

RPAS Design Project

Cargo Resupply for Remote Locations

AERO 443/444/445, 2020-21

Introduction

The system for this design project is a cargo re-supply Remotely-Piloted Aircraft System (RPAS) that will augment or replace existing systems—not necessarily aircraft—to deliver high-value and time-critical supplies to the South Pole research station during the local winter season. In order to design this system, it will be necessary to develop an understanding of the target customers, their needs, the current and expected competition, and performance and operating characteristics that will make the system successful.

System Need

Developing a new remotely-piloted aircraft system is a major undertaking for an aerospace company and/or a government agency that may be funding it. Because of the significant expense, time, and risk associated with new projects, they happen infrequently and only after careful consideration of the merits of the project. Your system concept will be competing with other related and unrelated program ideas for resources and funding. As such, it needs to provide as compelling as possible a case for being a valuable solution to an important problem. Key functions of the system should be determined by the design team, but may include delivery of critical equipment, maintenance parts, fresh produce, medical supplies, or other consumables for station personnel. The system **cannot** be vertical takeoff and landing (VTOL) or lighter than air (LTA).

Design Approach

This remotely-piloted aircraft system design problem allows significant leeway for the design team to focus on the characteristics most likely to result in a long-term successful product. To arrive at such a focus, the system designer must develop an understanding of the stakeholders and their needs and concerns (far beyond what they may be expected to actually tell you).

Major elements of this design project include:

- Determine user needs and characteristics of competing systems.
- Identify specific design requirements and objectives.
- Evaluate candidate system configurations/approaches and select a preferred approach.
- Use the sizing, design, and specification of the initial aircraft configuration to assess the soundness of the design requirements; iterate to improve the system.
- Refine the design with additional detail to improve confidence in the system characteristics and performance predictions.
- Plan the development of the system, assess development characteristics, and identify risks with mitigation approaches.
- Use sound analysis to make an objective case for the viability and superiority of the design as a new product development for your company.

System Evaluation and Assessment

The following characteristics will form part of the basis for assessing the relative merit of competing concepts:

1. Attractiveness of product to customers and/or funding agencies
2. Competitiveness with other existing and future systems
3. Development risk
4. Development cost and schedule

Each design team must use well-thought-out analysis, in coordination with the results of research on customers and missions, to objectively assert the value of their system solution.

Design Reviews

Design Review 1: October 2020—*Explanation of the customer, user, and missions as the basis for selected system characteristics.*

Design Review 2: November 2020—*Candidate airplane configurations and selection of preferred approach.*

Design Review 3: November 2020—*Initial sizing of preferred approach. Program plans, schedules, and approach to advanced technologies.*

Design Review 4: February 2021—*System component sizing, how system component characteristics affect requirements, and program development plans.*

Design Review 5: March 2021—*Sized system components and projected system performance. Comparison of expected system performance to completion/alternate approaches. Well-defined technology development plans.*

Design Review 6: April 2021—*Fully-described system components and overall system performance. Identification of development risks and mitigation plans.*

Aerospace Engineering Symposium: May 2021—*Complete details on the system conceptual design, the performance and merits of the system, the development risks and mitigations, the cost, schedule, and plans for development, and the operational characteristics.*