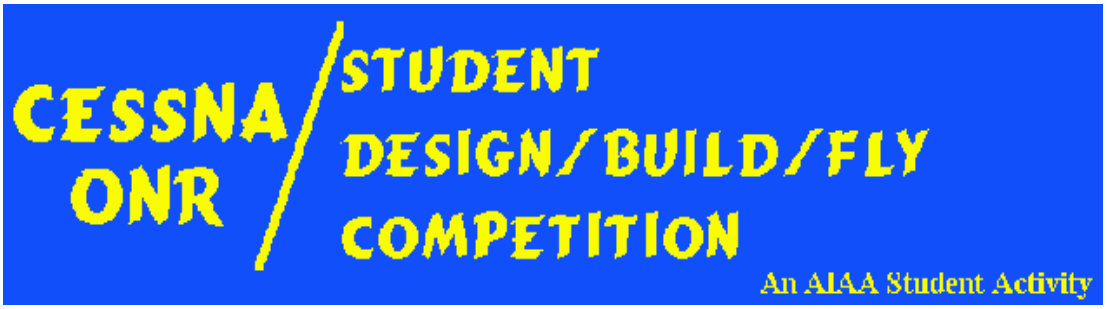
23Aug05 Update



2006 Rules and Vehicle Design

Rules Posting: 15 Aug 2005

Entry Deadline: 31 Oct 2005

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/ONR 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 FAQ, and 2006 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 ONR and may be published or reproduced at their discretion.

Contest Site:

Host for the competition will be the Cessna Aircraft Company. The fly-off is planned to be held at their facilities 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.

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 on or before **31 October 2005**.

The entry form for the DBF is different from the ones used for all 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.***

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 **7 March 2006**. 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 **21-23 April 2006**. 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 **21 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 queue. 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 or incomplete 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 will also contain a list of potential suppliers for materials and equipment available to build an entry. 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:

AIAA Design/Build/Fly Contest/Report Judging
Mr. David Levy
Cessna Aircraft Company
5701 East Pawnee MS-PAW
Wichita, KS 67218
316-831-2014

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 $1.66 each)
- 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. Both upright and inverted wing lift tests will be performed. 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 flight missions as outlined in the mission matrix below. Teams will have a maximum of **5** flight attempts. A flight attempt is defined as advancing the throttle “stick” for take-off, or going past the 2 minute preparation time. The best ***Single Flight Score*** from each of **2 different mission types** will be summed for the team's ***Total Flight Score***.

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

Mission	Description
	General Mission Information ... Aircraft must fit into a 4 foot x 2 foot x 1-1/4 foot internal dimension box. ... Aircraft must be designed and be physically capable of supporting all specified missions even if it is the intent or practice of the team to fly only one or two of the missions during the contest. ... Cargo must be securely restrained in the aircraft by mechanical means. Tape and Velcro are not allowed restraining methods. ... Payloads may not be carried in external pods. ... Speed Loaders may be used but may not be loaded until the ground crew is directed to start the payload loading/unloading operation (ie. They can not be pre-loaded while the aircraft is in the air on a prior lap). ... On all flight laps the aircraft must complete at least one 360^{o} turn in the opposite direction of the flight pattern.

	... Take-off distance is 100 ft wheels off the runway. For each take-off of a multi-sortie mission the aircraft may be returned to the start line for each new take-off, or may start from it's present location providing that location is "past" the take-off line. In either case the maximum take-off distance allowance will be MEASURED from the start line. ... Note: There is no timed-repair of damage allowed in this year's competition. ... Maximum mission time is **10** minutes.
Cargo Flexibility	**DF = 10.0** ... Aircraft must be capable of carrying all of the three standard payloads: 1. 48 loose tennis balls. Tennis balls are 2.5-2.625" diameter and 57-58g. 2. Two 2-Liter soda bottles full of water 3. A single large rectangular wood block no larger than 4"x4"x24" weighing not more than 8 lbs The contest administration will supply the payload items to be flown so all teams will be using the same payloads. ... Special "inserts" may be used to aid in securing the cargo, but must be installed/removed as part of the team cargo handling time. Payloads may not be installed into the cargo handler until the designated "Loading_Time". ... The "Loading_Time" will be the cumulative loading/unloading time (in minutes), flight time is not included. ... "Loading_Time" for each lap starts when the team is cleared to go and get the payload and begin loading and ends when the prior payload is returned to the staging area and the aircraft is secured and begins the take-off roll. On the final lap "Loading Time" begins when the aircraft stops moving and ends when the last payload is removed and returned to the staging area. ... For partial missions there will be a 3 minute penalty for each payload not flown. Payloads must be flown in the order specified. ... Mission Profile: 1. Select and load payload #1 (tennis balls). Fly one

	lap of course and land. 2. Remove payload #1 and return it to the staging area. Select and load payload #2 (soda bottles). Fly one lap of course and land. 3. Remove payload #2 and return it to the staging area. Select and load payload #3 (wood block). Fly one lap of course and land. 4. Remove payload #3 and return it to the staging area. ... **Single Flight Score** is: SCORE = DF * #Laps/Loading_Time
Minimum RAC	**DF = 150** ... Aircraft must carry 96 loose tennis balls for a minimum flight (air) time of 2 minutes. Tennis balls are 2.5-2.625" diameter and 57-58g. The contest administration will supply the payload items to be flown so all teams will be using the same payloads. ... You may carry all of the balls on a single flight if desired, or you may make multiple flights each with fewer balls. ... There is no score if you do not successfully fly all of the required payload. ... Mission Profile: 1. Load any amount of tennis balls into aircraft. Take off and fly as many laps of the course as required to have an "in air" time of greater than 2 minutes, then land. 2. Remove the "flown" tennis balls, reload with additional tennis balls. 3. Repeat as required until all 96 tennis balls have been flown. ... **Single Flight Score** is: SCORE = DF/RAC
Incremental Payload	**DF= 1.25** ... Aircraft will fly as many laps as the team determines possible. On each lap the payload to be carried will be increased.

	... Mission Profile: 1. Load 2 x 2-Liter soda bottles filled with water. Take off and fly one lap of the course and land. 2. Load an additional 2-Liter soda bottle filled with water. Take off and fly one lap of the course and land. 3. Load an additional 2-Liter soda bottle filled with water. Take off and fly one lap of the course and land. 4. Load an additional 2-Liter soda bottle filled with water. Take off and fly one lap of the course and land. ... **Single Flight Score** is: SCORE = DF * #Laps x #Laps

Aircraft that run off the runway before reaching the start line may be returned to the runway to taxi back to the line or may be carried to the line by the ground crew as determined by the requirements of the specific mission.

Aircraft Cost Model:

Rated Aircraft Cost (RAC) = MEW

Coef.	Description	Value
MEW	Manufacturers Empty Weight	Actual airframe weight [lb] ***WITH*** all flight and propulsion batteries but without any payload.

General Mission Specification and Notes:

- Aircraft are to remain assembled while waiting in the queue. Teams will install the propulsion batteries once reaching the **3rd "On Deck"** position (i.e. when the aircraft is 3rd in the queue, the team must begin to install the batteries).
- Aircraft may not have any work performed in the starting line queue, other than as specified above at the 3rd On Deck position. Aircraft propulsion batteries may be left out of the aircraft when in line.
- Aircraft batteries may be charged while the aircraft is in the queue IF AND ONLY IF the batteries are removed from the aircraft.
- 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 experiencing significant damage during landing will be considered to have completed their flight where they come to rest and may not be "carried" to the starting line to "complete" a lap. Determination of "significant –vs- non-critical" damage will be made by the flight line judges. Aircraft with "significant" damage will not receive a score for that flight. Aircraft with "non-critical" damage may continue to the disassembly task with no penalty.*
- 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.

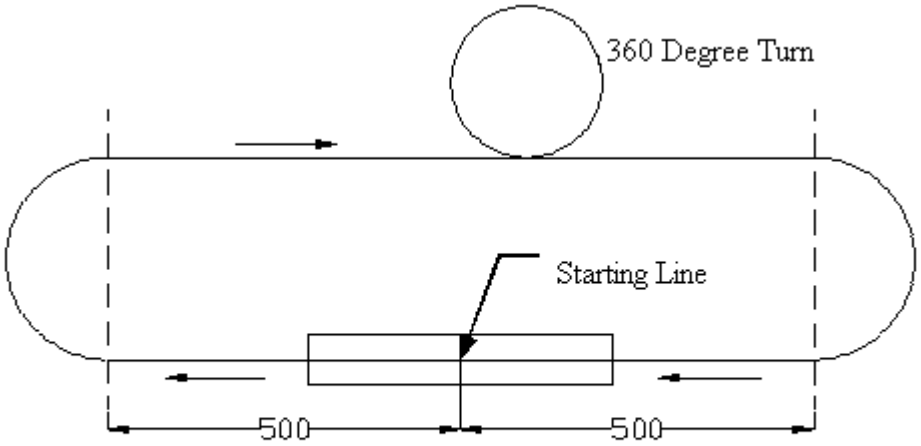
5. Detail Design (15 points for discussion items, 10 points for drawing package, 25 points total for the section):
   Document component selection and systems architecture selection. Include your final competition aircraft's *Rated Aircraft Cost* using the contest supplied cost model. RAC table should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

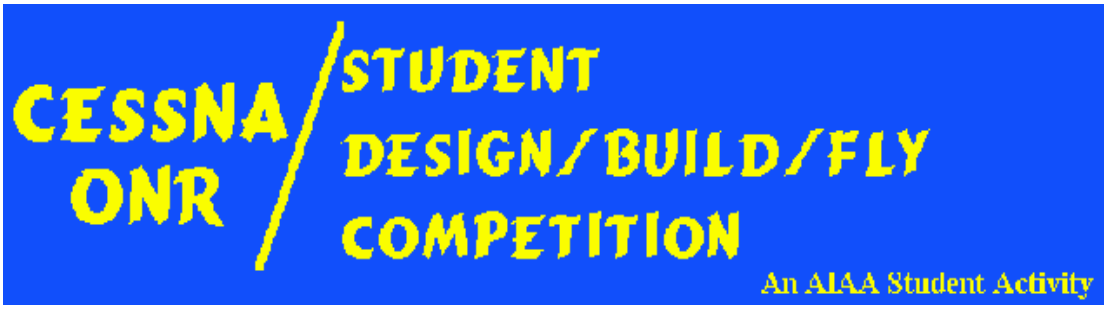
7. Testing Plan (10 points):
   Detail testing objectives, schedules, check-lists, results and any lessons learned for component and full aircraft testing, both static and dynamic (ie. in flight). Realistic test schedules and expectations, ability to measure any key mission/design parameters.



Course Layout
Shown to Scale

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

23 Sep 2005 Update



Frequently Asked Questions (FAQ)
2006 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.
- There has been some question of the interpretation of "spare" parts for repair. "Spare" parts may include:
  - Any purchased component, such as: wheels, propellers, motors, servos, control links, control horns
  - Team Pre-Fabricated spare parts are limited to: landing gear, control surfaces, hatches, linkages and mechanical actuator mechanisms.

  All other aircraft components must be repaired, meaning they retain some reasonable portion of the original, or are completely re-fabricated by the on site team members using the same materials and techniques as the component they replace.

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 practice payloads.

1. **Question:** The rules say the aircraft must be capable of flying all missions. If we only plan to fly lap 1 of mission #3, Incremental Payload, does the aircraft have to hold 5 bottles? What weight will the wing tip test be done at?
   Answer: To be "physically capable" of performing all missions the aircraft must be able to hold each of the required payloads: 48 tennis balls (or more if you choose for the minimum RAC mission), the block of wood, and a minimum of 2 (two) up to the maximum of 5 (five) 2-Liter soda bottles. The wing tip lift test will be done with the largest number of 2-liter bottles that the aircraft is designed to hold.

2. **Question:** Can we insert the 48 tennis balls as a package into the fuselage, all of them in one attempt?
   Answer: You can load the individual tennis balls into your payload insert, then install the "loaded" insert. The time required to place the individual balls into the insert will then become part of your "loading time" and can not begin until directed by the flight line judge.
3. **Question:** If a "payload insert" is used is it included in the aircraft weight?
   Answer: No, inserts are not part of the aircraft MEW.
4. **Question:** Does the aircraft have to be able to fly without the "payload insert"?
   Answer: You won't have to fly the aircraft without any payload (empty) during the competition, but the aircraft must be able to fly without a "payload insert", ie. It can't be a required part of the aircraft structure.
5. **Question:** Is the block of wood fully 4" x 4", or standard 3.5" by 3.5"?
   Answer: Read the rules carefully, "*A single large rectangular wood block no larger than 4"x4"x24" weighing not more than 8 lbs*"
6. **Question:** Will the blocks center of mass coincide with it's center of volume?
   Answer: The block will be essentially homogeneous.
7. **Question:** In what format will the tennis balls be provided to the teams?
   Answer: They will be loose in a large bucket or box.
8. **Question:** Are we allowed to pick up whatever container the balls are in and "dump" them into the plane/insert or does the container need to stay on the ground at all times?
   Answer: You may pick-up the bucket or box.

Flight / Mission Questions

1. **Question:** Do we have to fly all of the different missions to get a score?
   Answer: No. If you choose or are unable to fly more than 1 mission you will still get a score for that mission.
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 could however run only 1 motor of a two motor aircraft for a no payload lap/flight, and run both motors for a with payload lap/flight, provided both motors and propellers are installed for all flights. 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.

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 for this year. 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:** Does the ten minute mission window apply to one flight attempt (chosen from Mission A, B or C) or to two different Missions flown in one uninterrupted sequence?
   Answer: The 10 minute window is for a single mission event (A, B or C).
4. **Question:** 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.
5. **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.
6. **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.
7. **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.
8. **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.
9. **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.
10. **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.

11. **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.
12. **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.
13. **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.
14. **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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