Next Generation Strategic Airlift Military Transport

Overview.

In 2025 Australian Government is planning on running a “competitive evaluation process” (not a tender) (RFP) for a new heavy lift military aircraft. This aircraft is designed to replace current medium lift transport vehicles that are currently in operation. The specifications for the vehicle are partially described below but are not completely fixed as the government expects competitors to submit their own optimised design that will give them the option to choose a final vehicle that will suit their potential operational requirements.

Competition Rules – General

• Only students enrolled in AERO4460 are eligible to participate.
• Students may NOT participate on more than one team. Student teams must submit a final single design.
• The maximum number of members in a team is 8 students.
• Students must submit their final report in hardcopy and as a pdf via email to unit coordinator doug.auld@sydney.edu.au. I recommend utilizing the return receipt option for validation. Intermediate component reports will be required as per the UoS schedule and should all be submitted in hardcopy.
• A “Plagiarism Compliance” page must be included in the report and indicate all participants, students’ SID numbers and signatures. Designs that are submitted must be the work of the students, but guidance may come from the tutor and the unit coordinator. No other external advice will be permitted.
• Each final design proposal should be no more than 100 double-spaced pages (including graphs, drawings, photographs, and appendices) if it were to be printed on A4 paper and the font should be no smaller than 10 pt. Times New Roman. Up to five of the 100 pages may be foldouts (11” x 17” max).

Schedule and Sequences Activity

Significant activities, dates, and addresses for submission of proposal and related materials are as follows:

A. Letter of Intent ---- week 2
B. Preliminary Design --- week 4
C. Detail Design Solutions (part 1)--- week 7
D Detailed Design Solutions (part 2) ---- week 10
E. Final Design Report and Industry Presentation ---- week 13
Assessment of these components for a final unit of study grade is shown in the UOS detailed descriptor.

**Proposal Requirements.**

The technical proposal is the most important factor in the award of marks. It should be specific and complete. While it is realized that all of the technical factors cannot be included in advance, the following should be included and will be marked accordingly:

1. Demonstrate a thorough understanding of the RFP requirements.

2. Describe the proposed technical approaches to comply with each of the requirements specified in the RFP including phasing of tasks and submission of preliminary components. Legibility, clarity, and completeness of the technical approach are primary factors in evaluation of the proposals.

3. Particular emphasis should be directed at identification of critical, technical problem areas. Descriptions, sketches, drawings, systems analysis, method of attack, and discussions of new techniques should be presented in sufficient detail to permit engineering evaluation of the proposal. Exceptions to proposed technical requirements should be identified and explained.

4. Include tradeoff studies performed to arrive at the final design.

5. Provide a description of automated design tools used to develop the design.

**Request for Proposal**

“Next Generation Strategic Airlift Military Transport”

1. Mission Requirements

Option 1: Mission Performance Requirements:

- XXXX nm unrefueled range with a planned load of X00,000 lb. Competing groups should aim for a specific payload/range requirement and be prepared to justify why this is appropriate for the Australian Government.
- Maximum payload weight shall be no more than 600,000 lb
- Time to top of climb / climb to initial cruise altitude no more than 20 min with 205,000 lb
- Takeoff field length with maximum payload, and landing field length with maximum landing weight, no greater than 9,000 ft
- Takeoff, landing and climb requirements must be met at sea level in a ISA + 30 C day. Takeoff, and landing performance should also be shown at ISA +10 C at 10,000’ above MSL.
- The aircraft shall be able to perform a takeoff, climb to pattern altitude, conduct pattern flight, and return to base with one or more engines out immediately after decision speed. Aircraft with an even number N of engines shall meet this requirement with any N/2 engine inoperative; if N is odd then assume N/2 +1 engines inoperative. Indicate the maximum allowable increase in temperature and altitude over ISA sea level for which engine(s) out takeoff, as described here, can be met.
- The aircraft shall be able to perform a tactical approach for arrivals to bases embedded in combat environments (see primary design objectives)
- Internal cargo volume, and corresponding cargo weight capacity, shall be no less than 44 463L master pallets.
Other features and considerations

- The aircraft must be designed for minimal turn-around time, including: load and off load time, total cargo transfer time, servicing and refueling time.
- Loading and unloading access must be demonstrated, with proper access doors, ramps, and clearances, for anticipated cargo units

Primary Design Objectives

- Maximize range for maximum payload
- Minimize operating and fly away cost
- Minimize time and ground track distance below 10,000 ft for optional tactical approach and landing
- Minimize fuel consumption for all missions

Secondary Design Objectives

- Maximize cargo capacity in terms of number of units.

Notes and assumptions:

- Unless otherwise noted, assume standard atmosphere, and sea level for takeoff and landing.
- Assume fuel reserves for a 200 nm radius (at optimal altitude for reserve cruise)
- No cruise altitude or Mach number is specified.
- Only level cruise segments may be considered, no cruise-climb is allowed.
- Cruise may be broken down to no more than 3 segments with altitude changes.
- Selection of all altitudes and timing of altitude changes within the cruise leg must be justified with proper analysis.
- Climb speed shall not exceed 250 kts below 10,000 ft
- Assume production of 120 units
- Assume an Estimated In-Server date of (EIS) 2040 for technology and concept assumptions

Proposal and Design Data Requirements

The technical proposal shall present the design of the aircraft clearly and concisely; the proposal shall cover all relevant aspects, features, and disciplines. Pertinent analyses and studies supporting design choices shall appear in sufficient detail.

A full description of the aircraft is expected along with performance capabilities and operational limits. These include, at a minimum:

1. A description of the design mission defined for the proposed concept for use in calculations of mission performance as per design objectives. This includes the selection of cruise altitude(s) and Mach number(s) supported by pertinent trade analyses and discussion.

2. Aircraft performance descriptions for key mission segments and performance flight envelope
3. Takeoff and landing performance, takeoff performance for required engine out conditions including maximum increase of altitude and temperature over SL ISA, climb performance, tactical approach performance

4. Payload range chart(s)

5. Aircraft weight statement, aircraft center-of-gravity envelope reflecting relevant payloads and fuel allocation.

6. Materials selection for main structural groups and general structural design, including layout of primary airframe structure.

7. A V-n diagram for the aircraft with identification of necessary aircraft velocities and design load factors.

8. Complete geometric description, including clearances, control surfaces, and internal arrangement of the aircraft illustrating sufficient volume for all necessary components and systems. Scaled three-views and 3-D model imagery of appropriate quality are expected. In addition the following shall be procured:

   a. Diagrams and/or estimates showing that internal volume requirements are met, including as a minimum the internal arrangement of the cargo arrangement (X 463L master pallets).

   b. Diagrams of representative loading/unloading of 463L master pallets, demonstrating feasibility of access into and out of the aircraft, with consideration for minimal cargo transfer time design requirements

9. Important aerodynamic characteristics and aerodynamic performance for key mission segments and requirements

10. Propulsion system description and characterization including performance, dimensions, and weights. The selection of a propulsion system concept, sizing, and airframe integration must be supported by appropriate analysis, trade studies, and discussion

11. Summary of basic stability and control characteristics; this should include, but is not limited to static margin, pitch, roll and yaw derivatives

12. Summary of cost estimate analysis, with clear identification of main cost groups and drivers, assumptions, and design choices aimed at the reduction of operating costs.
Final Report

The proposal response will include trade documentation on the major aspects of the design development.

A. The students are to develop and present the alternative concepts considered leading to the downselect of their preferred concept. The methods and rationale used for the downselect shall be presented. At a minimum a qualitative assessment of strengths and weaknesses of the alternatives shall be given, discussing merits, leading to a justification as to why the preferred concept was the best proposal response.

Quantitative justification of why the selected proposal is the best at meeting the proposal measures of merit(s) will strengthen the proposal.

B. In addition, the submitted report shall include justification of the optimization, sizing, architectural arrangement and integration of the specifically selected proposal concept. Quantitative data shall be presented showing why their concept ‘works’ and is the preferred design compromise that best achieves the RFP requirements and objectives.

1. Mission performance and sizing for the definition of a mission profile, particularly cruise altitude(s) and Mach number(s)

2. Overall aircraft concept selection (airframe and propulsion system) vs. design requirements objectives

3. Consideration for two-, three-, and other multi-engine options vs. the conventional four-engine configuration with regards to design requirements and objectives

All concept and technology assumptions must be reasonable and justified for the EIS year.