

28 October 07 Update



2007/08 Rules and Vehicle Design

Rules Posting: 15 Aug 2007

Entry Deadline: 31 Oct 2007

The contest rules may be augmented/supplemented at any time during the competition. During the period from the rules posting up to the entry deadline the FAQ will be used to document any changes.

Following the entry deadline changes will be e-mailed to each teams contact e-mail address. Questions may be submitted at any time, answers will be provided **ONLY** as outlined above.

Summary:

The AIAA through the Applied Aerodynamics, Aircraft Design, Design Engineering and Flight Test Technical Committees and the AIAA Foundation invites all university students to participate in the **Cessna Aircraft Company/Raytheon Missile Systems - Student Design/Build/Fly Competition**. The contest will provide a real-world aircraft design experience for engineering students by giving them the opportunity to validate their analytic studies.

Student teams will design, fabricate, and demonstrate the flight capabilities of an unmanned, electric powered, radio controlled aircraft that can best meet the specified mission profile. The goal is a balanced design possessing good demonstrated flight handling qualities and practical and affordable manufacturing requirements while providing a high vehicle performance.

To encourage innovation and maintain a fresh design challenge for each new year, the design requirements and performance objectives will be updated for each new contest year. The changes will provide new design requirements and opportunities, while allowing for application of technology developed by the teams from prior years.

Check the rules package carefully as items and approaches that were legal in past years may not be legal for this contest year. Only the contents of this Rules package, the 2007/08 FAQ, and 2007/08 Q&A documents hold bearing on the requirements and/or allowances for the current contest year. It is the responsibility of the teams to know and follow all provided rules, the FAQ, and all contest day briefings.

Questions may be addressed to the contest director as outline in the communications section below.

Cash prizes are \$2500 for 1st, \$1500 for 2nd and \$1000 for 3rd place. The winning team will be invited to present their design at an AIAA conference hosted by the sponsoring technical committees.

Judging:

Students must design, document, fabricate, and demonstrate the aircraft they determine to be capable of achieving the highest score on the specified mission profile(s). Flight scores will be based on the demonstrated mission performance obtained during the contest.

Each team must also submit a written Design Report. A maximum of 100 points will be awarded for the team design report. Scores for the written reports will be announced at the beginning of the fly-off.

Each aircraft will have computed a Rated Aircraft Cost, reflecting the complexity/technology of the design.

The overall team score is a combination of the Design Report and Flight scores. The team with the highest overall team score will be declared the winner.

Scores will be FINAL 7 working days after the completion of the contest. This period will allow for review of the scores in a timely fashion following the contest.

All submitted reports are the property of AIAA, Cessna and Raytheon and may be published or reproduced at their discretion.

Contest Site:

Host for the competition will be the Cessna Aircraft Company in Wichita, KS. You can check on weather historical conditions at www.weatherbase.com or www.weatherunderground.com.

Team Requirements:

All team members (except for non-student pilots) must be full time students at an accredited University or College and student members of the AIAA. At least 1/3 of the team members must consist of Freshman, Sophomores or Juniors. The pilot must be an AMA (Academy of Model Aeronautics) member. Teams may use a non-university member for the pilot if desired. We will also provide qualified pilots on the contest day for any teams who are unable to have their pilot attend.

There may be a maximum of two (2) teams entered from any one educational institution. For schools with multiple campuses in different cities/parts of the state, each campus will be considered as a separate entity.

Past Year Reports:

Winning team design reports from all of the prior contest years are posted on the contest website as examples. Note that the formatting and content has evolved from one year to the next. Only the rules noted in this document apply for the current year. The top scoring report from this year's contest will be placed on the contest web site for the next year's competition.

Sponsorship:

Teams may solicit and accept sponsorship in the form of funds or materials and components from commercial organizations. All **design, analysis and fabrication** of the contest entry is the sole responsibility of the student team members.

Schedule:

A completed electronic entry must be **RECEIVED** by the contest administrator by 5 PM local time on **31 October 2007**. Entry forms may not be submitted before **1 October**.

Note: The DBF entry form is different from the one used for other AIAA student competitions. The DBF entry form is a MS-Word file and can be found on the contest web site. It must be submitted by e-mail to the contest administrator at director@aiaadb.org. Be sure to include the Phone and FAX number for your team advisor and at least one student contact so we may reach you in case of any last minute problems or changes. All teams are

required to provide two point-of-contact e-mail addresses with their contest application, one of which must be the teams advisor. *It is the teams responsibility to make sure the e-mail contact addresses they supply remain active during the entire period from entry to the close of the competition, as e-mail will be the primary means to provide information and updates. Do not use an internal team correspondence e-mail list server as your point of contact e-mail address.*

Please Note: The **Entry Name** may not be changed once the form is submitted, but must be retained and used on all reports and correspondence during the competition year.

Design reports must **ARRIVE** at the Chief of Scoring address by 5 pm local time on **4 March 2008**. Reports will be judged “as received”, no “corrections/additions/page changes after the due date and time” will be made by the organizers so check your reports carefully before sending them. **NEW: Teams must submit 5 hard copies of the report (printing details are outlined in the report section at the bottom of this document) AND one electronic copy in PDF format on a CD. The hard copies will be used for judging. The CD copy will be used for AIAA archive purposes.**

The contest is scheduled for **18-20 April 2008**. The competition will run from Noon to 5PM on Friday, and 8AM to 5PM on Saturday and Sunday. Final awards will be presented at the end of Sunday's competition. All teams should plan their travel so that they may stay for the awards presentations on Sunday.

Please note that tech inspections will be available on Friday **18 April**. All teams are encouraged to be prepared to have your plane inspected on Friday. Inspections will also be available on Saturday, but waiting until Saturday to go through tech may mean that your team will miss one or more rounds through the flight sequence. If we have a full turnout you may not be able to get in a full set of scoring flights unless you are "ready to fly" at every opportunity.

Late entries will **NOT** be accepted. Late report submissions will **NOT** be judged. Teams who do not submit the required written reports will **NOT** be allowed to fly. It is the team's responsibility to assure that all deadlines are met, as they will be strictly enforced.

Communications:

The contest administration will maintain a World Wide Web site containing the latest information regarding the contest schedules, rules, and participating teams. The contest web site is located at:

<http://www.ae.uiuc.edu/aiaadbf>

Questions regarding the contest, schedules, or rules interpretation may be sent to the contest administrator by e-mail at:

director@aiaadbf.org

Questions received prior to the official entry submission date will not be answered directly. Select questions “may” be answered in the FAQ prior to the entry submission date. Official questions and answers received following the entry submission date will be provided by e-mail to all teams of record.

Written reports and CD copies should be sent to the Chief of Scoring at:

AIAA Design/Build/Fly Contest/Report Judging
Tom Zickuhr
Cessna Aircraft Company
MS 178P
5701 E. Pawnee
Wichita, KS 67218
316-831-2810
316-206-6800 FAX

Aircraft Requirements - General

- ... The aircraft may be of any configuration except rotary wing or lighter-than-air.
- ... No structure/components may be dropped from the aircraft during flight.
- ... No form of externally assisted take-off is allowed. All energy for take-off must come from the on-board propulsion battery pack(s).
- ... Must be propeller driven and electric powered with an unmodified over-the-counter model electric motor. May use multiple motors and/or propellers. May be direct drive or with gear or belt reduction.
- ... Motors may be any commercial brush or brushless electric motor.
- ... For safety, each aircraft will use a commercially produced propeller/blades. Must use a commercially available propeller hub/pitch mechanism. Teams may modify the propeller diameter by clipping the tip, and may paint the blades to balance the propeller. No other modifications to the propeller are allowed. Commercial ducted fan units are allowed.
- ... Motors and batteries will be limited to a maximum of 40 Amp current draw by means of a 40 Amp fuse (per motor or battery pack) in the line from the positive battery terminal to the motor controller. Only ATO or blade style plastic fuses may be used. (e.g. "Maxi" size Slow Blow, 1.15"x0.85". Available online www.Mcmaster.com part #7460K51)
- ... Must use over the counter NiCad or NiMH batteries. For safety, battery packs must have shrink-wrap or other protection over all electrical contact points. The individual cells must be commercially available, and the manufacturers label must be readable (i.e. clear shrink wrap preferred). All battery disconnects must be "fully insulated" style connectors.
- ... **Maximum propulsion battery pack weight is defined in the mission rules section.** This battery pack must power propulsion systems only. Radio Rx and servos MUST be on a separate battery pack. Batteries may not be changed or charged between sorties during a flight period.
- ... Aircraft and pilot must be AMA legal. This means that the aircraft TOGW (take-off gross weight with payload) must be less than 55-lb, and the pilot must be a member of the AMA.
- ... Since this is an AMA sanctioned event, the team must submit proof that the aircraft has been flown prior to the contest date (in flight photo) to the technical inspection team. Contest supplied qualified pilots will be available to teams who require them.

Aircraft Requirements - Safety

All vehicles will undergo a safety inspection by a designated contest safety inspector prior to being allowed to make any competition or non-competition (i.e. practice) flight. All decisions of the safety inspector are final. Safety inspections will include the following as a minimum.

- Physical inspection of vehicle to insure structural integrity.
 1. Verify all components adequately secured to vehicle. Verify all fasteners tight and have either safety wire, locktite (fluid) or nylock nuts. Clevises on flight controls must have an appropriate safety device to prevent their disengaging in flight.
 2. Verify propeller structural and attachment integrity.
 3. Visual inspection of all electronic wiring to assure adequate wire gauges and connectors in use.
 4. Radio range check, motor off and motor on.
 5. Verify all controls move in the proper sense.
 6. Check general integrity of the payload system.
- Structural verification. All aircraft will be lifted with one lift point at each wing tip to verify adequate wing strength (this is "roughly" equivalent to a 2.5g load case) and to check for vehicle cg location. Teams must mark the expected empty and loaded cg locations on the exterior of the aircraft. Special provisions will be made at the time of the contest for aircraft whose cg does not fall within the wing tip chord. This test will be made with the aircraft filled to its *maximum payload capacity*.
- Radio fail-safe check. All aircraft radios must have a fail-safe mode that is automatically selected during loss of transmit signal. The fail-safe will be demonstrated on the ground by switching off the transmit radio. During fail safe the aircraft receiver must select:

Throttle closed
 Full up elevator
 Full right rudder
 Full right (or left) aileron
 Full Flaps down (if so equipped)

The radio Fail Safe provisions will be strictly enforced.

- All aircraft must have a mechanical motor arming system separate from the onboard radio Rx switch. This **MUST** be the contest specified "blade" style fuse. This device must be located so it is accessible by a crewmember standing **ahead** of the propeller(s) for pusher aircraft, and standing **behind** the propeller(s) for tractor aircraft (i.e. the crew member must not reach across the propeller plane to access the fuse). The "Safety Arming Device" will be in "Safe" mode for all payload changes. The aircraft Rx should always be powered on and the throttle verified to be "closed" before activating the motor arming switch. Fuses **MUST be mounted on the outside the aircraft** (they can not be behind an access panel or door) and **MUST** act as the "safeing" device.

Note: The aircraft must be "safed" (arming fuse removed) any time the aircraft is being manually moved, or while loading/unloading payload during the mission. The arming fuse must be removed anytime the aircraft is in the hanger area.

Scoring:

In the event that, due to time or facility limitations, it is not possible to allow all teams to have the maximum number of flight attempts, the contest committee reserves the right to ration and/or schedule flights. The exact determination of how to ration flights will be made on the contest day based on the number of entries, weather, and field conditions.

Each team's overall score will be computed from their **Written Report Score and Total Flight Score** using the formula:

$$\text{SCORE} = \text{Written Report Score} * \text{Total Flight Score}$$

The total flight score is the sum of the Mission 1: Delivery Flight (50 max) and Mission 2: Payload Flights (100 max).

Mission Task Matrix:

Reconfigurable Short Field Transport

General Specifications:

- ... All payloads will be comprised of a mix of passengers and/or cargo. The air vehicle must be able to accommodate any/all of the alternate payload combinations.
- ... The contest administration will provide all payloads.

Aircraft Specifications

- ... Aircraft must fit in a spot size of 4 feet x 5 feet when sitting on it's landing gear in a normal ground attitude.
 - Spot size is defined as a 4 ft x 5 ft rectangular outline on the ground. When sitting on the ground in normal attitude no part of the aircraft when projected to the ground can cross or be outside of this outline.
- ... Aircraft will have a **RAC** to be used as a factor in the **Payload Mission** score.
 - $\text{RAC} = \text{System_Weight} \times \text{Battery_Weight}$
 - System_Weight – Aircraft weight with no payload or batteries, with any/all payload insert/restraint components (aka "Speed Loaders") that may be used for any flight/payload combination.
 - Battery_Weight – Weight of the specific batteries flown on that mission.
- ... Maximum allowed battery weight is **4 lbs**.
- ... All payloads must be mechanically restrained. The cargo hatch may not form any part of the restraint system. Velcro and tape are not allowed.
 - Teams will demonstrate passenger/cargo restraints are sufficient to restrain the payload by holding the loaded aircraft such that the payload hatch opening is down (upside down for top hatch, on end for front or rear hatch, etc) with the hatch removed.

- You may not fill the cargo compartment with foam or other packing material to act as a restraint. There must be visible airspace around each individual payload element.
- ... All payloads must be carried internally. All external aircraft surfaces (ie any surface presented to the air stream) must be the same profile, and the same physical elements, when configured to carry any/all payloads.

Payload Specifications

- ... Passengers will be simulated by 1/2 liter plastic bottles (typical water bottles).
 - Passengers (bottles) will be ballasted to approx. ½ lb each. All passengers (bottles) will not be the same weight.
 - Diameter Approx 2.5 in Height Approx 8.5 in
 - Each passenger (bottle) will include a collar to limit spacing. Collars may be round (not to exceed 4" diameter) or square (not to exceed 4"x4"). Collars will not be located at the extreme top or bottom of a passenger (bottle). Collar location may vary among passengers (bottles).
 - Passengers (bottles) must be upright when the aircraft is in flight attitude.
 - Passengers (bottles) may not be stacked vertically unless there is a separate, structural (ie non-removable), floor between each level.
- ... Cargo Pallets will be simulated by US 1/2 size clay bricks.
 - All cargo pallets (bricks) will not be the same exact size or weight.
 - Dimensions Approx 4 in x 4 in x 2-2/3 in
 - Approx wt. 1.8 lbs.

Payload Combinations

- ... Possible payload combinations are:
 - 14 Passengers (nominal 7 lb)
 - 4 cargo pallets (nominal 7.2 lb)
 - 10 passengers and 1 cargo pallet (nominal 6.8 lb)
 - 7 passengers and 2 cargo pallets (nominal 7.1 lb)
 - 3 passengers and 3 cargo pallets (nominal 6.9 lb)
- ... All payload combinations will not be the same weight.

Mission Specifications

- ... The maximum number of flight attempts is **5**.
- ... Aircraft must take off in 75 feet.
- ... On all flight laps the aircraft must complete one 360° turn in the opposite direction of the flight pattern.
- ... There is no timed repair of damage in this years contest.
- ... There will be no 2 minute preparation time this year.
- ... Teams must be prepared to begin their take-off attempt as soon as they arrive at the flight line. Teams unable to proceed into their take-off run must leave the flight line and wait for their next attempt.
- ... If the first take-off attempt is not successful, there is a maximum time limit of 5 minutes allowed from the time you were cleared to approach the flight line to make additional attempts.

Mission 1: Delivery Flight

- ... Teams will select the battery pack to fly when entering the staging box. The weight of that pack will be recorded and will apply only for that mission's scoring formula.
- ... There is no payload for this flight. Any/all passenger/cargo restraint components/elements must be stowed inside the aircraft during flight.
- ... Teams must fly a successful delivery flight before being allowed to attempt a cargo flight.
- ... Teams may fly only one successful delivery flight, you may not repeat the flight to try to improve your score.
- ... The delivery flight will be the maximum number of complete laps that can be flown in a **5** minute time period.
- ... Time will start at the beginning of take-off, and will end when passing over the start/finish line in the air.
- ... Aircraft must land successfully on the runway.
- ... Mission score is **# complete laps/Battery_Weight**

- ... Mission scores will be normalized across all aircraft that successfully complete this mission. Maximum mission score will be 50.

Mission 2: Payload Flights

- ... Teams will select the battery pack to fly when entering the staging box, before being given their payload assignment for that mission. The weight of that pack will be recorded and will apply only for that mission's RAC.
- ... Payloads will be assigned randomly.
 - o There is no guarantee that all teams will fly the same payload or combination/sequence of payloads.
 - o A team may get a new payload assignment or may have to repeat a payload assignment on each new flight attempt depending on the random payload selector used by the contest administration.
 - o Teams will not be told which payload they will fly until they begin the timed payload loading.
- ... Teams will be timed on configuring the aircraft and loading the payload for that mission.
 - o Any/all payload restraint components/elements must be flown in the aircraft on all flights.
 - o Any/all payload restraint components/elements will be inside the aircraft at the beginning and end of the timed configuration/loading.
- ... Aircraft must fly 2 laps of the course and land successfully on the runway.
- ... There is no overall flight time constraint for this mission. However, the time limit for completing a successful take-off above still applies..
- ... Mission score is: **1 / (Loading time x RAC)**.
- ... Teams will receive a score for their **first 2** successful payload flights.
- ... Mission scores will be normalized across all aircraft that successfully complete this mission. Maximum mission score will be 50 for an individual flight, so the maximum possible score will be 100 for the 2 allowed payload scoring flights.

Flight Line Order:

- ... A flight order list will be generated and posted at the beginning of flying on Saturday. Teams will always rotate in this order. The flight order will be repeated continuously.
The flight order list will carry over from Saturday to Sunday at what ever spot in the rotation it leaves off.
- ... Each teams position in the flight order will be determined from their written report score, highest report score goes first.
- ... There will be four **staging box** positions near the flight line. While in the **staging box** teams can make any final preparations and checkout required prior to flight.
- ... If you are not in place in a **staging box** when your rotation number comes up you will miss your opportunity for that rotation.
Note: We will not call teams to the **staging box**, it is the teams responsibility to monitor the progress of the contest and decide when they need to get ready to enter an open spot in the **staging box**. A contest official will be available to help teams in entering the **staging box** area.
- ... Electing to enter one of the **staging box** positions on your turn in the rotation order **will constitute using a flight attempt**.
If you choose to leave the **staging box** for any reason you will **forfeit that flight attempt**.
If you go to the flight line and are not able to begin your takeoff when instructed you will **forfeit that flight attempt**.

General Mission Specification and Notes:

- ... The aircraft propulsion system(s) must be disarmed or "safed" during any time when crew members are preparing the aircraft.
- ... Maximum flight support crew is: pilot, observer, and 3 ground crew. Only the designated ground crew may load the aircraft payload . Pilot and observer may be members of the ground crew, provided total ground crew size remains 3 people.
- ... Observer and all ground crew must be students. **Only the pilot may be a non-student**.
- ... The upwind turn will be made after passing the upwind marker. The downwind turn will be made after passing the downwind marker. Upwind and downwind markers will be 500 ft from the starting line. Aircraft

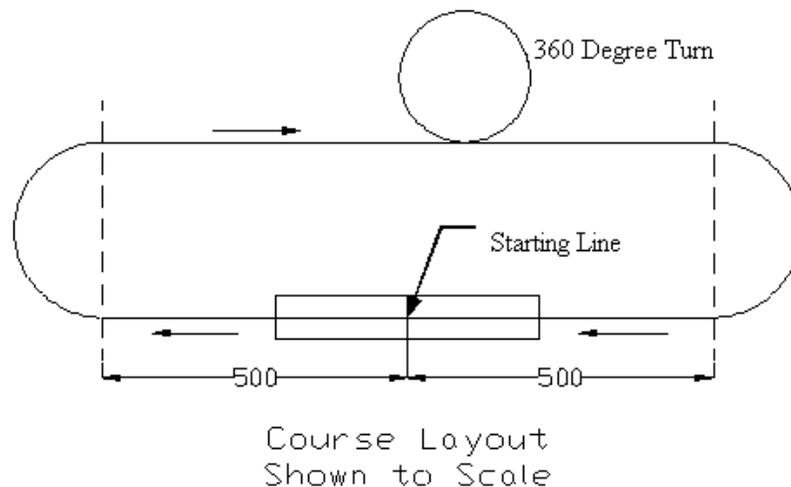
must be "straight and level" when passing the turn marker before initiating a turn.

- ... Aircraft must land on the paved portion of the runway. Aircraft may "run-off" the runway during roll-out. Aircraft may not "bounce" off the runway.
- ... After landing, aircraft **may** taxi back to the starting line. Alternatively, aircraft may be carried back to the starting line; however, the team may not leave the pit area to retrieve the aircraft until the aircraft has come to a complete stop, and they are signaled it is "Ok" to retrieve the aircraft by the Flight Line Judge. *Aircraft with "significant" damage will not receive a score for that flight. Determination of "significant" is solely at the discretion of the Flight Line Judge.*
- ... Flight altitude must be sufficient for safe terrain clearance and low enough to maintain good visual contact with the aircraft. Decisions on safe flight altitude will be at the discretion of the Flight Line Judge and all rulings will be final.

Additional information is included in the [FAQ](#) (Frequently Asked Questions).

Flight Course:

The orientation (direction) of the flight course will be adjusted based on the prevailing winds as determined by the Flight Line Judge. The flight course will be positioned to maintain the greatest possible safety to personnel and facilities. The nominal flight course is shown in the Figure below.



Protest Procedure:

Submitting a protest is a serious matter and will be treated as such. Teams may submit a protest to the Contest Administration at any time during the competition. Protests may not be submitted after the conclusion of the competition. Protests must be submitted in writing and signed by the team advisor, designees are not allowed for protest submissions. If the team advisor is not present, he may FAX a signed protest to the team for them to present. Protests may be posted for review at the decision of the administration.

Protests and penalties (up to disqualification from the contest for deliberate attempts to misinform officials, violate the contest rules, or safety infractions) will be decided by the Contest Administration. The decision of the Contest Administration is final.

Design Report:

Each team will submit a judged design report as outlined below and in the schedule section of this document.

- ... Reports must have the University and Team name (as listed on the ORIGINAL entry form, not team "nicknames") on the cover page. Reports missing this identification information will not be scored.

- ... Reports must be bound; unbound reports will not be scored. Simple spiral bindings are sufficient and preferred. Paper clips, 3-ring binders, or clamps are **NOT allowed**. Stapled reports are discouraged and will be **penalized 10 points**
- ... Report paper may be **no larger** than 8 ½ inches wide by 11 inches long with the exception of the drawing package. A4 paper may be used **ONLY** if it is cut to a maximum length of 11 inches. The drawing package may be on 11 inch long x maximum of 17 inch wide pages. **A 10 point penalty will be given for the use of oversize paper.**
- ... Absolute maximum page count for the report is **60 pages**, inclusive of all pages of any type including any form of front and back cover. **Reports exceeding the maximum page count will be given a 10 point penalty for each additional page.**
- ... All reports should be **at least** one and one half line spacing, 10-pt Arial font. Tables and figures will also be **at least** 10-pt Arial font. Margins should be **at least** 1 inch on all sides. All figures and tables should be clear and readable for the judges. The reports will be judged on format and readability.
- ... Reports will be scored on a 100 point basis following the guidelines outlined below. All information used for scoring **must be in the outlined sections, content that is out of sequence, including the drawing package, will be treated as missing** and scored accordingly. Report scores will not be available prior to the contest weekend.
- ... **ALL** items listed must be present, easy to locate and identify, well documented and in the correct section for full scoring.
- ... Examples of winning team design reports from prior contest years are posted on the contest website. Note that the formatting and content has changed from one year to the next. Prior year reports may not reflect or meet the rules listed for the current year.

Note: Please do not ship reports packed in “packing peanuts”. Please keep your packaging recyclable and as compact as possible.

Report scoring is based on the reports **AS SUBMITTED**. Final proofing of the report printed copies (**ALL**) prior to submission is **STRONGLY** encouraged.

Design Report

All section scores will include format, completeness and readability

1. Executive Summary: (10 points):
 - ... Maximum of 2 pages. If section exceeds page limit it will be scored as 0 points.
 - ... Provide a summary description of your selected design and why it is the best solution to the specified mission requirements.
 - ... Describe your key mission requirements and design features keyed to those requirements.
 - ... Document the performance/capabilities of your system solution.
2. Management Summary (5 points):
 - ... Describe the organization of the design team.
 - ... Provide a chart of design personnel and assignment areas.
 - ... Provide a milestone chart showing planned and actual timing of the design / fabrication / testing processes.
3. Conceptual Design (15 points):
 - ... Describe mission requirements (problem statement).
 - ... Translate mission requirements into design requirements.
 - ... Review solution concepts/configurations considered.
 - ... Describe concept weighting and selection process and results.
4. Preliminary Design (20 points):
 - ... Describe design/analysis methodology
 - ... Document design/sizing trades
 - ... Describe/document mission model (capabilities and uncertainties)
 - ... Provide estimates of the aircraft lift, drag and stability characteristics.

- ... Provide estimates of the aircraft mission performance.
 - 5. Detail Design (30 points total. 15 points for discussion items, 15 points for drawing package):
 - ... Document dimensional parameters of final design.
 - ... Document structural characteristics/capabilities of final design.
 - ... Document systems and sub-systems design/component selection/integration/architecture.
 - ... Document Weight and Balance for final design. Must include a Weight & Balance table for the empty aircraft and with each of the possible payloads
 - ... Document **flight** performance parameters for final design.
 - ... Document Rated Aircraft Cost
 - ... Document **mission** performance for final design.
 - Drawing Package
 - ... 3-View drawing with dimensions.
 - ... Structural arrangement drawing.
 - ... Systems layout/location drawing.
 - ... Payload(s) accommodation drawing(s).
 - 6. Manufacturing Plan and processes (5 points):
 - ... Document the process selected for manufacture of major components and assemblies of the final design.
 - ... Detail the manufacturing processes investigated and selection process/results.
 - ... Include a manufacturing milestone chart showing scheduled and actual event timings.
 - 7. Testing Plan (5 points):
 - ... Detail testing objectives, schedules, and check-lists.
 - 8. Performance Results (10 points):
 - ... Describe the **demonstrated** performance of key subsystems and compare it to predictions from Section 5. Explain any differences and improvements made.
 - ... Describe the **demonstrated** performance of your complete aircraft solution and compare it to predictions from Section 5. Explain any differences and improvements made.
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[\[AIAA Student Design/Build/Fly Competition homepage\]](#) [\[AIAA Homepage\]](#)

8 November 2007 Update



Frequently Asked Questions (FAQ) 2007/08 Competition Specific

Please check the FAQ often during the competition. Please note that rules interpretation questions are not answered by e-mail until after the entry date (when all participant e-mail address are known), so that all teams will have equal access to all rules information.

***** All Rulings In This FAQ Supplement The Official Rules! *****

General Notes:

- ... 2.4 GHz ISM band radios are now legal for the contest. They MUST be capable of implementing the full fail-safe sequence procedure outlined in the rules. If you are going to use a 2.4 GHz radio please note it in the appropriate location on the entry form.
- ... Brushless motors are now legal.
- ... Ni-mH batteries are now legal. Li-Poly batteries are NOT legal for use either as propulsion or RC batteries.

Payload Questions:

All payloads for this year will be provided by the contest administration. Suitable payload definitions are given in the rules to allow teams to create their own payloads for testing.

1. **Question:** Are the passenger collars used for a means of separating one another or are they for mounting purposes?
Answer: The collars will only be slipped over the bottles, they may not be secured to the bottles sufficiently for use as part of a retention system.
2. **Question:** Can the collars of the passengers overlap?
Answer: No.
3. **Question:** What is the ballast material (ie water, sand, other)? Is the collar itself the ballast? Will passengers that are heavier be identified?
Answer: The ballast will be water. The weight of individual “passengers” will not be marked. The collar is not part of the ballast.
4. **Question:** Can you provide the exact size, shape and weight for the water bottle “passengers”?
Answer: The “passengers” may be comprised of any mix of commercial ½ liter water bottles. They range from about 2.4 to 2.6 inches in diameter (61 to 65 mm) and 7.6 to 8.3 inches in

height (194 to 210 mm).

Typical bottle shapes are shown in the attached figures.



"Passenger" with notional collar. Contest passengers will not be wearing glasses.



Flight / Mission Questions

1. **Question:** Do we have to fly all of the different missions to get a score?
Answer: You will get a score for each mission you successfully complete. The Delivery Flight must be completed before any Payload Flight(s) may be attempted.
2. **Question:** Is there a minimum altitude for flying the course?
Answer: No. Altitude must be high enough for safe flight as set by the discretion of the Contest Director.
3. **Question:** Can we tailor the configuration of the aircraft differently for the different missions? For example, could we use different sized propulsion systems for each flight?
Answer: You cannot change the hardware configuration of the aircraft for the different missions. You can however change the propeller diameter/pitch for each flight attempt.
4. **Question:** At what wind speed will the contest be called.
Answer: It will be up to each team to determine whether they want to fly or not. The contest will be called if the wind speed exceeds 30 mph for a period of time sufficient to prevent all teams who are ready to fly from being assigned a flight time slot. The 30 mph limit is consistent with normal AMA competitions and is required to retain our contest insurance coverage.
5. **Question:** For the rule requirement that the aircraft fit within a specified spot size, does the aircraft have to fit in this area fully assembled? If so, does it also have to be flight ready or would something like folded, but attached wings be considered assembled?
Answer: It must be fully flight ready.
6. **Question:** Is there a height limit for the aircraft to go with the spot size?
Answer: No

7. **Question:** Is the “hatch open” payload test going to be done with holding the plane from wingtips, or from anywhere from the fuselage while hatch is open?
Answer: The airplane need not be held by the wingtips for this test, but can be held from any orientation that exposes the payload.
8. **Question:** I have noticed that you have allowed the use of 2.4 GHz systems. I currently own and work with these new transmitters and have found it to be that none of them actually have a full-fail safe system. Mine, the Spectrum DX7 only has a fail safe with throttle only. When the transmitter is turned off the airplane returns to engine idle. Although I have flown my airplane over 50 times and not once got hit with a spike in signal or loss of control over various airports. The system is virtually perfect. What can we do about this system? Are we still allowed to use this system or do we have to use FM bands only?
Answer: Not all of the 2.4 systems have the full fail safe feature that we require. Just like not all of the 72Mhz radios have a full failsafe. The JR 9303 2.4 (<http://www.horizonhobby.com/Products/Default.aspx?ProdID=JRP2910>) has the full failsafe available. The XtremeLink by Xtreme Power Systems (<http://www.xtremepowersystems.net/index.php>) also features a full failsafe option. The Spectrum and Futaba 2.4 radios are throttle only. To be legal for the contest a 2.4 radio **MUST** support the full failsafe sequence.
9. **Question:** For mission one, do you have to be flying for five minutes or can you land prior to that? Do you have to land within the five minutes?
Answer: You may end the mission prior to the 5 minutes. The aircraft does not have to be on the ground within the 5 minutes. The last lap COMPLETED within the 5 minutes determines the mission score.

Aircraft Configuration Questions

1. **Question:** On the webpage it states that aircraft CANNOT be of rotary wing design. Rotary wing being somewhat defined in another section as 'vertical flight capability'. However, thrust vectoring IS allowed, as are ducted-fan units. Is vertical Take-off via ducted-fan units legal, or does that fall under the rotary aircraft definition?
Answer: A ducted fan configuration capable of thrust vectoring for short take-off but not true vertical flight would be legal.
2. **Question:** We have talked with an outside vendor and they possess a manufacturing technique and material that we are not capable of producing here at the school. The design of the part would be done by us, with manufacturing done by them.. Is this permitted by the rules?
Answer: No. The rules (sponsor section) say “All design, analysis and fabrication of the contest entry is the sole responsibility of the student team members.” Commercial components may be used if part of the manufacturer's public product line.
3. **Question:** Since the hatch holds no load can it be magnetically constrained?
Answer: The mechanical fastener requirement does not apply to elements of the aircraft outside the payload retention system.
4. **Question:** Are gyros legal for stability purposes?
Answer: Yes

Report Questions

Report format rules are significantly changed from prior years. Be sure to follow the current rules. Being allowed in prior years is not grounds for expecting the same item to be allowed this year.

1. **Question:**
Answer:

General Questions

1. **Question:** Is it safe to assume that if the rules do not explicitly forbid something, it is allowed?
Answer: The rules are intentionally designed to not impose too many limitations while allowing each team an equal chance. If something adheres to the "spirit" of the rules it is likely to be allowed. **If you have any specific questions you would like clarified** they may be addressed in a private e-mail to the contest administrator. Ideas will not be disclosed to other teams if they represent a legal and innovative approach. If it is deemed to be not legal, it may be added to this FAQ or posted to the other teams at the administrator's discretion.
2. **Question:** What would constitute "non-critical" versus "significant damage" on landing as described in the rules?
Answer: The decision will be at the discretion of the flight line judges. In general, "non-critical" damage would allow the aircraft to be easily returned to safe flight status. A couple of examples of "non-critical" damage would be a broken propeller, bent landing gear, sheared nylon bolts or minor scratches to the finish. If any component is structurally damaged and would be considered a hazard to safe flight then it will be considered as "significant damage".
3. **Questions:** Can there be thrust vectoring via rotating the engine, nozzles, blown surfaces etc.?
Answer: Yes. Any of the above options is allowed, and may be varied during flight. However, "rotary wing" vehicles are not allowed, so you may need to consult the judges with your specific design and it's thrust levels to be sure it doesn't cross over the line into vertical flight capability.
4. **Question:** Do all of the team members need to be student members of AIAA?
Answer: Since the DBF is part of the AIAA competitions sanctioned by the Student Activities Committee and the AIAA Foundation, all team members should be student members of the AIAA.
5. **Question:** What was the maximum number of people that can make-up a team.
Answer: There is no specific limit on team size. It is up to the team itself to determine a size sufficient to meet the required tasks and small enough to remain manageable. It is expected most teams would fall in the 5 to 10 member size range, but this is only an estimated guideline. There is a maximum size of the flight crew (pilot and assistant) and ground crew (3) for this years competition. Please see the RULES section for more details on the limitations on the flight and ground crews.
6. **Question:** Is it necessary to list all team members on the entry.
Answer: Yes, we need to know all the team members to verify the under/upper classmen rule. Teams will be allowed to revise/update their official membership one time in February.
7. **Question:** What is meant by "Upper and Under Classmen"
Answer: Upper Classmen are (for purposes of the contest) seniors and/or graduate students. Lower Classmen are Freshmen, Sophomores and Juniors.
8. **Question:** Does the 1/3 under classmen rule apply to the people present at the fly-off site?
Answer: No. The 1/3 , 2/3 distribution applies to the team as a whole, from the entry date through the end of the contest. Not all team members must be present at the fly-off.
9. **Question:** Is it allowed to have/declare more then 1 pilot in a team (in case one of them can not go to the contest, or simply have a back-up pilot)?
Answer: Yes, teams may register multiple pilots as long as each meets the requirements listed in the rules.
10. **Question:** Can we have corporate sponsors? If so, can we put their logo on the UAV at any place that pleases them?
Answer: Teams may solicit and accept sponsorship in the form of funds or materials and components from commercial organizations. All design, analysis and fabrication of the contest entry is the sole responsibility of the team members.

Sponsor and university decals or logos may be placed as desired. Teams should make sure that the final color scheme of the aircraft provides good visibility of the aircraft location and orientation for the pilot.

11. **Question:** Our team has completed our design calculations and we have found a manufacturer that carries wing components that will meet our design criteria. Can we purchase components (i.e. foam cores and skins) to construct the wing for our UAV, or are we required to build it from scratch?

Answer: You may use unassembled components such as wing cores providing they are integrated in a way that results in the final configuration being an original design. You may also have components of your design machined to your design specifications by an outside contractor if the team and/or university does not have the required machining facilities.

12. **Question:** How is the radio fail-safe described in the safety supplement to be implemented.

Answer: This is a feature available in many production RC radio systems. It is ***required*** that your radio system be able to provide this function.

13. **Question:** When you check the CG, what kind of a point will you use? For example will it be checked with fingers or dowels or something even sharper?

Answer: The CG check will be coincident with the structural verification test described in the Safety Requirements supplement to the basic rules. Specifically, two team members will be asked to pick the aircraft up by the wing tips using their hands (usually a clenched fist placed under the wing at the desired location works well). They will (gently) lift the aircraft at it's full contest weight by the wing tips at the marked axial CG location. For aircraft configurations where the CG is not within the chord of the wing tips, a third lift point, located as far from the CG as possible, will be used to balance the aircraft.

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