towards and/or participation in this RFP process or the submission by such person of a proposal, and liabilities, losses, costs, and expenses (including reasonable attorney's fees and expenses) incurred by any indemnified party as a result of, or in connection with, any claim asserted or arising as a result of, or in connection with this RFP process. This includes any and all activities related to the Authority's exclusive negotiations with the selected developer(s).

8.6 Public Information

All information submitted in response to this RFP becomes the property of the Authority. The documents and other records submitted to the Authority are part of the public record and subject to public disclosure; accordingly, information submitted should be expected to be subject to public availability. Therefore, **any response submitted which contains confidential information must be conspicuously marked on the outside as containing confidential information, and each page upon which confidential information appears must be conspicuously marked as containing confidential information**. The Authority will consider the treatment of such information as confidential as provided in and subject to Sections 8.13 and 8.16 below.

8.7 Organizational Conflicts of Interest

Each Proponent should clearly identify in its Proposal any person or entity that has assisted the Proponent in the preparation of its Proposal.

8.8 Other Terms and Conditions

The Act and its regulations, as well as all applicable Puerto Rico and Federal laws and regulations, will govern this RFP and all agreements entered into in connection with this RFP.

8.9 Not a Contract

This RFP does not constitute and should not be construed in any way as an offer to enter into a contract with any individual or entity, thus no contract of any kind is formed under, or arises from, this RFP; provided, however, that nothing contained in this section shall affect in any way the rights and remedies afforded under this RFP to the Authority.

8.10 Confidentiality of Information Associated with the Authority

Information associated with the Authority, or a government entity obtained by the Proponents as a result of participation in this RFP is confidential and must not be disclosed without prior written authorization from the Authority.

8.11 Reservation of Rights

The Authority reserves the right, in its sole and absolute discretion,
to:

(i) Change, modify or amend the business opportunities described in this RFP;
(ii) Change, postpone, or suspend this RFP process or any or all phases, at any time for any reason or no reason;
(iii) Accept or reject any Proposal based on the selection criteria and as determined by the discretion of the Authority;
(iv) Waive any defect as to the form or content of this RFP or any response thereto;
(v) Not accept any or all Proposals;
(vi) Select one or multiple developers that will best meet the Authority's needs and objectives, regardless of differences in fees and expenses among responders to this RFP;
(vii) Reject any or all of the Proposals without any obligation, compensation or reimbursement to any Proponent or any of its team members; and
(viii) Extend any date, time period or deadline provided in this RFP, upon notice to all Proponents.

8.12 Restriction of Damages.

Each Proponent agrees that:

(i) In the event that any or all Proposals are rejected, or this RFP is modified, suspended or canceled for any reason, neither the Authority nor any of its officers, employees, contractors, or advisors will be liable, under any circumstances;

(ii) By participating in this RFP process, each Proponent agrees to indemnify and hold harmless the Authority and its officers, employees, contractors, and advisors from and against any and all real estate and other brokerage fees or commissions, finder's fees, and any other forms of compensation related in any way to activities undertaken by any person as a result of such person's efforts towards and/or participation in this RFP process or the submission by such person of a proposal, and liabilities, losses, costs and expenses (including reasonable attorney's fees and expenses) incurred by any indemnified party as a result of, or in connection with, any claim asserted or arising as a result of, or in connection with this RFP process. This includes any and all activities related to the Authority's exclusive negotiations with the selected developer(s).

8.13 Disclosure

(i) The information submitted by the Proponents may be subject to public disclosure in compliance with applicable law.

(ii) All public information generated in relation to the process, including communications with the media and the public, must be coordinated with, and is subject to prior approval of the Authority.

8.14 No Obligation to Accept Proposals

The Authority is not obligated to accept a Proposal where, at the discretion of the Authority, it is not in compliance with the requirements of this RFP; or it includes a false or misleading statement, claim or information; or background checks reveal any false statements in the Proposal.

8.15 No Collusion or Fraud

Each Proponent is held responsible to ensure that its participation in this RFP process is conducted without collusion or fraud.

8.16 Disclaimer

Information provided in this RFP regarding the Project is believed to be reliable; however, each Proponent should rely exclusively on their own diligence, analysis, and experts to independently confirm and validate any information and/or data contained herein, provided in connection with this RFP or needed to form the basis of its Proposal.

All proposals submitted to the Authority are subject to public disclosure. An exception may be made for "trade secrets". Additional information regarding the trade secrets' requirement is available upon written request.

9 REVIEW AND RECONSIDERATION

9.1 Protest

In accordance with Article XIX and XX of the Regulation and the Puerto Rico Uniform Administrative Procedure Act, Act No. 38-2017, 3 LPRA § 9659, as amended, any Proponent adversely affected by a decision made by the Authority in connection with the selection and award procedures provided in this RFP may submit a request for reconsideration ("Protest") before the Bids Appeals Board no later than ten (10) days of the date in which the notice of the selection of a preferred proponent is sent via the U.S. Postal Service. A Protest must be in writing, shall be submitted with two (2) copies, and contain the following:

- The procurement title and/or number under which the Protest is made.
- Name and address of the allegedly aggrieved party.
- A summary of the Bids presented in the Auction and a true and concise narrative of the important and pertinent facts.
- A detailed description of the specific grounds for the Protest, including a brief and concise statement of the errors and all supporting documentation.
- A discussion of the errors stated, including the applicable provisions of law and jurisprudence.
- The specific ruling or relief requested.
- A protest bond that shall serve as security for any damages that the protest may cause to the Authority, and which shall consist of fifteen percent (15%) of the Proposal amount, which shall not be reimbursable. The bond shall be posted in cash, certified check, money order, or a bond issued by a company approved by the Office of the Commissioner of Insurance of Puerto Rico.

The Protest shall be addressed to:

Bid Appeals Board
PO Box 362829
San Juan, P.R. 00936-2829

A copy of the Protest shall be sent to the President of the Bids Board and to all Proponents participating in the RFP. The Protest must include a certification that the Bids Board and Proponents that participated in the RFP were notified by certified mail with return receipt, within the term established to submit the motion for reconsideration.

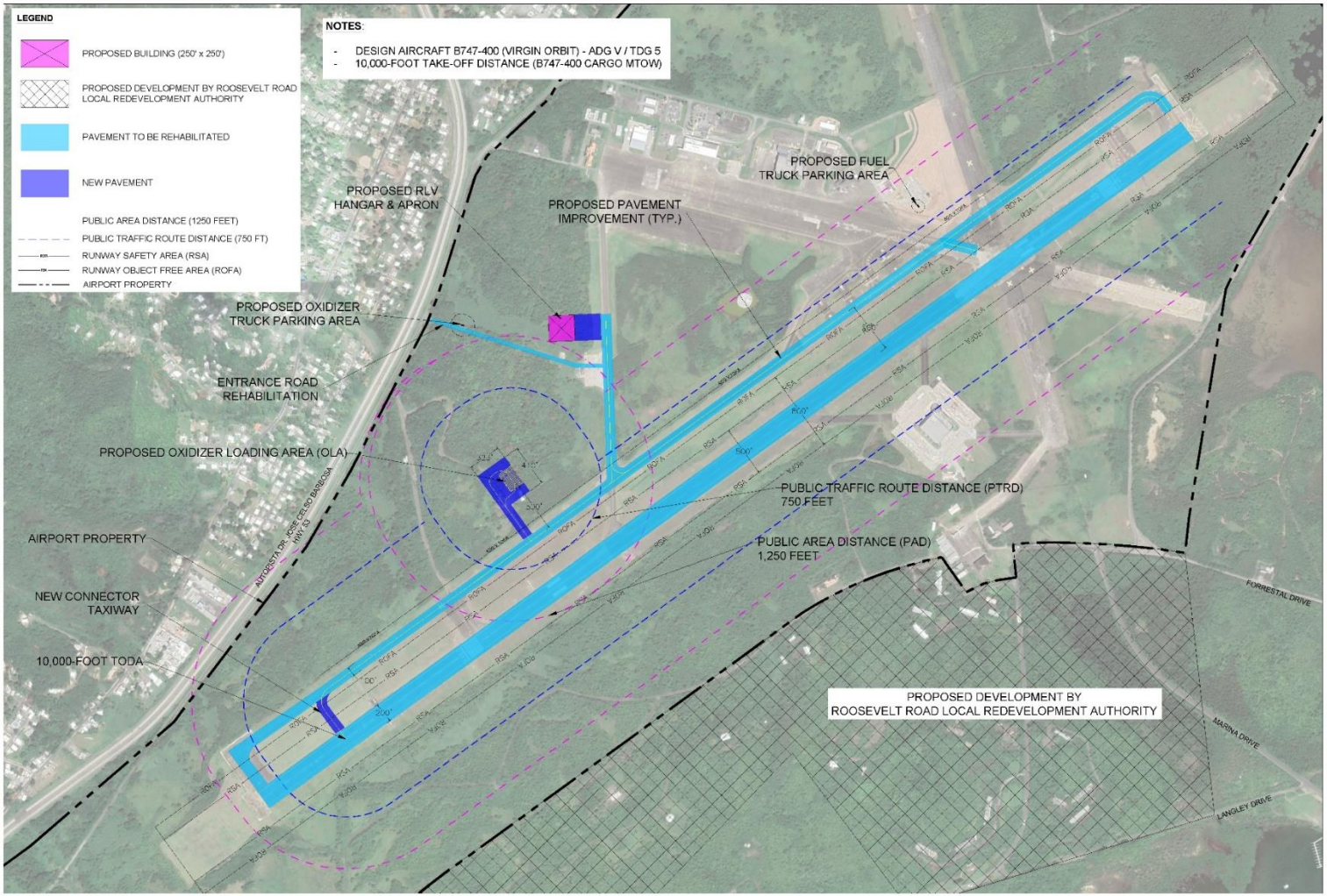
A request for reconsideration or other petition for review that fails to comply with Applicable Law may be dismissed or denied without further consideration.

The Bids Appeals Board shall consider the motion for reconsideration within thirty (30) calendar days from the date of filing thereof. If the Bid Appeals Board does not resolve, address, or otherwise resolve the Protest, the period for seeking judicial review will begin to run after the aforementioned term.

9.2 Judicial Review

Any party adversely affected by a final decision or order by the Bid Appeals Board may seek judicial review before the Puerto Rico Court of Appeals within twenty (20) days from the date in which a copy of the notice of the final decision or order of the Bid Appeals Board is filed, or the term for the Bid Appeals Board to submit a decision has expired. The mere filing of an appeal for judicial review shall not have the effect of paralyzing or staying the award of the contested RFP.

Exhibit A (PDF)

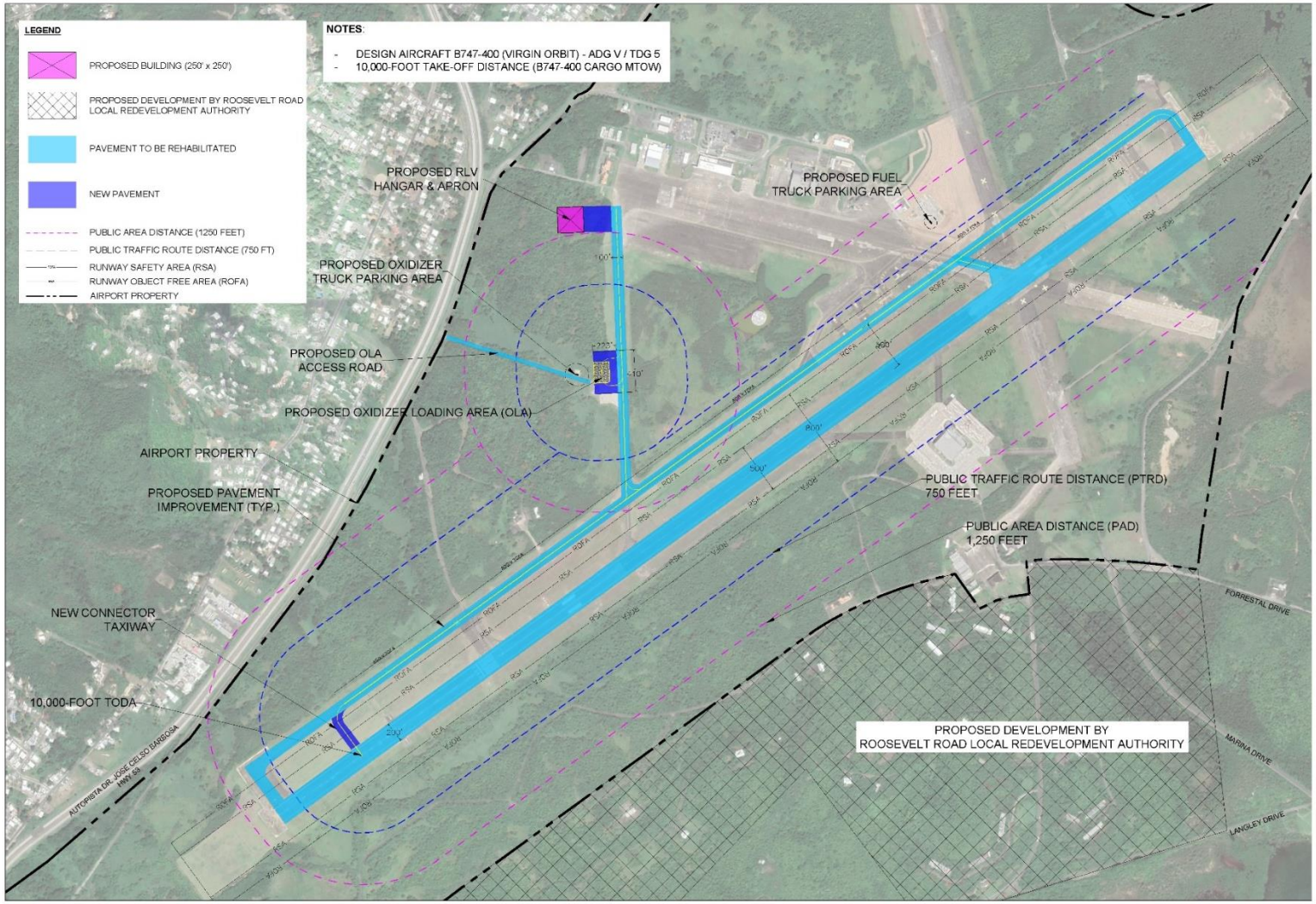


RS&H

RVR AIRPORT - LSOL APPLICATION

SPACEPORT INFRASTRUCTURES - ALTERNATIVE 1

DRAFT
6/2/2023

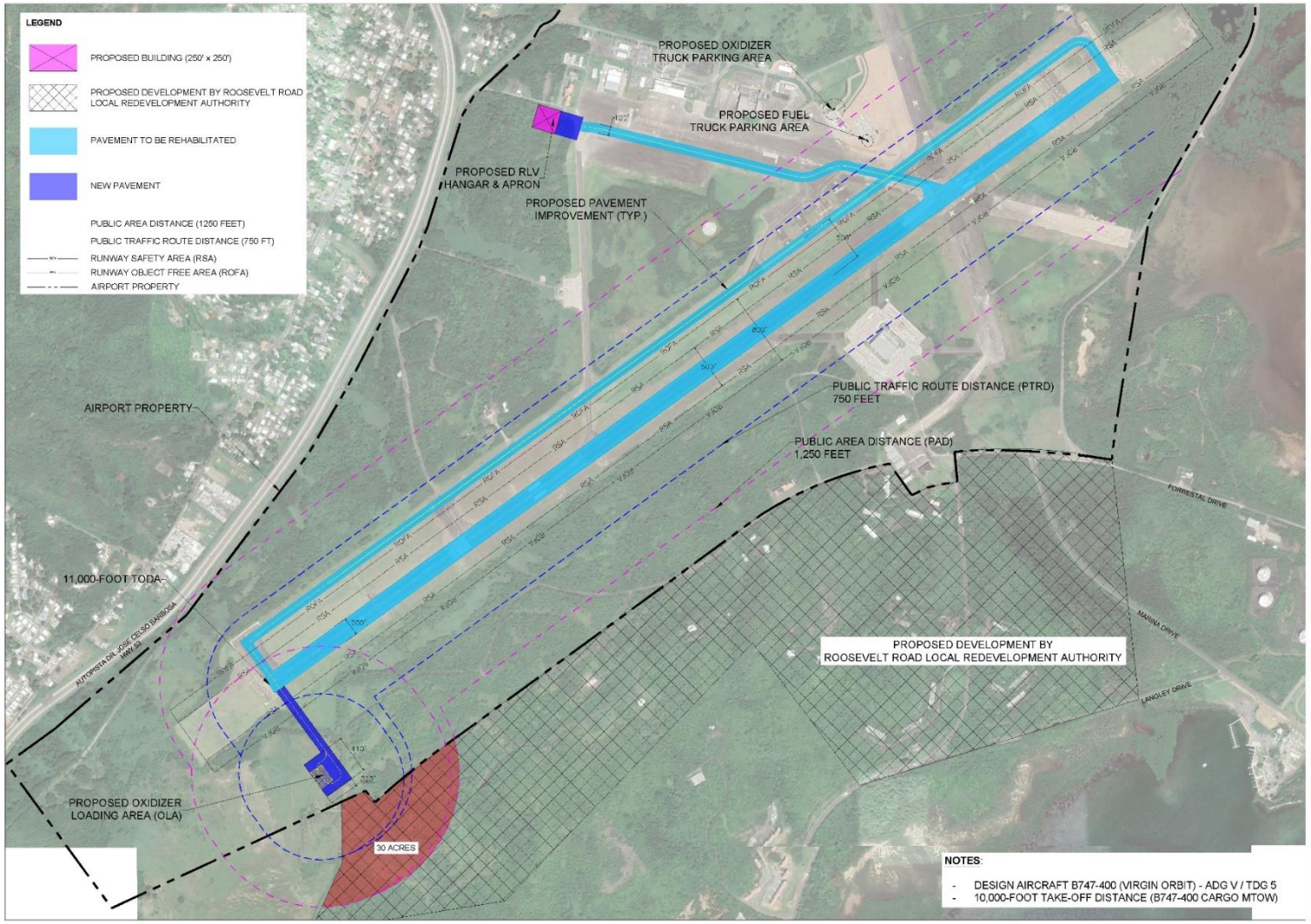


RS&H

RVR AIRPORT - LSOL APPLICATION

SPACEPORT INFRASTRUCTURES - ALTERNATIVE 2

DRAFT
2/6/2023



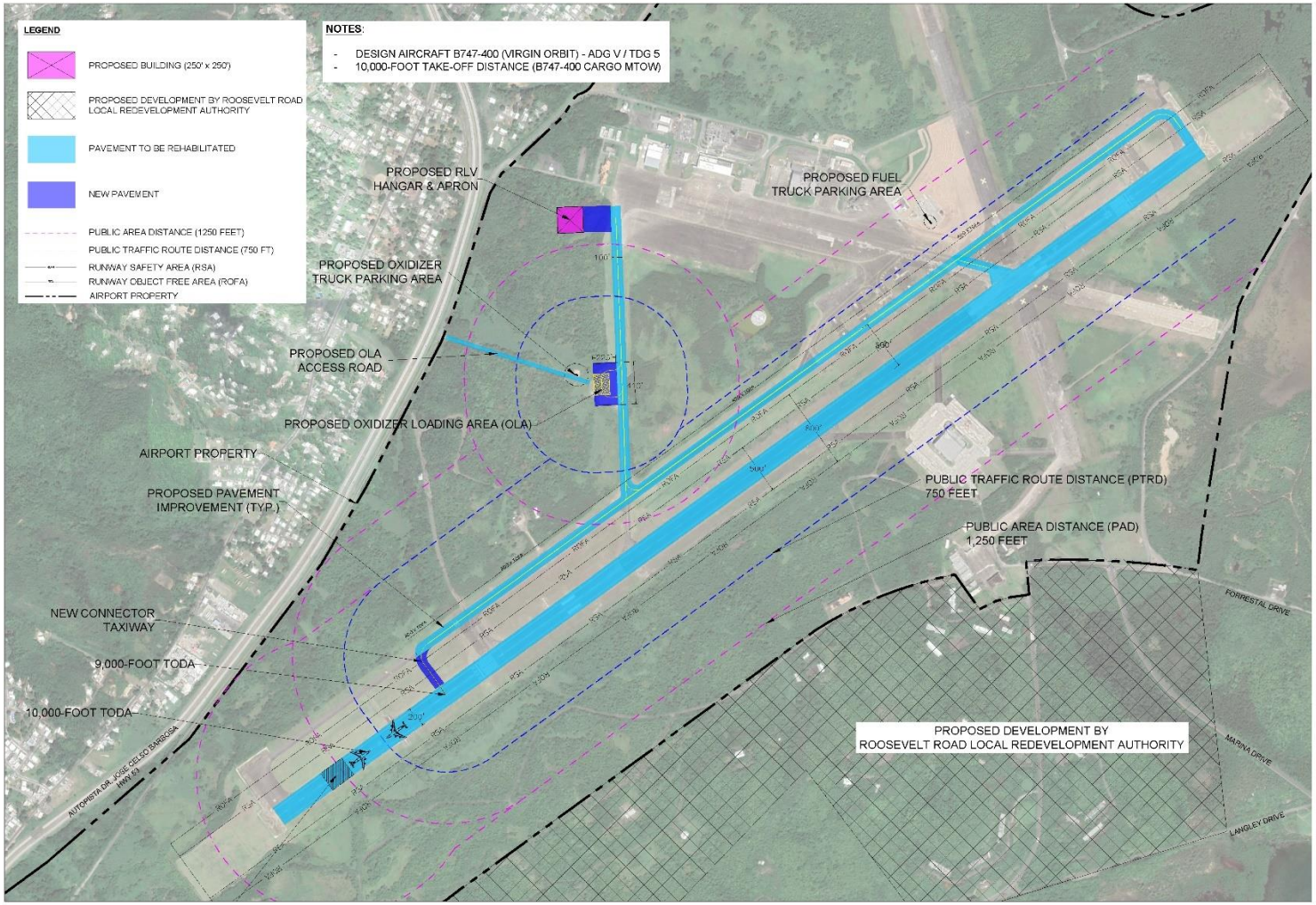
RS&H

DRAFT
2/6/2023

RVR AIRPORT - LSOL APPLICATION

SPACEPORT INFRASTRUCTURES - ALTERNATIVE 3 - Option 1

0 50 100 Feet



RS&H

RVR AIRPORT - LSOL APPLICATION

SPACEPORT INFRASTRUCTURES - ALTERNATIVE 4

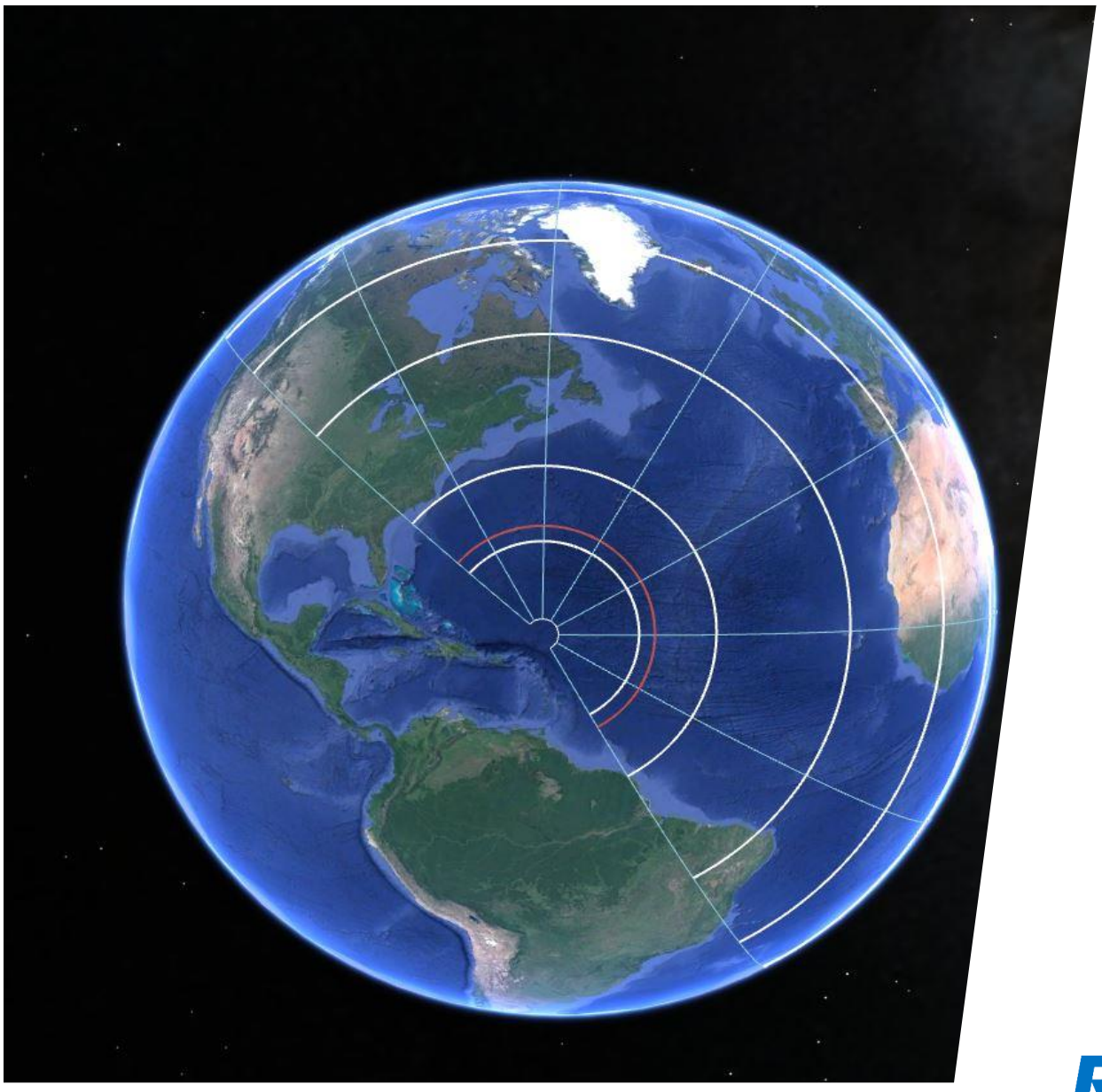
DRAFT
2/6/2023

JULY 29, 2019

EXHIBIT B

Jose Aponte de la Torre Airport

Spaceport Feasibility Study



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CHAPTER 1

CREATING A COMMERCIAL SPACEPORT

1.1 INTRODUCTION

The purpose of this study is to evaluate the feasibility of the Puerto Rico Ports Authority (PRPA) and Jose Aponte de la Torre Airport (also referred to as the Airport or RVR) to support spaceport operations for horizontally operated reusable launch vehicles (RLV) that utilize airport runways for launch and recovery operations. This feasibility study uses a variety of evaluation criteria to determine the compatibility of commercial spaceport operations with the Airport and the feasibility of undertaking spaceport development.

1.1.1 Spaceport Licensing and Regulations

Before an airport is able to operate as a commercial spaceport and conduct space launch activities, the Airport must be licensed by the Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST). The FAA issues licenses for commercial launch sites, as well as licenses for specific vehicles at those launch sites, when it determines that an applicant's proposal to operate a launch or reentry site would not jeopardize public health, welfare, the safety of property, United States national security, foreign policy interests, and/or international obligations of the United States. The regulations that govern spaceport licensing can be found in Chapter III of Title 14 of the Code of Federal Regulations (CFR) Part 420 – License to Operate a Launch Site, also known as Part 420. The license application procedures are found in 14 CFR Part 413.

According to Section 420.17, the FAA will issue a license under this part when the FAA determines that:

1. The FAA has completed an analysis of the environmental impacts associated with the proposed operation of the launch site, in accordance with the National Environmental Policy Act (NEPA), 40 CFR Parts 1500–1508, and FAA Order 1050.1F
2. The launch site location meets the requirements of Sections 420.19, 420.21, 420.23, 420.25, 420.27, and 420.29
3. The applicant has completed the agreements required by Sections 420.31
4. The application demonstrates that the applicant shall satisfy the requirements of Sections 420.53, 420.55, 420.57, 420.59, 420.61 and 420.71
5. The explosive site plan meets the criteria of Sections 420.63, 420.65, 420.66, 420.67, 420.69 and 420.70
6. Issuing a license would not jeopardize foreign policy or national security interests of the United States

In addition, the FAA will advise an applicant in writing of any issue arising during an application review that would lead to denial. The applicant may then respond by amending its license application per Section 420.17 (7)(b).

A license to operate a launch site authorizes the licensee to offer that site to an operator of a launch vehicle of the type and weight class identified in the license application. Issuance of a license to operate a launch site does not relieve the licensee of its obligation to comply with any other laws or regulations, nor does it confer any proprietary, property, or exclusive rights in the use of airspace or

outer space (14 CFR 420.41). A Launch Site Operator License remains in effect for five years from the date of issuance unless surrendered, suspended, or revoked before the expiration of the term and is renewable upon application by the licensee (14 CFR 420.43).

A launch vehicle operator must independently obtain a vehicle-specific license and demonstrate that they can safely operate from the licensed spaceport. The result is that it is possible for a spaceport to be licensed but not have any licensed operators utilizing its facilities.

1.1.2 Project Background

As the commercial space industry matures, the prospect of conducting space launch activities from public airports using launch vehicles that take off and land horizontally has become practical. This project is designed to determine the feasibility of Jose Aponte de la Torre Airport obtaining such a license, which requires a number of analyses to develop the business case for the proposed action.

These analyses include:

- Existing facilities
- Preliminary explosive siting, i.e., locations of sufficient size to accommodate potential explosive hazards and the required safety setbacks
- Potential future launch operations
- Ease of access
- Cost of development
- Impact on air traffic

This study uses the following assumptions:

- Both suborbital and orbital missions would be possible
- All analyses will be conducted with the aim of limiting overall capital investment
- Horizontal launches will be considered; vertical launches will not be included

1.2 JOSE APONTE DE LA TORRE AIRPORT INFRASTRUCTURE

Jose Aponte de la Torre Airport is located approximately 34 miles southeast of San Juan on the eastern side of the Ceiba municipality. The Airport is abutted by three barrios and a major toll road on its northern and western sides. They are Ceiba, Aguas Claras, Quebrada Seca and the Expreso Jose Celso Barbosa Toll Road (PR-53). On the eastern side, the Airport is abutted by Medio Mundo beach and Bosque Estatal de Ceiba Natural Reserve. To the south of the Airport are facilities remaining from the now decommissioned Roosevelt Roads Naval Base. Jose Aponte de la Torre was previously a military airfield for this naval base.

The PRPA administers the facility and sponsors the Airport. The Airport reference point is 18° 14′ 42.4000″ North, 65° 38′ 36.3250″ West. The Airport elevation is 38.1 feet above mean sea level and the Airport encompasses approximately 1,646 acres. The mean maximum temperature in August is 88.1 degrees Fahrenheit.

1.2.1 Runway 7-25

Runway 7-25 is 11,000 feet long and 150 feet wide. It is constructed with concrete and asphalt, with a design pavement strength of 185,000 pounds for Dual-Wheel Gear (DWG) aircraft. The effective runway longitudinal gradient is 0.26 percent. Runway pavement is considered to be in good condition. Left traffic is established to both runway ends. The runway has displaced thresholds on both ends, with Runway 7 end having a displacement of 2,398 feet and Runway 25 end having a displacement of 855 feet.

The runways are equipped with Medium Intensity Runway Lights, Precision Approach Path Indicator (PAPI) lights, and Runway End Indication Lights (REIL). There are no published instrument approaches, therefore, both ends of the runway are for visual approaches only.

1.2.2 Taxiways, Apron and Terminal Area Facilities

The Airport has seven active taxiways and taxiway connectors. Taxiway L is a 50 feet wide partial-parallel taxiway, providing access on and off Runway 7-25 via B, G, and H taxiway connectors. Taxiway C provides access from the north apron to Taxiway L. Taxiway connector D and E provide airfield access for an aeronautical tenant located southeast of the runway.

Several taxiway connectors have been deactivated; however, their pavement still exists and could potentially be reactivated after reconditioning. These include A, F, I, and J taxiway connectors. For the purpose of clarity, these taxiways will be referenced when regarding development on or near their locations.

A, B, G, H and I are concrete taxiways with taxiways A, B, G, and H accommodating safety areas for Airplane Design Group (ADG) V aircraft, and Taxiway I accommodate ADG III safety areas. Taxiway C, D, E, and J are asphalt taxiways, with taxiways D and E accommodating ADG V, and taxiways C and J suitable for ADG III safety areas. Taxiways F and L are concrete taxiways with asphalt overlay and are both sited for ADG V safety areas.

The North Parking Apron is located on the northwest side of the field and provides 225,000 square yards of pavement. This apron provides parking for transient aircraft as well as access to the primary development area and services at the Airport.

The terminal building encompasses approximately 38,000 square feet and is located on the north side of the apron, with accompanying transient aircraft parking and an automobile parking lot. North of the terminal is one hangar with approximately 31,000 square feet of hangar and office space. A Fixed Based Operator (FBO) is located just south of the terminal and provides maintenance, fueling, ground handling, and other services. Several other buildings exist within the terminal area, however, they are in generally poor condition. On the southeast edge of the apron is the fuel farm for the Airport, with four aboveground storage tanks and room for parking fuel trucks.

1.2.3 Airport Services

Jose Aponte de la Torre Airport is classified by the FAA as a Primary, Non-hub airport. Though the Airport has recorded enplanements, it is not Part 139 certified and does not have FAA Aircraft Rescue and Firefighting (ARFF) facilities. The Airport is currently attended from 6:00 am to 6:30 pm local time.

1.2.4 Area Zoning and Land Use

The Puerto Rico Land Use Plan was developed as an instrument to promote the optimal use of land in Puerto Rico. *Figure 1-1* depicts the designated land uses on and around RVR. Most of the land on and around the Airport (general boundary of the Airport is identified by the red outline) is designated as Suelo Urbano (Urban Land or SU), with other small portions designated as Suelo Rustico Comun (Rustic Common Land or SRC), and Suelo Rustico Especialmente Protegido (Specially Protected Rustic Land or SREP).

The aerospace industry has been identified by the Department of Economic Development and Commerce as the largest economic contributor. Other notable public facilities in the area are three schools located in the Pueblo of Ceiba and one school located northwest in the Pueblo of Aguas Claras.

FIGURE 1-1
PUERTO RICO LAND USES IN THE VICINITY OF RVR

Clasificaciones:

Suelo Urbano

SU - Suelo Urbano

Suelo Urbanizable

SURP - Suelo Urbanizable Programado

SURNP - Suelo Urbanizable No Programado

Suelo Rústico

SRC - Suelo Rústico Común

SREP - Suelo Rústico Especialmente Protegido

SREP-H - Suelo Rústico Especialmente Protegido-Hídrico

SREP-P - Suelo Rústico Especialmente Protegido-Paisaje

SREP-A - Suelo Rústico Especialmente Protegido-Agrícola

SREP-AE - Suelo Rústico Especialmente Protegido-Agrícola/Ecológico

SREP-AP - Suelo Rústico Especialmente Protegido-Agrícola/Paisaje

SREP-AH - Suelo Rústico Especialmente Protegido-Agrícola/Hídrico

SREP-E - Suelo Rústico Especialmente Protegido-Ecológico

SREP-EA - Suelo Rústico Especialmente Protegido-Ecológico/Agrícola

SREP-EH - Suelo Rústico Especialmente Protegido-Ecológico/Hídrico

SREP-EP - Suelo Rústico Especialmente Protegido-Ecológico/Paisaje

Source: Mapa de Clasification del Territorio Plan de Use de Terrenos de Puerto Rico; Estado Libre Asociado de Puerto Rico, 2015, RS&H, 2019

1.2.5 Area Airports, Airspace and Navigational Aids

Jose Aponte de la Torre Airport is a non-towered facility utilized predominantly by small aircraft, it has a lighted wind cone and an airport beacon light.

For departing and arriving aircraft as well as traffic in the pattern, 122.7 MHz is the common traffic advisory frequency (CTAF) that can be used to communicate position and pilot's intent. Departing aircraft that need to file flight plans can do so through the San Juan Flight Service Station. Instrument Flight Rules (IFR) services are provided by San Juan Air Route Traffic Control Center (ARTCC).

The Airport is located within Class G uncontrolled airspace. This airspace begins at the Airport elevation of 38.1 feet until reaching the vertical limit of Class A airspace of 18,000 feet. Approximately 5 miles west of the Airport is a Flight Avoidance Area for El Yunque National Forest.

1.3 LAUNCH VEHICLE COMPATIBILITY

A commercial launch site at the Airport would rely on the horizontal takeoff or landings of an RLV that utilizes runways to take off or land like an airplane. The FAA has designated three generic concepts for RLVs: Concept X, Y, and Z. Additionally, there is potential to use Jose Aponte de la Torre Airport as a reentry site for an orbital vehicle, so reentry vehicles will also be considered.

1.3.1 Concept X

The Concept X launch vehicle is a dual-propulsion RLV that would take off from a runway using jet power and fly to a safe altitude before igniting its rocket engines to complete its launch profile. Upon completion of its mission, the Concept X launch vehicle would return for a horizontal landing by either restarting its jet engines or by gliding unpowered.

1.3.2 Concept Y

The Concept Y launch vehicle is a rocket-powered vehicle that would ignite its rocket engines while on the ground and take off horizontally from a runway. This RLV would be under rocket power until engine cutoff during ascent. Upon completion of its launch profile, it would returns gliding unpowered for a horizontal landing. Currently, there are no known active designs for Concept Y vehicles, so this concept will not be considered as an option in this study.

1.3.3 Concept Z

The Concept Z launch vehicle is a two-part launch vehicle consisting of a reusable carrier aircraft and a reusable or expendable launch vehicle. The carrier aircraft, powered by jet engines, would lift the launch vehicle to a high altitude, where the two components separate, and the rocket engine of the launch vehicle is ignited. The carrier aircraft would fly back to the spaceport and land normally. The launch vehicle, which could be either suborbital or orbital, would complete its mission profile and either return for a horizontal landing or be expended. *Figure 1-2* shows an example of a Concept Z launch vehicle where Orbital ATK, now Northrop Grumman Innovation Systems, air launches the Pegasus XL expendable launch vehicle.

1.3.4 Reentry Vehicle

A reentry vehicle is a horizontal orbital vehicle that is launched, either vertically or horizontally, from a different launch site. Upon completion of its mission, this vehicle would begin its return trajectory, via rocket engines or an unpowered glide, and land horizontally along the runway.

FIGURE 1-2
ORBITAL ATK AIR LAUNCH OF PEGASUS XL ROCKET

Source: NASA

CHAPTER 2

OBJECTIVES AND STRATEGIC VISION

2.1 SPACEPORT OBJECTIVES

Due to the uncertainty regarding the future of commercial launch activities, it was important that PRPA and the Airport articulate the objectives of the spaceport licensing process to ensure expectations are in line with the potential benefits. Three general prompts were presented to PRPA and the Airport senior staff, which generated discussion that was then distilled to the following elements:

- What do I want the Spaceport License to accomplish?
  - Provide more skilled job opportunities in Puerto Rico
  - Support additional economic development in the region
  - Bring manufacturing jobs to the vicinity of the Airport
  - Offer development opportunity for the Land Redevelopment Authority (LRA)
- The Spaceport License will be successful if…
  - Jobs are created and skilled labor is retained
  - LRA development complements spaceport activities
  - The license is sustainable in all of the following areas
    - Economic
    - Environmental
    - Social
- My priorities for the Spaceport License are…
  - Capture a horizontal launch operator
  - Have satellites and/or rockets manufactured on-site
  - Increase diverse range of local jobs
  - Create additional tax base
  - Help Airport become self-sustaining

2.2 SWOT ANALYSIS

A strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted to articulate the goals of PRPA in obtaining the license, and to help determine the focus for the potential facilities and markets. During discussion with PRPA and the Airport, senior staff, the following SWOT analysis was produced:

Strengths

- No commercial airline activity reduces potential for schedule conflicts
- Proximity to open ocean and equator means multiple effective launch trajectories are available
- Coastal location reduces risk to public
- Vacant land available for development
- Nearby seaport (potential for Sea Launch-type operations)
- Low tax rate, available tax incentives
- Easy import to US

Weakness

- Public perception of former military operations at Jose Aponte de la Torre Airport
- Dated infrastructure
- Reliance on a public/private partnership for financial support
- Land-ownership limits
- Impacts from hurricanes and other natural conditions

Opportunities

- Direct and indirect economic impacts
- Zero-gravity availability for pharmaceutical industry
- Industrial/payload type industries
- Potential for point-to-point suborbital flights someday
- Space tourism
- Retain locally trained engineers
- Local universities have aerospace programs that can be built upon

Threats

- Public skepticism due to former military operations
- Potential incompatibility with planned land uses to the south
- Limited window of opportunity due to political environment

2.3 INFRASTRUCTURE REQUIREMENTS

Some additional infrastructure would be sought by launch vehicle operators, but the requirements are anticipated to be highly dependent on the specific operator. Therefore, no dedicated operator infrastructure is included in the financial feasibility analysis, as it is not required to obtain a launch site operator license. The following infrastructure is described to enable planning of ultimate facilities, and to provide additional insight into the potential cost of spaceport development for third parties. Specific infrastructure requirements are outlined in more detail in Chapter 3.

2.3.1 Runway

RVR Runway 7-25 has a length of 11,000 feet and a width of 150 feet. The pavement consists of concrete and asphalt with sufficient size and strength to accommodate all horizontal launch operators.

No improvements are required at this time.

2.3.2 Taxiway

The RVR taxiway system can serve anticipated horizontal launch operators.

No improvements are required at this time.

2.3.3 Apron

The operator would require dedicated apron adjacent to the hangar for fueling and staging. If the hangar were built adjacent to existing apron, no apron construction would be required. For a large hangar facility that was not adjacent to existing suitable apron, the cost of the apron could reach $1.5 million.

2.3.4 Oxidizer Loading Area (OLA)

An OLA is a spaceport-specific requirement that represents the location at which concentrated oxidizer is loaded into the fueled launch vehicle.

To serve all potential operators, the OLA is planned to be 150-feet-by-200-feet. For OLA Site 1, construction of the OLA pad would cost of approximately $700,000. Site 4 is located on existing concrete runway pavement, and the assumption is made that no reconstruction would be necessary, however, the location of the OLA would be painted to ensure safety distance requirements are met for fueling operations. If Site 1 becomes the selected OLA for development, the taxiway connector would cost approximately $3 million.

2.3.5 Fuel Storage

There are three primary types of fuel proposed for spaceport operations: liquid, hybrid, and solid.

RP-1 is a kerosene-based fuel that is similar to Jet-A. Therefore, RP-1 would be provided on an on-demand basis by commercial tanker trucks, which would be parked on a short-term basis at the Airport's existing fuel farm and/or existing fuel truck parking area(s).

Hybrid fuel can potentially include relatively inert materials such as hydroxyl-terminated polybutadiene (HTPB). HTPB can be stored without restriction, such as in a hangar or shed.

Solid fuels are flammable but not explosive materials such as ammonium perchlorate composite propellant (APCP). APCP is not regulated by the US Bureau of Alcohol, Tobacco, and Firearms as an explosive hazard, however FAA/AST requires APCP to be stored in an appropriate area that must be identified on the Explosive Site Plan.

No modifications would be required for initial operation for RP-1 or HTPB. Storage of APCP would require the siting and development of an appropriate storage area.

2.3.6 Oxidizer Storage

Due to the initial low number of operations, concentrated oxidizer is proposed to be supplied on-demand via tanker truck provided by a conventional industrial gas supplier. Because of the nature of concentrated oxidizer, short-term parking of an oxidizer tanker truck should occur on concrete instead of asphalt. Oxidizer cannot be co-located with fuel and must be placed at a specified location identified on the Explosive Site Plan. RVR has adequate existing concrete apron pavement to park oxidizer tanker trucks.

No construction would be required for initial operations.

2.3.7 RLV Processing

The RLV processing facility is envisioned as a conventional aircraft hangar, with associated office space. A dedicated or modular clean room may or may not be included, depending on the nature of planned operations. The construction and use of a conventional aircraft hangar for this purpose would allow adaptive reuse should the spaceport operation falter.

A launch vehicle facility would be sized and equipped appropriately for the specific operator. Depending on the needs of the tenant, the cost of the RLV processing facility could range from $2 million to $20 million.

2.3.8 Payload Processing

A separate payload processing facility may be required, depending on the relationship between the vehicle operator and potential launch customers. The payload processing facility potentially could be contained within the RLV processing facility. It would be sized and equipped in accordance with the needs of potential launch customers. Given the state of vehicle development, specialized equipment such as overhead cranes is not anticipated to be required. The construction and use of a conventional aircraft hangar for this purpose would allow adaptive reuse if necessary.

Developing a freestanding payload processing facility could create the opportunity to service multiple payload customers and launch operators. As a separate facility, this hangar could be expected to be 10,000 sq. ft. in size, with a cost of approximately $1.5 million.

Table 2-1 summarizes the infrastructure development discussed above.

TABLE 2-1
ROM CAPITAL COST ESTIMATE SUMMARY

Item	ROM Cost	
	OLA 1	OLA 4
Short-Term Spaceport Facilities (0-5 years)		
Oxidizer Loading Area	$700,000	$0
Oxidizer Loading Area Taxiway	$3,000,000	N/A
Total	**$3,700,000**	**$0**

Source: RS&H, 2019

2.4 BUSINESS OPPORTUNITIES

The business opportunities that define the financial feasibility of developing a commercial spaceport come from several different sources: primary revenue from vehicle operators and other spaceport tenants; secondary revenue such as fuel flowage, parking, and related services; and broader economic benefits to the community as a whole.

For the purposes of this study, broader economic benefits such as applying an economic impact multiplier are not considered. Only primary and secondary revenues to the Airport are outlined, since these benefits

will be instrumental in establishing the financial feasibility of the proposed project by creating revenues that flow to the Airport. Economic benefits to the greater community will be identified in some cases, but will not be quantified because they represent impacts that are outside of the Airport's purview.

2.4.1 Potential Revenue Opportunities

2.4.1.1 Primary Revenue Opportunities

The following primary revenue opportunities form the financial basis for an airport to become an FAA licensed spaceport.

- Launch Vehicle Operators
  Attracting launch vehicle operators are the primary purpose to create a licensed commercial spaceport. An operator may lease facilities from and purchase services offered by the Airport. The vehicle operator may perform many non-flight tasks on-site, including development, manufacturing, and testing of RLVs and associated technology, launches of RLVs for tourism, research payloads, or other launch actions.
- Launch and Landing Fees
  Just as airports may have takeoff/landing fees and passenger facility charges associated with them, a fee system could be set up to support the use of the spaceport facilities. The frequency of the flights and the fee schedule that is applied would determine the amount of revenue obtained by the spaceport.
- Spaceport Services
  Another source of primary revenue may come from the Airport offering services such as fueling and storage to launch vehicle operators that are not based at the spaceport. Airports typically offer a menu of services available for aircraft, and a similar menu can be developed for launch vehicles.

2.4.1.2 Secondary Revenue Opportunities

Secondary revenue opportunities include opportunities that are attracted to do business at the spaceport due to the launch vehicle operations. These companies may lease office space or hangar space or perform other activities at the spaceport. They offer revenue opportunity for the spaceport and enhanced job growth and tax base for the surrounding community.

- Academic Institutions
  A consortium of 17 difference universities, schools, and agencies of Puerto Rico have partnered with NASA to provide grant funds directly related to the development of capabilities in Science, Technology, Engineering, and Mathematics (STEM). A partnership between the Spaceport and this consortium could develop into a mutual gain for each party, as the research and design would rely on the development of the spaceport facilities and provide convenient launch opportunities for student and research payloads.

  With enough interest, an aerospace academy could be developed. Students would be able to work on-the-site providing an added benefit that other similar academies in the region would lack. Attracting these individuals would provide the foundation for a commercial space district corridor.

- Commercial Space District Corridor
  Considering the potential development opportunities of the LRA located south of the Airport, a Commercial Space District Corridor could be developed outside of the secure area of the Airport and enable a variety of uses to connect to the Spaceport. An aerospace academy as well as facility and vehicle tours, aerospace technological manufacturing, museums, and other forms of media could develop in concert with the spaceport. This corridor could be more effective with the use of the seaport and attracting a launch operator such as Sea Launch.

Whether through the leasing of property or buildings, launch and landing fees, or ticket and museum sales, there are numerous opportunities for the spaceport to generate revenue. The potential secondary revenue sources not only benefit the spaceport by adding value to their spaceport license but will also benefit the surrounding community through an increased selection of high-tech jobs, tourism, new industries, and facilitating growth in the area surrounding the spaceport

CHAPTER 3

CONCEPT OF OPERATIONS AND EXPLOSIVE SITE PLAN

3.1 EXAMPLE LAUNCH VEHICLES

A number of companies are developing launch vehicles, but only a small number are operational or near operational status. The examples below are intended to illustrate the state of the industry. As with any immature industry, the companies and their developmental vehicles are in a constant state of flux. This list is intended to reflect known launch vehicle designs currently under some state of development at the time of this study.

3.1.1 Airbus Group SE

The European Aeronautic Defense & Space Co. (EADS) which is a subsidiary of Airbus Group SE has been designing a Concept X vehicle. The spacecraft would provide passenger space travel as paying customers and a pilot are transported on a suborbital flight trajectory.

The spacecraft would employ twin turbofan engines for a horizontal takeoff. Rocket ignition would occur at an altitude of approximately 40,000 feet. Maximum speed is projected to be about Mach 3.0, with an apogee above 328,000 feet. Reentry is a ballistic descent to about 50,000 feet, at which point the turbofan engines would restart and the spacecraft would fly like a conventional jet to a horizontal landing. Total flight time would be approximately 1.5 hours.

This RLV is similar in size to a medium business jet and would be capable of takeoff and landing on 6,000- to 10,000-foot runways.

TABLE 3-1
EADS ASTRIUM TBN

Specifications

Vehicle Size	
Airplane Design Group	N/A
Max Takeoff Weight	N/A
Wingspan	N/A
Propellant – Jet-A (air breathing) – N/A (rocket)	25,000 lb N/A
Runway Requirement	6,000-10,000 ft
Max Boosted Payload	N/A

Image Source: Marc Newson, 2007

3.1.2 CubeCab

CubeCab is developing a Concept Z RLV that would utilize a Lockheed F-104 Starfighter and a Cab-3A rocket. A CubeSat is inserted into a Cab-3A rocket, which is attached to the Starfighter on a missile hardpoint. At an altitude of approximately 60,000 feet, the Cab-3A rocket would launch from the Starfighter into low earth orbit and deploy the satellite.

TABLE 3-2
F-104 STARFIGHTER

Specifications	
Vehicle Size	
Airplane Design Group	I
Max Takeoff Weight	29,083 lb
Wingspan	21.8 ft
Propellant	
JP-4 (carrier vehicle)	19,240 lb
N/A (launch vehicle)	Undisclosed
Runway Requirement	4,500 ft (est)
Max Boosted Payload	N/A

Source: NASA

3.1.3 Generation Orbit

Generation Orbit's (GO) GOLauncher1 is a Concept Z vehicle that uses a modified Gulfstream G-III business jet as the carrier aircraft, with an expendable suborbital single stage liquid rocket underneath. The suborbital launch vehicle uses a solid propellant rocket motor.

After successfully completing three flight tests under a public-private partnership with the NASA Armstrong Flight Research Center, GO1 has plans for air launch of the GO1 on operational flights beginning in 2020. GO expects to require a staff of approximately 10 people for launch operations, plus an additional 10 people for vehicle integration and checkout.

TABLE 3-3
GOLAUNCHER1

Specifications	
Vehicle Size	
Airplane Design Group	II
Max Takeoff Weight	69,700 lb
Wingspan	77.8'
Propellants	
Jet-A (carrier vehicle)	29,650 lb
Jet-A (launch vehicle)	6,000 lb
Runway Requirements	
Takeoff	5,100 ft
Landing	2,600 ft

Source: Generation Orbit 2019

3.1.4 Northrop Grumman Innovation Systems

Northrop Grumman Innovations Systems (formerly Orbital ATK) has operated a Concept Z vehicle for more than 20 years, using a Lockheed L-1011, nicknamed Stargazer, as the carrier vehicle, and a Pegasus rocket mounted underneath. The three-stage Pegasus vehicle was developed to market to small satellite customers (up to 1,000 lb) into low earth orbit. Since 1990, Pegasus has conducted 43 successful missions, launching 94 satellites.

TABLE 3-4
STARGAZER AND PEGASUS XL

Specifications	
Vehicle Size	
Airplane Design Group	IV
Max Takeoff Weight	466,000 lb
Wingspan	155 ft
Propellants	
Jet-A (carrier vehicle)	177,500 lb
Solid (launch vehicle)	43,500 lb
Runway Requirement	8,000 ft

Source: Northrop Grumman 2019

3.1.5 Orbital Access

Orbital Access is designing the Orbital 500R, which is a two-stage to orbit system. The design plans to deliver payloads of 500 kg (1,102 lb) to a sun synchronous orbit of 600 km (373 mi) through the use of an L-1011 carrier aircraft and a launch vehicle that attached beneath it.

TABLE 3-5
ORBITAL 500R

Specifications	
Vehicle Size	
Airplane Design Group	IV
Max Takeoff Weight	466,000 lb
Wingspan	155.33 ft
Propellants	
Jet-A (carrier vehicle)	180,000 lb
N/A (launch vehicle)	N/A
Runway Requirement	8,000 ft

Source: Lockheed Martin APM

3.1.6 Sierra Nevada Corporation

The Sierra Nevada Corporation (SNC) Dream Chaser spacecraft is a multi-mission RLV and space utility vehicle that launches vertically within a rocket fairing, and glides back to a runway. Dream Chaser does not fall into any of the specified horizontal concept vehicles and is categorized as a reentry vehicle. This study does not consider the viability of launching Dream Chaser vertically, however Jose Aponte de la Torre Airport but could potentially host a Dream Chaser recovery. The SNC designed the Dream Chaser to carry experimental payloads, cargo, or personnel.

The Dream Chaser Cargo System provides uncrewed missions for delivery of both pressurized and unpressurized cargo payloads up to 5,500 kg (12,125 lb). Other future missions may include the removal of orbital debris, space exploration technology testing, and satellite deployment or servicing.

The SNC Dream Chaser has undergone successful testing of an approach and landing at the NASA Armstrong Research Flight Center in the Edwards Air Force Base located in southern California. SNC has a contract with NASA to perform six cargo missions to and from the International Space Station (ISS) between 2020 and 2025.

TABLE 3-6
DREAM CHASER

Specifications

Vehicle Size	
Airplane Design Group	I
Max Takeoff Weight	Undisclosed
Wingspan	24 ft
Length	30 ft
Propellants	
H_2O_2	Undisclosed
RP-1	Undisclosed
Runway Requirements	10,000 ft

Source: SNC

3.1.7 Stratolaunch Systems Corp.

The Stratolaunch system is a Concept Z RLV designed to handle intermediate class payloads (10,000 lb) into low-earth orbit. The Stratolaunch, nicknamed "the Roc", has a 385-foot wingspan, making it the largest aircraft ever built.

The unique design includes twin fuselages with six Pratt and Whitney turbofan engines, all of which are sourced from the Boeing 747-400. It has a maximum takeoff weight of 1.3 million lb and the ability to carry a payload of 500,000 lb. The primary use would be to launch satellites, however, passenger spacecraft could eventually be carried as well.

The aircraft completed its first test flight in April 2019, however the company then suspended development and placed the system up for sale.

TABLE 3-7
STRATOLAUNCH

Specifications	
Vehicle Size	
Airplane Design Group	VI
Max Takeoff Weight	1.3 million lb
Wingspan	385 ft
Landing Gear Width	125 ft (est)
Runway Requirements	12,500 ft x 250 ft
Propellant*	
JP-4 (carrier vehicle) Various (rocket)	Undisclosed
Max Boosted Payload	13,000 lb

Source: FAA Office of Commercial Space Transportation, 2018
Image: Stratolaunch Systems Corp., 2017

3.1.8 Virgin Galactic

Virgin Galactic is nearing operational flights with the WhiteKnightTwo and SpaceShipTwo. The WhiteKnightTwo is a four-engine, dual fuselage jet aircraft that carries SpaceShipTwo to an altitude of approximately 50,000 ft, at which time the SpaceShipTwo detaches and fires its hybrid rocket motor for ascent on a suborbital trajectory.

With a maximum payload of 600 kg (1,323 lb) SpaceShipTwo will transport up to six paying customers and two pilots to approximately 350,000 ft. Paying passenger flights are expected in 2020.

TABLE 3-8
WHITEKNIGHTTWO AND SPACESHIPTWO

Specifications	
Vehicle Size	
Airplane Design Group (launch/carrier)	C-I / C-IV
Max Takeoff Weight	120,000 lb
Wingspan	141'
Propellants	
Jet-A (carrier vehicle)	21,600 lb (est)
HTPB (launch vehicle)	2,500 lb (est)
N_2O (launch vehicle)	13,500 lb (est)
Runway Requirements	12,000 ft

Source: Virgin Galactic, 2018

3.1.9 Virgin Orbit

Virgin Orbit, a sister company of Virgin Galactic under the Virgin Group, is in the late phases of testing its two-stage expendable LauncherOne rocket. The Concept Z vehicle uses a Boeing 747-400 on which a LauncherOne rocket is mounted.

The initial flights of the Virgin Orbit vehicle are set for the second half of 2019, and Virgin Orbit expects LauncherOne to operate from a variety of locations once in service. The US Department of Defense also declared in 2017, that it would have a prototype flight with Virgin Orbit's LauncherOne in 2019.

TABLE 3-9
COSMIC GIRL AND LAUNCHERONE

Specifications	
Vehicle Size	
Airplane Design Group	V
Max Takeoff Weight	N/A
Wingspan	211 ft
Propellant	
Jet-A1 (carrier vehicle)	387,247 lb
LOX (launch vehicle)	N/A
RP-1 (launch vehicle)	N/A
Runway Requirement	10,000 ft
Max Boosted Payload	N/A

Source: FAA AST 2018 Compendium

3.2 EXPLOSIVE SITE PLAN

A detailed explosive site plan for the launch site is required by FAA regulations to identify areas that may include potentially hazardous operations. The explosive site plan is used to ensure the safety of people and property from the potentially hazardous areas. In the case of spaceports, the explosive hazards are typically those operations associated with the launch vehicle's propellants, rocket motors, and critical event systems. The explosive site plan is also submitted to the FAA Airports District Office for approval and incorporation into the Airport Layout Plan as part of the environmental approval process required by the National Environmental Policy Act.

The explosive siting standards found in Part 420 were considered during this assessment. For propellants or propellant combinations or scenarios that are not explicitly defined with Part 420, additional information from the United States Department of Defense (DoD) 6055.09-M (Ammunition and Explosives Safety Standards) were used.

The following terms associated with separation distances are defined by FAA regulations for spaceport operations:

- Public Area Distance (PAD) – The minimum distance required between a public area (defined as an area outside of the spaceport's control) and a potentially hazardous activity.
- Public in the Open Distance (POD) – The minimum distance between a freestanding person and a potentially hazardous activity. Any person not involved in the launch operation who is inside the POD is required to be inside a vehicle or building. This is an operational requirement rather than a facility design requirement.
- Public Traffic Route Distance (PTRD) – The minimum distance between a public highway or railroad line and a potentially hazardous activity.
- Intraline Distance (ILD) – The minimum distance permitted between any two incompatible materials, such as fuel and oxidizer.
- Quantity Distance (QD) – The quantity of potentially hazardous material and distance separation relationship that provides a defined level of protection.
- Net Equivalent Weight (NEW) – The quantity of a propellant combination normalized to a quantity of TNT with comparable explosive force.
- Net Equivalent Weight for Quantity Distance (NEWQD) – A combination of NEW and QD, defined above, that standardizes separation distances across various combinations of propellants.

An explosive site plan considers all possible explosively hazardous materials on site and determines the maximum safe quantities allowable for specific locations. The quantity of explosives at a location in use or stored must be in compliance with the stated separation distance.

3.2.1 Propellant Types and Combinations

Common propellants for launch vehicles are separated into three categories: liquid propellants; solid propellants, and hybrid propellants. *Table 3-10* lists the propellants of each of the proposed launch vehicles, the type, and their hazard classification.

- Liquid Propellants are a two-part system with a liquid oxidizer and liquid fuel. This type of propellant is typical for large vertical rockets. Additionally, there are liquid monopropellants, which can be single chemical or a combination in a single solution. Then the fuel and oxidizer are co-located, liquid propellants typically have a greater explosive risk than the other types of propellants.
- Solid Propellants is a single propellant that has an oxidizer and a fuel combined with a binder into a solid mass. This type of propellant is easier to store and generally safer to use than liquid propellants.
- Hybrid Propellants typically use a liquid oxidizer and a solidified fuel. This type of fuel offers the safety and ease of storage of solid propellants with the performance and throttle-ability of liquid propellants.

FAA Part 420 uses the United Nations (UN) classification of materials. Explosive hazards are considered Hazard Class 1 materials and are divided into six sub-divisions, with Division 1.1 being the most hazardous and Division 1.6 being the least. Generally speaking, liquid propellants are classified as Division 1.1 while solid propellants are classified as Division 1.3. Hybrid fuels are characterized as Division 1.1 when accompanied by concentrated oxidizer but as inert substances when not.

- Division 1.1 consists of materials that have a mass blast hazard. A mass blast is one that affects almost the entire lot of material instantaneously.
- Division 1.3 consists of materials that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass blast hazard.

TABLE 3-10
LAUNCH VEHICLES AND THEIR RESPECTIVE PROPELLANTS

Launch Vehicle	Type	Propellant Combination*	UN Hazard Classification
SpaceShipTwo	Hybrid	N_2O / HTPB	HD 1.1**
GO Launcher1	Liquid	LOX / RP-1	HD 1.1**
Stratolaunch	Various	Various	HD 1.1** / HD 1.3
PegasusXL	Solid	Various	HD 1.3
Dream Chaser	Liquid	H_2O_2 / RP-1	HD 1.1**
LauncherOne	Liquid	LOX / RP-1	HD 1.1**
Orbital 500R	Unknown	Unknown	TBD
EADS Astrium TBN	Unknown	Unknown	TBD
F-104 Starfighter	Unknown	Unknown	TBD

*For defined propellant acronyms, see Appendix B
**Treated as HD 1.1. Liquid propellant combinations are not explicitly defined as HD 1.1.
Source: RS&H, 2018

3.2.2 Quantity Distance

The explosive site plan determines the locations where potentially explosive materials can be handled and stored. This is typically provided as a hazard class and division of explosive and the NEW, which, in turn, provides the required separation distances. For NEW quantities between 500 lb and 30,000 lb, the PAD

and PTRD are constant at 1,250 feet and 750 feet, respectively. Since a majority of the RLVs under development fall far below that NEW, 30,000 lb represents a practical upper limit for explosive siting at public airports. This strategy accommodates the current generation of RLVs while allowing for growth without requiring updates to the explosive site plan.

Using common oxidizer to fuel ratios and propellant densities, the maximum quantity of various propellant combinations with a 30,000 lb NEW can be calculated and is provided in *Table 3-11*. For these calculations, RP-1 and kerosene are considered equivalent, as is the LO_2 / RP-1 and H_2O_2 / RP-1 propellant combination. Note that the quantities provided are estimates and each launch vehicle may have different propellant ratios and densities.

TABLE 3-11
LIQUID AND HYBRID PROPELLANT QUANTITIES AT MAX NEWQD

Propellant Combination	Hazard Classification	Quantity of Propellant			TNT Equivalence Factor	NEW (lb)
		Oxidizer (lb)	*Fuel (lb)*	*Total (lb)*		
N_2O / HTPB or nylon	HD 1.1*	173,262	26,738	200,000	15%	30,000
LO_2 / RP-1	HD 1.1*	108,333	41,667	150,000	20%	30,000
H_2O_2 / RP-1	HD 1.1*	132,035	17,965	150,000	20%	30,000
LO_2 / LH_2	HD 1.1*	183,673	30,612	214,286	14%	30,000

*Treated as HD 1.1: Liquid propellant combinations are not explicitly defined as HD 1.1.
Source: RS&H, 2018 (Ref [1] [2] [3])

Solid propellants, such as APCP, are HD 1.3 and have significantly smaller separation distances than HD 1.1. For instance, it takes a NEW of over 2.2 million lb of HD 1.3 before the separation distances start to approach those of 30,000 lb NEW of HD 1.1. For locations where HD 1.1 is allowed, for this assessment, it is assumed that the quantity of solid propellant carried by current generation RLVs is compatible.

The maximum solid propellant quantity is typically limited by the location of the operational hangars or storage areas since these facilities are often adjacent to other operational facilities.

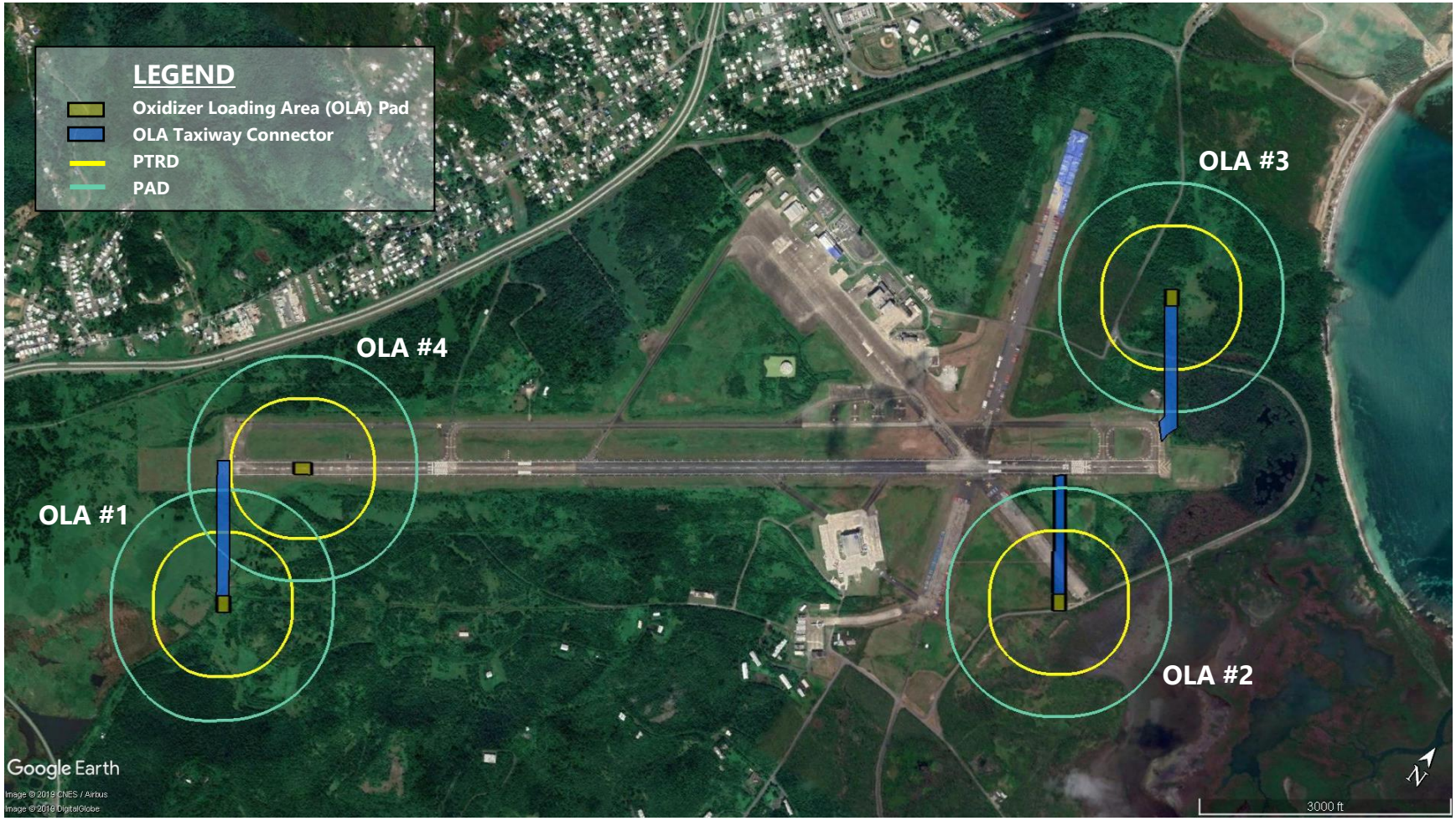
3.2.3 Oxidizer Loading Area

The Oxidizer Loading Area (OLA) is a location where concentrated oxidizer is loaded onto the fueled vehicle, creating the HD 1.1 separation requirement. The required size of the OLA pad would vary based on the actual launch vehicle. For this study, an OLA of 150 feet by 200 feet is expected to be able to accommodate all vehicles that might operate from Jose Aponte de la Torre Airport.

The PAD setback requires the OLA to be placed in a relatively isolated location that is compatible with launch activities and planned Airport development. The PAD must be under the control of the Spaceport while an explosive hazard is present, i.e., whenever fuel and concentrated oxidizer are co-located. In order to simplify the explosive site plan, this distance is calculated off the pavement edge of the OLA pad.

Four potential oxidizer loading areas were identified during an initial assessment. Each location utilizes areas that meet applicable separation requirements and are as compatible as possible with Jose Aponte de la Torre Airport's long-term future planning as identified in its most recent Airport Master Plan Update. Their locations are shown in *Figure 3-1*.

FIGURE 3-1
OXIDIZER LOADING AREA OPTIONS



Source: RS&H, 2019; Google Earth, 2019

The following sections compare each of the options. The preliminary OLA separation distances for each of the quantities of propellant is provided in *Table 3-12*. Each OLA option was evaluated using these distances. Some locations may require property or easement acquisition for sites and separation distances that fall outside the airport's property boundary.

TABLE 3-12
OXIDIZER LOADING AREA QUANTITY DISTANCE, HD 1.1

Propellant Combination	Quantity of Propellant (lb.)	NEW (lb.)	PAD (ft.)	PTRD (ft.)	ILD (ft.)	POD (ft.)
LOX / RP-1	150,000	30,000	1,250	750	557.75	1,250
N_2O / HTPB	200,000	30,000	1,250	750	557.75	1,250
LOX / LH_2	214,286	30,000	1,250	750	557.75	1,250
H_2O_2 / RP-1	150,000	30,000	1,250	750	557.75	1,250

Source: RS&H, 2018 (Ref [1] [2] [3])

3.2.3.1.1 Oxidizer Loading Area Option 1

The Oxidizer Loading Area Option 1 pad and the safety areas are located off Airport property. A conveyance of land would be expected with the Local Redevelopment Authority (LRA) for Roosevelt Roads. Since this option is not located on any area that is currently paved, construction is required. The PAD does not overlap any building but steps would need to be taken to ensure the PAD was within the Airport's control, either through property conveyance or other legal agreement that gave the Airport control during launch operations.

3.2.3.1.2 Oxidizer Loading Area Option 2

The Oxidizer Loading Area Option 2 pad is located on airport property, however, the PAD extends off current Airport property. Either a property conveyance or other legal agreement would be required to give the Airport control during launch operations. A segment of Tarawa Drive, a public road, would need to be relocated around the proposed OLA site, and controls to Tarawa Drive would need to be in place to prevent vehicle traffic during potentially hazardous operations.

3.2.3.1.3 Oxidizer Loading Area Option 3

The Oxidizer Loading Area Option 3 pad would be on airport property, however, the safety areas are located outside of current Airport property. An agreement to allow the Airport to restrict activity in this area would be needed. Tarawa Drive would need to be relocated east of the proposed OLA site. Controls on Tarawa Drive would need to be in place to prevent vehicle traffic during potentially hazardous operations.

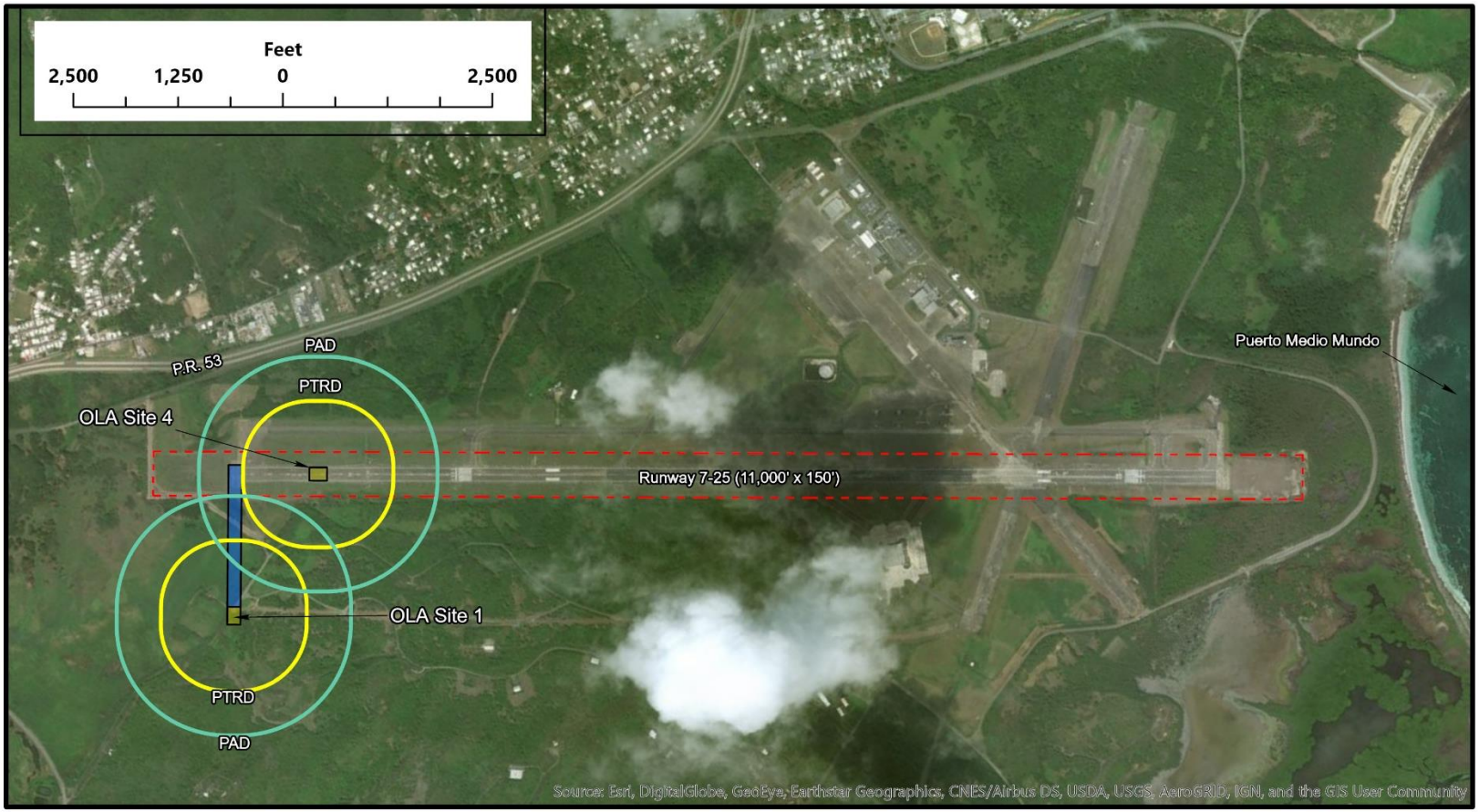
3.2.3.1.4 Oxidizer Loading Area Option 4

The Oxidizer Loading Area Option 4 pad would be on airport property, however, the safety areas are located outside of current Airport property. Since this option would use a portion of the existing runway's concrete pavement, no construction is needed. Steps would need to be taken to ensure the PAD was within the Airport's control, either through property conveyance or other legal agreement that gave the Airport control during launch operations.

3.2.3.1.5 Oxidizer Loading Area Decision

While Option 4 would carry the least cost of development, its potential impact to operations may be significant, depending on the potential launch operations. In addition, several lines of business within FAA would need to review and approve the acceptability of using the runway as an OLA. That coordination was not included in this analysis. Therefore, both Option 1 and Option 4 are carried forward as preferred alternatives. They are depicted in the conceptual Explosive Site Plan shown in *Figure 3-2*.

FIGURE 3-2
SELECTED OXIDIZER LOADING AREAS



Legend

Oxidizer Loading Area (OLA)
OLA Taxiway
PAD
PTRD
Runway Safety Area (RSA)

N
W
E
S

Source: RS&H, 2019; Google Earth, 2019

3.2.4 Propellant Storage and Operating Areas

Each type of propellant has specific storage requirements. Liquid and hybrid propellants are stored separately as fuels and oxidizers, while solid propellants are stored as a single unit. The determination of which fuels, oxidizers, and solid propellants are compatible with the proposed spaceport heavily influences which launch vehicle providers can be hosted on site. *Table 3-13* identifies the different propellants and oxidizers and the required separation distances.

TABLE 3-13
PROPELLANT STORAGE SEPERATION DISTANCES

Propellant/ Oxidizer	Quantity (lb.)	PAD/PTRD (ft.)	Compatible ILD (ft.)	Incompatible ILD (ft.)	Comments
LOX	Unlimited	100	50	100	Concrete surface
N_2O	500,000	50	50	50	Concrete surface
H_2O_2 <91%	400,000	75	75	75	Varies based on purity
RP-1	Unlimited	50	50	50	Similar to jet fuel
LH_2	32,000	1,200	110	1,200	Unshielded storage distance
Hydrazine	22,000	1,200	105	1,200	Unshielded storage distance
HTPB	Unlimited	N/A	N/A	N/A	Store away from oxidizer
ABS	Unlimited	N/A	N/A	N/A	Store away from oxidizer
Nylon	Unlimited	N/A	N/A	N/A	Store away from oxidizer
Solid HD 1.3	50,000	240	162.5	162.5	Expected max

Source: RS&H, 2018 (Ref [1] [2] [3])

Initially, each of the liquid fuels and oxidizers would be delivered by tanker truck for specific operations. The explosive site plan contains provisions for parking them temporarily on site, at the locations outlined in the following sections and identified in *Figure 3-3*. Permanent storage facilities would not be required until the frequency of flights increased to a level that justified the investment.

Along with identifying temporary storage locations of each of the propellants, the travel route for each of the propellants to the storage areas is also defined and shown in *Figure 3-3*. Once on airport property, all movements of the propellant tanker trucks will be escorted by airport personnel.

3.2.4.1 Liquid Fuel Storage Areas

3.2.4.1.1 RP-1 Storage Area

Liquid fuels such as RP-1 and kerosene are similar and compatible with aviation fuels and can be stored at the airport fuel farm and in proximity to aviation fuel trucks.

3.2.4.1.2 Hydrazine Storage Area

Hydrazine is a liquid fuel with strict storage requirements. Hydrazine is not expected to be used as a rocket propellant, however small quantities are often used aboard payloads as a repositioning thruster propellant, and a payload storage area would require separation distances if the payloads were loaded

with hydrazine. Furthermore, a separate payload holding area would be required for those payloads containing hydrazine. For those operators that may require the use of hydrazine, storage and handling is assumed to occur at the OLA.

3.2.4.1.3 Hydrogen Peroxide Storage Area

Hydrogen peroxide (H_2O_2), which can be used as either a monopropellant or an oxidizer, is used at various levels of purity, which affects the storage requirements and separation distances. For purities less than 91 percent, the separation distances are similar to those of N_2O and LOX. When purities reach concentrations greater than 91 percent, the required separation distances increase to sizes similar to liquid hydrogen and hydrazine.

3.2.4.1.4 Liquid Hydrogen Storage Area

Liquid hydrogen carries storage requirements that are significantly more stringent than those discussed earlier. For those operators that may require the use of liquid hydrogen, storage and handling is assumed to occur at the OLA.

3.2.4.2 Liquid Oxidizer Storage Area

The liquid oxidizer storage area is for the temporary storage of liquid oxidizers, principally liquid oxygen and nitrous oxide. The storage of these oxidizers requires a separation distance of 100 feet from public areas, roads, and incompatible materials. Liquid oxygen spilled onto an asphalt surface can ignite with a spark or shock, and storage facilities should be paved with concrete. Oxidizer tanker trucks will be parked in designated areas marked on existing concrete apron.

3.2.4.3 Solid Propellant Storage Areas

There are two different types of solid propellants used by the RLVs discussed; solid fuel for a hybrid system and a solid composite propellant.

3.2.4.3.1 Inert Solid Fuels for Hybrid Systems

Hybrid propellant systems utilize a liquid oxidizer, such as LO_2 or N_2O, in combination with a solid fuel that consists primarily of an inert hydrocarbon, such as hydroxyl-terminated polybutadiene, acrylonitrile butadiene styrene and nylon. As such, solid fuels for hybrid systems can be stored within or near the RLV's hangar facilities with little additional protection required. However, the storage area should be kept free of concentrated oxidizers.

3.2.4.3.2 Solid Propellants

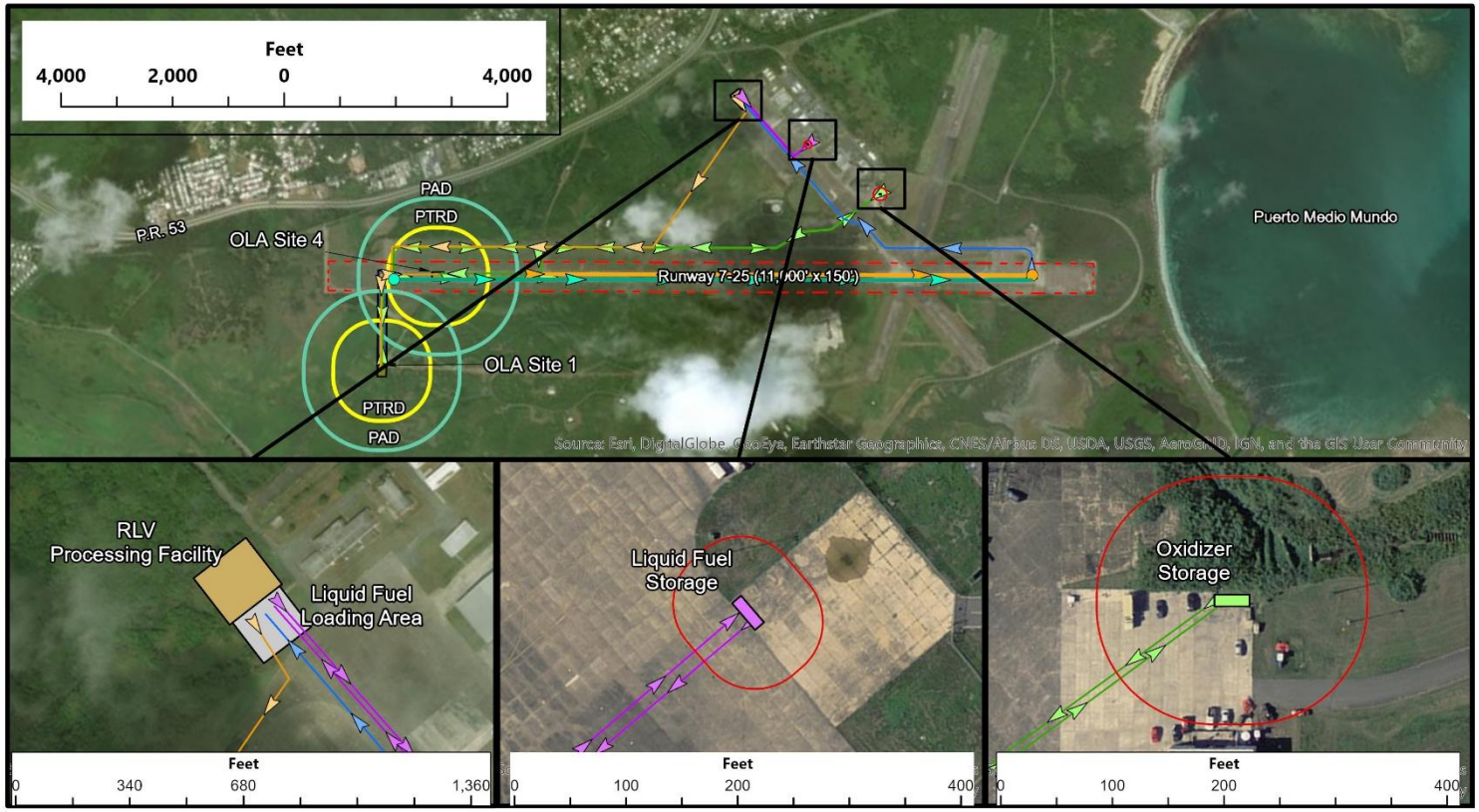
Solid propellant systems are those where the fuel, oxidizer, and a binder combine to create a solid propellant. The PAD, PTRD, and ILD separation distances for solid propellants are smaller than liquid propellant combinations with the same NEWQD. Often, solid propellants require storage with strict environmental constraints including temperature and humidity.

3.2.4.4 Fuel Loading Area

As outlined in Section 3.3, the expected launch vehicle CONOPS for a liquid and hybrid LV is that the fuel would be loaded prior to the oxidizer. Once loaded, the launch vehicle would travel to the location designated for oxidizer loading, and subsequent passenger loading, if applicable.

Most liquid and solid fuels will be loaded onto the launch vehicle either within the hangar and processing facility or on the apron near it. Liquid hydrogen is an exception. Due to larger separation distances, LH_2 would be required to be loaded at the OLA prior to oxidizer arrival.

FIGURE 3-3
CONCEPTUAL EXPLOSIVE SITE PLAN



Legend

- Liquid Fuel Storage Area
- Oxidizer Storage Area
- RLV Processing Facility
- RLV Processing Facility Apron
- Oxidizer Loading Area (OLA)
- OLA Taxiway
- RLV Departure Taxi Route
- RLV Arrival Taxi Route
- Liquid Propellant Transport Route
- Oxidizer Transport Route
- RLV Takeoff
- RLV Landing
- PAD
- PTRD
- Incompatible Intraline Distance (ILD)
- Runway Safety Area (RSA)

Source: RS&H, 2019; ESRI, 2019

3.3 SPACEPORT CONCEPT OF OPERATIONS

When developing a concept of operations (CONOPS), each potential vehicle type to use the spaceport must be considered. The concept of operations section is organized into two different vehicle types: Suborbital Launch Vehicles and Orbital Launch Vehicles.

Suborbital launch vehicles perform missions that do not place payloads into orbit. These missions are typically used for scientific research and space tourism.

Orbital launch vehicles perform missions that do place payloads into orbit. These missions are typically used for placing earth sensing, communications, and experiment satellites into a desired orbit for a desired duration. An expendable upper stage for payload orbital insertion may be required.

3.3.1 Suborbital Launch Vehicles

The proposed CONOPS for suborbital RLVs at Jose Aponte de la Torre Airport is expected to align with the general process outlined below, illustrated in *Figure 3-4*.

3.3.1.1 Take-off

1. A payload (if applicable) is processed and integrated with the RLV at a facility at the spaceport or offsite.
2. Final checkout and processing of the RLV occurs at the RLV operator's facility (or other facility as required).
3. Liquid fuel tankers arrive from fuel storage area.
4. The RLV is loaded with liquid fuel on the apron. Solid and hybrid fuel systems may be installed inside the RLV operator's hangar.
5. The RLV taxis or is towed to the oxidizer loading area (OLA).
6. Oxidizer tanker trucks arrive from the oxidizer storage area to fuel RLV.
7. Oxidizer is loaded and RLV safety checks are performed, as required.
8. Spaceflight participant(s) board the RLV, if applicable.
9. Clearance for takeoff is received.
10. The RLV taxis or is towed to Runway 7 for takeoff.

3.3.1.2 Recovery

1. The RLV lands and exits the runway. Remaining oxidizer is vented, made inert, or otherwise safe as identified in the concept of operations of the specific vehicle, and the vehicle is placed into a safe condition.
2. The RLV taxis (or is towed) back to the RLV operator's facility, where passengers are unloaded (if applicable).

3.3.2 Orbital Launch Vehicles

The proposed CONOPS for Orbital RLVs at Jose Aponte de la Torre Airport is expected to align with the same general process outlined above, and as illustrated in *Figure 3-4*.

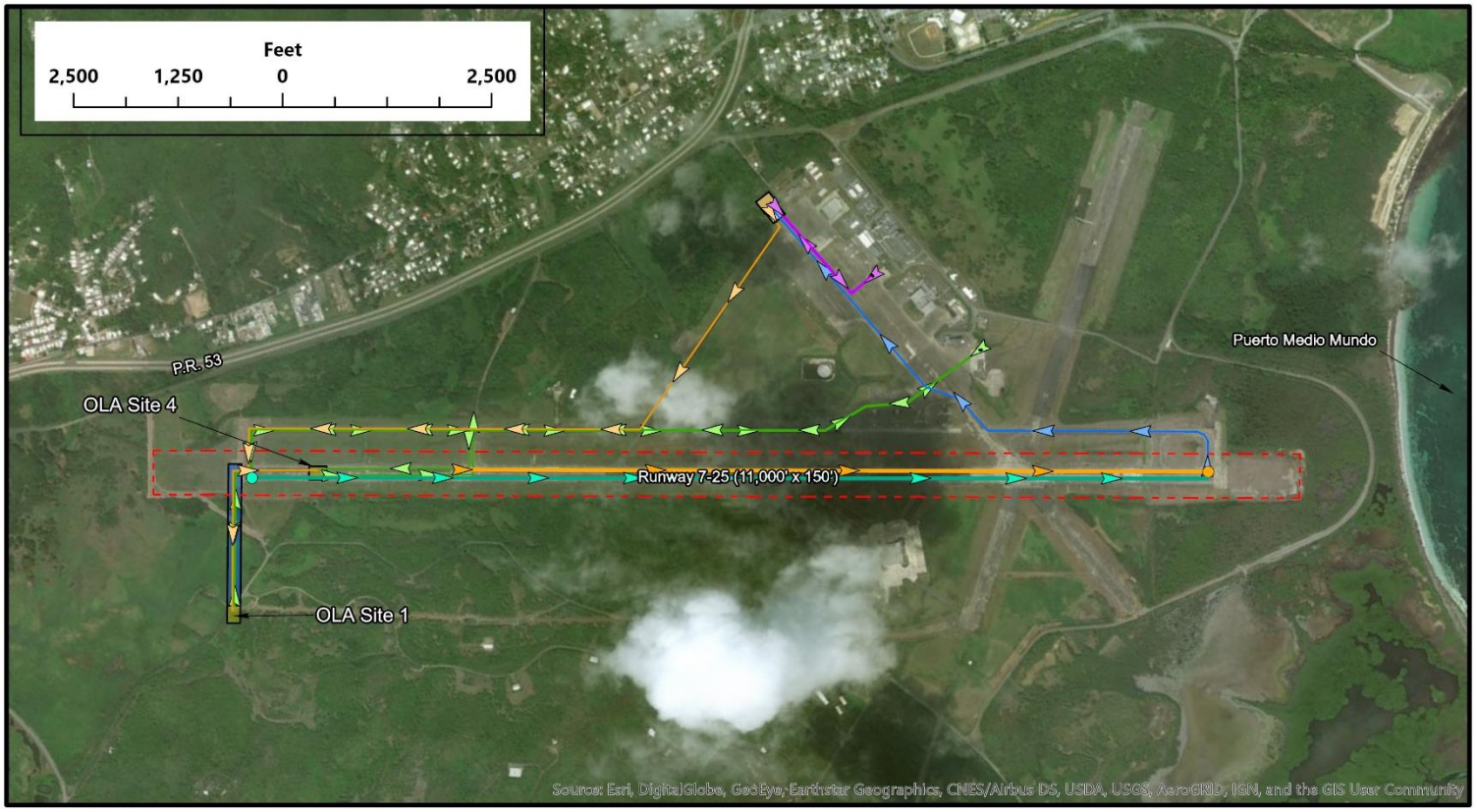
3.3.2.1 Take-off

1. The orbital payload is process and integrated to the orbital rocket stage at a facility at the spaceport or offsite.
2. The orbital stage is integrated to the RLV.
3. Final checkout and processing of the RLV occurs at the RLV operator's facility (or other facility as required).
4. Liquid fuel tankers arrive from fuel storage area.
5. The RLV is loaded with liquid fuel on the apron. Solid and hybrid fuel systems may be installed inside the RLV operator's hangar.
6. The RLV taxis (or towed) to the oxidizer loading area (OLA).
7. Oxidizer tanker trucks arrive from the oxidizer storage area to fuel RLV.
8. Oxidizer is loaded and RLV safety checks are performed, as required.
9. Spaceflight participant(s) then board the RLV, if applicable.
10. Clearance for takeoff is received.
11. The RLV taxis or is towed to Runway 7 for takeoff.

3.3.2.2 Recovery

1. During the mission, the orbital stage is released and delivers payload to orbit. This stage is expended and not reused.
2. The carrier vehicle lands and exits the runway like a normal aircraft.
3. The carrier vehicle taxis back to the RLV operator's facility

FIGURE 3-4
GENERAL CONCEPT OF OPERATIONS



Legend

- Liquid Fuel Storage Area
- Oxidizer Storage Area
- RLV Processing Facility
- RLV Processing Facility Apron
- Oxidizer Loading Area (OLA)
- OLA Taxiway
- RLV Departure Taxi Route
- RLV Arrival Taxi Route
- Liquid Propellant Transport Route
- Oxidizer Transport Route
- RLV Landing
- RLV Takeoff
- Runway Safety Area (RSA)

Concept of Operations Summary

A - Processing Payload / Fuel Loading
B - Oxidizer Transport
C - Oxidizer Loading
D - Take-Off
E - Landing
F - Offloading

Source: RS&H, 2019; ESRI, 2019

CHAPTER 4

FLIGHT CORRIDOR AND AIRSPACE ANALYSIS

4.1 INTRODUCTION

This chapter reviews airspace within the vicinity of Jose Aponte de la Torre Airport to identify potential horizontal launch vehicle operating areas, identify potential airspace concerns associated in reaching designated operating areas, and identification of key airspace stakeholders that would need to be involved in future airspace planning.

4.2 TYPICAL MISSION

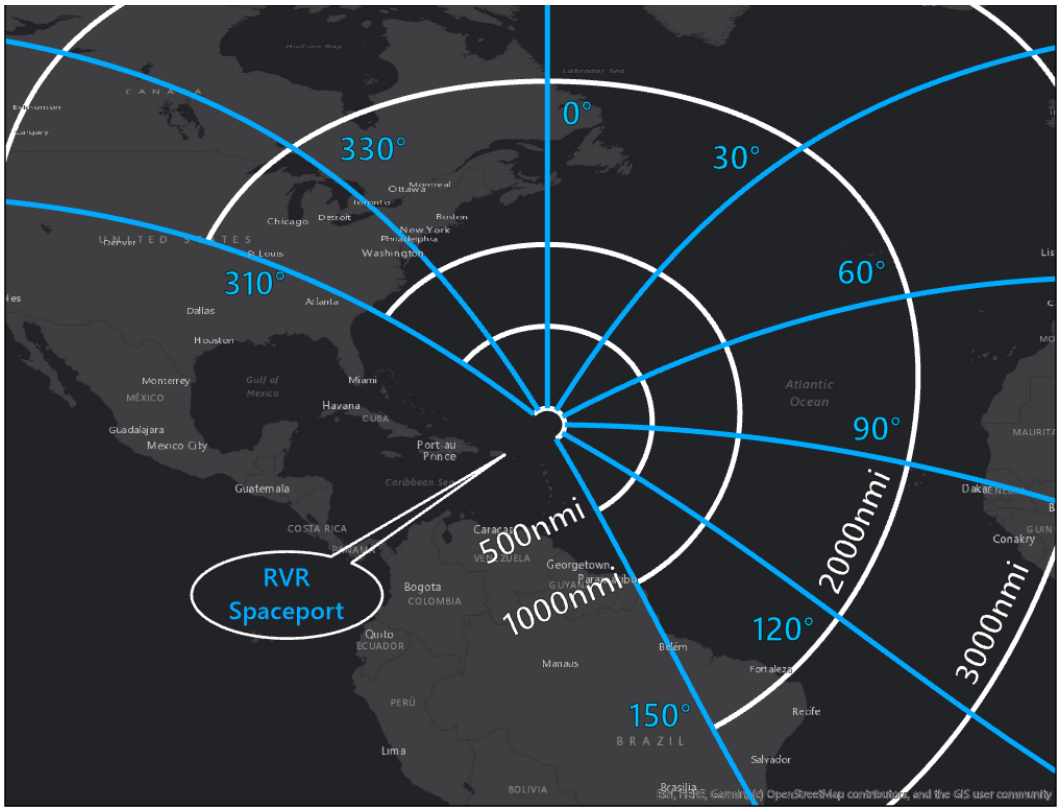
The primary type of operations anticipated for the potential spaceport involve a carrier aircraft and an attached launch vehicle, which FAA terms a Concept Z vehicle. The point at which the launch vehicle detaches and its rocket engines ignite is called the ignition point. An ignition point 200 nautical miles northeast of RVR was used to determine airspace compatibility.

Launch operations will induce temporary flight restrictions (TFR) along the launch vehicle's route of flight. Airports reviewed to determine impacts from the TFR are Luis Munoz Marin International Airport (SJU/TJSJ), Cyril E King Airport (STT/TIST), Antonio Rivera Rodriguez Airport (VQS/TJVQ), and Benjamin Rivera Noriega Airport (CPX/TJCP).

4.2.1 Review of Potential Azimuths

An ignition point 200 nm northeast of RVR is shown in *Figure 4-1* for a conceptual launch operation. From that ignition point, useful launch azimuths are available from 0° to 120°, which avoids populated areas and enables stage drops. The range of azimuths is shown in *Figure 4-1*. Because of the large range in launch azimuths, this location can provide access to all common orbit inclinations. Depending on the mission and risk associated with specific launch azimuths, a launch vehicle operator may choose other ignition points.

FIGURE 4-1
200 NAUTICAL MILE LAUNCH AZIMUTHS



Source: RS&H, 2019

4.3 AIRSPACE ANALYSIS

4.3.1 Review of Published Procedures

Launch operations have the potential to put temporary limitations on the use of surrounding airspace by aircraft. During launch activities, segments of airspace typically are closed to other air traffic. For that reason, it is necessary to assess the impact of potential horizontal launch vehicle operations on adjacent airspace and nearby airports.

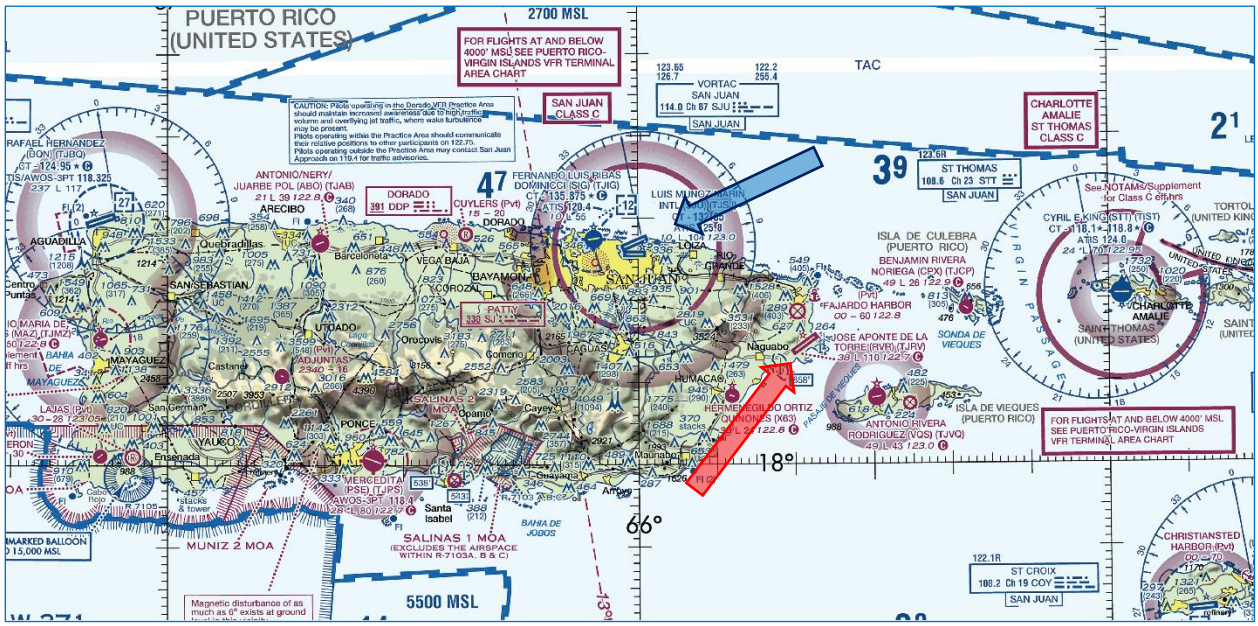
This analysis identifies the potential impact of launch activities on aircraft operations at Luis Munoz Marin International Airport (SJU/TJSJ), Cyril E King Airport (STT/TIST), Antonio Rivera Rodriquez Airport (VQS/TJVQ), and Benjamin Rivera Noriega Airport (CPX/TJCP). In addition, this analysis identifies the potential effect of launch activities to the El Yunque National Forest Flight Avoidance Area, located west of Jose Aponte de la Torre Airport.

The airspace analysis included departure routes, standardized instrument approach procedures, and standard terminal arrival routes. Even though horizontal launch vehicle operations are likely to occur only in VFR conditions, this approach was taken because many pilots use published approach and departure procedures to aid in navigation, even when they are operating in visual meteorological conditions.

4.3.2 Luis Munoz Marin International Airport (SJU)

The proximity of RVR to SJU (24 nm) means air traffic arriving SJU from the east and departing SJU to the east may be affected by a TFR associated with horizontal launch vehicle operations. The impact is anticipated to be minimal, given the locations of the two airports and the expectation that horizontal launch vehicle operations will take place to the northeast, over the Atlantic Ocean. *Figure 4-2* shows the locations of SJU and RVR, depicted on an excerpt from the Caribbean 2 Sectional chart. All published Standard Terminal Arrival Routes (STAR), departure procedures (DP), and instrument approach procedures (IAP) for SJU were reviewed.

FIGURE 4-2
RVR LOCATION RELATIVE TO LUIS MUNOZ MARIN CLASS C AIRSPACE



Note: Red arrow depicts location of RVR, blue arrow depicts location of SJU.
Source: FAA, 2019

SJU has five published STAR procedures, nine departure procedures, and five instrument approach procedures. Shown in *Table 4-1*, one STAR procedure, three departure procedures, and one instrument approach procedure are anticipated to be impacted by horizontal launch vehicle operations.

TABLE 4-1
LUIS MUNOZ MARIN INTERNATIONAL AIRPORT PUBLISHED PROCEDURES

SJU Chart Data		
TYPE	NAME	IMPACTED
STAR	CHAKA FOUR	YES
	TROCO THREE	NO
	JOSHE THREE	NO
	SAALR TWO	NO
	BEANO THREE	NO
DP	SNGRA TWO	YES
	JETSS ONE	YES
	HAMAR TWO	YES
	CRSTL ONE	NO
	VERMO FIVE	NO
	JAAWS ONE	NO
	GLADA THREE	NO
	GANBO ONE	NO
	ACONY THREE	NO
IAP	RNAV (GPS) RWY 26	NO
	ILS or LOC RWY 8	NO
	ILS or LOC RWY 10	NO
	RNAV (GPS) RWY 10	NO
	RNAV (GPS) RWY 8	NO

Source: RS&H, 2019; FAA, 2019

4.3.2.1 SJU Standard Terminal Arrival Routes (STAR)

SJU's five published STAR procedures outline how aircraft flying under IFR approach SJU. Four of the published STARs likely would not be affected by a horizontal launch vehicle-related TFR, but one STAR would.

The CHAKA FOUR Arrival route, shown in *Figure 4-3*, provides a standardized approach to SJU from the east for propeller aircraft, including turboprops. This published procedure involves flying from the St. Maarten Very High Frequency Omni-Directional Range (VOR) transmitter west to the JUICE intersection, then to the CHAKA intersection, and then to the REKUA waypoint. As shown in *Figure 4-4*, this takes air traffic directly north of RVR and represents a conflict during horizontal launch vehicle operations. Air traffic arriving from the east would need to be rerouted. For example, air traffic from the St. Maarten VOR would fly to the COY VOR, then west to the TUUNA intersection, and north to the PLENA or REKUA waypoints.

FIGURE 4-3
CHAKA FOUR ARRIVAL ROUTE

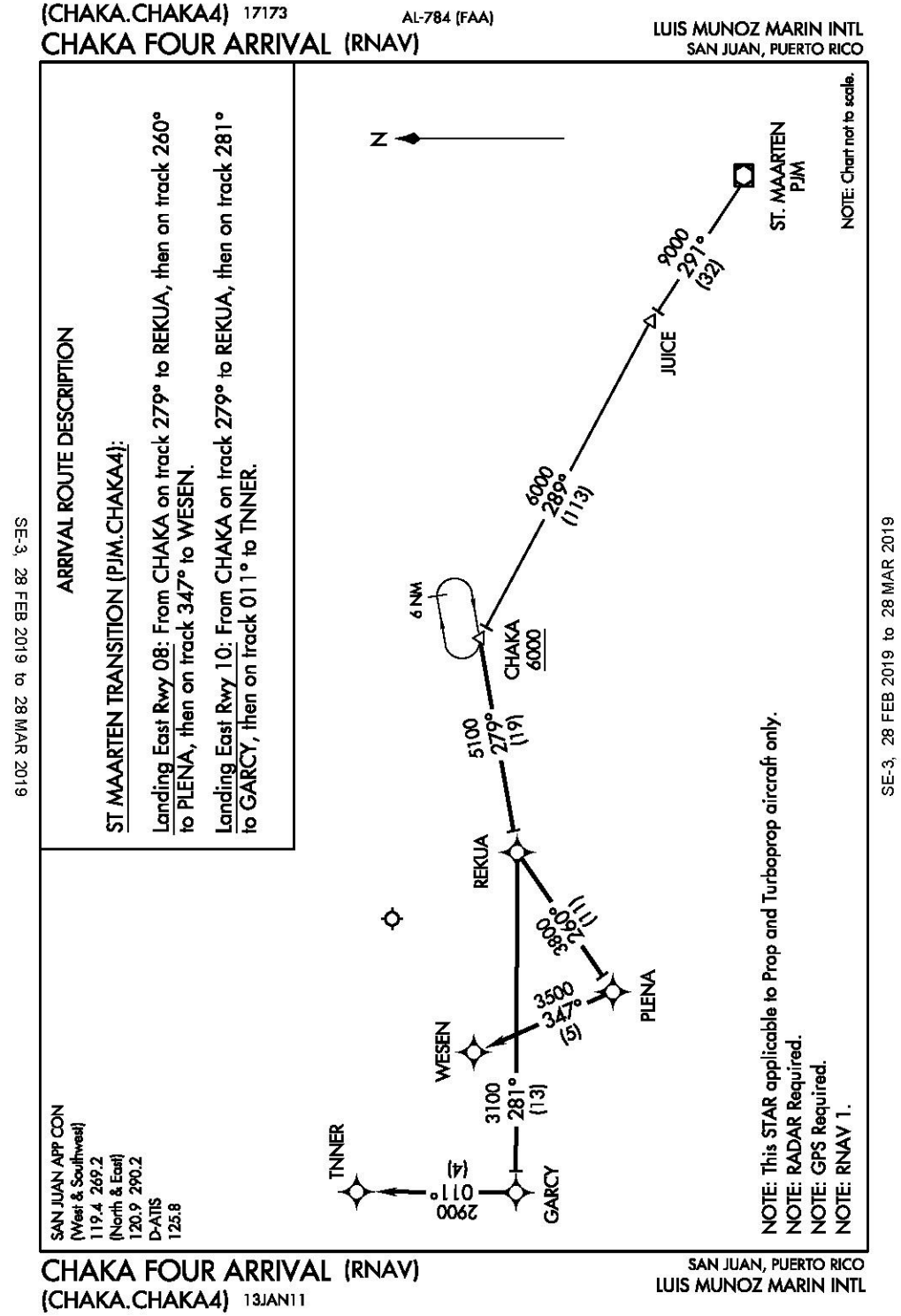
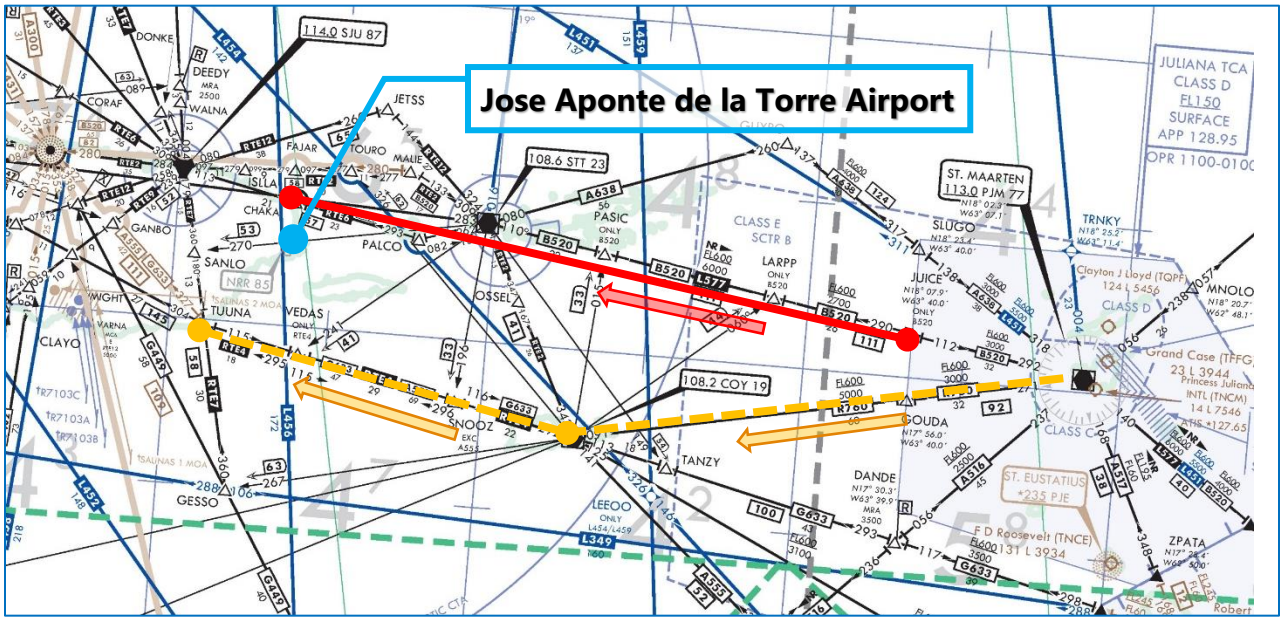


FIGURE 4-4
ALTERNATE CHAKA FOUR ARRIVAL ROUTE



Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019; RS&H, 2019

4.3.2.2 SJU Departure Routes

SJU has nine published departure routes, which outline how aircraft flying under IFR typically depart from SJU. Six of the published departure procedures will not be affected by a horizontal launch vehicle-related TFR, but three would.

The SNGRA TWO Departure, shown in *Figure 4-5*, provides a standardized departure from SJU to the east for propeller aircraft, including turboprops. The published procedure involves flying from the SNGRA waypoint east to the CHAKA intersection, then to either the SLUGO or JUICE intersections or the COY VOR. As shown in *Figure 4-6*, this takes traffic directly north of the Airport and represents a conflict during horizontal launch vehicle operations. Air traffic departing to the east would need to be routed differently, for example, from SNGRA to TUUNA, then east to SLUGO or JUICE, or the COY VOR.

FIGURE 4-5
SNGRA TWO DEPARTURE PROCEDURE

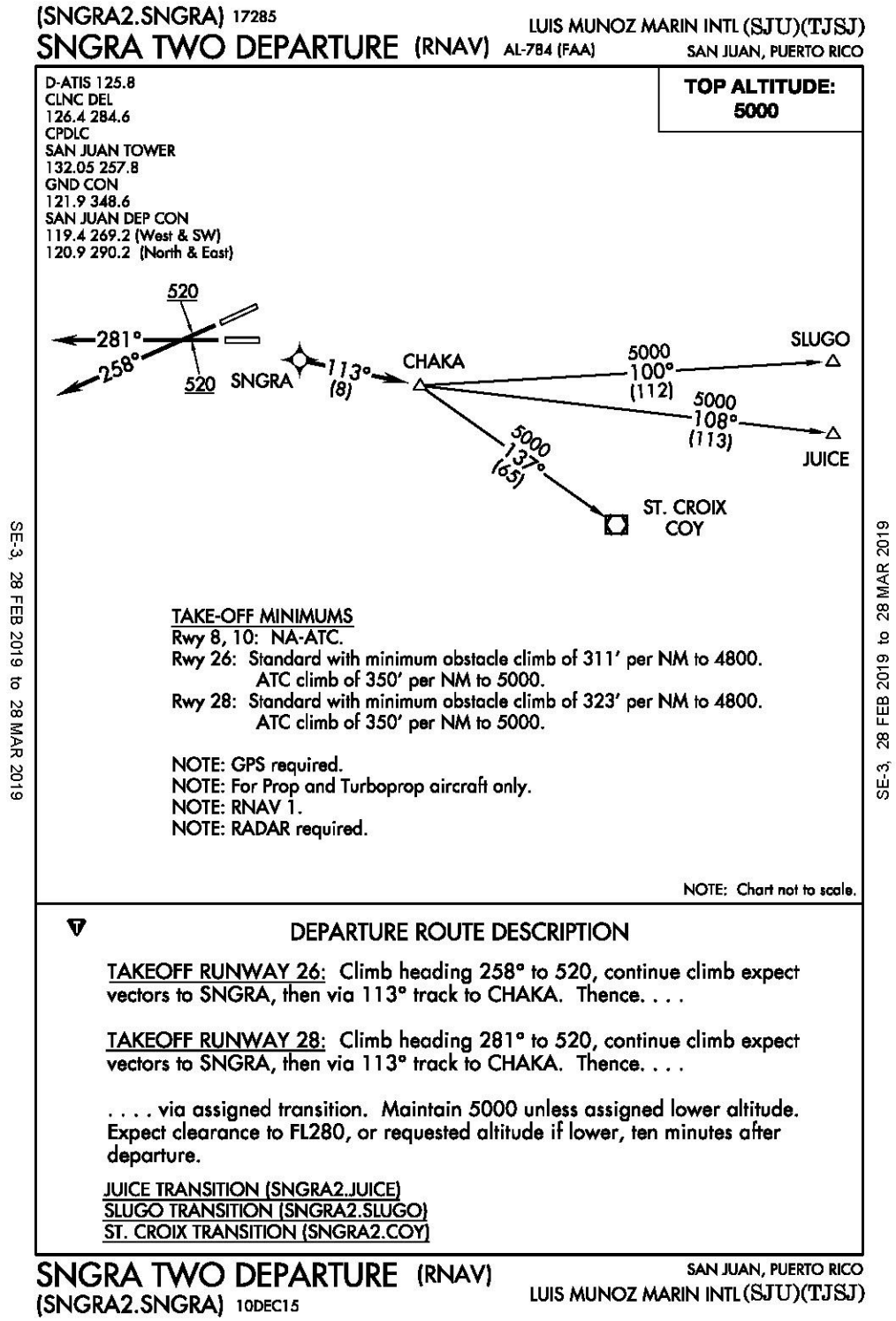
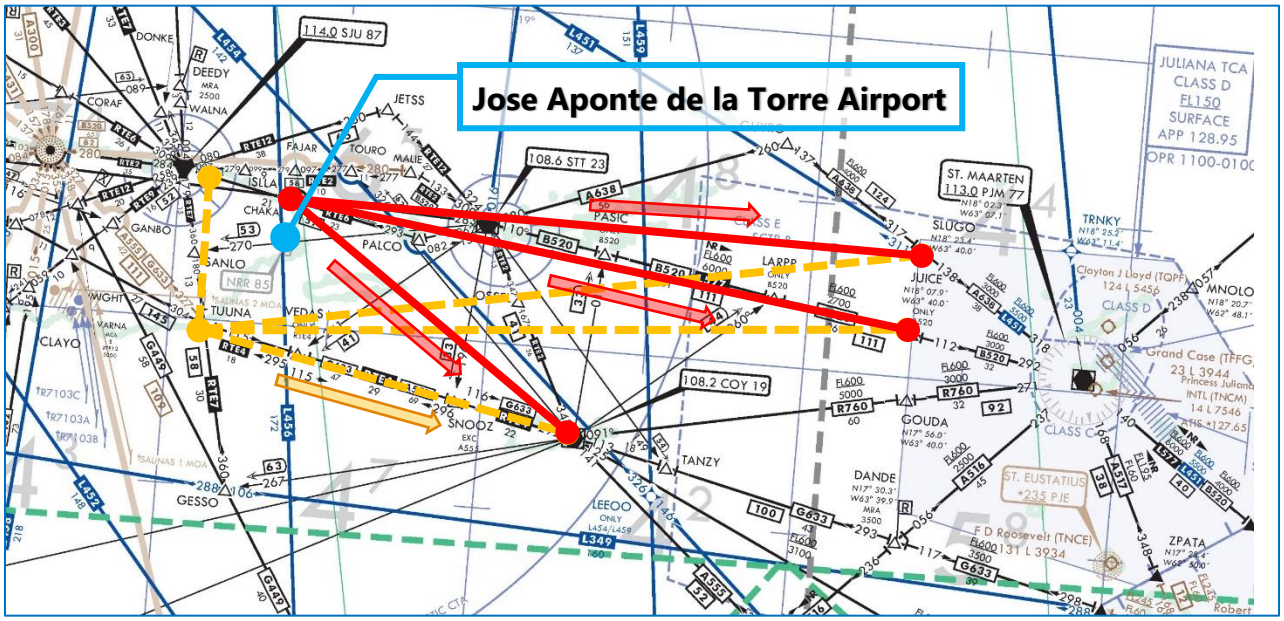


FIGURE 4-6
ALTERNATE SNGRA TWO DEPARTURE PROCEDURE



Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019; RS&H, 2019

The JETSS ONE Departure, shown in *Figure 4-7*, provides a standardized departure from SJU to the east. The published procedure involves flying from the SJU VOR east to the JETSS intersection, then proceeding to either SLUGO or JUICE, or the COY VOR. As shown in *Figure 4-8*, this takes traffic directly north of the Airport and represents a conflict during horizontal launch vehicle operations. Air traffic departing to the east would need to be routed differently than depicted, for example as shown in the alternate route proposed for SNGRA TWO.

FIGURE 4-7
JETSS ONE DEPARTURE PROCEDURE

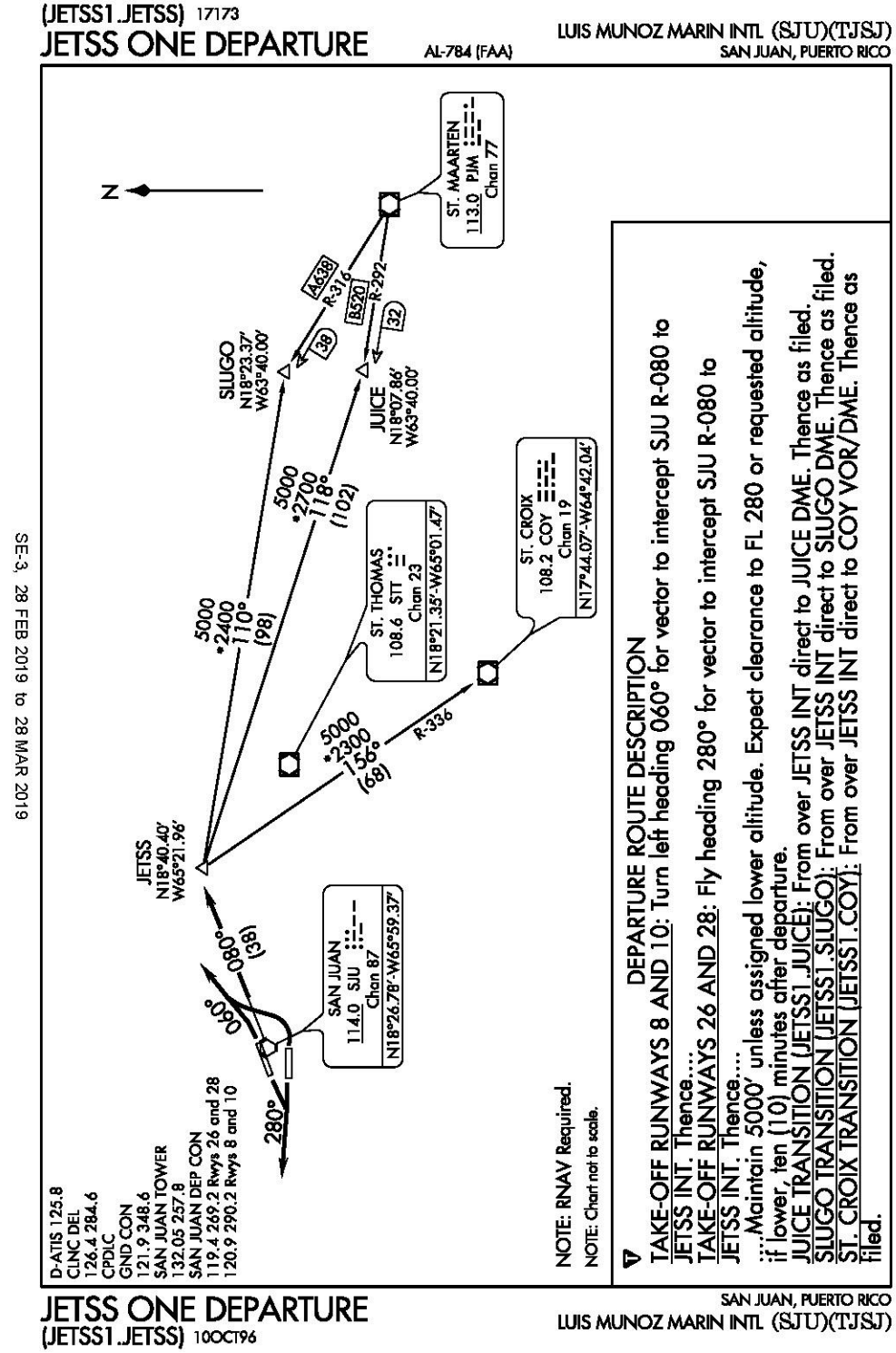
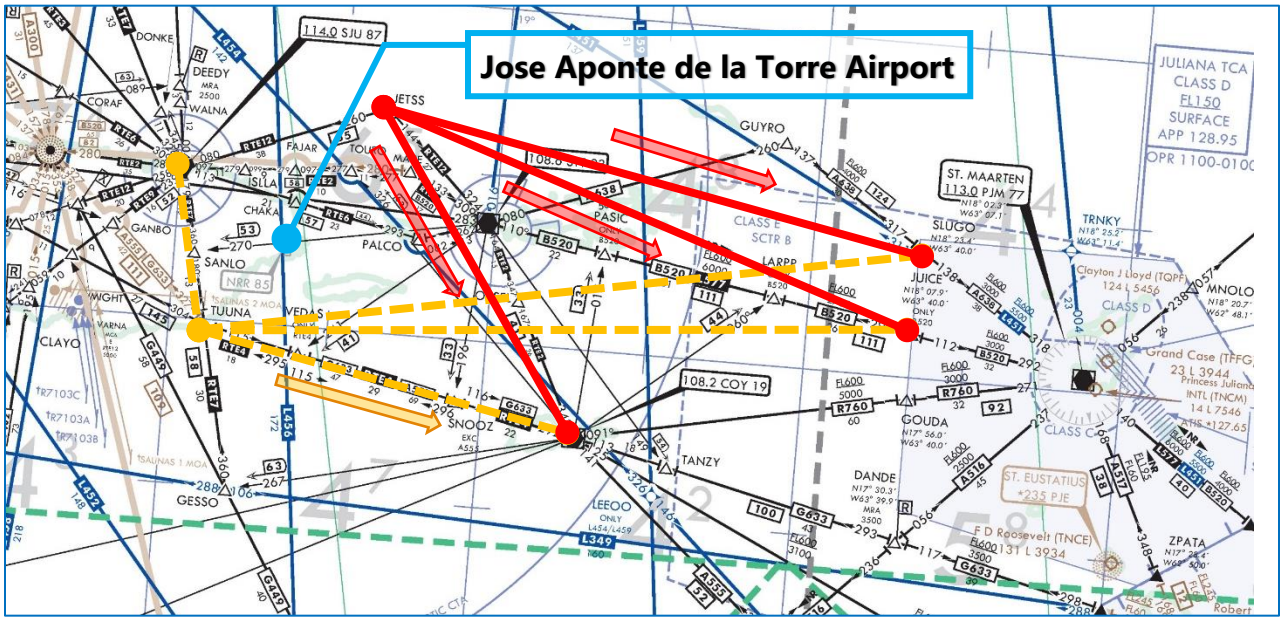


FIGURE 4-8
ALTERNATE JETSS ONE DEPARTURE PROCEDURE



Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019; RS&H, 2019

The HAMAR TWO Departure, shown in *Figure 4-9*, provides a standardized departure from SJU to the east for propeller aircraft, including turboprops. The published procedure involves flying from the HAMAR waypoint east to the NAILL waypoint, and then proceeding to either SLUGO or JUICE, or the COY VOR. As shown in *Figure 4-10*, this takes traffic directly north of the Airport and represents a conflict during horizontal launch vehicle operations. Air traffic departing to the east would need to be routed differently than depicted, potentially similar to the alternate routes proposed for previous departure procedures.

FIGURE 4-9
HAMAR TWO DEPARTURE PROCEDURE

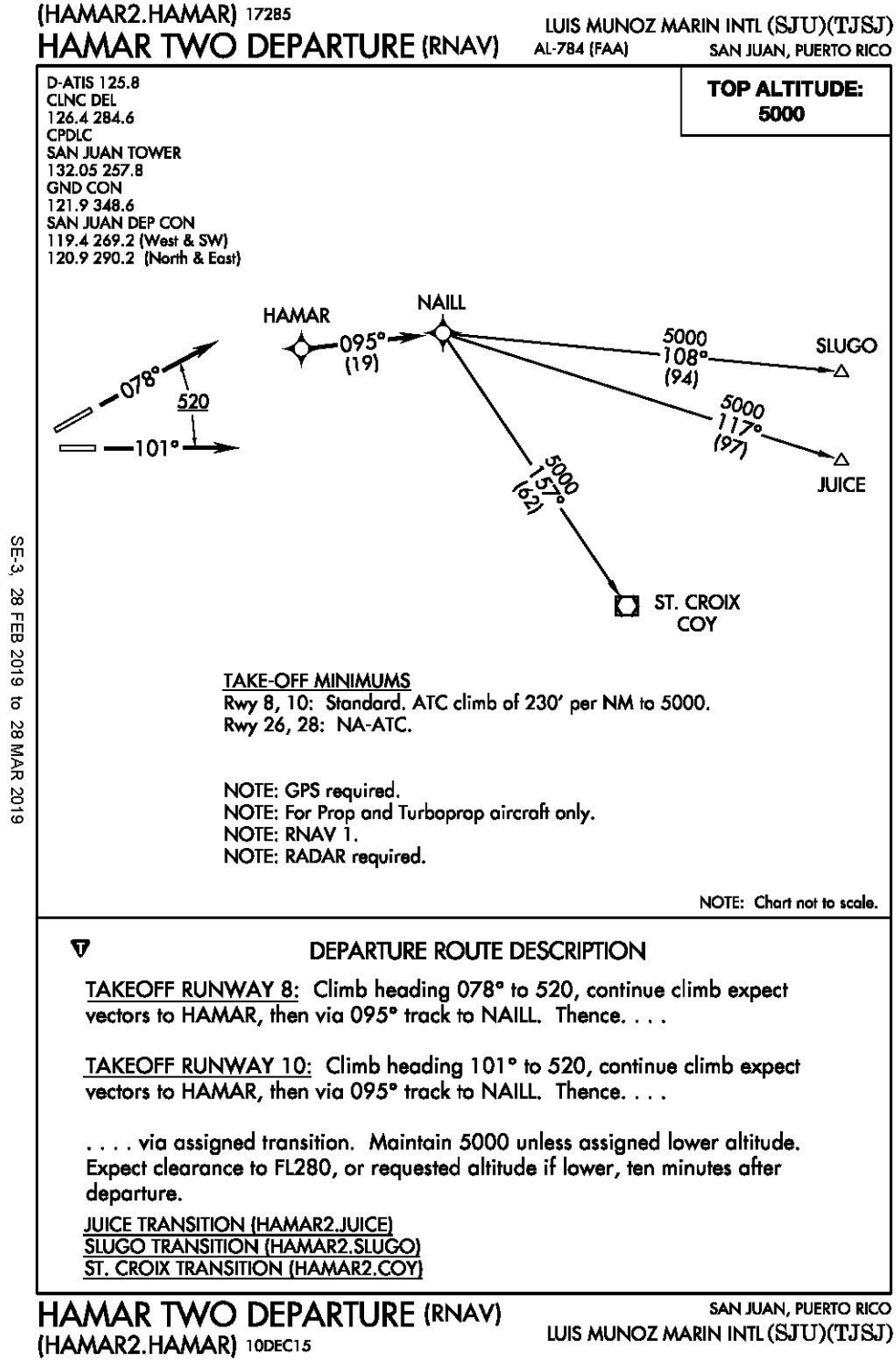
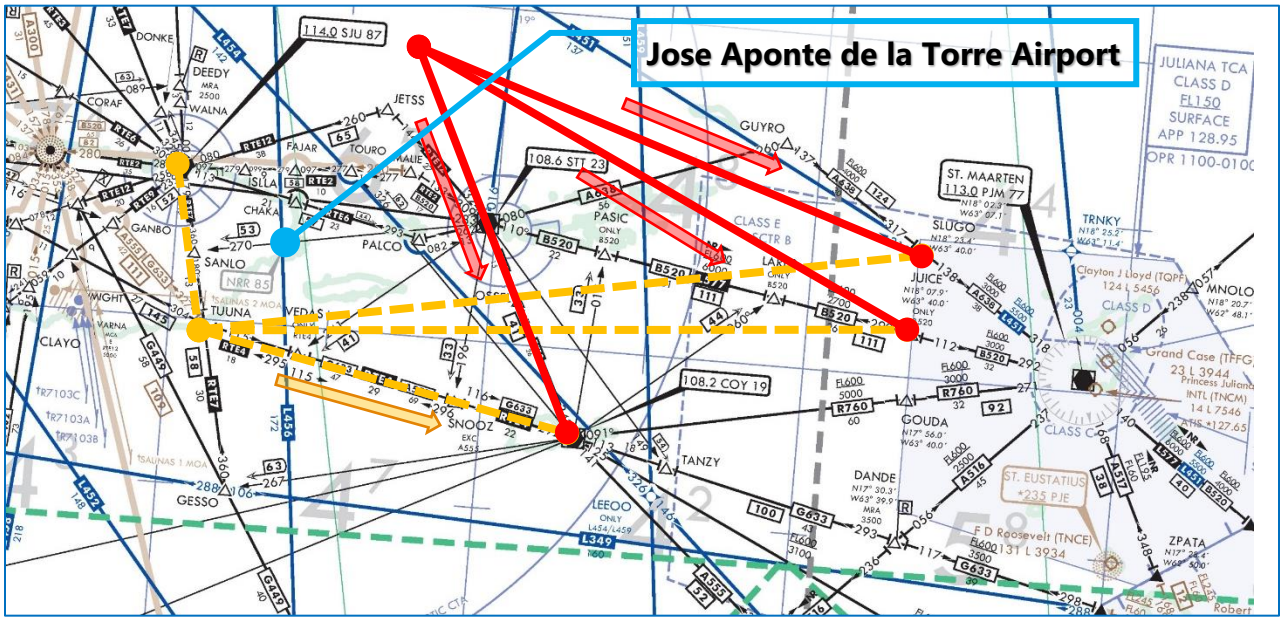


FIGURE 4-10
ALTERNATE HAMAR TWO DEPARTURE PROCEDURE



Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019; RS&H, 2019

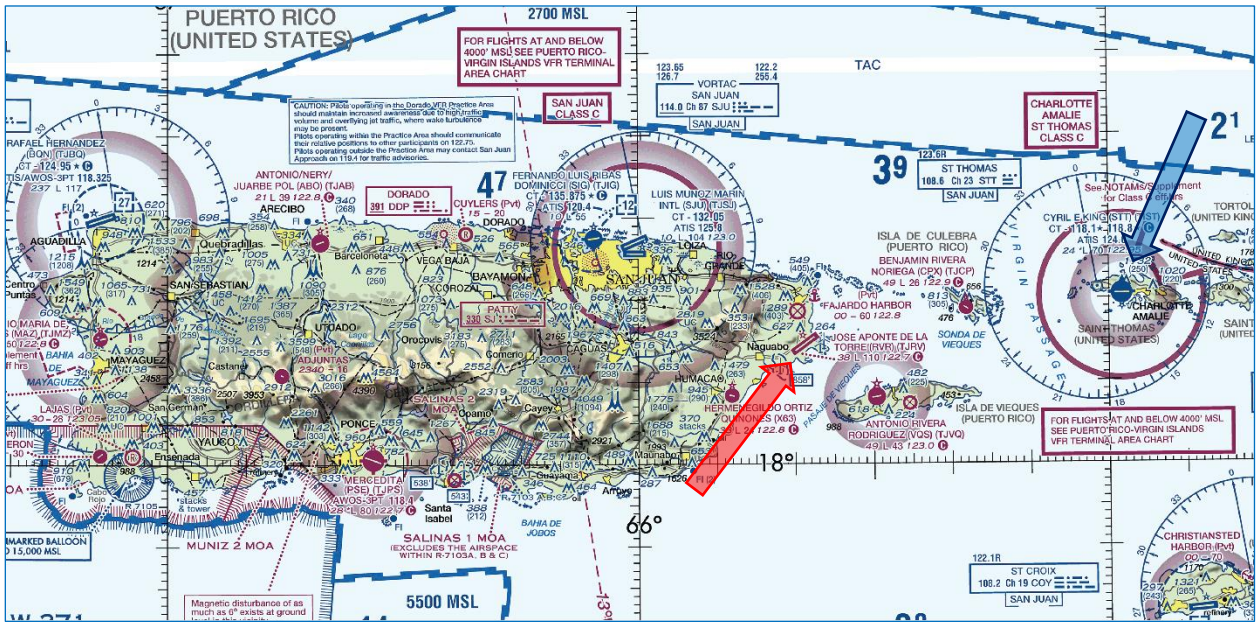
4.3.2.3 SJU Instrument Approach Procedures

A review of published approach procedures was conducted for SJU. Of the five published approach procedures, four begin west and one from the east. No instrument approach procedure is anticipated to be impacted by horizontal launch vehicle operations from Jose Aponte de la Torre Airport.

4.3.3 Cyril E King Airport (STT)

The proximity of RVR to STT (39 nm) means that traffic arriving STT from the west and departing STT to the west may be affected by TFR associated with horizontal launch vehicle operations. The impact is anticipated to be minimal, given the relative locations of the two airports and the intention for launch operations to take place north of both airports, over the Atlantic Ocean. *Figure 4-11* shows the locations of RVR and STT, depicted on an excerpt from the Caribbean 2 Sectional chart. All DP and IAP charts for STT were reviewed. At the time of this writing, no STAR charts exist for STT.

FIGURE 4-11
RVR LOCATION RELATIVE TO CYRIL E KING CLASS C AIRSPACE



Note: Red arrow depicts location of RVR, blue arrow depicts location of STT.
Source: FAA, 2019

STT has one published departure procedure and two instrument approach procedures. Shown in *Table 4-2*, all three published approach procedures are anticipated to be impacted.

TABLE 4-2
CYRIL E KING AIRPORT PUBLISHED PROCEDURES

STT Chart Data		
TYPE	NAME	IMPACTED
DP	PALCO SEVEN	YES
IAP	RNAV (GPS) RWY 10	YES
	ILS or LOC RWY 10	YES

Source: RS&H, 2019; FAA, 2019

4.3.3.1 STT Departure Procedures

STT has one published departure route. The PALCO SEVEN Departure procedure, shown in *Figure 4-12*, is not anticipated to be impacted by launch operations from RVR. However, once an aircraft continues on from the PALCO waypoint during a horizontal launch vehicle operation, diversion to the south would be needed to avoid the TFR in place, shown in *Figure 4-13*.

FIGURE 4-12
PALCO SEVEN DEPARTURE PROCEDURE

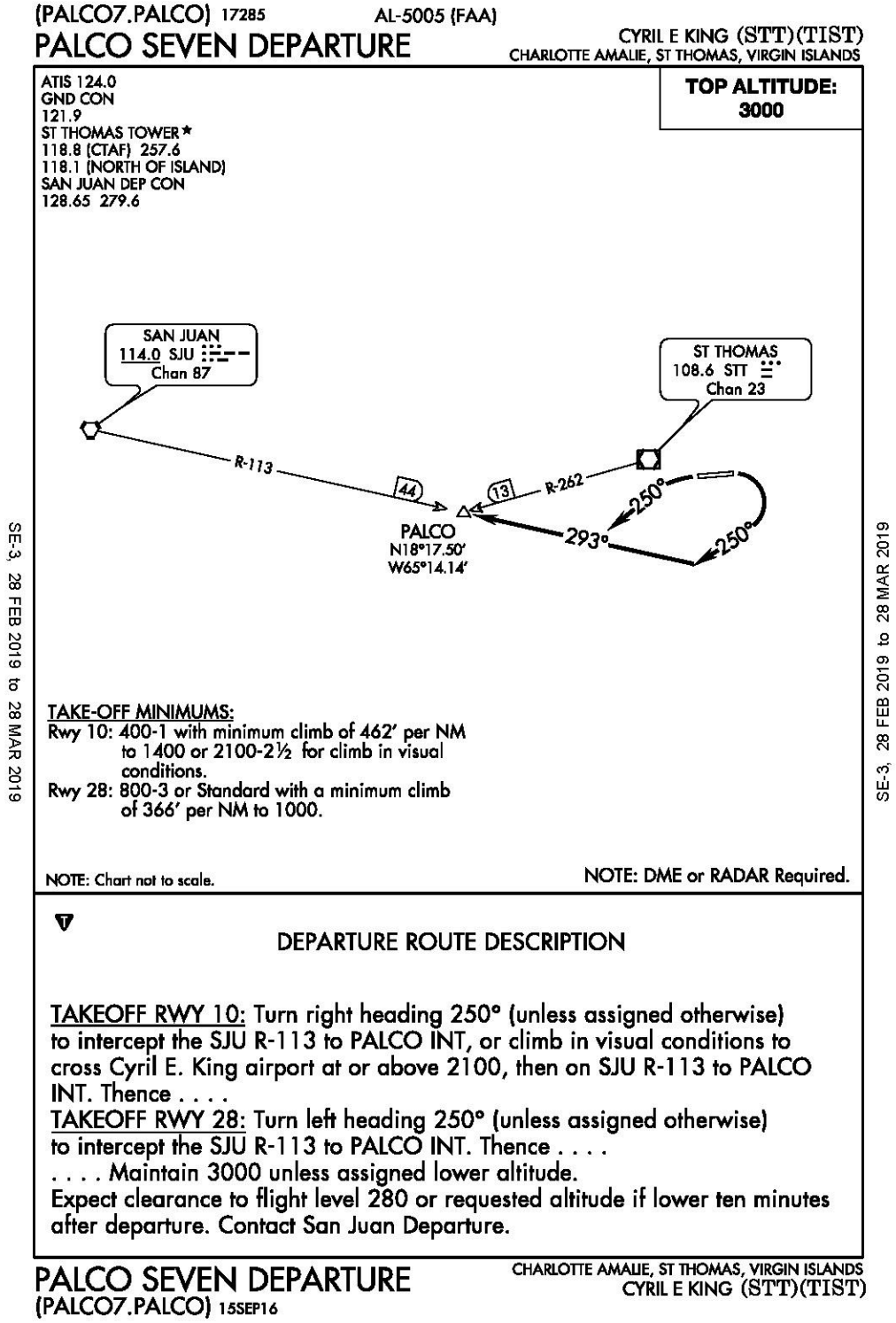
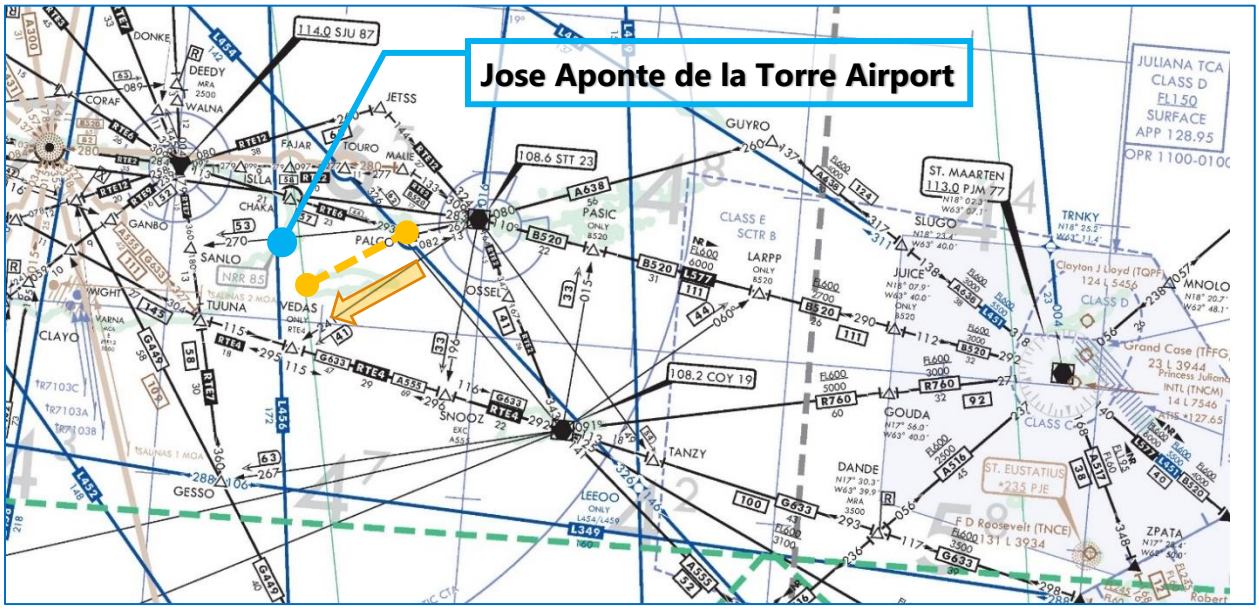


FIGURE 4-13
PALCO SOUTH DIVERSION



Note: Orange dotted line depicts potential alternate route.
Source: FAA, 2019; RS&H, 2019

4.3.3.2 STT Instrument Approach Procedures

STT has three published approach procedures. All procedures begin from the west and could potentially be impacted by horizontal launch vehicle operations from RVR.

An RNAV (GPS) and ILS or LOC for Runway 10, shown in *Figure 4-14* and *Figure 4-15* respectively, provide non-precision instrument approach procedures to STT; the Runway 10 ILS or LOC approach procedure is considered to be two published procedures for one approach. As shown in *Figure 4-16*, both approaches have an IAF at TOURO intersection before proceeding to the KUTHO waypoint. During a horizontal launch vehicle operation, an IAF at TOURO represents a conflict and radar vectors south of RVR and then to KUTHO would be necessary.

FIGURE 4-14
RNAV (GPS) RWY 10 INSTRUMENT APPROACH PROCEDURE

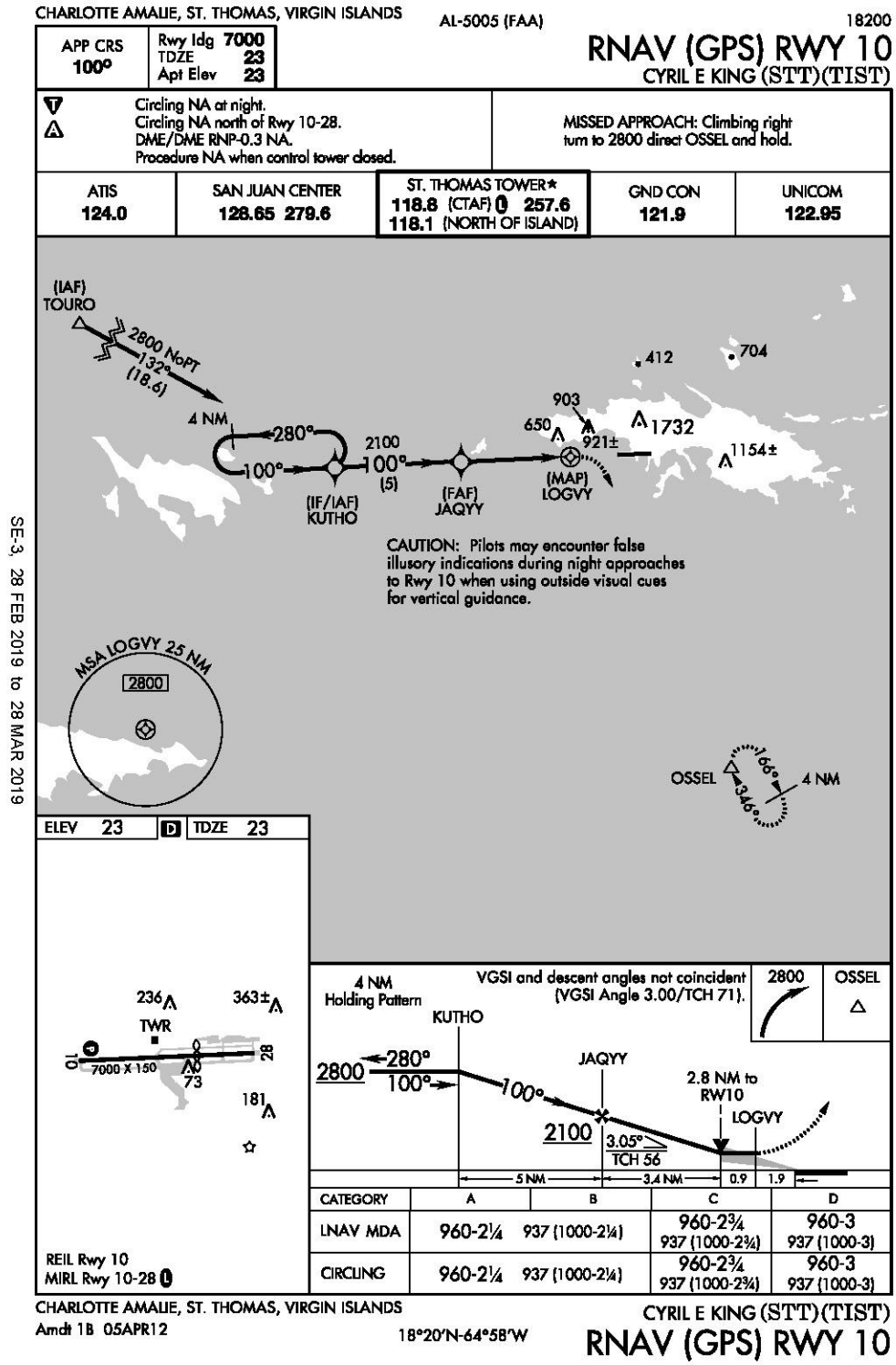


FIGURE 4-15
ILS OR LOC RWY 10 INSTRUMENT APPROACH PROCEDURE

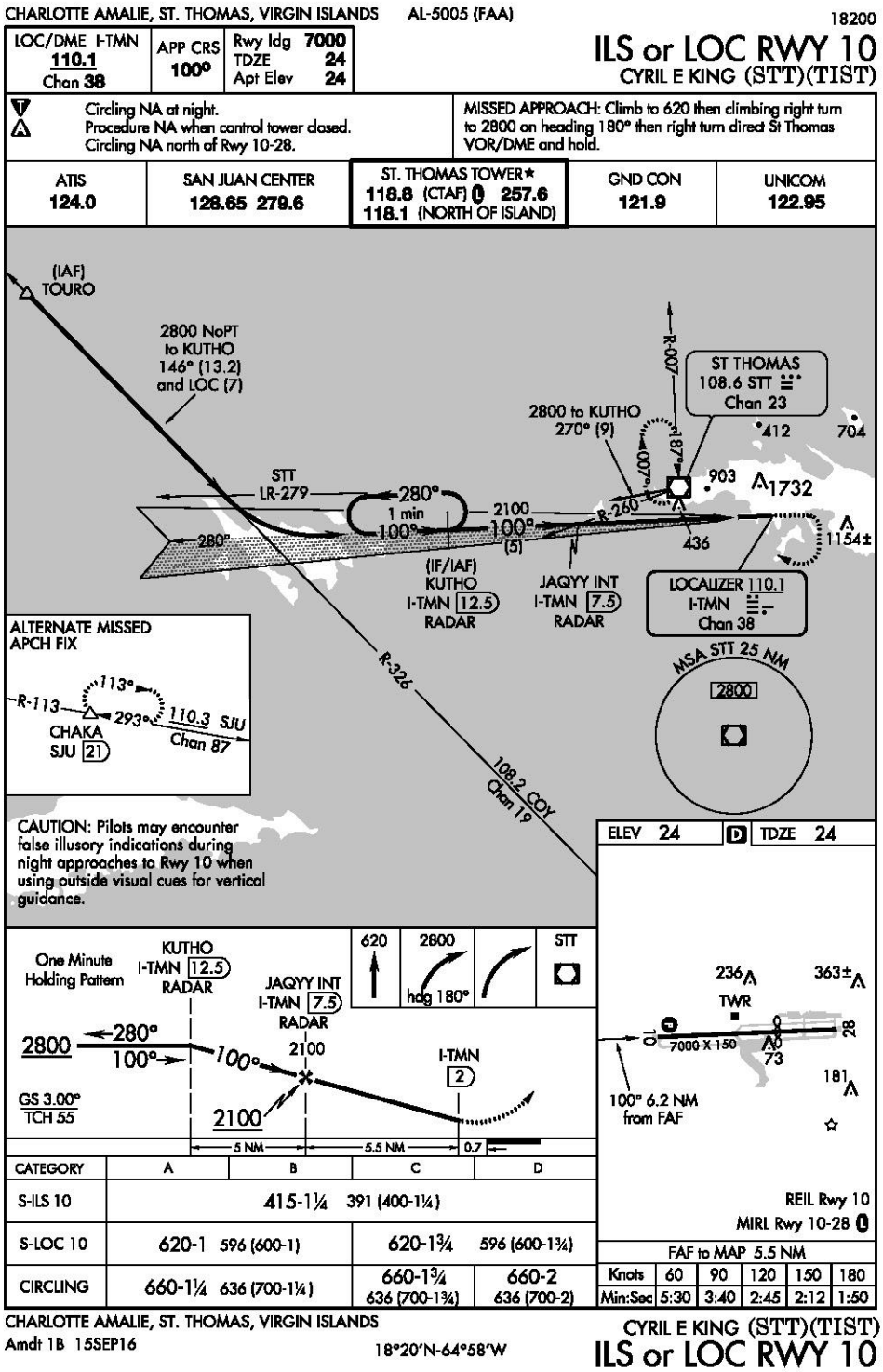
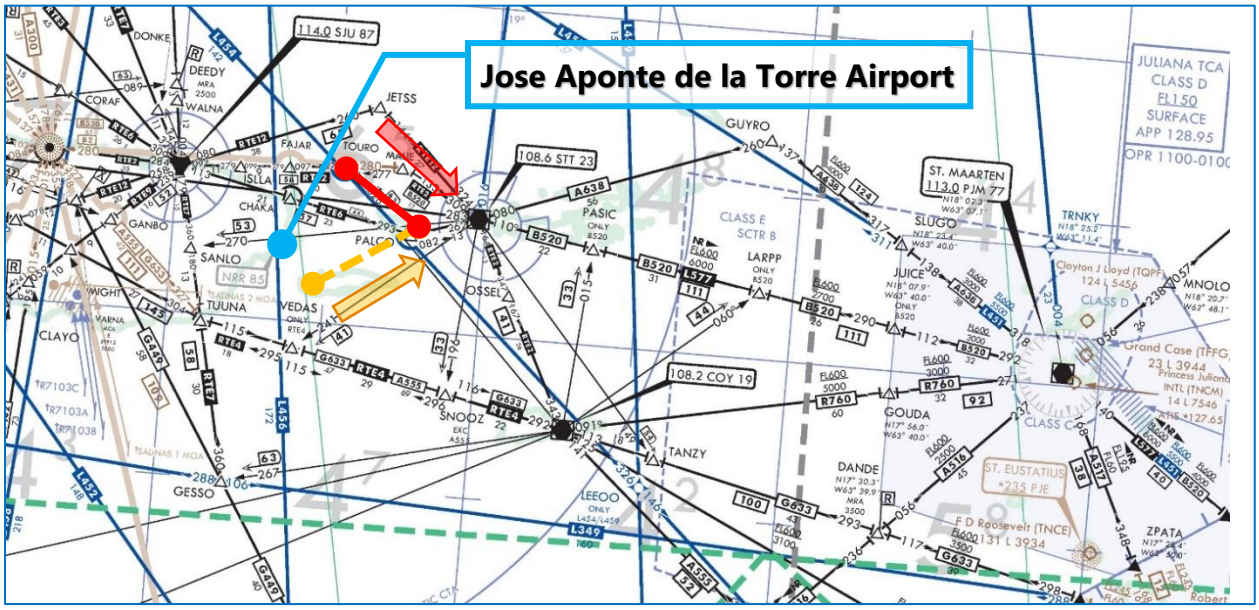


FIGURE 4-16
TOURO TO KUTHO INSTRUMENT APPROACH SEGMENT



Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019

A VOR instrument approach procedure, shown in *Figure 4-17*, provides a circling approach to Cyril E King Airport via the STT VORTAC. As shown in *Figure 4-18*, the procedure has an IAF at MALIE intersection before proceeding to DRINK intersection, then on to STT VORTAC. During a horizontal launch vehicle operation, an IAF at MALIE represents a conflict and radar vectors south of RVR and then to STT VORTAC would be necessary.

FIGURE 4-17
STT VOR A INSTRUMENT APPROACH PROCEDURE

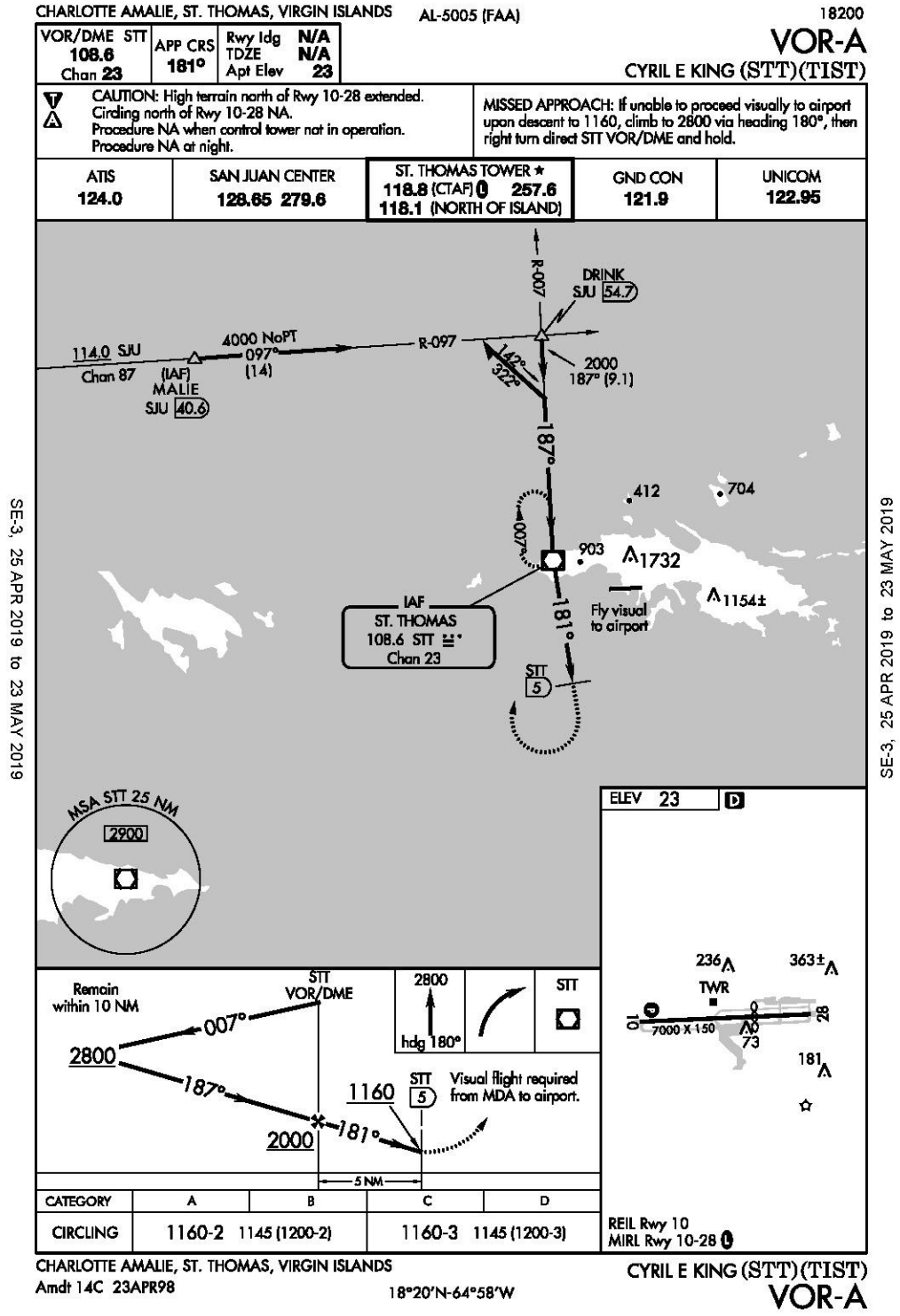
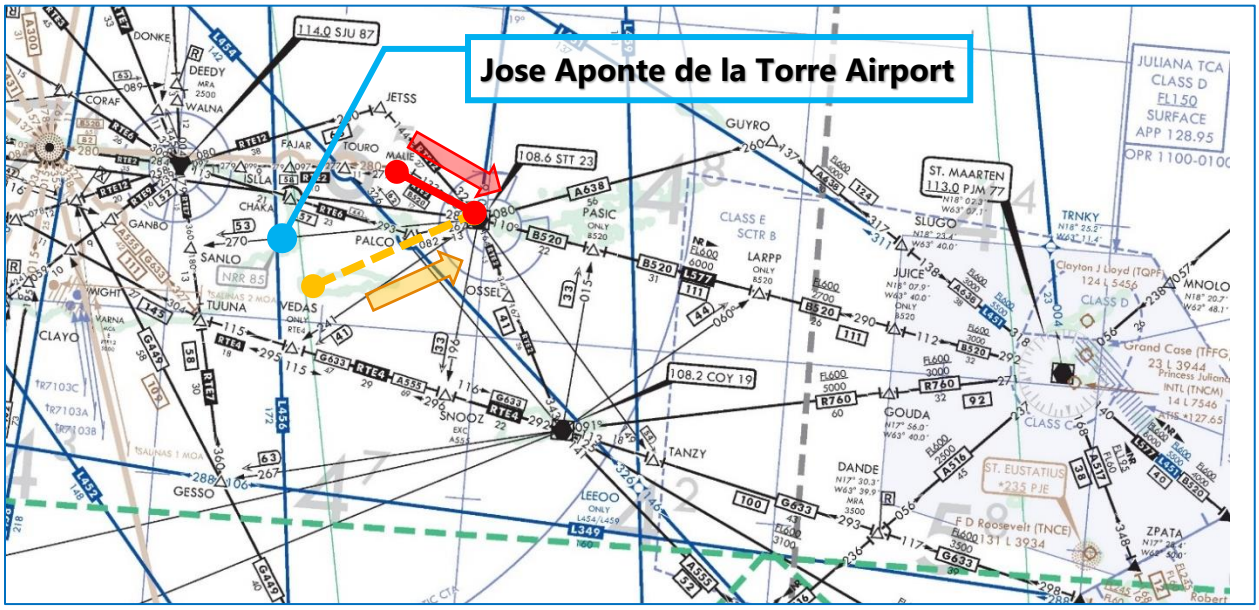


FIGURE 4-18
MALIE TO STT VORTAC INSTRUMENT APPROACH SEGMENT



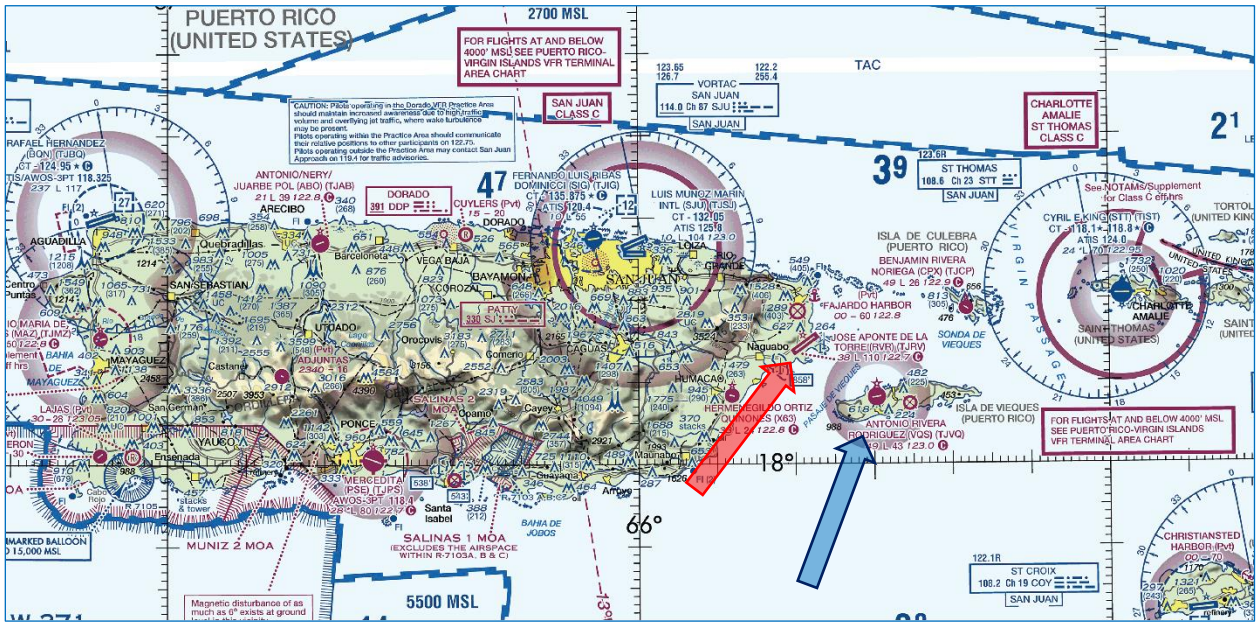
Note: Red line depicts route with launch conflict, orange dotted line depicts potential alternate route.
Source: FAA, 2019

4.3.4 Antonio Rivera Rodriguez Airport (VQS)

The proximity of RVR to VQS (11 nm) means that traffic arriving or departing from VQS may be affected by TFR associated with horizontal launch vehicle operations from RVR. The impact is anticipated to be minimal, given the relative locations of the two airports and the expectation that horizontal launch vehicle operations will take place to the north, over the Atlantic Ocean.

Figure 4-19 shows the locations of RVR and VQS, depicted on an excerpt from the Caribbean 2 Sectional chart. All published DP and IAP charts for VQS were reviewed. At the time of this writing, no STAR procedures exist for VQS.

FIGURE 4-19
RVR LOCATION RELATIVE TO ANTONIO RIVERA RODRIGUEZ CLASS E AIRSPACE (VFR)



Note: Red arrow depicts location of Jose Aponte de la Torre Airport, blue arrow depicts location of Antonio Rivera Rodriguez Airport.
Source: FAA, 2019; RS&H, 2019

VQS has one published departure procedure and one instrument approach procedure. Shown in *Table 4-3*, no published procedures are anticipated to be impacted.

TABLE 4-3
ANTONIO RIVERA RODRIGUEZ AIRPORT PUBLISHED PROCEDURES

VQS Chart Data		
TYPE	NAME	IMPACTED
DP	VEDAS FOUR	NO
IAP	RNAV (GPS) RWY 9	NO

Source: RS&H, 2019; FAA, 2019

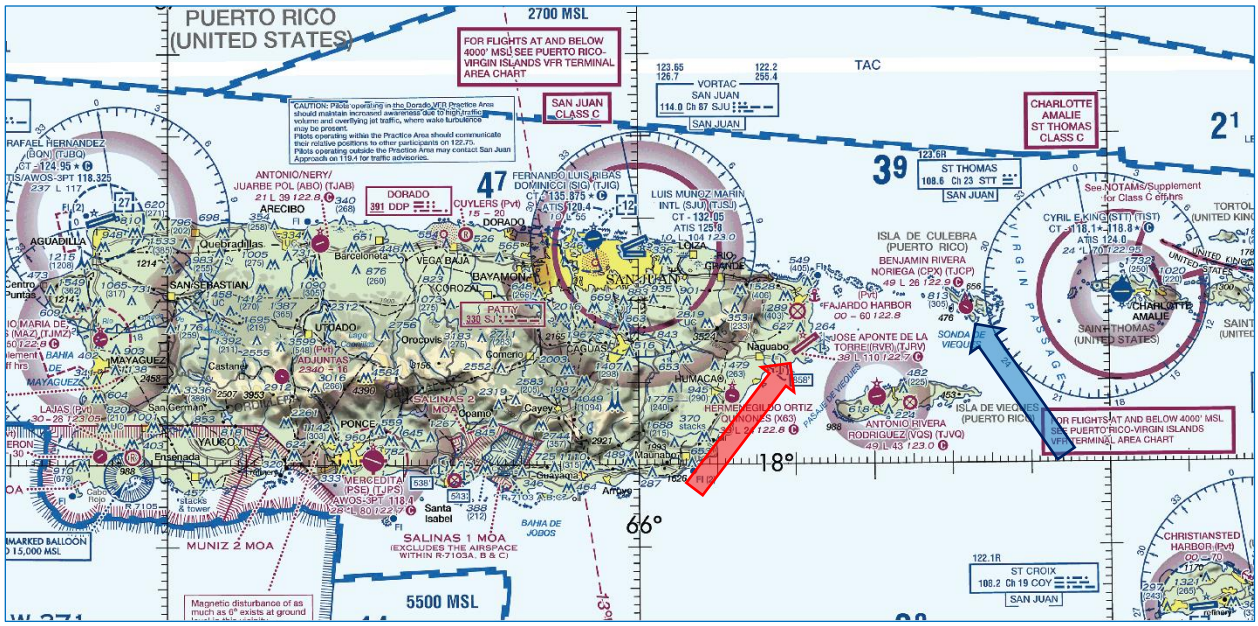
4.3.5 Benjamin Rivera Noriega Airport (CPX)

The proximity of RVR to CPX (20 nm) means that traffic arriving or departing from CPX may be affected by TFRs associated with horizontal launch vehicle operations. Impacts to CPX are anticipated, given the

relative locations of the two airports and the intention for horizontal launch vehicle operations to take place to the north, over the Atlantic Ocean. *Figure 4-20* shows the relative locations of RVR and CPX, depicted on an excerpt from the Caribbean 2 Sectional chart. At the time of this writing, CPX has no published procedure charts.

Due to its proximity to the potential TFR corridor for horizontal launch vehicle operations, diversions to and from the south would be required.

FIGURE 4-20
RVR LOCATION RELATIVE TO BENJAMIN RIVERA NORIEGA CLASS G AIRSPACE (VFR)



Note: Red arrow depicts location of Jose Aponte de la Torre Airport, blue arrow depicts location of Benjamin Rivera Noriega Airport.
Source: FAA, 2019; RS&H, 2019

4.3.6 Special-Use Airspace

There is no special-use airspace in the immediate vicinity of RVR. However, there are two Military Operating Areas (MOA), Muniz 1 and Muniz 2, and one warning area, W-371, located on the southwest side of the island, approximately 70 miles away from RVR. Though it is anticipated that launch operations would be conducted over the Atlantic Ocean to the northeast and will have no impact to this airspace, this airspace may be available for specific launch activities.

4.3.7 Other Airspace Stakeholders

In addition to these airports, the FAA Air Traffic Control Office, Southern Region and U.S. Coast Guard District 7 were identified as other stakeholders needing further coordination.

CHAPTER 5

FINANCIAL FEASIBILITY

5.1 FORECAST OF LAUNCH OPERATIONS

RLVs dedicated to suborbital space tourism and the use of horizontal launch vehicles for launching small satellite (smallsat) payloads and deploying them into low Earth orbit represents a significant growth industry. Currently, the Northrop Grumman Innovation Systems PegasusXL is the only operational air launch-to-orbit satellite system. Multiple prospective RLV operators have continued testing and have published plans to begin operations in 2019 to 2020.

Based on the payloads of prospective horizontal launch vehicles, and the projected declining cost of launching payload into space, the market for small satellites is forecast to exhibit substantial growth, with the largest growth anticipated to be in nanosatellites. The nanosat market is driven by the flexibility, affordability, and popularity of the CubeSat among academic institutions and organizations with limited funding.[1] This forecasting effort focused on the nanosat market, with the assumption that the small number of satellites in the larger classes would represent an insignificant incremental change.

The Nanosats Database has one of the largest databases of reported nanosats and CubeSats publicly available. According to records maintained within this database, nanosatellites have a historical growth since 2013 (shown in *Table 5-1*). This database also includes a projected growth of the industry that forecast nearly 3000 launches over the next 5 years (shown in *Table 5-2*).

TABLE 5-1
COMMERCIAL NANOSATELLITES LAUNCHES

Summary	2013	2014	2015	2016	2017	2018
Nanosatellites (1.1-10 kg)	88	142	129	88	294	236

Source: Nanosatellite & CubeSat Database, 2019

TABLE 5-2
NANOSATS DATABASE FORECAST

Summary	2019	2020	2021	2022	2023
Nano Satellites (1.1-10 kg)	538	546	586	622	703

Source: Nanosatellite & CubeSat Database, 2019

Based on the historical growth and the 5-year forecast, a 10-year forecast was created for all nanosats worldwide. Determining the market share RVR could expect was considered too speculative given the formative state of the industry, so the forecast assigned RVR an equal market share among all commercial launch facilities worldwide, both vertical and horizontal, that are equipped to launch commercial space flight vehicles carrying nanosatellites. This resulted in RVR being projected to capture a 3.45 percent market share.

The forecast includes a Base Case, a Growth Case, and a Constrained Case. The Base Case Forecast was derived from the Nanosatellite and CubeSat Database projections from 2019-2023, at which point the

[1] CubeSats are satellites that come in a standard 10 cm, 1U (1.3 kg) cube design. They were created by California Polytechnic State University, San Luis Obispo and Stanford University's Space Systems Development Lab in 1999. The standard design has been adopted around the world by hundreds of organizations. (cubesat.org, 2018).

remainder of the Base Case Forecast continued the linear rate of growth for the next five years, equaling a compound annual growth rate (CAGR) of 15.5% from 2013-2028. The Growth Case Forecast was derived by doubling the CAGR from the Base Case Forecast to 31.0%. This growth rate was then used to create the projected 2019-2028 Growth Case Forecast. The Constrained Case Forecast was derived by halving the CAGR from the Base Case Forecast to 7.75%. This growth rate was then used to create the projected 2019-2028 Constrained Case Forecast.

The worldwide historical launches and launch projections for nanosatellites are shown in *Table 5-3* and the forecast for RVR obtaining a 3.45% market share of that forecast is shown in *Table 5-4*, respectively.

TABLE 5-3
PROJECTED WORLDWIDE NANOSATELLITE LAUNCH ACTIVITY

	Year	Base	Growth	Constrained
Historical	2013	88	88	88
Historical	2014	142	142	142
Historical	2015	129	129	129
Historical	2016	88	88	88
Historical	2017	294	294	294
Historical	2018	236	236	236
Projected	2019	538	309	254
Projected	2020	546	405	274
Projected	2021	586	531	295
Projected	2022	622	695	318
Projected	2023	703	911	343
Projected	2024	721*	1193	369
Projected	2025	761*	1,563	398
Projected	2026	802*	2,048	429
Projected	2027	843*	2,683	462
Projected	2028	883*	3,515	498

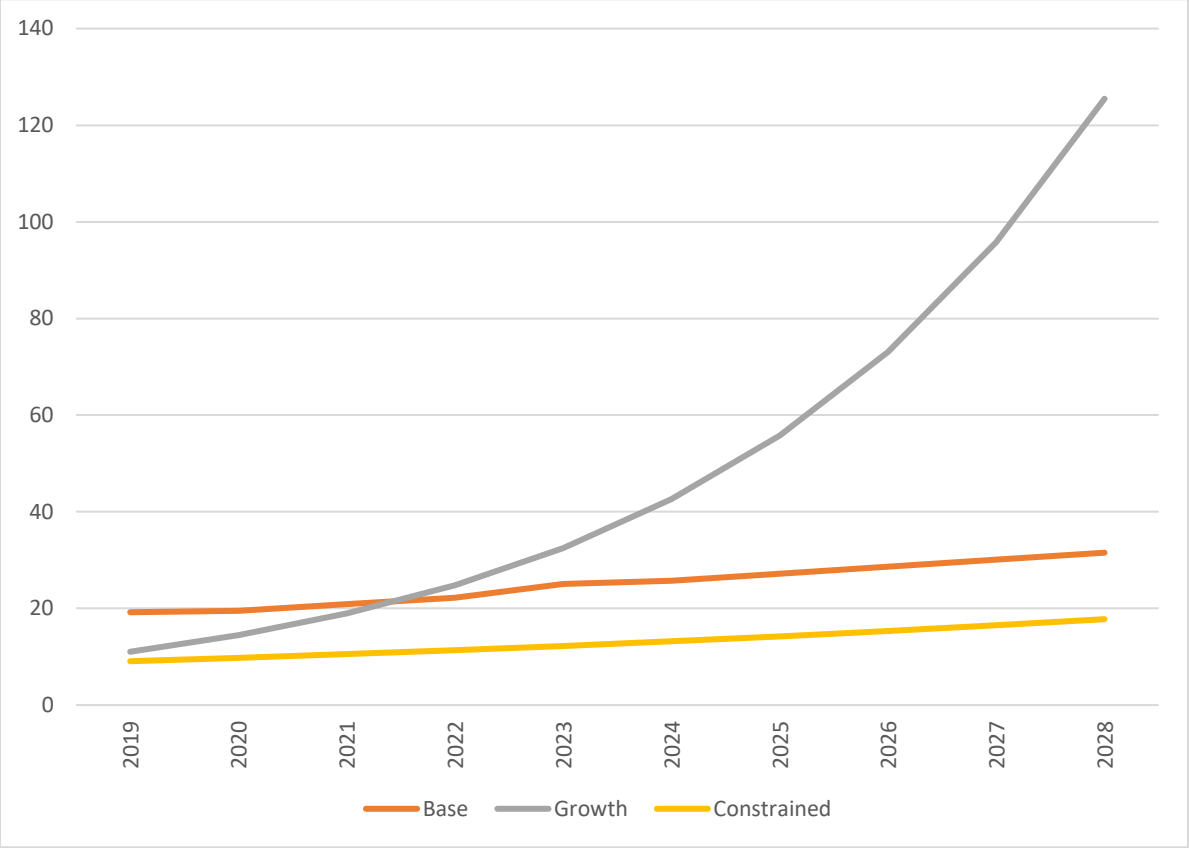
Note: * linear projected growth based on 5-year forecast from 2019 - 2023
Source: Nanosatellite & CubeSat Database, 2019; RS&H, 2019

TABLE 5-4
PROJECTED RVR NANOSATELLITE LAUNCH ACTIVITY

RVR Market Share (3.45%)			
Year	**Base**	**Growth**	**Constrained**
2019	19	11	9
2020	19	14	9
2021	20	18	10
2022	21	24	11
2023	24	31	12
2024	25	41	13
2025	26	54	14
2026	28	71	15
2027	29	93	16
2028	30	121	17

Source: Nanosatellite & CubeSat Database, 2019; RS&H, 2019

FIGURE 5-1
PROJECTED RVR NANOSATELLITE LAUNCH ACTIVITY



Source: RS&H, 2019

5.2 REVENUE ANALYSIS

The emerging commercial space flight industry is in still in the early stages of development. No conventions exist for setting rates and charges. Therefore, the determination for sources of potential revenue resulting from spaceport operations must be built from a number of assumptions, such as launch rates, facilities constructed, the types and sizes of launch vehicles, market rates for launch services, a customer base, and the spaceport's potential market share of the commercial launch industry as a whole.

In order to project the revenue for a spaceport, a model must be constructed that relies on rates and charges for launch services. To leverage the use of existing airport infrastructure and processes, it is necessary to adapt the Airport's revenue model to the new, related industry. However, spaceport operations differ from conventional airport operations significantly, and there is still a great level of uncertainty in the commercial space flight industry.

5.2.1 Airport Revenue Model

For the purposes of creating user rates and charges, it is assumed the Federal Aviation Administration (FAA) will not consider the launch vehicles to be "aircraft" from a regulatory or policy standpoint. This assumption is made based on several FAA regulatory positions:

- Launch vehicles will not be certified under the airworthiness certificate requirements that govern other aircraft
- Launch vehicle operations will not fall under the aircraft operating rules described in 14 CFR Part 91, Part 121, or Part 135
- Under the Commercial Space Launch Competitiveness Act of 2015, the "learning period" restrictions that limit FAA/ AST's ability enact regulations governing the design or operation of launch vehicles has been extended through 2023[2]

Therefore, it is assumed that launch operations will not be bound by the same set of non-discrimination standards that apply to aircraft operators, and that unique pricing rules for space operations will not violate an airport's grant assurances.

5.2.1.1 Passenger Airline Model

For an average airport, the revenue could be generated from passenger airline operations from any combination of the following sources, among others:

- Passenger enplanements
- Concessions and parking
- Fuel sales/flowage
- Lease revenue

The relative importance of any one of these revenue sources varies substantially by airport, depending on market position, airline competition, terminal amenities, and many other factors. Airline pricing models can be used to create rough order of magnitude estimates for the revenues that may be expected. A

[2] FAA (2018) The Annual Compendium of Commercial Space Transportation: 2018

broad generalization is that airport facility charges represent approximately 6 percent of airline expenditures. The historically low profitability of airlines over the long-term implies that airport facility charges represent approximately 6 percent of airline ticket revenue. This figure typically includes:

- Terminal Facility leases
- Terminal Facility equipment
- Security Fees
- Landing Fees
- Allocation to corporate overhead

5.2.1.2 Cargo Airline Model

Due to the nature of the vehicles that are likely to be operational within the near term, an argument could be made that the space launch operational model is akin to air cargo. To normalize the relationship between passenger airline revenue and air cargo revenue, an examination was made of operational yields for air cargo. To capture the "developing industry" aspect, only international operations were examined.

For the past 15 years, historical yields on international air cargo have averaged approximately 77 percent of the yields on international passenger traffic. Applying that adjustment to the planning factor of 6 percent of gross revenue used in the passenger airline model, air cargo would be paying approximately 4.6 percent of revenue in airport facility-related charges.

5.2.2 Spaceport Revenue Model

A financial model was created that assumes total revenue to RVR would be representative of some percentage of total launch vehicle industry revenue. The model calculates the spaceport revenue that may be realized based on two potential levels of funding: one at 5 percent of the launch revenue and one at 10 percent. The 5 percent level represents a close approximation of the revenue to airports derived from international passenger airline and international air cargo revenue. The 10 percent level represents an acknowledgement that some spaceport infrastructure would be specialized in nature and would require the spaceport to have an enhanced ability to recapture costs. The exact rates and charges schedule would be set by the spaceport management and could vary significantly due to competitive pressures.

Pricing for three horizontally launched launch vehicle developers is publicly available. The price per pound of boosted payload for the Virgin Orbit LauncherOne is listed at $10,886 per lb, or $24,000 per kg. [3] The Cab-3A vehicle operated by CubeCab is priced at $22,680 per lb or $50,000 per kg.[4] The PegasusXL vehicle operated by Northrop Grumman Innovations is priced at $40,319 per lb or $88,888 per kg. [5] These prices represent the cost for sending payloads into Low Earth Orbit (LEO).

Northrop Grumman Innovations is currently the only active horizontal launch provider, with Virgin Orbit and CubeCab planning to be operational by 2019 and 2020, respectively. Based on the average payload

[3] FAA (2018) The Annual Compendium of Commercial Space Transportation: 2018
[4] CubeSat rates are based on $250,000 per launch of a 3U CubeSat
[5] FAA (2018) The Annual Compendium of Commercial Space Transportation: 2018

price per pound for all three operators and taking the average weight of nanosatellite launches since 2011 of 10.2 lb (4.6 kg), the average launch cost to the satellite customer is $251,300.

Table 5-5 summarizes the projected revenue for Jose Aponte de la Torre Airport.

TABLE 5-5
RVR SPACEPORT OPERATIONS 10-YEAR REVENUE PROJECTION

10-Year Revenue Projection				
Scenario	**Satellite Launches Over 10 Years**	**Gross Revenue**	**5%**	**10%**
Baseline	242	$ 60,563,300	$ 3,028,165	$ 6,056,330
Constrained	126	$ 31,663,800	$ 1,583,190	$ 3,166,380
Growth	478	$ 120,121,400	$ 6,006,070	$ 12,012,140

Source: RS&H, 2019

5.2.3 Benefit/Cost Analysis

The purpose of the benefit/cost analysis is to associate the minimum development needed to begin operations for a licensed spaceport while being financially capable of sustaining that development.

The first of these steps was completed in Section 2.3 when infrastructure development was reviewed. It was determined then that the airport would be responsible in the near-term to have an Oxidizer Loading Area made available before launch operations can begin. Two options have since moved forward, OLA Option 1 and OLA Option 4. OLA Option 1 would require the construction of a taxiway connector and the construction of a concrete pad. OLA Option 4 would only require that a location of concrete pavement near the 7 end would be marked as the OLA site for safety separation distance purposes. The Rough-Order-Magnitude Cost for each site is summarized in *Table 5-6* below.

TABLE 5-6
OLA SITES ROM COST ESTIMATE SUMMARY

Item	**ROM Cost**	
	OLA 1	**OLA 4**
Short-Term Spaceport Facilities (0-5 years)		
Oxidizer Loading Area	$700,000	$0
Oxidizer Loading Area Taxiway	$3,000,000	N/A
Total	**$3,700,000**	**$0**

Source: RS&H, 2019

As explained in the previous section, the second step uses anticipated revenue from spaceport operations for the first 10 years. The six potential funding levels are carried forward in a benefit/cost analysis (BCA) to determine the financial feasibility of developing spaceport infrastructure.

The BCA used a discount rate of 3 percent and recaptured the discounted value of infrastructure at the end of year 10. A benefit/cost ratio of at least 1.0 means investment in a new facility is justified

economically, although lower ratios may be acceptable if they meet other goals, such as providing ancillary economic development goals.

Table 5-7 presents what the BCA for constructing OLA Site 1. Five of six scenarios had a benefit/cost ratio greater than 1.0, providing strong economic justification for development. Because OLA Site 4 required no dedicated infrastructure, a benefit/cost ratio does not exist[6].

TABLE 5-7
BENEFIT/COST RATIO – OLA SITE 1

10-Year Benefit / Cost Ratios (Site 1)		
Scenario	**5% Revenue**	**10% Revenue**
Baseline	1.19	1.90
Constrained	0.85	1.22
Growth	1.83	3.17

Source: RS&H, 2019

[6] The infrastructure required for OLA Site 4 already exists, therefore if the site were to be a viable option there would be no cost associated with the benefit.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This feasibility study detected no "fatal flaws" in the use of Jose Aponte de la Torre Airport to host commercial space launch operations using horizontal launch and/or horizontal recovery vehicles. While obtaining a Commercial Launch Site Operator License does not guarantee future launch operations, the Airport appears to be capable of supporting some kinds of launch operations with minimal investment in dedicated infrastructure.

Propellant storage and most other operational needs can be accommodated with existing facilities or by using temporary facilities, such as tanker trucks. An explosive site plan would contain provisions for hosting all necessary spaceport activities. Permanent fuel and oxidizer facilities would not be required until the frequency of flights and demand increased to an appropriate level to justify the investment.

FAA regulations require launch vehicle operators to demonstrate that launch operations impose minimal risk to the uninvolved public. This is especially relevant for unmanned rockets, which include flight termination systems to destroy the rocket if it goes off course. In addition, spent booster stages falling to the ground constitute risk to people on the ground. For these reasons, rocket launches have historically been conducted over open ocean. The Airport's coastal location supports that strategy well.

Launch operations have the potential to put significant temporary limitations on the use of surrounding airspace by aircraft. Initial analysis determined no areas where the potential impact of launch activities would unreasonably affect operations at Luis Munoz Marin International Airport, Antonio Rivera Rodriguez Airport, Benjamin Rivera Noriega Airport, or Cyril E King Airport or special use airspace in the Atlantic Ocean.

Whether through the leasing of property or buildings, launch and landing fees, or ticket and museum sales, there are numerous opportunities for Jose Aponte de la Torre Airport to generate revenue. This study assessed only the primary revenue stream – rates and charges paid by the launch vehicle operator – in order to represent as conservative an analysis as possible. A variety of secondary revenue sources and ancillary community benefits were identified, but not integrated into the financial model or the benefit/cost analysis. The potential secondary revenue sources benefit the spaceport by adding value to the spaceport license, and also benefit the surrounding community through an increased selection of high-tech jobs, tourism, new industries, and facilitating growth in the area surrounding the spaceport.

As part of a formative industry, launch vehicle operators are likely to be operating on thin margins – particularly in the near term – and the spaceport's potential for generating revenue from spaceport operations is uncertain. Furthermore, the operators of competing spaceports are likely to be inclined to provide financial incentives to attract launch customers, putting further pressure on the ability of the Airport to levy sufficient charges to create a financially self-sufficient spaceport.

6.2 RECOMMENDATIONS

- Evaluate economic development and social goals to determine their worth in justifying spaceport investment.
- Obtain a Launch Site Operator License and begin marketing vehicle operators that are targeting suborbital and orbital small satellite payloads using expendable rockets.
- Construct short-term facilities (oxidizer loading area and connecting taxiway, if necessary) in a location that would also not impact future aeronautical development, allowing the infrastructure to support multiple uses.
- Assess the potential for accommodating re-entry vehicles that may carry payloads of interest for pharmaceutical companies to the Airport facility.
- Study pricing trends that emerge in the industry to refine rates and charges.
- Study pricing and launch trends that emerge in the industry to determine the wisdom of investing in additional facilities.

APPENDIX A

REFERENCES

PUBLICATIONS

[1] 14 CFR Part 420 – License to Operate a Launch Site, FAA/AST, 19 October 2000

[2] 14 CFR Part 420 Amendment – Explosive Siting Requirements Final Rule, FAA, 7 September 2012

[3] DoD 6055.09-STD, DOD Ammunition and Explosives Safety Standards, 29 February 2008

APPENDIX B

PROPELLANT ACRONYMS

PROPELLANTS LISTED IN THIS DOCUMENT

APCP: Ammonium perchlorate composite propellant

H_2O_2: Hydrogen peroxide

HTPB: Hydroxyl-terminated polybutadiene

Jet-A: Conventional aviation jet fuel

JP-4: Kerosene/gasoline blend military jet fuel

LOX: Liquid oxygen

N_2O: Nitrous oxide

RP-1: Rocket Propellant-1

Exhibit C

RFP-PROPONENT REGISTRATION FORM

REQUEST FOR PROPOSALS
FOR THE LEASING, DEVELOPMENT, CONSTRUCTION,
OPERATIONS, MARKETING, AND MAINTENANCE OF A
SPACEPORT AT JOSÉ APONTE DE LA TORRE (JAT) AIRPORT,
CEIBA, PUERTO RICO

Proponents participating in the above-referenced RFP must complete the following Proponent Registration Form and send it by email to, with a copy to rfpspaceportceiba@prpa.pr.gov by **April 07, 2023.**

FIRST NAME_____ **LAST NAME:** _____

TITLE:_____

COMPANY:_____

ADDRESS: _____

CITY:_____**STATE:**_____**ZIP CODE:** _____

COUNTY:_____

EMAIL:_____

WORK PHONE NUMBER: _____

CELL PHONE NUMBER:_____**FAX NUMBER:** _____

BY REGISTERING, THE REGISTERED PROPONENTS AGREE TO BE BOUND BY ALL THE TERMS AND CONDITIONS OF THE RFP.

ANY CHANGE TO THE INFORMATION ABOVE MUST BE SENT TO THE PUERTO RICO PORTS AUTHORITY TO RPEDRAZA@PRPA.PR.GOV, with a copy to rfpspaceportceiba@prpa.pr.gov

Exhibit D

CERTIFICATION

_____, who desires to enter into an agreement with the Puerto Rico Ports Authority ("PRPA"), certifies, represents, and warrants to the PRPA that:

1. Under penalty of nullity, no official, employee, or contractor of the PRPA will derive or obtain any benefit or profit of any kind from the contractual relationship that will result from this procurement. If such a benefit exists, the required waiver has been submitted before the Proposal.
2. None of the Members of the Board of Directors, Executives, Authorized Representatives, or Shareholders of our company have been accused and convicted of crimes against the Government of Puerto Rico or the Federal Government that involve appropriation of public funds or fraud against public property.
3. There is no criminal or civil procedure or investigation pending for any of the crimes or felonies described on the precedent paragraphs against any of the members of its Board of Directors, Executives, Authorized Representatives or Shareholders.
4. We will inform the PRPA of any situation or procedure that may be initiated against any of the parties mentioned above at any time after the signing of any agreement resulting from this RFP.
5. Our company: (a) does not discriminate in any manner against an employee, an applicant for employment, a subcontractor or any person because of race, color, religion, creed, age, sex, marital status, national origin, ancestry, sexual orientation, or physical or mental handicap unrelated in nature and extent so as reasonably to preclude the performance of such employment; (b) includes a provision similar to that contained in subsection above in any subcontract executed in connection with the services to be provided under the contract resulting from this RFP, but excluding subcontracts for standard commercial supplies or raw materials; (c) posts in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this clause; and (d) maintains a written sexual harassment policy and informs our employees of the policy.
6. When issuing this Proposal, as an employer, we are in full compliance with Act No. 5 of December 30, 1986, as amended, also known as the Organic Act for the Administration of Child Support Enforcement of the Government of Puerto Rico.
7. The Proposals have been prepared and developed without collusion with other Eligible proponents and without effort to preclude the PRPA from obtaining the best competitive Proposal.
8. If an agreement is reached with the PRPA, we will be registered to do business in Puerto Rico and have any required business and professional licenses.
9. We understand that violation of these certifications may lead to the resolution of the agreement resulting from this RFP without prior notice.
10. No PRPA official, employee, or contractor involved in this procurement has a financial interest in this contract, purchase, or commercial transaction, and neither has had, directly or indirectly, financial interest in this company for the last four years.

11. No PRPA's official, employee, or contractor solicited or accepted, directly or indirectly, for his/her, some member of its family unit or any other person, gifts, allowances, favors, services, donations, loans, or any other thing of monetary value.
12. No PRPA's official, employee, or contractor associated with this transaction solicited or accepted valuable goods from any person from my entity as payment to complete the duties or responsibilities of his/her job.
13. No PRPA's official, employee, or contractor asked, directly or indirectly, for him/her, or any member of his/her family unit, nor any other person, business or entity, valuable goods, including gifts, loans, pledges, or favors in exchange of acting to favor me or my entity.
14. I have no relationship within the fourth level of consanguinity or second of affinity with any employee that has the power to influence or participate in the organizational decisions of the PRPA.

Company:

_____
Representative Name

_____
Signature

_____
Date

Exhibit E

SCHEDULE OF RFP PROCESS

Description	**Date***
Issuance of RFP	02/22/2023
Deadline for Submission of Proponent Registration Form	04/07/2023
Period for Site Visits	From: 04//10/2023
	Up to: 04/14/2023
Deadline for Questions on the RFP	04/21/2023
Deadline for Responses to Questions	05/04//2023
Proposal Deadline	05/22/2023
Finalist Meetings (if any)	06/05/2023 to 06/16/2023
Announcement of Preferred Proponent and Commencement of Negotiations	06/30/2023
Execute Binding Agreement	08/31/2023

***All dates are subject to modification, extension and/or suspension by the PRPA, as provided in the RFP.**

EXHIBIT F
SUBMISSION OF QUESTIONS FORM

Proponents can submit additional sheets of this Form if more than ten (10) questions and Request for Clarifications are to be submitted.

Proponent: _____
Date: _____

No.	Question	RFP Section or Document	RFP Section or Document Page No.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

EXHIBIT G

LIMITED DENIAL OF PARTICIPATION (LDP)/SUSPENSION OR DEBARMENT STATUS AFFIDAVIT

By signing this Affidavit, the Entity affirms that it has not been LDP, suspended, debarred or otherwise lawfully precluded from participating in any public procurement activity with any Federal, State or local government. Failure to disclose all pertinent information about a debarment or suspension shall result in rejection of the proposal or cancellation of a contract. PRPA may also exercise any other remedy available by law.

[Al firmar esta Declaración Jurada, la entidad afirma que no está sujeta a una denegación limitada de participación (LDP, por sus siglas en inglés) ni ha quedado suspendida, inhabilitada o impedida de participar en alguna actividad de adquisición pública con alguna dependencia del Gobierno federal, estatal o local. El no divulgar toda la información pertinente relacionada con una inhabilitación o suspensión podrá causar el rechazo de una propuesta o la cancelación de un contrato. lLa Autoridad también podrá ejercer cualquier recurso que permita la ley.]

_____

DUNS Number

[Número DUNS]

In _____, _____this _____day of _____of 20 _____.

[En _____, _____el día_____de _____de 20 _____.

Entity Name: _____

(Name of Entity)

[Nombre de la entidad]

By: _____

(Signature of Authorized Representative)

[Firma del Representante autorizado]

_____

(Printed Name of Authorized Representative)

[Nombre del Representante autorizado en letra de molde]

_____

(Position)

[Título]

Affidavit No. _____
[Afidávit Núm.]

Subscribed and sworn to before me in the city of _____, _____, this _____ day of _____, 20___, by _____ of legal age, _____ (civil status), _____ (occupation) and resident of _____, _____, in his/her capacity as _____ of Proponent, who I personally known or have identified by his/her _____.

[Jurado y suscrito ante mí en la ciudad de _____, _____, hoy día _____ de _____ de 20___, por _____, mayor de edad, _____ (estado civil), _____ (ocupación) y vecino de _____, _____, en su capacidad como _____ del Proponente, a quien doy fe de conocer personalmente o a quien he identificado mediante su _____.

_____
Public Notary
[Notario Público]

EXHIBIT I

DECLARACIÓN JURADA
Ley 2-2018, Código Anti-Corrupción para el Nuevo Puerto Rico[1]

[SWORN STATEMENT]
[Act 2-2018, Anti-Corruption Code for a New Puerto Rico][2]

Yo,_____, en mi carácter personal y en representación de _____ ("Proponente" o "Licitador"), con número de seguro social patronal _____, mayor de edad, de profesión: _____, con estado civil: _____ y vecino de _____el más solemne juramento declaro como sigue:

[I,_____, in my personal capacity and in representation of _____ ("Respondent" or "Bidder"), Tax I.D. Number _____, of legal age, with profession: _____, marital status: _____ and resident of _____, do hereby solemnly swear as follows:]

1. Mi nombre y demás circunstancias personales son las anteriormente expresadas.

1. *[My name and personal circumstances are as stated above.]*

2. A la fecha en que suscribo esta declaración jurada, el suscribiente, el Proponente o Licitador, su presidente, vicepresidente, director, director ejecutivo, miembro junta de oficiales o directores y personas que desempeñen funciones equivalentes para el Proponente o Licitador **no ha sido convicto ni se ha declarado culpable en el foro estatal o federal,** o en cualquier otra jurisdicción de los Estados Unidos, por cualquiera de los siguientes delitos: (a) apropiación ilegal agravada; (b) extorsión; (c) sabotaje de servicios públicos esenciales; (d) falsificación de documentos; (e) fraude; (f) fraude por medio informático; (g) fraude en las construcciones; (h) uso, posesión o traspaso fraudulento de tarjetas con bandas electrónicas; (i) enriquecimiento ilícito; (j) enriquecimiento ilícito de funcionario público; (k) enriquecimiento injustificado; (l) aprovechamiento ilícito de trabajos o servicios públicos; (m) intervención indebida en las operaciones gubernamentales; (n) negociación incompatible con el ejercicio del cargo público; (o) alteración o mutilación de propiedad; (p) certificaciones falsas; (q) soborno, en todas sus modalidades; (r) influencia indebida; (s) malversación de fondos públicos; o (t) lavado de dinero.

2. *[As of the date of execution of this sworn statement, neither the undersigned nor the Respondent or Bidder, or its president, vice president, director, executive director, member of Board of officers or directors, or any persons performing equivalent functions on Respondent's or Bidder's behalf, has been convicted or has pleaded guilty in state or federal court, or in any other jurisdiction of the United States, for any of the following crimes: (a) aggravated misappropriation; (b) extortion; (c) sabotage of essential public services; (d) forgery of documents; (e) fraud; (f) electronic fraud; (g) construction fraud; (h) fraudulent use, possession or transfer of cards with electronic bands; (i) illicit enrichment; (j) illicit enrichment by public official; (k) unjustified enrichment; (l) illicit enrichment of public work or services; (m) improper intervention in government operations; (n) negotiation incompatible with the exercise of public office; (p) false certifications; (q) bribery, in all its modalities; (r) undue influence; (s) embezzlement of public funds; or (t) money laundering.]*

3. A la fecha en que suscribo esta declaración jurada y **por los pasados veinte (20) años**, ni el suscribiente, ni el Proponente o Licitador, ni cualquiera de sus siguientes oficiales: presidente, vicepresidente, director, director ejecutivo o miembro junta de oficiales o directores o personas que desempeñen funciones equivalentes para el Proponente o Licitador, ha sido convicto o se ha declarado culpable en el foro estatal o federal, o en cualquier otra jurisdicción de los Estados Unidos, por cualquiera de los siguientes delitos: (a) daño agravado; (b) retención de propiedad; (c) alteración o mutilación de propiedad; (d) archivo de documentos o datos falsos; (e) posesión y uso ilegal de información, recibos y comprobantes de pago de contribuciones; (f) compra y venta ilegal de bienes en pago de contribuciones; (g) presentación de escritos falsos; (h) posesión ilegal de recibos de contribuciones; (i) falsificación de asientos en registros; (j) falsificación de sellos; (k) falsedad ideológica; (l) falsificación de licencia, certificado y otra documentación; (m) falsificación

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[1] Como requisito para la participación en esta Solicitud de Propuestas, el Proponente deberá suscribir esta declaración tal como está redactada, sin alteración, reserva o modificación de índole alguna. Si el suscribiente, Licitador o Proponente no puede suscribir esta declaración según redactada, deberá someter una certificación bajo juramento aclarando todas las excepciones y/o aclaraciones aplicables. Someter información falsa, incompleta o incorrecta podría conllevar la imposición de sanciones civiles y criminales en contra del suscribiente, el Proponente.

[2] *[As a requirement to participate in this RFP, the Proposer must file this sworn statement in the exact form and content as set forth herein, without alteration, exception or modification of any kind. If the Proposer is unable to execute this statement in the exact form provided herein, the Bidder or Respondent shall submit a separate sworn certification stating all exceptions, clarifications or modifications to this form of sworn statement. The submission of false, incomplete or incorrect information could lead to the imposition of civil and/or criminal penalties against the Proposer.]*

en el ejercicio de profesiones u ocupaciones; (n) posesión y traspaso de documentos falsificados; (o) posesión de instrumentos para falsificación; (p) preparación de escritos falsos.

3. *[As of the date of execution of this sworn statement and **for the twenty (20) years** prior, neither the undersigned nor the Respondent or Bidder, or any of its officers, including its president, vice president, director, executive director, member of board of officers or directors, or any person performing equivalent functions on Respondent's or Bidder's behalf, has been convicted or has pleaded guilty in the state or federal forum, or in any other jurisdiction of the United States, for any of the following crimes: (a) aggravated damage; (b) property retention; (c) alteration or mutilation of property; (d) filing of false documents or data; (e) illegal possession and use of tax information, receipts and payment vouchers; (f) illegal purchase and sale of goods for the payment of taxes; (g) filing false writings; (h) illegal possession of tax receipts; (i) falsification of entries in registers; (j) forgery of stamps; (k) ideological falsehood; (l) forgery of license, certificates and other documents; (m) forgery in the exercise of professions or occupations; (n) possession and transfer of forged documents; (o) possession of counterfeit instruments; (p) preparation of false writings.]*

4. A la fecha en que suscribo esta declaración jurada y **por los pasados ocho (8) años**, ni el suscribiente, ni el Proponente o Licitador, ni cualquiera de sus siguientes oficiales: presidente, vicepresidente, director, director ejecutivo o miembro junta de oficiales o directores o personas que desempeñen funciones equivalentes para el Proponente o Licitador, ha sido convicto o se ha declarado culpable en el foro estatal o federal, o en cualquier otra jurisdicción de los Estados Unidos, por cualquiera de los siguientes delitos: (a) omisión en el cumplimiento del deber; (b) venta ilegal de bienes; (c) incumplimiento del deber; (d) negligencia en el cumplimiento del deber; (e) usurpación de cargo público; o (f) impedir la inspección de libros y documentos.

4. *[As of the date of execution of this sworn statement and **for the eight (8) years** prior, neither the undersigned nor the Respondent or Bidder, or any of its officers, including its president, vice president, director, executive director, member of board officers or directors, or any person performing equivalent functions on Respondent's or Bidder's behalf, has been convicted or has pleaded guilty in the state or federal forum, or in any other jurisdiction of the United States, for any of the following crimes: (a) omission in the fulfillment of duty; (b) illegal sale of goods; (c) breach of duty; (d) negligence in the fulfillment of duty; (e) usurpation of public office; or (f) preventing the inspection of records and documents.*

5. A la fecha en que suscribo esta declaración jurada y **por los pasados diez (10) años**, ni el suscribiente, ni el Proponente o Licitador, ni cualquiera de sus siguientes oficiales: presidente, vicepresidente, director, director ejecutivo o miembro junta de oficiales o directores o personas que desempeñen funciones equivalentes para el Proponente o Licitador, ha sido convicto o se ha declarado culpable en el foro estatal o federal, o en cualquier otra jurisdicción de los Estados Unidos, por delitos graves contra el ejercicio del cargo público o contra fondos públicos codificados en el Código Penal de Puerto Rico; la Ley Núm. 1-2012, según enmendada, la "Ley Orgánica de la Oficina de Ética Gubernamental"; o cualquier otro según dispuesto en la Ley 2-2018.

5. *[As of the date of execution of this sworn statement and **for the ten (10) years prior**, neither the undersigned nor the Respondent or Bidder, or any of its officers, including its president, vice president, director, executive director, member of board officers or directors, or any person performing equivalent functions on Respondent's or Bidder's behalf, has been convicted or has pleaded guilty in the state or federal forum, or in any other jurisdiction of the United States, for crimes against the exercise of public office or public funds as defined in the Puerto Rico Penal Code, ; Law No. 1-2012, as amended, the Government Ethics Office Enabling Act; or any other crime defined in Law 2-2018.]*

6. Entiendo y acepto el deber de informar cualquier cambio al contenido de esta declaración durante el proceso de contratación o la vigencia del contrato, ya sea por alegación de culpabilidad o convicción por cualquiera de los delitos antes mencionados, o cualquier otra conducta proscrita en el Código Anticorrupción para el Nuevo Puerto Rico, Ley 2-2018.

6. *[I accept and acknowledge my obligation to inform of any change or modification to this statement during the contracting process or the term of the contract, as the result of a guilty plea or conviction for any of the above-mentioned crimes or any other conduct prohibited by the "Anti-Corruption Code for a New Puerto Rico", Law 2-2018.]*

7. Entiendo y acepto que la convicción posterior a esta declaración por cualquiera de los delitos enumerados en cualquiera de los incisos anteriores conllevará, además de cualquiera otra penalidad, la rescisión automática de cualquier contrato entre el suscribiente, el Proponente o el Licitador, y cualquier entidad gubernamental, corporación pública o municipio.

7. *[I accept and acknowledge that a conviction for any of the crimes specified in the above paragraphs will result, in addition to any other penalties, in the immediate termination of any contract in force at the time of conviction, between the undersigned, the Bidder or Respondent, and any government entity, public corporation or municipality at the date of conviction or guilty plea.]*

8. El suscribiente, el Proponente o el Licitador, según sea el caso, se compromete a cumplir con lo dispuesto en el Código de Ética para Contratistas, Suplidores y Solicitantes de Incentivos Económicos de las Agencias Ejecutivas del Gobierno de Puerto Rico", Código Anticorrupción para el Nuevo Puerto Rico", Ley 2-2018.

8. *[The undersigned and/or the Bidder or Respondent, as the case may be, commits to complying with the "Anti-Corruption Code for a New Puerto Rico", Law 2-2018.]*

9. Suscribo esta declaración jurada de conformidad con las disposiciones de la Ley 2-2018, y los requisitos de esta Solicitud de Propuestas.].

9. *[I execute this sworn statement pursuant to Law 2-2018, and the terms and provisions of this RFP.]*

10. Hago la presente declaración jurada para que cualquier entidad gubernamental, corporación pública o municipio, tenga conocimiento de lo aquí declarado para cualquier propósito administrativo y/o legal.

10. *[I execute this sworn statement so that any government entity, public corporation or municipality has knowledge of what is herewith declared and for any administrative and/or legal purpose in relation thereto.]*

AFFIDAVIT NO. _____

Sworn and signed before me by _____ , of the circumstances describe, whom I have personally identified by _____.

In _____, Puerto Rico, as of _____.

Notary Public Signature

EXHIBIT H

NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee gift, commission or thing of value on account of such sale.

OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated this ___ day of _____, _____

_____
(Name of Organization)

_____
(Title of Person Signing)

_____
(Signature)

ACKNOWLEDGEMENT

AFFIDAVIT NO. _____

Sworn and signed before me by _____, whom I have personally identified _____.

In _____ Puerto Rico, as of _____.

Notary Public Signature

EXHIBIT J

CERTIFICATION REGARDING LOBBYING FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract , the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, or the extension, continuation, renewal, amendment, or modification of any Federal contract grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities" in accordance with its instructions.[1]

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 21, U.S. Code. Any Person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Firm Name:_____

Signature of Authorized Official: _____

Title of Authorized Official: _____

Date:_____

[1] https://www.ojp.gov/sites/g/files/xyckuh241/files/media/document/disclosure.pdf.

EXHIBIT K
M/WBE EFFORTS

This form is to be completed by the Proponent if their firm, or the proposed subcontracted entities, **do not have** a M/WBE certification. If the firm has the certification, please submit it or send an affidavit to that effect.

The Proponent must explain the steps made so that Minority Business Enterprises (MBE) and Women Business Enterprises (WBE) participate in the work required in this contract by documenting efforts for contracting M/WBE's and contracting minorities and women.

M/WBE Form
Who performed the effort(s):
Describe types of efforts made: (see example to complete: Direct Solicitation; Negotiation; Queries to Databases; etc.)
Which group was targeted (MBE, WBE) :
Date(s) of efforts made:
Briefly provide a summary description M/WBE efforts: (see examples to complete: Provided documents/plans/bid specifications to certified M/WBE's and allowed adequate time to respond; Sent written notification to M/WBE and trade associations located in the region where work will be performed; Log responses from M/WBEs.; etc.)
Difficulties/Additional Information: Provide any other information you deem relevant which may help the Authority in evaluating the extent of your efforts.