2004 Request for Proposals

Design for Certification

Mountain rescue helicopter

21st Annual Student Design Competition

for

Undergraduate and Graduate Students

Sponsored by

and

AGUSTAWESTLAND

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1. Participation

1.1 All graduate and undergraduate students may participate in this competition. Part time students may participate at the appropriate graduate or undergraduate level.

1.2 Schools are encouraged to form project teams, although individual entrants may participate. The highest education level on the team will determine the classification of the design team. There is no limit on the number of students on a team. Air vehicle designs must be the work of the students. Guidance may be provided by faculty advisors and should be acknowledged.

1.3 Air vehicle design projects used as part of organized curriculum requirements or class work are eligible and encouraged to enter this competition.

1.4 The AHS must be notified of the intent to submit a proposal in accordance with the schedule in section 4. Each individual or team may submit only one proposal, however, any number of proposals may be submitted from any school. If any student or team wishes to withdraw from the competition, they must notify the AHS National Headquarters immediately in writing.

2. Awards

Graduate Category:

- 1st place - $1000
- 2nd place - $500

Undergraduate Category:

- 1st place - $1000
- 2nd place - $500

In addition, the best new entrant (1st or 2nd year of participation) in each category will also be awarded $500.

Certificates will be presented to the winners and to their faculty advisors for display at the school. In the case of teams, each member will receive a certificate. The 1st place winner, or a representative if a team, in each category will be expected to present a technical summary of their design at the 2005 AHS Annual Forum. The 1st place winners will receive complimentary registration to the 2005 AHS Annual Forum and Agusta Westland will provide $1000 to help defray the cost of attendance.

3. Evaluation Criteria

The proposal will be judged in 4 categories with the following weighting factors:

A. Technical Content (40 points)

- Design meets RFP requirements
- Assumptions are clearly stated and logical
- All major technical issues are considered

- Appropriate trade studies are performed to direct/support the design process
- Well balanced and appropriate substantiation of complete aircraft and subsystems with an emphasis on the systems to be upgraded
- Technical drawings are clear, descriptive, and represent a realistic design

B. Application & Feasibility (25 points)
- Proposal exhibits an understanding of the mission requirements and the material and operational means to accomplish them.
- Technology levels used are justified and substantiated
- Affordability considerations influenced the design process
- Reliability and maintainability features influenced the design process
- Manufacturing methods and materials are considered in the design process
- Regulatory requirements are understood and considered in the design process.

C. Originality (20 points)
- Aircraft concept is innovative and shows the use of imagination in treatment of problems
- Unique vehicle attributes and subsystem integration show innovative thinking
- Aesthetically pleasing lines and features

D. Organization & Presentation (15 points)
- Meets all format and content requirements
- Self-contained Executive Summary contains all pertinent information
- Introduction clearly describes the major features of the proposed helicopter .
- Proposal is well organized so that all information is readily accessible and in a logical sequence
- Clear and uncluttered graphs and drawings

4. Schedule

Issue of RFP ..... July 1, 2003
Request for information and clarification ..... Up to April 16, 2004
Submit Letter of Intent to Propose (Outline of maximum 20 pages)..... April 23, 2004
Submit 6 copies of proposal (postmark date) ..... June 1, 2004
AgustaWestland notifies AHS of winners ..... August 9, 2004
AHS announces winners ..... August 13, 2004
Presentation of winning papers at AHS Forum ..... May 2005

All questions by teams put forward to the AHS before submittal of the Proposal Outline will be distributed with answers to all participating teams. Any Questions or Requests for Clarifications from the judges after review of a team's Proposal Outlines will not be provided to other teams.

5. Contacts

The point of contact for the sponsor of the competition and **any technical questions about the design**:

Mr. Luigi U. Ricci Moretti, Chief Engineer
Agusta Aerospace Corp.
Telephone number: (215) 281-1424
Fax number: (215) 281-0447
Email: l.moretti@us.agusta.com

All correspondence and competition submissions will be mailed to the following address:

Kim Smith, Deputy Director
AHS
217 N. Washington St
Alexandria, VA, 22314

Telephone number: (703) 684-6777
Fax number: (703) 739-9279
Email: kim@vtol.org

6. Design Objectives and Requirements

The increase of human activity in mountain environment in recent years has been accompanied by a more than proportional increase of the requests for airborne supported rescue services.

The helicopters that currently support these endeavors are developments of existing designs or adaptations of models that are characterized by good high-altitude performance.

However none of them has been conceived from the start as a platform specifically designed for mountain rescue operations using a hoist.

The objective of this RFP is the design of a helicopter specifically conceived for high altitude rescue operations.

The requirements are as follows:

- Designed to meet CFR Title 14, Part 27 or Part 29, as applicable according to MTOW or JAR Part 27 or 29. No other certification basis will be accepted.
- Certifiable for Single Pilot day/night IFR operations. Flight in known icing conditions is not required, but will be considered.
- Meets Part 27, Appendix C system and engine requirements for Category A, if designed under Part 27. Capable of OEI HOGE at MGW up to 12000 feet Hd, standard ISA.
- HOGE with all engines operative at MGW up to 15000 feet Hd, standard ISA.
- Cruise speed of at least 145 Knots.
- Anti-torque control system capable of maintaining heading in hover with wind from any azimuth up to at least 40 Knots at 15000 feet.
- Capable of performing a mission consisting of take off from 6000 feet Hd, 1 hour outbound leg with 4 crew at 140 Knots, 20 minutes on station hoist operation with recovery of 2 patients at 12000 feet Hd, 1 hour return leg at 140 Knots

- Provided with accommodations for two pilots, at least two paramedics and two 6-feet patients to be in a supine position on litters or cots. CG envelop to allow for all flyable combinations of crew, passengers and fuel.
- Capable of operation on snow.
- Provisions for in flight recovery and stowage of loaded basket litter after the first patient has been already recovered and secured to its supine accommodation.
- Equipped with weather radar, EGPWS, TCAS or TCAD/TAS, GPS, navigational displays and control panels for these units, 600-pound internal or external hoist, 15-million candlepower controllable searchlight and FLIR/EO stabilized camera system, to be displayed on instrument panel on a 12-inch diagonal screen or similarly sized multifunction display. Navigation / communication equipment and navigation /engine /systems instruments required for certification must be accounted for.
- Electrical system equipped with two engine-driven 200A, 28VDC starter generators and 28V storage battery of capacity sufficient to start engines. A separate 110 VAC electrical system of the necessary capacity can be additionally specified if required to power specific equipment (e.g. hoist).
- Designed using currently certified engines or models currently under development.
- Designed using state-of-the-art technology. No concession will be made for design features based on future technology that is not fully documented. (No unobtainium allowed in the design!).
- Requires provisions for stowage and use of the medical equipment listed in Section 7.
- All auxiliary systems (hydraulics, electrical, engine controls, fuel, oil, avionics and stabilization) must be briefly but clearly described, in order to demonstrate understanding of the requirements and means to accomplish them. The equipment selected for these systems and accounted for in the weight and balance analysis must be shown in the inboard profile. Provisions are required for access to the units installed within the airframe for service and maintenance.
- Particular consideration will be given to the design with respect to compact configuration of airframe and rotors compatible with mission requirements, lowest MGW and installed power, lowest MGW/payload ratio and simplicity of design.

7. Data Package

7.1 Powerplant

Considering that the design of the airframe and lift system is already a daunting task within the limited time available to the team, the use of a currently certified engine or models currently under development is specified.

It is left to the team to define the number of engines and the drivetrain design accordingly.

7.2 Weights

Pilot and passengers 95 kg (210 lb.) each (this includes weight of the equipment carried by the crewmembers on their person).

Medical equipment:

- cardiac monitor (8 lb, 7"H x 9"W x 5"D) within 5 ft of patient's chest
- defribillator (12 lb, 7"H x 10"W x 9"D)
- gaseous oxygen (2200 liters capacity)
- one spare E-size oxygen cylinder installed within reach of the medical crew
- two packs of Advanced Life Support equipment (25 lb, 20"H x 14"W x 7"D each)
- 8"H x 8"W x 12"D storage volume for miscellaneous equipment
- one basket litter

All medical equipment must be accessible in flight by the paramedics. The main oxygen cylinder can be located outside of the cabin.

A fuel specific density of 0.81 (Jet-A) is to be used.

8. Proposal Data Package Requirements

At least one hardcopy of the proposal must be submitted to AHS. A copy in digital format readable with Microsoft Word 98 or Acrobat Reader is also required.

The proposal is not to exceed 100 typewritten 8½ x 11 or A4 pages, with a font of not less than 11 pt 1½ spaced, and will contain:

A. The following 6 items which are not numbered and not included in the page limit -
   - Cover page with the name of the school and the judging category
   - Page carrying the names and signatures of all members of the team
   - Table of Contents
   - List of Figures
   - List of Tables
   - List of Symbols and Abbreviations

B. Executive Summary not to exceed 4 pages (including figures)

C. Table of Physical Data listing -
   - Major dimensions
   - Gross weight, empty weight, and useful load
   - Fuel capacity
   - Engine model and ratings
   - Transmission ratings.

D. MIL-STD-1374 Weight Statement and Longitudinal CG envelop.

E. Performance Charts -
   - HOGE altitude vs. gross weight for both all-engine operative (AEO) and one-engine inoperative (OEI) conditions. Standard ISA conditions to be considered.
   - Payload vs. range at sea level.
   - Altitude vs. maximum continuous speed

F. Drawings -

- General Arrangement foldout drawing on up to 3 sheets of 11x17 or A3 paper showing major dimensions and alternate configurations (if applicable). Doors, windows and access panels layout should be shown on the drawing.
- Inboard Profile foldout drawing on up to 2 sheets of 11x17 or A3 paper showing the size and location of major aircraft features and systems.
- Airframe structural layout on up to 2 sheets of 11x17 or A3 paper showing location and overall size of main structural units (boxbeams, frames, longerons, structural floors and walls).
- Instrument panel and center console layout on up to 2 sheets of 11x17 or A3 paper showing location of instruments, radios, control panels etc.
- Field-of-view diagram for pilots.
- Drive system schematic with gear ratios and shaft speeds, including a description of the structural installation of the main gearbox in the airframe.
- Flight controls schematic showing routing of control rods (if applicable), and geometry of fixed and rotating frame elements.

G. A description of the process by which the configuration was selected, a description of the technical approach and the design features of the helicopter, and an explanation of the analyses supporting the design data. Special attention will be paid to airframe, rotors, flight controls and drivetrain design as well as to the proposed manufacturing processes.

The proposal should provide a clear, even though necessarily synthetic, description of the design, including the installed systems, that will demonstrate thorough understanding of the design process and of the interactions that design features have on the system configurations.

Considering that cost estimation at this level is subject to too many unknowns, it is not requested. If performed, explanation of the method should be provided.

The oral presentation will be held by no more than two team members, however in the following question and answer session, all team members can participate. During the question and answer session the team is allowed to use additional documentation (data or specification sheets, user manuals, etc.) regarding the third-party vendor systems selected in the design only to the extent necessary to clarify design details. This supporting documentation will not be considered part of the proposal and will not be judged in se. No other material in addition to what has been listed above can be submitted for the proposal evaluation.