15Sept06 Update

2006/07 Rules and Vehicle Design

Rules Posting: 16 Aug 2006
Revised: 15 Sept 2006
Entry Deadline: 31 Oct 2006

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 2006/07 FAQ, and 2006/07 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, Rated Aircraft Cost 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 Raytheon Missile Systems. The fly-off is planned to be held near their facilities in Tuscon, AZ. 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:

The top scoring report from the past year's competition will be available for reference on the contest web site. The team with the top scoring report from this year's contest will be required to submit an electronic copy of their report following the competition, which 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 2006**. Entry forms may be submitted at any time after 1 October 2006

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 greg.page@nrl.navy.mil . 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.

Written reports (**5 hard copies, electronic reports will not be accepted**), must ARRIVE at the Chief of Scoring address by 5 pm local time on **6 March 2007**. Reports will be judged "as received", no "corrections/additions/page changes" will be made by the organizers so check your reports carefully before sending them.

(A note primarily for foreign entrants but also allowed for domestic teams. If sending the report by courier is prohibitive you may send it electronically to a commercial printer (KINKO's comes to mind) local to the report submission address and have them print/collate and DELIVER the reports to meet the deadline. No deadline exceptions will be made, but this may be easier than international courier service.)

The contest is scheduled for **20-22 April 2007**. 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 **20 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:

greg.page@nrl.navy.mil

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 (only) should be sent to the Chief of Scoring at:

Gregory Page
AIAA Design/Build/Fly Contest
ITT Corporation
2560 Huntington Ave B210
Alexandria, VA 22303

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 **3** lb. 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 accessible from outside the aircraft and 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.

Mission Profile:

Teams must complete the missions as outlined in the mission matrix below. Teams will have a maximum of **5** flight attempts. The best ***Single Flight Score*** from each of the **different mission types** will be summed for the team's ***Total Flight Score***. Note: Ground tasks are separated from their related flight task for safety of flight and to speed the contest flow. However, this is a "Design/Build/FLY" contest, so the ground task scores will not be included in the ***Total Flight Score*** until the aircraft has obtained a valid score on at least one of the two flying tasks.

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, Total Flight Score***, and the ***Rated Aircraft Cost*** using the formula:

$$\text{SCORE} = \frac{\text{Written Report Score} * \text{Total Flight Score}}{\text{Rated Aircraft Cost}}$$

Mission Task Matrix

ission Information

loads must be securely restrained in the aircraft by mechanical means. Tape and Velcro are not allowed restraining ds.

all flight laps the aircraft must complete one 360^{o} turn in the opposite direction of the flight pattern.

e-off distance is 100 ft wheels off the runway.

re is no timed-repair of damage allowed in this year's competition.

re will be no 2 minute preparation time this year.

ximum mission time is **10** minutes.

l be a new flight order procedure in use this year.

nission order list will be generated and posted at the beginning of flying on Saturday. Teams will always rotate in this The mission order will be repeated continuously.
vill be separate mission order rotations kept for flight and ground missions, but both will use the same sequence. If a number comes up at the same time in both rotations the team must decide if they will use the flight or ground mission spot, and will have to wait for the next occurrence of their rotation number in the other sequence.
ssion order lists will carry over from Saturday to Sunday at what ever spot in the rotation they leave off.

h teams position in the mission order will be determined from their written report score, highest report score goes first.

re will be four ***staging box*** positions near the flight line. While in the ***staging box*** teams can make any final tions and checkout required prior to flight.

ou are not in place in a ***staging box*** when your rotation number is called you will miss your opportunity for that .
We will not call teams to the ***staging box***, it is the teams responsibility to monitor the progress of the contest and when they need to get ready to enter an open spot in the ***staging box***. A contest official will be available to help teams ing the ***staging box*** area.

cting to enter one of the ***staging box*** positions on your turn in the rotation order **will constitute using a flight t**. If you must leave the ***staging box*** for any reason you will **forfeit that flight attempt**. If you go to the flight line not able to begin your takeoff when instructed you will **forfeit that flight attempt**.

ce you have a score for a particular task you may only make 1 attempt to better that specific task score.

ircraft must comply with all aspects of the following specification:

Reconfigurable Sensor Platform

ystem Specifications:

complete system (airframe and both payloads) must be stowed within a maximum 2 ft x 4 ft x 1.5 ft inside dimension
ainer
:ainer inside dimension tolerance (+)0 inch / (-) Unlimited inch

container must be capable of being lifted by the lid when latched. Teams may be required to demonstrate that the ainer and latches meet this requirement as part of the ground tasks.

air vehicle must be able to accommodate two alternate payloads.
Air Sampler System
Camera Ball System

er System Specifications

air sampler tube will consist of an "L" shaped tube (see sketch 1)

erial: opaque plastic

leg length 18"
ension tolerance (–)0" (+)0.5"

leg will contain a 45 deg back-cut at the exit

nal diameter must be sufficient to allow a 1" diameter precision steel ball to freely pass entirely through the air tract. l be demonstrated during tech inspection)

inlet leg must protrude 4" from the local air vehicle surface
ension tolerance (–)0" (+)1.0"

back-cut of the exit tube must be completely outside of the air vehicle surfaces

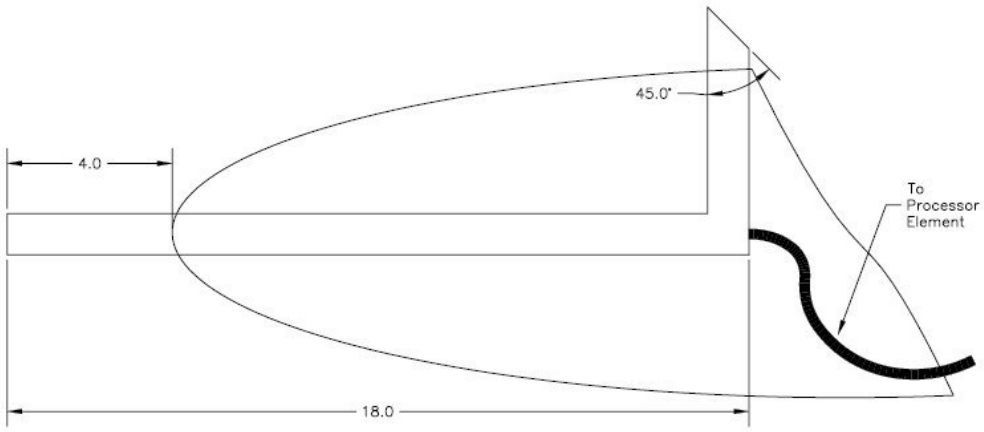
inlet leg must protrude from the air vehicle at it's most forward location, inclusive of all other components of the air cle including the propulsion system (spinner).

inlet need not be on the aircraft centerline.

air sampler system will also contain a processor element of 8 inch x 8 inch x 8 inch weighing 3 lbs.
ension tolerance (–)0" (+)0.5" Weight tolerance (–)0 lb (+)0.5 lb

e will be a minimum 3/8 in outside diameter rubber or plastic tube connecting the air sampler at the 90 deg bend to the er of one face of the processor element (see sketch 1).

connecting tube must not have any visible kinks.



Sketch 1

ıll System Specifications

camera ball will consist of a “12-inch softball” which shall be not less than 11.25 inch circumference

ast ½ of the camera “ball” must protrude clear of the air vehicle lower surface at the lowest point of the vehicle lusive of landing gear).

camera ball must be located completely behind the main landing gear plane for tricycle gear configured vehicles and pletely ahead of the main landing gear plane for tail-dragger gear configured vehicles

nting provisions may be attached to the ball on any portion of the ball that is located inside of the air vehicle surface

camera ball system will also contain a processor element of 4 inch tall by 6 inch wide by 15 inch long weighing 5 lbs. ension tolerance (–)0” (+)0.5” Weight tolerance (–)0 lb (+) 0.5 lb.

e will be a minimum 3/8 in outside diameter rubber or plastic tube connecting the camera “ball” from any portion that side the airframe to the center of one of the 4 inch by 6 inch faces of the processor element.

connecting tube must not have any visible kinks.

ecifications

pling

The air vehicle system configured with the air sampler payload will be placed at the take-off location.

The team will demonstrate that all controls and propulsion systems are operating correctly. The mission attempt will be aborted for any inoperative system.

Aircraft will take-off and fly two timed laps of the flight course and land. The timed laps will begin when the throttle is advanced and will end when the aircraft passes over the starting line IN THE AIR.

Score will be 1/Total_Lap_Time

Mission score is “Zero” if the aircraft does not successfully complete the entire mission.

Scores will be normalized based on the time of the best scoring team such that the best scoring team will always have a score of “100”.
Score = 100 / Team_Time * Best_Time

veillance

The air vehicle system configured with the camera ball payload will be placed at the take-off location

The team will demonstrate that all controls and propulsion system are operating correctly. The mission attempt will be aborted for any in-operative system

Aircraft will take-off and fly two timed laps of the flight course and land. The timed laps will begin when the throttle is advanced and will end when the aircraft passes over the starting line IN THE AIR. Each timed lap must be at least 2 minutes long.

Score will be 1/RAC

Mission score is “Zero” if the aircraft does not successfully complete the entire mission.

Scores will be normalized based on the RAC of the best scoring team such that the best scoring team will always have a score of “100”.
Score = 100 / Team_RAC * Best_RAC

onfiguration (non-flying)

The air vehicle system pre-configured with the camera ball payload will be placed at the designated location.

The air sampler payload system elements and any required tools will be staged at the crew location inside the **closed and latched** storage container.

Prior to reconfiguration (un-timed) the team will demonstrate that all controls and propulsion systems are operating correctly. The mission will be aborted for any in-operative system

When directed, the team will remove the camera ball payload system and install the air sampler payload system.

The camera ball payload elements and any tools will be returned to the storage container and it will be **re-closed and latched**.

Score will be 1/Time (in seconds) to reconfigure the air vehicle. Time begins when the judge signals "**go**" and will end when the team signals "**done**".

Following reconfiguration (un-timed) the team will demonstrate that all controls and propulsion systems are operating correctly. There will be a **500 second penalty** for any in-operative system.

Scores will be normalized based on the time of the best scoring team such that the best scoring team will always have a score of "50".
Score = 50 / Team_Time * Best_Time

loyment (non-flying)

The air vehicle system including both payloads and all assembly tools and fixtures will be inside the **closed and latched** storage container.

When directed, the air vehicle equipped with the air sampler payload will be removed from the storage container and readied for flight. Any tools used will be returned to the storage container and it will be **re-closed and latched**.

Score will be 1/Time (in seconds) to ready the air vehicle system for flight and place it at the designated location. Time begins when the judge signals "**go**" and will end when the team signals "**done**".

Following assembly/preparation (un-timed) the team will demonstrate that all controls and propulsion systems are operating correctly. There will be a **500 second penalty** for any in-operative system.

Scores will be normalized based on the time of the best scoring team such that the best scoring team will always have a score of "50".
Score = 50 / Team_Time * Best_Time

Aircraft Cost Model:

Rated Aircraft Cost (RAC) = MEW*SPAN

Coef.	Description	Value
MEW	Manufacturers Empty Weight	Actual airframe weight [lb] ***WITH*** all flight and propulsion batteries but without any (either) payload.
SPAN	Wing Span	Greatest possible measurement [inches] perpendicular to the aircraft flight axis from the tip of any wing or aerodynamic surface to the tip of any other wing or aerodynamic surface.

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 reload 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 pylon. The downwind turn will be made after passing the downwind pylon. Upwind and downwind pylons will be 500 ft from the starting line. Aircraft must be "straight and level" when passing the pylon before initiating the turn.
- Aircraft must land on the paved portion of the runway. Aircraft may "run-off" the runway during roll-out.
- 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 judges.*

- 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 judges and all rulings will be final.

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

Protest Procedures

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 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. The submission date is contained in the schedule section of this document.

Reports must be bound. Simple spiral bindings are sufficient and preferred; 3-ring binders are not allowed. Paper clips or clamps are NOT sufficient. Unbound reports will not be scored. 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, printed or blank, including the front and back covers. 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.

Please note that the judges will be using this same report outline for evaluating reports. **ALL** items listed will be expected to be present, easy to locate and identify, and be well documented in the report for a maximum score.

Please do not ship reports packed in “packing peanuts”. The scoring judge must redistribute the reports to up to 40 individual judges for review so 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 sections will be weighted for format, completeness and readability

1. Executive Summary: (5 points):
   Provide a summary of the development of your design. This should be a narrative description highlighting the major areas in the development process for your final configuration and a broad description of the range of design alternatives investigated.

2. Management Summary (5 points):
   Describe the organization of the design team. Provide a chart of design personnel and assignment areas. Include a (single) milestone chart showing planned and actual timing of major elements of the design process, including as a minimum the conceptual design stage, preliminary design stage, detailed design stage, flight testing and report preparation periods.

3. Conceptual Design (20 points):
   Describe the key elements of the mission requirements (problem statement). Document the alternative configuration concepts (e.g. biplane, canard, flying wing, pusher -Vs tractor, number of engines etc.) investigated during the conceptual design stage and the reason why each concept was considered. Describe and document the numerical figures of merit (FOM's) used to screen competing concepts, and the mission feature each FOM was selected to support. ***Rated Aircraft Cost*** **(RAC)** MUST be one of the FOM's used during the screening process, teams should generate a sufficiently accurate RAC estimate to differentiate between design concepts. Numerical data need not be extensive at this stage, but should include as a minimum: a final ranking chart giving the quantitative value of each design for each FOM.

4. Preliminary Design (30 points):
   Document the design parameter and sizing trades investigated during the preliminary design stage, and why each was felt to be important to the mission. Describe the analysis methods used. Describe the mission model used and the predicted performance. Provide estimates of the aircraft lift, drag and stability characteristics. Document the design optimization and trade studies conducted and their results.

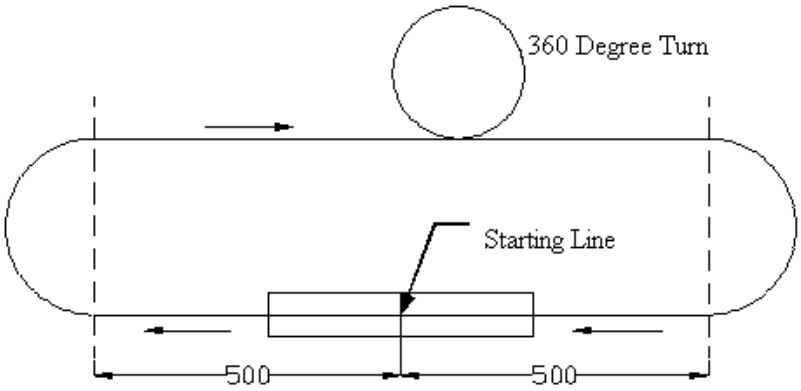
5. Detail Design (15 points for discussion items, 10 points for drawing package, 25 points total for the section):
   Document component selection and systems architecture selection. Include your final competition aircraft's *Rated Aircraft Cost* using the contest supplied cost model. RAC table should include all input parameter, intermediate and final computation.

   Include a table giving data for the sized aircraft. The table should include;
   Geometry: length, span, height, wing area, Aspect Ratio, control volumes
   Performance: CL max, L/D max, maximum Rate of Climb, stall speed, maximum speed, take-off field length (two sets, empty and gross weight)
   Weight and Balance Statement (airframe, propulsion system, control system, payload system, payload, empty weight, gross weight, Center of Gravity)
   Systems (radio used, servos used, battery configuration used, motor used, propeller (nominal), gear ratio (if used))

   The Drawing Package will be included with this section and must contain drawings of the design in sufficient detail to indicate aircraft size and configuration; primary structure component size and location; payload size, location and restraint method; and location of propulsion and flight control system components.

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 describe the FOM's used (including but not limited to: availability, required skill levels and cost) to screen competing concepts. Describe the analytic methods (cost, skill matrix, scheduling time lines) used to select the final set of manufacturing processes. Include a manufacturing milestone chart showing scheduled event timings.

7. Testing Plan (10 points):
   Detail testing objectives, schedules, check-lists, results and any lessons learned for component and full aircraft testing, both static and dynamic (ie. in flight). Realistic test schedules and expectations, ability to measure any key mission/design parameters.



Course Layout
Shown to Scale

[AIAA Student Design/Build/Fly Competition homepage] [AIAA Homepage]

2 October 2006 Update

Cessna Aircraft Company
Raytheon Missile Systems
AIAA Foundation

Frequently Asked Questions (FAQ)
2006/07 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:

- 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 individual teams. Suitable payload definitions are given in the rules to allow teams to create their own payloads.

1. **Question:** Must the camera ball be an actual softball or can it be any spherical object with at least a 11.25 in circumference? If it must be a softball, can it be modified (e.g. to reduce its weight) or is there any particular kind of softball required
   Answer: It must be a commercially produced softball meeting the specified minimum circumference. You may not hollow out the ball. You may add attachments to mount the ball as outlined in the Rules document.
2. **Question:** Would a biplane's wingspan be recorded as the wingspan of one wing, the wingspan of one wing times two, or the distance from one top corner to the diagonally opposite bottom corner? How would a swept wing be measured?
   Answer: The definition of wing span for the RAC calculation is covered in the 2007 rules document.
3. **Question:** Does the outlet leg of the air sampler need to be vertical as shown in the sketch in the rules document?
   Answer: No, it may point in any radial direction wrt the airplane flight axis.
4. **Question:** Are you going to give a minimum weight, specific brand, or other details for the soft ball?
   Answer: No. The rules contain all the specifications for the softball required. Also, see #1 above.
5. **Question:** Does the aircraft need to be capable of flight without either of the payloads?
   Answer: The payloads may not constitute a structural portion of the aircraft, but the aircraft cg does not need to be such that the aircraft could fly if the payload(s) are not installed.
6. **Question:** Is there a specification for the cg location of the payload simulated processor units?
   Answer: No.
7. **Question:** Do the payloads need to be fully enclosed and if so can “payload specific” fairings be utilized to enclose the payload elements?
   Answer: The payload elements must be enclosed except for the sampler tube inlet and outlet as specified in the rules (the entire sampler tube may not be external, only the sections specified in the rules), and at least ½ of the softball (also defined in the rules). You may use payload specific fairings provided they are not structural and are such that

the aircraft could still fly (possibly with ballast, see #5 above) without either payload being present.

Flight / Mission Questions

1. **Question:** Can we design our plane to only perform the non-flying tasks?
   Answer: No. The rules clearly state "**Contest aircraft must comply with all aspects of the following specification:"** which includes both flight missions and both ground tasks.
2. **Question:** Since the box must be "latched" at the beginning and end of the ground mission, what is the requirement for a "latch"?
   Answer: The latches must be sufficient to allow lifting the box by the lid when closed (it is recommended that teams install handles on the top of their box to make it easier to demonstrate).
3. **Question:** Do we have to fly all of the different missions to get a score?
   Answer: See #1 above. The aircraft must complete at least one of the two flight missions for a score before the ground task scores will be included (see Rules).
4. **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.
5. **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.
6. **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.
7. **Question:** Does the RC transmitter need to also fit inside the specified storage box?
   Answer: No.

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.

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.

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