

31Oct14



2014/15 Rules and Vehicle Design

Final Rules: 31 Oct 2014

Entry Deadline: 31 Oct 2014

The contest rules may be augmented/supplemented at any time during the competition through the Q&A process.

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 2015 FAQ, and 2015 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.

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. The team with the best Report Score will receive a \$100 prize from the Design Engineering Technical Committee.

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. The overall team score is a combination of the Design Report score, Flight score and Rated Aircraft Cost (RAC). 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 at the TIMPA field in Tucson, AZ. Details on the contest site and schedule will be sent to registered teams early in the fly-off calendar year. You can check on historical weather conditions at www.weatherbase.com or www.weatherunderground.com.

Teams are advised to check with their airlines on what materials they will be allowed to bring both to and from the contest site. Hazmat items like paints, thinners and glues may need to be purchased locally and PROPERLY disposed of following the contest.

Team Requirements:

All team members (except for a non-student pilot) 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 (Below senior year, for non-four year programs). 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 provide qualified pilots at the contest on an as-available basis to assist teams who are unable to have their pilot attend.

There is no set requirement for the number of students that must attend the flyoff. It is preferred, but not required, for the team advisor or responsible faculty member to attend.

Team members may be updated/changed at any time during the contest but must always comply with the **1/3** rule. Following the initial team postings at the contest beginning we will make a "One Time" update to the team member lists posted on the website. We will notify teams when the website update change information may be sent, normally in February. Teams wishing a team member list update at that time must submit an updated copy of the contest entry form with all fields fully filled (but only the team member information may be changed).

Each educational institution may submit one (1) team entry. The team members may be changed during the contest period, so schools may use an internal selection process to determine their final design and team members prior to the written report submission and fly-off. For schools with multiple campuses in different cities each campus will be considered as a separate entity.

- ε **Two or more schools may combine to submit a single entry.**
- ε **Schools which already have an entry may not have additional students from their school participate as members of a team from a different (shadow) school.**

The number of entries is limited to a maximum of 100 teams. Entries are accepted on a first-come first-served basis, based on the time stamp when they are received.

Past Year Reports:

Winning team design reports from 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(s) 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:

Entries: The entry period **OPENS** 15 October 2014 at 8AM US East Coast Time. No entries will be accepted before that time. A completed electronic entry must be **RECEIVED** by 5 PM US East Coast Time on **31 October 2014** Entry forms may not be submitted before **15 October**.

- ε At the beginning of the entry period, the entry form will be posted on the website. The entry form is an Excel spreadsheet.
- ε The number of entries is limited to a maximum of 100 teams. Entries are accepted on a first-come first-served basis, based on the time stamp when they are **RECEIVED**. Entries received after the deadline will not be accepted and will not be allowed to compete. There is no allowance for computer, internet, or power outage, or any other type of error beyond the control of the Organizing Committee.
- ε The DBF entry form is different from the ones used for other AIAA student competitions. The DBF entry form can be found on the contest web site. It must be submitted by e-mail to the contest administrator at director@aiaadbf.org .
 - Be sure to include **ALL** information requested in the form. We will use the first (valid) entry received so be sure all supplied information is correct the first time.
 - If AIAA membership has been applied for, but a member number has not been issued, use "pending" for the member number in the entry form. The data must then be updated when the team roster update occurs in early 2015.
 - **Incomplete entry forms will not be accepted. Incomplete forms will be returned for correction and may miss the deadline**
- ε *It is the team's 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.*
- ε **Note: The AIAA mail servers will not send e-mail to @hotmail.com addresses. Do NOT use a hotmail address for any of your team contacts or e-mail.**

Design Reports: Design reports must be **RECEIVED** at the designbuildfly@gmail.com email by 5 pm US East coast time on **23 February 2015**.

- ε Reports sent to the "director" email address will not be accepted.
- ε Reports will be judged "as received", no corrections/additions/changes will be made by the organizers so check your reports carefully before sending them.
- ε **Teams may only submit one report copy, any copies received after the initial submission will be deleted.**

Submission of reports is electronic only (no hard copy required). The details for the electronic report format and submission, including a new requirement for a separate 3-view, are at the end of thereport section in this rules document.

Contest Flyoff: The contest flyoff is scheduled for **10-12 April 2015** and is anticipated to run from 8AM to 6PM on Friday, 7AM to 6PM on Saturday and 7AM to 5PM Sunday. Awards will be presented at 5:30PM on Sunday. All teams should plan their travel so that they may stay for the awards presentations on Sunday. A final

contest schedule will be e-mailed to the teams prior to the contest date.

Tech inspections will begin on Friday and will continue as required on Saturday and Sunday.

To help streamline the contest flow and maximize opportunities for each team to get their flights in, the Tech inspections will be conducted in the same order as the flight rotation (which is based on report scores) so that the first teams inspected will be the first teams in the flight queue. Teams may use the sequence to help estimate when they need to arrive at the contest site to make sure they do not miss their slot in the first tech inspection rotation.

Note: All schedule deadlines are strictly enforced.

- ε **All deadlines are based on when an entry or submission is Received by Contest officials.**
- ε **Late entries will NOT be accepted.**
- ε **Late report submissions will be disqualified.**
- ε **There is no allowance for computer, internet, or power outages by the submitter, or any other type of error beyond the control of the DBF Organizing Committee.**
- ε **Teams which do not submit the required electronic report and 3-view will NOT be allowed to fly.**
- ε **It is the team's responsibility to assure that all deadlines are known, understood and met.**

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.aiaadbf.org>

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 posted on the website.

The DBF Organizing Committee will utilize Facebook as an additional means of communicating with the teams during the contest weekend only. This will NOT be a means of communicating rules, FAQ's, protests, etc, but only used in case of emergencies, weather delays or contest weekend schedule updates. Additional information will be included in a contest site/ schedule email to be sent out to the registered teams prior to the fly-off.

Aircraft Requirements - General

- ε The aircraft may be of any configuration except rotary wing or lighter-than-air.
- ε No structure/components may be dropped from the aircraft during flight.
- ε No form of externally assisted take-off is allowed. All energy for take-off must come from the on-board propulsion battery pack(s).
- ε 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.
- ε Motors may be any commercial brush or brushless electric motor.

- ε 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.
- ε You can change the propeller diameter/pitch for each flight attempt.
- ε Motors and batteries may be limited in current draw by means of a **fuse** in the line from the positive battery terminal to the motor controller. **New for 2015: There is no set limit on the fuse rating.** If used, it is the responsibility of each team to properly size the fuse to protect the battery, motor, and controller against overcurrents from any source.
 - ∩ Fuse(s) should be located such that no propulsion system component: motor; motor controller; or battery may see more current than the stated limit (fuse value).
 - ∩ Fuse should be placed in the positive (+) lead from the battery, and should be as close to the battery(s) as feasible.
- ε 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/documented (i.e. clear shrink wrap preferred). All battery disconnects must be "fully insulated" style connectors.
- ε **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 during a flight mission attempt.
- ε 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.
- ε 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. We will provide qualified pilots at the contest on an as-available basis to assist teams who are unable to have their pilot attend.
- ε **The aircraft must remain substantially the same as documented in the report (for example you can not change a flying wing design to a conventional tail design). You may make small modifications to the design to improve flight performance after the report submission (one example would be changing a control surface size). The three-view drawing supplied in pdf form as described below in the electronic report section will be used to verify the flight article during tech inspection.**

Aircraft Requirements - Safety

All vehicles will undergo a safety inspection by a designated contest safety inspector prior to being allowed to make any competition flight. **All decisions of the safety inspector are final.**

To speed the tech inspection process each team must present a signed ***Pre-Tech and First-Flight Certification*** when called to begin their on-site tech inspection. Teams may not begin the on-site tech inspection without a completed certification. The ***Pre-Tech and First-Flight Certification*** sheet is available on the contest website.

The Pre-Tech must be conducted by, and signed off by, a non team member RC pilot or the team faculty advisor. The Pre-Tech will cover the same safety of flight requirements as the on-site tech inspection and will assist teams in making sure they are ready and able to pass the on-site tech inspection the first time. An expanded First-Flight requirement, which also must be signed off by a non team member RC pilot or the team faculty advisor, requires demonstration of a complete flight including take-off, flying a minimum flight pattern, and landing in a pre-designated location without damage to the aircraft. The non team member RC pilot who signs the inspection and flight certifications may be the same as a team's non-student contest pilot.

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 aileron
 Full Flaps down

For aircraft not equipped with a particular control, then the safety inspector must be satisfied that the intended function of the fail-safe system will be carried out.

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 may be the contest specified "blade" style fuse. Or, an arming plug such as http://wsdeans.com/products/plugs/ultra_plug.html may be used. 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 arming system). 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. The arming system **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/plug 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. In the event of a tie, Report Score will take precedence over Flight Score as a tie-breaker.

Each team's overall score will be computed from their **Written Report Score**, **Total Mission Score** and **Rated Aircraft Cost** using the formula:

$$\text{SCORE} = \text{Written Report Score} * \text{Total Mission Score} / \text{RAC}$$

The **Total Mission Score** is the product of the Ground Score, **GS** and Flight Score, **FS**: **Total Mission Score = GS*FS**

The flight score is the sum of the individual mission flight scores: **Flight Score = FS = M1 + M2 + M3**

The RAC is a function of empty weight and complexity: **RAC = EW * N_Servo**

- ε Empty weight will be measured after each successful scoring flight: **EW = Max(EW1, EW2, EW3)**
- ε **EW_n** is the post flight weight with the payload removed
 - Note: Any payload mounting or fairing provisions will be included in the empty weight.
- ε **N_Servo** is the number of servos used in the airplane. For the purposes of this contest, a "servo" can mean any mechanical or electronic device used to control the airplane or payload release mechanism. These will include but may not be limited to:
 - Conventional R/C servo actuator
 - Speed controller
 - Electric motor not used for propulsion
 - Solenoid actuator
 - Electric relay

Mission Task Matrix:

Remote Sensor Delivery and Drop System

General:

- ε Battery pack(s) maximum weight limit is **2.0** lb.
- ε Missions must be flown in order as described below. There is no longer a maximum number of flights a team may attempt. **Upon completion of all three missions, teams may at their option attempt a single re-flight of each of the flight missions previously flown. The larger of the two flight scores for each mission will count toward the total mission score. Normal queuing procedures will be used.**
- ε All payloads must be secured sufficiently to assure safe flight without possible variation of aircraft cg outside of design limits during flight.
- ε Assembly/flight line crew is limited to pilot, observer and 1 ground crew.
- ε Scoring measurement units are feet, lbs, and seconds.

Mission Sequence:

- ε The Ground Mission may be completed at anytime the flight line is open.
- ε **The three Flight Missions must be flown in order. A new mission can not be flown until the team has obtained a successful score for the preceding mission.**
- ε **Aircraft must be designed to be capable of performing all required missions.**
 - **Aircraft must pass the wing tip load test with the largest payload loading intended to fly for any mission.**
 - **The maximum load demonstrated will be recorded and can not be altered after completing tech inspection.**
- ε The aircraft will enter the assembly area with the payload for mission 2 and 3 uninstalled.
- ε Payload "loader" systems may be used to assist in loading for ground and flight missions, but the payloads may not be "pre-loaded" before the start of the mission/prep.
- ε The team will have a total of 5 minutes to load the payload and checkout the aircraft systems as fully functional.
- ε There is no work allowed on the aircraft after the loading/checkout time.
 - **The RC receiver should be able to be turned on externally or must be left on. You will not be allowed to re-open any compartment after the loading/checkout time to turn on the receiver.**
- ε Only the assembly crew member, pilot and pilot assistant may go to and enter the staging box.
 - After the checkout is complete the assembly crew member may be swapped for a different flight

- line crew member if desired.
- ε Aircraft will use ground rolling take-off and landing
 - Takeoff field length will be limited to 60 ft.
- ε The initial upwind turn on the first lap of each mission will occur after passing the turn judge (signaled by raising a flag). The aircraft must remain in unaided visual control distance of the pilot at all times. The **Flight Line Judge** may require turns to be made to remain in a safe visual control range at his discretion.
- ε Aircraft must complete a successful landing at the end of each mission for the mission to receive a score.
 - A successful landing is outlined in the general mission specification section below.

Missions:

ε Ground Mission - Payload Loading Time

- Mission starts with airplane empty and hatches closed
- Load payload for Mission 2; re-close airplane as required to secure for flight
- Crew leaves the loading area; pause timing to verify airplane is secure
- Restart timing
- Remove Mission 2 payload and install mission 3 payload; re-close airplane as required to secure for flight
 - Number of balls will be the maximum number declared during Tech Inspection.
- Crew leaves the loading area
- Stop timing; verify airplane is secure for flight
- The mission must be completed within five minutes from the start.
- Mission Score:

$$GS = (\text{Fastest_Loading_Time} / \text{Loading_Time})$$
- Note, if ground mission has not been completed, then **GS=0.2** will be used for intermediate scoring calculations.

ε Flight Mission 1 - Ferry Flight

- No payload installed
- Take-off within the prescribed field length.
- Maximum number of complete laps within a **4** minute flight time.
- Time starts when the throttle is advanced for the (first) take-off (or attempt).
- A lap is complete when the aircraft passes over the start/finish line in the air.
- Mission score:

$$M1 = 2 * (\text{N_Laps_Flown} / \text{Max_N_Laps_Flown})$$
- Must complete a successful landing to get a score.

ε Flight Mission 2 - Sensor Package Transport Mission

- Take-off within the prescribed field length.
- All payloads and supporting equipment must be properly secured **internally** to the airplane.
 - Internal is defined as completely enclosed by airplane structure/skin.
 - No part may be exposed to freestream air
- 3 lap timed flight with Sensor Package
- Sensor Package is **One** stack of **Three** standard 2x6 wooden pine boards (dimensional lumber), 10" long.
 - The individual boards will be fastened together to form a single block
 - The nominal overall size will be 4.5" x 5.5" x 10". See figure below
 - The nominal weight will be ~5lb.
 - Dimensional tolerance will be +/-1/8" in all directions.
 - More information on 2x6 lumber can be found at http://www.engineeringtoolbox.com/softwood-lumber-dimensions-d_1452.html
- The payload during the competition will be provided by contest officials.
- Mission score:

$$M2 = 4 * (\text{Fastest_Time_Flown} / \text{Time_Flown})$$
 - Time flown is measured in seconds.

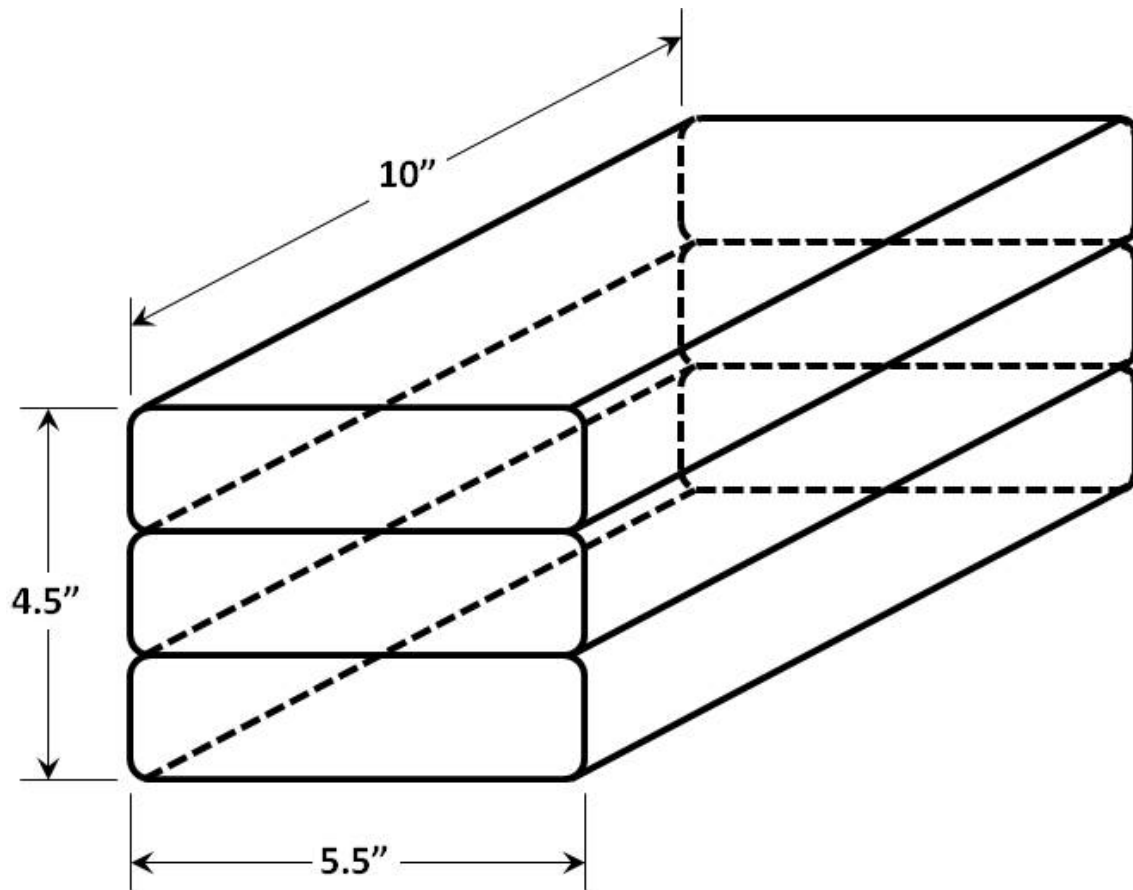
- Time starts when the throttle is advanced for the (first) take-off (or attempt).
- Time ends when the aircraft passes over the finish line (in the air) at the completion of the last lap.
- Must complete a successful landing to get a score.

ε **Flight Mission 3 - Sensor Drop Mission**

- Take-off within the prescribed field length.
- All payloads and supporting equipment (including restraint and release mechanisms, fairings, etc.) must be properly secured **external** to the airplane configuration flown in missions 1 and 2.
 - External is defined to be exposed to the air when viewed from at least three sides (top, bottom, left, right)
- Payload will be a team-selected number of Champro 12" Plastic Balls (12" Circumference "Softball" size, shown below). They may be ordered from locations such as:
 - <http://shop.champrosports.com/p-294-12-poly-molded-softball-white.aspx>
 - http://www.amazon.com/Champro-White-Balls-Softball-Dozen/dp/B000E1AIE8/ref=sr_1_1?ie=UTF8&qid=1414769397&sr=8-1&keywords=12%22+POLY+MOLDED+SOFTBALL++WHITE
 - http://www.eastbay.com/product/model:67068/sku:793/champro-softball-size-plastic-practice-balls/white/&SID=6391&inceptor=1&cm_mmc=SEM--Feeds--Amazon--793
- The payload during the competition will be provided by contest officials.
- Nominal weight for each ball is *approximately* 2.4 ounces (68 grams)
- On each lap, while airborne, the airplane will remotely drop a single ball
 - CG may not vary outside of design limits during the mission.
- The drop shall occur in a "drop zone" defined by (See figure below):
 - On the upwind leg, flight in the direction of the takeoff
 - Between the upwind/downwind turn stations
 - On the runway side opposite the spectators
- A lap will only count if a single ball is dropped within the drop zone.
 - Multiple drops in the zone on a single lap will invalidate that lap.
- No other part of the airplane or payload mounting system may drop with the ball
- Mission score:

$$M3 = 6 * (N_Laps_Flown / Max_N_Laps_Flown)$$
- Must complete a successful landing to get a score .

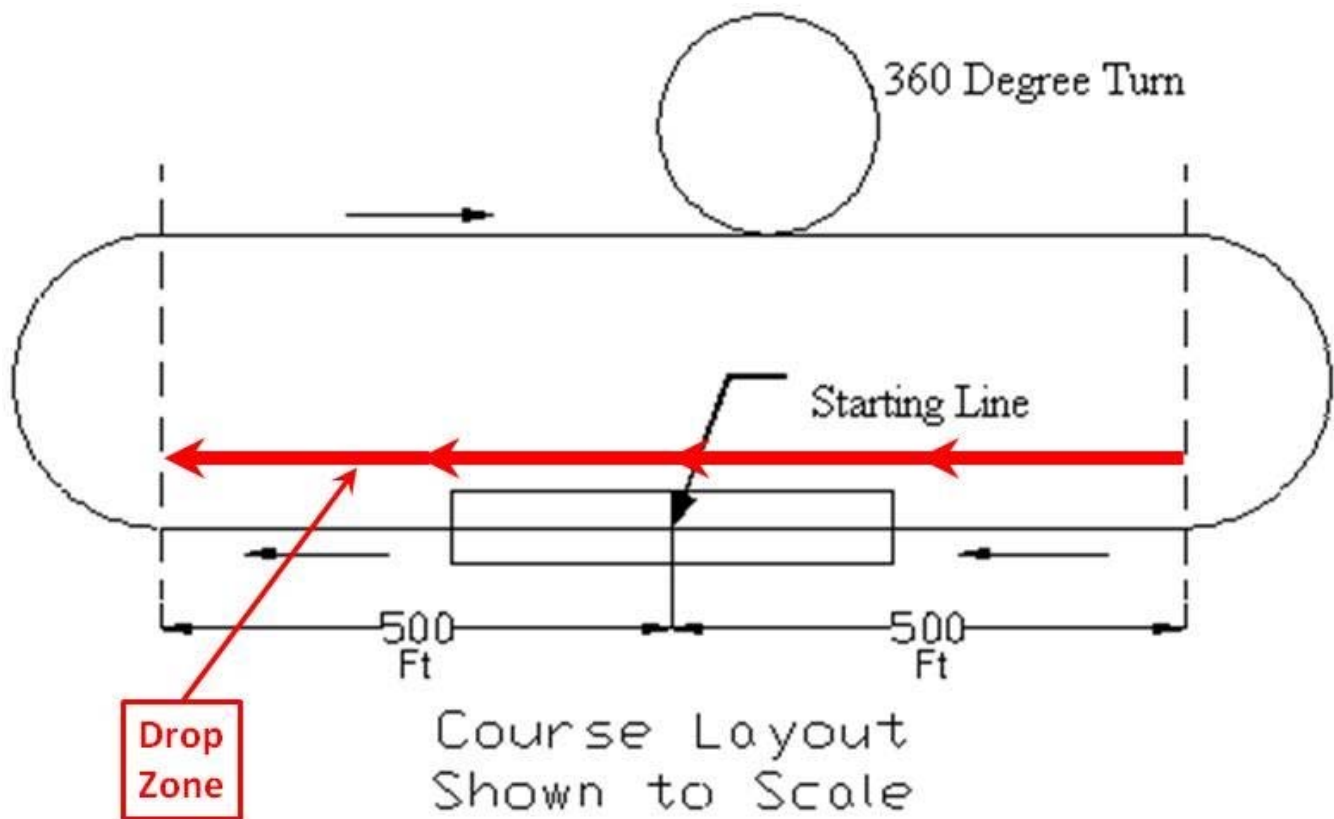
Mission 2 Payload



Mission 3 Payload: Champro 12" Plastic Ball



Mission 3: Drop Zone



Flight Line Order:

- ε A **flight order** list will be generated and **emailed to the teams on the Wednesday prior to the fly-off weekend**. Teams will always rotate in this order. The flight order will be repeated continuously.
 - The flight order list will carry over from Friday to Saturday and Saturday to Sunday at what ever spot in the rotation it leaves off.
 - Each team's position in the flight order will be determined from their written report score, highest report score goes first.
 - Report scores will be available following the pilot briefing at the start of the contest (they will not be included with the rotation sequence e-mail).
- ε There will be four **staging box** positions near the flight line.
- ε If you are not ready to enter a **staging box** when your rotation number comes up you will miss your opportunity for that rotation.

Note: It is each team's responsibility to monitor the notifications from the scoring table in order to respond if ready. A contest official will be available to help teams enter the **staging box**.
- ε If you choose to leave the **staging box** for any reason you may not attempt a flight until your turn comes up again in the rotation order.

General Mission Specification and Notes:

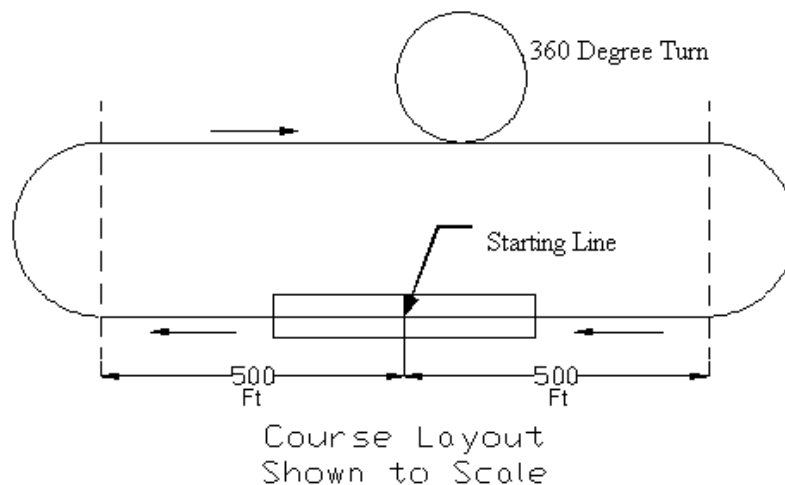
- ε The aircraft propulsion system(s) must be "safed" (fuse or arming plug removed) during any time when crew members are preparing/handling the aircraft.
- ε Maximum flight support crew is: **pilot, observer, and ground crew**.
- ε Observer and all ground crew must be students. **Only the pilot may be a non-student**.

- ε 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.
- ε 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.
- ε *Aircraft obtaining "significant" damage during landing will not receive a score for that flight. Determination of "significant" is solely at the discretion of the Flight Line Judge.*
- ε 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 or email a signed protest to the team for them to present. Remotely submitted protests must be on hard copy (printed by the team) and have the advisors signature. A phone number where the advisor may be contacted must be provided. 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. **Protests submitted but not upheld by the judges *may* be given a penalty of the loss of one flight score to the team submitting the protest.** 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 above.

Note: Reports must strictly adhere to the following requirements. Failure to meet requirements will result in penalties that range from score reduction to elimination from the contest.

- ε Reports must have the University name on the cover page.
Reports missing this identification information will not be scored.
 - ε Absolute maximum page count for the report is **60 pages**, the PDF reader "pages" value will be used as the official page count.
*Reports exceeding the maximum page count will be given a **10 point penalty** for each additional page.*
 - ε Report PDF must be formatted as 8.5 x 11" pages.
 - ν May use 11x17" pages for the drawing package.
 - ε A separate stand-alone three view drawing must be submitted along with the report file. See description below in the electronic submission section.
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- ε 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.
 - ε All reports must be one and one half line spacing, 10-pt Arial font. Tables and figures should be clear and readable for the judges. The reports will be judged on format and readability.
 - ε **ALL** items requested below should be present, easy to locate and identify, well documented and in the correct section for full scoring.
 - ε 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.

Design Report Scoring Rubric

All section scores include format, completeness and readability

1. Executive Summary (10 Points)
 - ν Maximum of 2 pages. If exceeded, score as 0 points
 - ν Summary description of selected design and why it best meets the mission
 - ν Describe key mission requirements and associated design features
 - ν Document the performance/capabilities of your system solution
 - ν Format, completeness, readability
2. Management Summary (5 Points)
 - ν Describe the organization of the design team
 - ν Chart of design personnel and assignments areas
 - ν Milestone chart showing planned and actual timing of major elements
 - ν Format, Completeness, Readability
3. Conceptual Design (15 Points)
 - ν Describes mission requirements (problem statement)
 - ν Translate mission requirements into design requirements
 - ν Review solution concepts/configurations considered
 - ν Describe concept weighting and selection process and results
 - ν Format, Completeness, Readability
4. Preliminary Design (20 Points)
 - ν Describe design/analysis methodology
 - ν Document design/sizing trades
 - ν Describe/document mission model (capabilities and uncertainties)
 - ν Provide estimates of the aircraft lift, drag and stability characteristics
 - ν Provide estimates of the aircraft mission performance
 - ν Format, Completeness, Readability
5. Detail Design (15 Points + 15 Points for Drawing Package)
 - ν Document dimensional parameters of final design
 - ν Document structural characteristics/capabilities of final design
 - ν Document structural and sub-systems selection/integration/architecture
 - ν Document Weight and Balance for final design
 - ν Must include Weight & Balance table empty and with each possible payload

- Document flight performance parameters for final design
 - Document Rated Aircraft Cost
 - Document mission performance for final design
 - Format, Completeness, Readability
 - Drawing package:
 - . 3-View drawing with dimensions
 - . Structural arrangement drawing
 - . Systems layout/location drawing
 - . Payload(s) accommodation drawing(s)
6. Manufacturing Plan (5 Points)
- Document the process selected for major component manufacture
 - Manufacturing processes investigated and selection process and results
 - Manufacturing milestones chart: plan and actual
 - Format, Completeness, Readability
7. Testing Plan (5 points)
- Test Objectives and schedule
 - Test and flight check lists
 - Format, Completeness, Readability
8. Performance Results (10 Points)
- Describe the demonstrated performance of key subsystems
 - Compare to predictions and explain any differences and improvements made
 - Describe the demonstrated performance of your complete aircraft solution
 - Compare to predictions and explain any differences and improvements made
 - Format, Completeness, Readability

Design Report Electronic Submission

Each team must provide an electronic copy of their final design report for the report judging as outlined below.

- ε Electronic copy must **Arrive** at the designbuildfly@gmail.com email by 5PM US East Coast time on 23 February 2015.
- ε Electronic report files must be named: “**2015DBF** [university].pdf”.
- ε Electronic report must be a single file with all figures/drawings included in the proper report sequence in PDF format.
(Free PDF file conversion programs are available on the Internet, such as www.pdf995.com.)
- ε Electronic reports should have all figures compressed to print resolution to minimize file size.
- ε Electronic reports must be less than **20 MB** in size (including encoding for e-mail transmission).

Stand Alone 3-view requirements:

- ε A separate file with a one page 3-view drawing formatted to fit 8.5" x 11" paper **must be submitted** with the report for confirmation of the basic configuration. Note that this page does not count toward the report total.
- ε The 3-view file shall be named as per above: “**2015DBF** [university]_3V.pdf”.
- ε The university and team names shall be clearly shown on the drawing.
- ε The 3-view file is limited to **2 MB** in size.

Reports and three-views not following the name format or exceeding the file size will be rejected. We will notify the team "only if" the report and 3-view arrive in the email 'in' box. If report and/or 3-view are rejected by the email system for being too large we will NOT be able to send a notification of the problem to the team!

4Sep14



Frequently Asked Questions (FAQ)

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 and recommend for the contest. They MUST be capable of implementing the full fail-safe sequence procedure outlined in the rules. We will accept an email request to use a 72 MHz style radio from teams with accepted entries following the close of the entry submission period.
- 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.

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 flights must be completed in the order specified to obtain a score.
2. **Question:** Do we have to use the same plane for each mission?
Answer: You must use a single plane for the entire contest weekend.
3. **Question:** If the airplane is damaged on a flight can we use the another copy of the aircraft which has the same design?
Answer: No, you must repair the original aircraft.
4. **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.
5. **Question:** What constitutes a successful landing?
Answer: The aircraft must touch down ON the runway. It may roll/slide, not bounce, off the runway after touchdown.
6. **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.

7. **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”.

8. **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 director will determine if it becomes unsafe for teams to fly. Wind speed is not the only factor that may be considered.

Aircraft Configuration Questions

1. **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 doesn’t cross over the line into vertical flight capability.

2. **Question:** Can we change the aircraft geometry, such as wing sweep or span, for different missions?

Answer: Variable geometry is allowed provided it is controlled remotely through the RC control system. You may not “swap out” parts for different missions.

3. **Question:** We have talked with an outside vendor and they possess a *manufacturing* technique 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.

4. **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? If our school does not have machining capabilities can we have a vendor laser cut our ribs and formers or machine our original design molds?

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. You may have molds machined for composite parts, but the team must make the actual parts themselves.

5. **Question:** Are gyros legal for stability purposes?

Answer: Yes

6. **Question:** Do the external fuse accessibility requirements (from behind if tractor, from the front if pusher) exclude the use of a pusher-puller type multi-engine configuration?

Answer: You may use a push-pull configuration but must locate the fuse(s) such that they can be accessed by the crew member without having to reach over or around either propeller or being in the propeller disk plane of either propeller.

7. **Question:** Does the propulsion battery have to be a single unit (with all cells physically and electrically connected) or can it consist of separate packs.

Answer: You may use multiple battery “packs” to power either multiple or a single motor(s) provided the total weight of all packs flown as a set meet the rules requirement. Any/all packs/motors must be fused such that no single battery or motor can exceed the maximum current requirement. If it requires multiple fuses to meet the current protection requirement, then **ALL** fuses must be removed whenever you are required to “safe” the aircraft system.

8. **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.

Report Questions

Report rules may be 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:** Do we need to use a Figure of Merit (FOM) chart?

Answer: No. You should describe and explain the decision making process you used. If you used a FOM chart, you should explain how you determined your weightings and assigned values. Your discussion should not be a justification for an arbitrary selection of what you wanted to build.

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:** Regarding the test flight photo, does this photo have to be submitted with the report, or just brought to the competition?

Answer: The photo must be shown to the judges during the technical inspection. We will not have copies of the reports available at the contest, so if you want to use a photo in your report you must bring your own copy.

3. **Question:** Can we use LiPo batteries in our transmitter?

Answer: No.

4. **Question:** Are the transmitter and receiver allowed to be store bought?

Answer: The transmitter and receiver MUST be a commercial FCC approved system. No modifications to the transmitter (or it's case) or the receiver (or it's case) are allowed.

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 is 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. Please see the CURRENT YEAR RULES 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 that at least 1/3 of the team members are Freshman, Sophomores or Juniors. Team members may be updated/changed at any time during the contest but must always comply with the 1/3 rule.

8. **Question:** Can we change team members during the contest year?

Answer: You may change team members anytime during the contest year as long as you continue to meet the team composition rules.

9. **Question:** Is it allowed to have/declare more than 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 aircraft 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:** 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.

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DBF Q&A #11 - 4/3/2015

(Addressing questions received between 3/20/2015 and 4/3/2015)

Competition Supplied Pilot as Crewmember

Q. In the event that we will not be able to send a three man crew, but one or two members, could the on-site pilots serve as a temporary crew member during the competition?

A. That is allowed if the pilot agrees. You will need to coordinate that at the flyoff with the pilot. The maximum crew size is 3, but there is no minimum crew size.

Pre Tech Form

Q. We have completed our pre-tech and first flight inspection sheet. Do we need to submit the entry form Excel with the inspector names, addresses, and e-mails and/or do we need to bring a printed copy to competition?

A. Bring the form with you to the competition. It is to be presented at Tech Inspection.

Receiver Battery

Q. We have noticed that in the pre-tech form, it required to verify the receiver is powered by separate NiCAD or NiMH battery. But it's not required to use NiCad or NiMH battery for the receiver in the rules. So, can we use separate LiPo battery for the receiver? It's urgent for our flight test and competition preparation.

A. We do not allow any LiPo batteries, including the transmitter and receiver.

DBF Q&A #10 - 3/23/2015

(Addressing questions received between 3/6/2015 and 3/19/2015)

More Payload Information

Q. What is the hole diameter of the balls?

A. Of the 8 balls that were measured, several holes per ball, the hole diameter measurements all fell within 0.610 - 0.640 inches.

Q. Just wanted to confirm that the wiffle balls to be used in competition are still the "Champro 12" Plastic Balls". Also, where will balls used in competition be purchased?

A. Yes, they are still "Champro 12" Plastic Balls. They have been purchased already and will be provided to the teams for use during the ground and flight missions.

Q. If the Mission 2 cargo weighs more/less than that which is stated in the contest rules, will weights be added to or material removed from the blocks @ Tucson so the M2 cargo weighs roughly 5 pounds?

A. Yes, material will be added/removed as needed to meet the specifications listed in the rules.

C.G. adjustments during Ground Mission

Q. In Q&A #8, you stated that "The airplane must be "flight ready" at the end of each loading, so the battery pack size and location must be appropriate for the mission." If the ground mission, M2, and M3 are each discrete, will the tech inspectors and flight line judges communicate those battery pack sizes and locations to each another by marking/recording them?

A. Yes, the necessary information will be recorded during the tech inspection so that the Ground Mission Official will know if the battery pack needs to be moved. A lift test may be used to check for CG location during the flight readiness inspection.

N_Servo

Q. Does a cooling fan used solely for cooling electronic components (batteries, speed controller, etc) count towards nServo?

A. If it is not controlled via radio command from the pilot then it does not add to the servo count.

Ground Mission

Q. Can the crew member enter and exit the loading area from any side of the box, or will there be a designated side?

Q. If during tech inspection, our team selected number of balls is 8, then is this the amount of balls that will be provided to us for the ground mission or will it be a large batch (more than 8 in this case) ?

Q. If during the ground mission, a ball that is not to be loaded on the airplane happens to roll out of the loading area while retrieving the required number of balls, must the crew member bring that ball back to its original location before the timing is stopped?

A. These issues will be determined at the contest.

Pilot Choice

Q. Can we choose the pilot for each one of the missions (that means our pilot and the pilot you give us)?

A. If you have your own pilot we would encourage you to use that pilot for all flights. A contest supplied pilot would only be provided in the event that your pilot is deemed unsafe by a flight line official.

DBF Q&A #9 - 3/9/2015

(Addressing questions received between 2/20/2015 and 3/5/2015)

Special Note:

I have been getting a large number of questions that have already been addressed in the rules and/or Q&A.

Please review the rules and Q&A before asking a question! I have been responding to these emails directly, stating that they are already answered. I will stop doing that and ignore repeat questions.

Ground Mission Information Summary

Please Note: Some of this information supersedes previously released information!

- Payload Loading Area will be 15' x 15' square
 - Supersedes information in Q&A #3, which has been updated.
- Ground crew will consist of 3 persons:
 - Supersedes information in Q&A #5 & 6, which have been updated.
 - 1 person ("crew") may load/unload the payload and prepare the aircraft.
 - 1 person ("pilot") will demonstrate proper operation of the flight controls via the transmitter.
 - 1 person ("observer") may give verbal advice and instructions.
 - The "pilot" need not be the competition pilot
 - The "pilot" and "observer" must remain outside the loading area
- Payloads will be provided in an area adjacent to the loading area, either on the ground or on a table. Mission 2 Payload must be returned to the same area before timing will stop after the Mission 3 loading.
- The airplane must start resting on its landing gear on the ground, and time will not stop until it is back in the same position. Stands may be used during loading procedures. Payload loaders may be used, but they will start empty.

- Team supplied tools may be used.
- "Crew" will start each segment outside of the loading area. Timing will not stop until the crew member is outside the box.
- Mission 3 loading will be the maximum number of balls declared at Tech Inspection.
- The airplane must be ready for flight before timing is stopped after each load. For example:
 - Propeller must be installed.
 - Battery must be installed at the proper station appropriate for the mission payload.
 - Payload and hatch(s) must be secure.
 - Flight control operation will be demonstrated
- Arming plug will not be installed and engine operation will not be required for safety reasons.
- Ground mission may be repeated. DBF queuing procedures will be used.
- Additional details will be determined at the Flyoff.

Turn Procedures

Q. According to the rules, the flight lap including two turns. We would like to know will there be a alert while we pass the turn marker? Or should the pilot to judge whether it's legal to turn by himself?

A. Turn judges will be stationed at each turn location and will raise a flag when it is legal to start the turn.

Payload 3 Ball Dimensions and Brand

Q. The Q&A does not provide any information about the ball hole dimension. Can you please provide the size of the holes for the balls. Where did you buy the balls that are going to be used in the competition? Are they still Champro balls or some other brand?

A. The balls have already been purchased via Mail order. They are the Champro brand, and available data are described in Q&A #4.

DBF Q&A #8 - 2/20/2015

(Addressing questions received between 2/10/2015 and 2/19/2015)

Ground Mission

Q. After removal, should the M2 payload be brought back to its original location or can it be left on the ground next to the airplane?

A. Mission 2 payload must be replaced at its original location before timing will be stopped.

Q. Does the propeller have to be installed for the ground mission?

A. Yes. The airplane must be "flight ready".

Q. For mission 2 we want the battery pack to be at Position A and at mission 3 we want it to be at position B. (Note: The battery position is just changed to optimize the performance!) We load the payload for mission 2 and we re-close the airplane as secure for flight (battery pack at position A). Then we leave the loading area and the time gets stopped and the plane is verified if it is secure to fly. Then as the time gets restarted, we remove the payload of mission 2 and install the payload for mission 3. Do we have to change the position of the battery pack to position B to ?

A. The airplane must be "flight ready" at the end of each loading, so the battery pack size and location must be appropriate for the mission.

Report Compression

Q. Is it acceptable to compress the PDF report into a zip or rar to minimize the file size to meet the 20MB limit?

A. No. The basic pdf file must be less than 20MB. Other formats will not be accepted.

Control System

Q. Is a pull - pull cable system allowed for use on a control surface rather than a push - pull rod system?

A. Yes

Mission 3 Drop Attempts

Q. Will the number of balls attempted to drop for Mission 3 be determined from our report estimate or at the competition during tech inspection? For example, if we say we'll attempt 10 in our report, must we adhere to that number when we arrive at the competition?

A. The maximum number of balls that may be carried will be determined at tech inspection.

Configuration Changes

Q. Can we resize our wingspan and eliminate/add a servo for the purpose of meeting takeoff requirements after report submission? Is it considered a violation of rules regarding changes in the competition aircraft? If it is a violation, what is the extent of penalty?

A. The basic external Small wingspan changes are allowed. Internal system changes are also allowed. **Note:** It is not possible to

anticipate all potential changes or to place a quantifiable standard that applies across the board. The configuration will be checked in tech against the 3-view supplied with your report. If the airplane looks substantially like the 3-view drawing then it will be allowed to compete. If the span is doubled, you've added a wing, or added a tail to a flying wing design, then the entry would not pass tech. The spirit of the competition is to design an airplane and bring that same design to the flyoff, and that is the spirit under which this rule will be interpreted.

Q. Would it be legal to change/modify the control mechanism after submission of the design report, if it is shown during flight testing that the mechanism is not sufficient, given that the no other aspects of the aircraft change (aerodynamic surfaces, control surfaces)?

A. Internal system changes are allowed.

Battery Packs

Q. Is the receiver batteries inside or outside the specified weight of the pre-contest laws which states: Battery pack(s) maximum weight limit is 2.0 lb, our plane propulsion battery weight 1.92 lb and receiver battery weight 0.26 lb.

A. Receiver batteries do not count toward the 2.0 lb limit and must be separate from the propulsion pack(s).

Q. Is it allowed that we use a battery pack with a 4in long cable for flight mission 1 + 3 and a battery pack with a 1in long cable in flight mission 2? (Assuming that the weight limit is not crossed)

A. Yes, different cable lengths are allowed.

Arming device

Q. Is the connector type XT60 legal? If the XT60 connector type is legal, can we use it as the arming device? Assuming that the connection plug would be somewhere outside the fuselage, easy and secure to reach.

A. The arming plug must be a separate standalone shorting connector or fuse that is removable from the plane to show that the propulsion system is unarmed. Simply unplugging the battery is not acceptable for this purpose. Compliance will be determined at tech inspection.

DBF Q&A #7 - 2/16/2015

(Addressing questions received between 2/2/2015 and 2/10/2015)

Notice to International Teams:

The DBF organizing committee does not provide shipping or customs information for teams traveling to the US. We cannot attest to the intent for use for teams bringing any kind remotely piloted vehicle or UAV.

Damage Repair:

Q. In the case of a damage. Are we allowed to replace the broken part by a replica? Or do we have to repair the broken part?

A. As long as the replicas (spares) are of the same basic design as the original, they may be used for repair. Note that broken components such as wings, tails, etc must be repaired, not replaced. Replacement of subcomponent parts such as ribs, stringers, skins, etc are allowed. After a crash, a judge will initial the major pieces to ensure components get repaired.

European Commercial Approval:

Q. Is it sufficient enough if the parts have to european commercial approval CE marking ?

(<http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/>)

A. CE marking is not required.

Pre-Tech Form:

Q. When will the Pre-Tech and First-Flight Certification form be uploaded?

A. These forms are in work and will be posted soon.

Mission 2 Payload Mounting:

Q. Is it legal to use foam on all the sides of the payload bay, which would compress on loading the payload (mission 2) thus securing it?

A. The payload must be secured on all sides to prevent movement. Final determination as to whether the payload is properly secured will be made at tech inspection.

Payload 3 Legality Judging:

Q. When will the release mechanism and ball mounting structure be judged as legal or illegal? At the tech inspection stage or after the team completed the 3rd mission? And if judged illegal, will team be allowed to make instant change during the flight off weekend to make it legal, such as add a servo, remove some mounting structure, as required by the judge?

A. These determinations will be made at Tech inspection. Teams may modify their aircraft at the flyoff to comply with needed changes.

Motor/Speed Controller Mounting:

Q. It was established that battery can be either internal or external. Is it the same case for the speed controller?

A. Yes.

DBF Q&A #6 - 2/5/2015

(Addressing questions received between 1/20/2015 and 2/2/2015)

Ground Mission:

Q. Can the removal of Mission 2 payload and installation of Mission 3 payload be performed simultaneously?

A. There is nothing in the rules that would prohibit this.

Q. Can you confirm that 3 people are allowed to load the aircraft during the Ground Mission? Also, is it allowed to repeat this mission same as flight missions to improve timing?

A. Only one person may handle the aircraft during the ground mission. The "pilot" will operate the controls to demonstrate flight readiness, and the observer may advise on aircraft loading and preparation. Yes, the ground mission may be repeated as time allows.

Mission 2 Payload Orientation:

Q. Will the Mission 2 payload be required to be carried with the 4.5" side being vertical (and the 5.5" side being horizontal)? In other words, are there requirements to the orientation of the Mission 2 payload?

A. There is no specific requirement for the payload orientation.

In-Flight Photo:

Q. Does the photo of the aircraft in flight have to be submitted along with the Final report submission in February?

A. The photo is required to complete tech inspection at the flyoff, and is part of the pre-tech certification. It is not required for the written report although you may include it if you wish.

Speed Requirements:

Q. What is the max and min allowed speed for the aircraft?

A. There is no specified minimum or maximum speed.

1/3 Rule:

Q. Is the 1/3 rule still in demand since some of the team members won't come to USA?

A. The 1/3 rule does not apply specifically to the team member composition at the flyoff, only the overall team that works on the competition during the year.

AMA Membership:

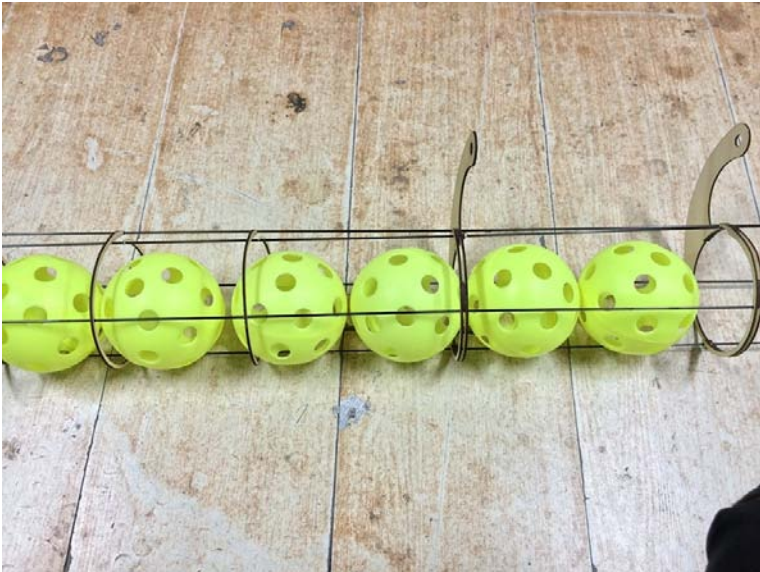
Q. Is it okay if the pilot is a FAI member instead of AMA member?

A. No. This is an AMA contest and the pilots must be AMA members.

“External” Payload Definition for Mission 3:

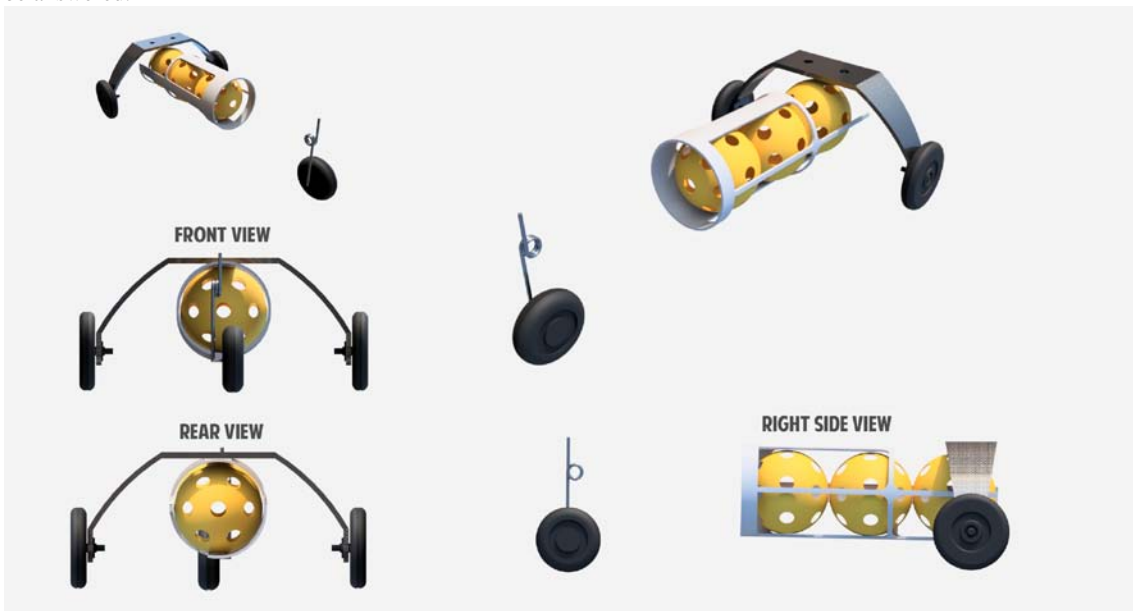
Q. For Mission 3, is it possible for us to carry and offload the balls with a cage system as below? This cage would be completely exposed to the air, external to the fuselage?

A. Yes, it is legal. Up to four rails are allowed (Supersedes answer in Q&A #3).



Q. We have the design showed in the picture for our mechanism, the fuselage is at the top of the mechanism and the thickness of the wall is around 5-6mm. Is it legal?

A. No, this design is not legal as the sides cover too much of the balls. (Landing gear is not an issue). NOTE: There have been sufficient examples shown as to what is legal or not for cage and rail mounts. Further questions similar to the current postings will not be answered.



Q. The rules posted on the competition website state "All payloads and supporting equipment (including restraint and release mechanisms, fairings, etc.) must be properly secured external to the airplane configuration flown in missions 1 and 2." Does this mean that a servo that is a part of the drop mechanism has to be externally mounted?

A. As clarified in Q&A #1, Supporting equipment, retraction mechanisms, and deployment mechanisms may be housed internally. This includes a servo.

Q. In Q&A #1 it was stated that "with the exception of propellers, any significant internal or external change between missions that is intended to change the lift, drag, or flying qualities will in general not be allowed" and also that "servos that are present for a specific mission will be included in the RAC for that mission." Is it then correct to assume that a servo which has no effect on lift, drag or flying qualities of the aircraft can be removed between missions? Furthermore does the latter quote indicate that the N_Servo is calculated for each mission separately ?

A. As stated in Q&A #2, all payload fairing and mounting provisions must be installed for all missions. This includes servos and actuation systems. N_Servo will be constant for all three missions.

Configuration Changes:

Q. Another question. Is it allowed to change aileron neutral angle between missions? For example, can we fly Mission 1 with ailerons

slightly lifted upwards in case it's too windy, and then "droop" them back for missions 2 and 3?

A. Yes, this is allowed.

Q. Our team has been considering repositioning our wing to a new location in-between missions. We have found that it is not allowed to use a different wing for each mission, however we were unable to discern if we would be allowed to move the same wing (that has passed tech inspection) back slightly.

A. No, a wing move is considered a configuration change and is not allowed. The airplane should be designed with a single wing location to handle any CG shifts that may occur with the different mission payloads.

Stabilization Systems:

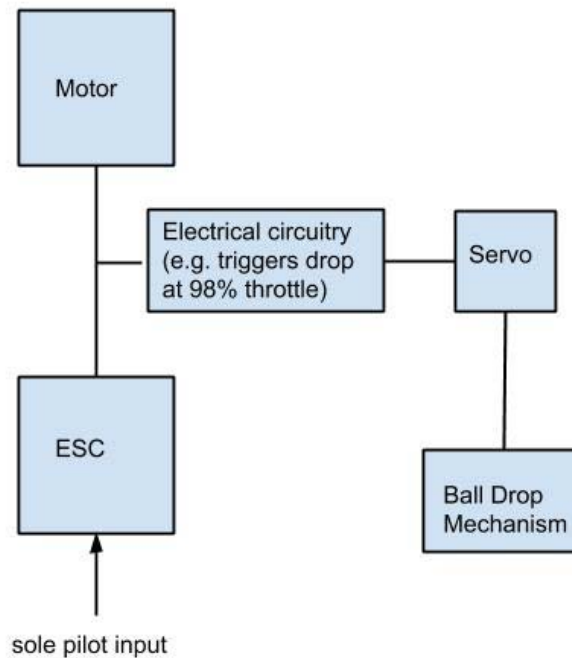
Q. I was wondering if we were allowed to use a flight stabilizing system that utilizes on board accelerometers and gyros to stabilize all the axis for control. We would like to emphasize that this is not an autopilot system, and all controls are still made by a transmitter and pilot.

A. Yes, a stabilization system is allowed (but not an autopilot). Please see the related question in Q&A #5.

More N_Servo:

Q. In the diagram, the motor is commanded by ESC that is controlled by the transmitter. ESC generates pulses, and at certain pulse (say, throttle over 95%), a circuit, that is installed between ESC and the motor, actuates a servo, that releases 1 ball. Would that whole set up count as 1 servo or more?

A. In your case, this would count as two servos because the electrical command uses a separate servo to actuate the motion in addition to the ESC (even though only one channel is used).



DBF Q&A #5 - 1/30/2015

(Addressing questions received between 12/7/2014 and 1/20/2015)

Single Servo Performing Multiple Functions:

Q. If we use a servo to control one of the control surface. At the same time, we use this servo to control a mechanical switch to trigger the electronic speed controller. Will it be count as two servos?

A. As stated in Q&A #2, a servo may perform two or more functions, and still count as a single servo.

Q. If we have a ball release mechanism that is actuated by throttle (i.e. aircraft flies at 70% throttle and the release only actuates at 100% throttle) will it count as an extra servo?

A. If the release is commanded by the same servo that controls motor speed, then yes. But if the release is controlled by a servo that is separate from the speed controller, then it will count as another servo. The ball release must be directly commanded by the pilot.

More N_Servo:

Q. Would a circuit with a sensor, which works somewhat as a switch with a small microcontroller, be considered two or one servo(s). The microcontroller does not receive any information from the radio. Additionally, would a servo with a circuit, which works like a switch where servo pushes on the rod, which trips the circuit that turns off a servo, be considered one or two servos?

A. Stand-alone circuits that do not command a motion will not count as a servo. As stated in the rules and in previous Q&A's any mechanism that commands a motion will be interpreted as a servo.

Fuses:

Q. In the rules, it says that we may use a fuse. Does it mean that we can build our aircraft without a fuse?

A. Yes. The requirement for a motor arming/safeing system is still in force. A properly sized fuse to protect motor circuitry is highly recommended.

Payload Loading:

Q. Can a component of the aircraft be removed in order for the wooden block to be loaded, and then replaced?

A. Yes

Battery and Component Mounting:

Q. Does the battery pack need to be mounted internally; can we have surfaces of the battery in contact with the airflow?

A. The battery pack may be internal or external.

Q. Can we use Velcro to securely attach parts or the payload to the plane?

A. Yes, Velcro is allowed to mount payload and other components. It may not be used for anything structural.

Ground Mission:

Q. How many assembly/flight line crew members are allowed to handle the plane at the same time during the ground mission? i.e. Will we be allowed to have one member pick up the plane while another member loads it or have one member unload payload 2 while another member loads mission 3?

A. The crew composition for the ground and flight missions are the same: 1 Pilot + **2 crew** members. The functions of the different members is left to each individual team.

Q. The rules and FAQ's have yet to state exactly how the ground mission segment will be laid out. Could some further insight be given as to how the Mission 2 and 3 payloads will be given to the teams? When exactly will the timer start (for example, when the loaders touch the plane or the cargo)? Is there a certain area that the loaders be within to work on the plane?

A. Please refer to the response in Q&A #3. Ground loading personnel will be outside of the box when timing starts.

Mission 2 Payload Dimensions:

Q. We are a little bit confused about the size values stated in mission two. The sentence "the nominal overall size will be 4.5" x 5.5" x 10"" and "sensor package is one stack of three standard 2x6 wooden pine boards (dimensional lumber), 10" long" sound as if they contradict with one another. Would you please inform us about according to which sentence we are supposed to design our aircraft. Should we take the nominal overall size or the size of wooden pine boards separately into consideration. Because they do not equate

A. The term "dimensional lumber", such as "2x6" does not refer to the actual size of the board and is common terminology in the lumber industry. The "nominal overall size" is the actual dimensions of the payload. For more information regarding dimensional lumber please see http://www.engineeringtoolbox.com/softwood-lumber-dimensions-d_1452.html

Battery Pack Change:

Q. Can we change our battery and battery configuration between each mission?

A. Yes

Q. Will all the 3 mission at the same day or there is a time between each mission that we could use to recharge the battery packs? May we should provide a pack of batteries for each mission?

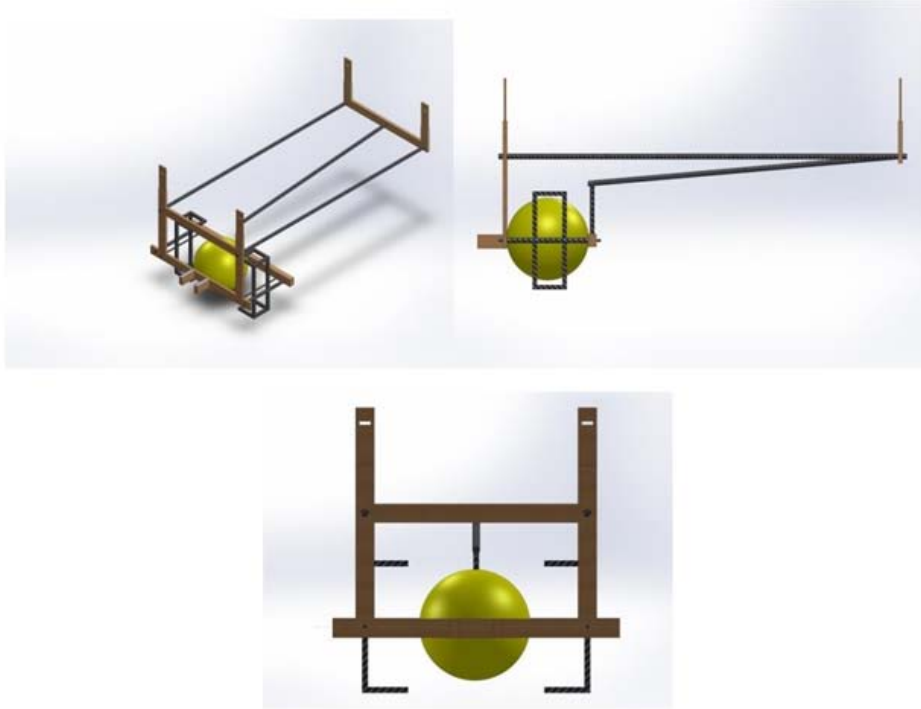
A. It is not possible to determine in advance which missions may be accomplished in a single day. Batteries may be replaced or recharged between flights at the teams' discretion. Please note that all batteries must be presented at tech inspection.

“External”Payload Definition for Mission 3:

Q. Is the following payload mounting scheme legal for Mission 3? It is to be externally attached to the fuselage exposed to air on

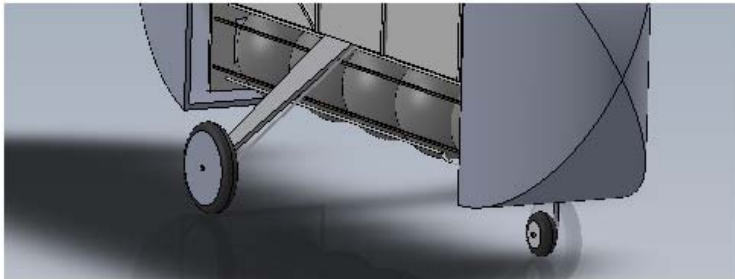
three sides.

A. Yes, it is legal.



Q. In our design, the gear “wraps around” the “cage” containing the balls for mission 3, as shown in the figure below. We do not expect the sides of the gear to come into contact with the wiffle balls. Would you consider that the wiffle balls are still sufficiently exposed to free stream air in in this configuration and is it legal?

A. In your case, the landing gear does not cover the balls and would be considered legal.



Receiver with Built-in Stabilizer:

Q. We were wondering if we could use a 6 channel receiver with inbuilt 3 axis stabilizer without violating the rules and regulations. Also does it count as a servo ?

A. Stabilization systems are allowed but autopilots are not. The stabilization system must be clearly identifiable during tech inspection so that the type of system can be determined. Since the type of setting used for a system built in to a receiver cannot be determined, it's use is not allowed – the system must be “stand alone”. A stabilization system does not add to the servo count.

Plastic Ball Hole Diameter:

Q. We would like to know the approximate diameter of holes on the whiffle balls that will be used in the competition.

A. The brand name and source for the balls has been defined in the rules. They are readily available for purchase. Additional data may be made available on this platform in the future.

Removable Payload Release Mechanism:

Q. Is the release mechanism for the 3rd mission allowed to be removable? We can mount it for the ground score and will be removed for missions 1 and 2. We will then mount it again for the 3rd mission. Is it allowed? This is intended to reduce gross weight for mission 2.

A. No. As stated in Q&A #2, all payload fairing and mounting provisions must be installed for all missions.

DBF Q&A #4 - 12/16/2014

(Addressing questions received between 11/27/2014 and 12/7/2014)

DBF 2014 – 2015 Mission 3 Payload Information

The mission 3 payload plastic balls have been procured in order to obtain physical data on the balls. A sample of 12 balls from the full population of 240 were measured for size and weight. The results are as follows:

Weight: All 12 balls measured exactly 1.0 ounces

Size: All of the balls fit through an opening that was 3.759 inches wide (All Go) and none of the balls fit through an opening that was 3.623 inches wide (No Go)

As stated, this is a sample from the population and being provided as a courtesy. Teams should consider that manufacturing tolerances could result in balls outside of these numbers. Balls will be chosen at random for the ground mission and mission 3 and teams will not be allowed to substitute or select balls.



Maneuvers during Mission 3:

Q. In the last FAQ you specified m3 ball drop cannot occur as a result of an aerobatic maneuver. To what extent are you limiting aerobatic maneuvers. Loops, rolls, and turns against prescribed flight path may be illegal- What about simple, more subtle maneuvers? I would like a list of flight maneuvers that are and are not banned. Methods of releasing the m3 balls via mechanical coupling (such as through the elevator, or aileron) would require a forced maneuver for some amount of time. Why isn't that illegal too?

A. As stated in Q&A #3, the ball drop must be commanded by the pilot and not occur as a result of a maneuver that the aircraft makes. It is not possible to anticipate all possible maneuvers that might be safe or unsafe. That has been and will remain the judgment of the flight line director at the flyoff. If a servo used for flight control also activates the payload release, some reasonable response of the airplane to the release is allowed. The airplane response must be a result of the activation/release and not the cause of the release. The airplane response must be controllable and safe in the judgment of the flight line director.

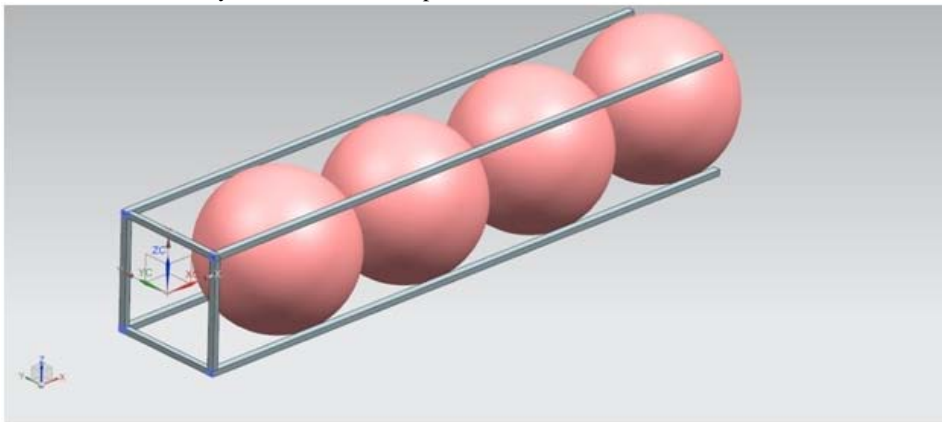
Team-Designed Circuits and Controllers:

Q. Are we allowed to build our own electrical circuits with over-the-shelf components (such as resistors, transistors, IC's, etc.), if yes is it limited to a certain area like the release mechanism? Are we allowed to use a microcontroller (like one of the Arduino boards [<http://arduino.cc/en/Main/Products>]) and their (over-the-shelf) motor shields to control our release mechanism? If we are allowed to use such a microcontroller and its motor shield would it count as one or two Servos in respect to the score and the variable N_Servo?

A. For safety reasons, all flight control transmitters, receivers, servos, and controllers must be commercial off the shelf items. Ball drop controls may be in-house designs. Due to the inherent autopilot capabilities in Arduino, its use is prohibited. As stated in the rules and in previous Q&A's any mechanism that commands a motion will be interpreted as a servo.

“External” Payload Definition for Mission 3:

Q. For Mission 3, is it possible for us to carry and offload the balls with a cage system from under the fuselage as below? This cage would be completely exposed to the air, external to the fuselage. It will only serve as a container for the balls. We are considering to offload the balls one by one from the rear open end.



A. A rail system as shown was stated to be legal in Q&A #3. To further clarify, there can not be more than four rails per row of balls, and the rail cross-section may not be greater than 0.250" square/diameter.

Battery Pack Location:

Q. Is it possible to move objects (like the batteries) in order to adjust the CG between Flight Missions? (e.g. We fix the battery pack in mission 2 in the nose and in mission 3 above the payload compartment)?

A. Yes. Battery packs may be positioned differently for each mission. They may not be relocated once you have entered the staging box.

“Internal”Payload Definition for Mission 2:

Q. Is a small hole (d~13/64in) in the fuselage-nose considered as not enclosed payload in respect to the definition of completely enclosed by airplane structure/skin of mission 2?

A. A small hole into the payload compartment as you describe is legal for Mission 2.

Mission 2 Payload compartment during Mission 3:

Q. Is it allowed that in mission 3 something that belongs to the release mechanism moves through the payload compartment of mission 2? Is it allowed that a shaft to pull into the internal compartment and maybe through the nose too (depending on the number of balls)?

A. Yes, this will be allowed.

DBF Q&A #3 - 12/04/2014*(Addressing questions received between 11/15/2014 and 11/26/2014)***Plastic Ball Weight Specification**

Q. We are having trouble finding wiffle balls that weigh 2.4 ounces. The heaviest ball that we have found so far weighs 1.419 oz. I bought these balls at a sports chalet so they are pretty common.

A. The plastic ball weight stated in the rules is based on specifications from the vendor website. It should be considered approximate. We are in the process of purchasing balls for the competition, and will post actual specifications when they are obtained.

Servo Type for Payload release

Q. I would like to know if it is legal to use the continuously rotating servo for the payload dropping mechanism?

A. For safety purposes, all payload drop mechanisms must be commanded directly by the pilot. The type of servo is not restricted, and since it is commanded by the receiver/transmitter, it will be included in the N_Servo count.

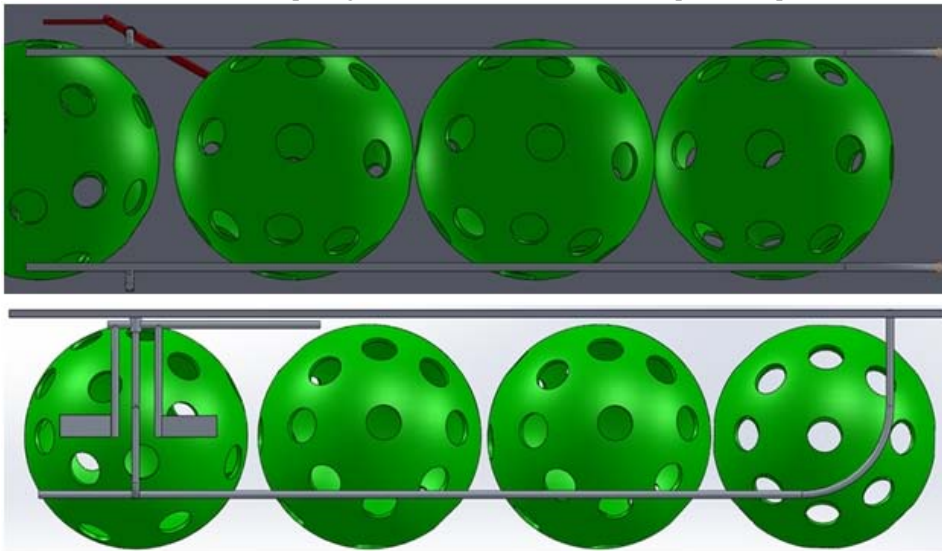
Team Member Additions

Q. Is it possible to add new members to the list after the initial team submission?

A. As stated in the rules: Team members may be updated/changed at any time during the contest but must always comply with the 1/3 rule. Following the initial team postings at the contest beginning we will make a "One Time" update to the team member lists posted on the website. We will notify teams when the website update change information may be sent, normally in February. Teams wishing a team member list update at that time must submit an updated copy of the contest entry form with all fields fully filled (but only the team member information may be changed)

"External" Payload Definition for Mission 3:

Q. For the purpose of external payloads, would rails count as walls? For example, if we had the wiffle balls sitting on two rails below the fuselage, would that count as external because it's exposed to the air from below and both sides or would the rails on which the wiffle balls sit not count as exposing the balls from below? An example of our plan is shown below:



A. Rails may be used to support the balls and as part of the release mechanism. Rails may not be larger than 0.25" in diameter, and no more than three per row may be used. As shown, this design would be acceptable.

Q. If three wiffle balls are lined up next to each other, do the two wiffle balls on the outside count against the middle wiffle balls for the purpose of being external?

A. No, balls mounted in a manner that they are covered by other balls are still considered external.

Q. Is it legal to put a rod through the holes in the wiffle balls?

A. Yes

Q. Must the payload be exposed to the airstream for the entire duration of the mission. Can the ball be 'external' during takeoff but be 'internal' (as in not exposed to airstream on at least 3 sides) when they are load into the release mechanism to be load?

A. The payload must be exposed during the entire flight as defined in the rules and Q&A.

Mission 2 Payload Dimensional Tolerance:

Q. Regarding the dimensional tolerance on the planks, is the figure $\pm 1/8"$ in reference to the stack of planks or each individual planks? (i.e. for the stack of planks, should we plan for as much as $3/8"$ difference in the vertical direction?)

A. The tolerance refers to the overall dimensions, not each individual plank/board.

Ground Mission Area:

Q. Can we have a layout that shows the dimensions of the ground mission area, the initial location of our plane and location of the payloads?

A. The ground mission layout has not yet been precisely defined. It will likely be an area approximately 15' x 15' square. The airplane will start inside the area resting on its landing gear. Payloads will be located on a table or on the ground adjacent to the loading area.

Mission 3 Course:

Q. Do we have to perform a round of flight after releasing the final ball?

A. The course layout is the same for all flight missions. To complete the lap after the ball drop, the plane must execute the downwind turn and land successfully on the runway after crossing the start/finish line.

Maneuvers during Mission 3:

Q. Is it allowed to make some maneuver during up-wind flight over the red drop zone? Is it allowed to make a 360 turn or half turn in one direction and half turn in other direction (8 turn) away from runway and spectators or full loop in vertical direction or roll along the line due to ball drop procedure? The ball drops somewhere during the maneuver and because of maneuver.

A. Intentional aerobatic maneuvers such as loops and rolls are prohibited due to safety concerns. The ball drop must be commanded by the pilot and not occur as a result of a maneuver that the aircraft makes.

DBF Q&A #2 - 11/24/2014

(Addressing questions received between 11/5/2014 and 11/14/2014)

Team Roster Updates

Q. May we update our team membership roster?

A. As stated in the rules: Team members may be updated/changed at any time during the contest but must always comply with the 1/3 rule. Following the initial team postings at the contest beginning we will make a "One Time" update to the team member lists posted on the website. We will notify teams when the website update change information may be sent, normally in February. Teams wishing a team member list update at that time must submit an updated copy of the contest entry form with all fields fully filled (but only the team member information may be changed).

"External" Payload Definition for Mission 3:

Q. Currently, we have a supporting mechanism on the bottom of the balls. The top, front/back, right/left, are exposed. Is this legal?

A. Yes

Q. In the rules it states that wiffle balls must be "viewed from at least three sides (top, bottom, left, right)", does front or back count as a direction? For example would it be legal to have a ball viewable from the front, left and bottom?

A. Yes

Q. Must the whole wiffle ball be visible from a side? Would 75%, for example, of the wiffle ball showing count?

A. No, 100% of the ball must be visible.

Q. The rules state that the release mechanism for the balls should be external to the aircraft. Does this mean that the entirety of the mechanism must be external including any wires, servos, gears, rods, string etc., or can a part of it be internal. What constitutes the end of the "release mechanism?"

A. As clarified in Q&A #1, part of the release mechanism may be internal.

Q. Our theoretical release system would include a "sleeve" to basically contain the balls prior to ejection. This sleeve would be physically unattached to the fuselage and would be in the external flow field as per the rules. It would also be visible from 3 directions at minimum. However, the team wants to be sure this maintains the "external" requirement for both the balls and the system as a whole. Our question: Would this system be considered legal and within the contest rules?

A. No, this is not legal. As clarified in Q&A #1: "No part of any structure, cage, or fairing may cover any part of the payload"

Q. Can we make an assembly part that allow us to remove the aircraft skin by hand for mission 3?

A. No. All payload fairing and mounting provisions must be installed for all missions.

Q. Is a standalone spring without any direct user input (not connected to the receiver) classified as a servo if it is used to hold back the balls during mission 3?

A. As you describe, this would not count as a servo because it's motion would not be commanded by the receiver.

Q. If we have a "cartridge" of M3 balls, do all balls need to be external at all times, or merely the one ball that will be deployed next?

A. All of the balls must be external all of the time.

N_Servos

Q. Would a servo that is only actuated during a fail safe condition count towards the number of servos for scoring purposes? This servo will not be for any other purpose and will have no control over the aircraft. It will only be actuated in the event of a fail safe and will only serve to meet the fail safe requirement?

A. Yes, this servo will count toward the total.

Q. If we use a single motor with a speed controller this seems to fall into the "propulsion usage" category. Will a single speed controller linked to a single motor be considered a servo? This configuration would not allow us any other controllability besides throttle. If we use 2 motors each with a speed controller, will these speed controllers be considered servos? Though they are technically propulsion related, our guess is they would be considered servos because this configuration has yaw control capability, therefore eliminating a rudder control surface.

A. Yes, your interpretation is correct.

Q. Would a shape-memory alloy that is used to secure and release the payloads be considered a servo?

A. Yes, if it is commanded to move by a signal from the receiver.

Q. Do the number of receiver channels used determine the number of servos?

A. No, unused receiver channels do not add to the servo count.

Q. Does running two functions off a single servo (ie. elevator+ball drop mechanism) count as one or two servos?

A. As you describe it, this would count as one servo.

Required Number of Balls for Mission 3

Q. Is it required that each team carry one ball on mission three? Can our "team selected number of balls" for mission three be zero? We would obviously receive a score of zero for mission three. However, if the team thinks it is competitive to carry no balls for that mission, causing our loading time to decrease for the ground mission, would that be allowed?

A. No, this is not allowed. The airplane must be capable of carrying and releasing at least one ball.

Competition Supplied Pilots

Q. Do we have to pay for the pilot the competition provided or it's for free, if we have to pay how much?

A. Pilots are available at the competition without any fees or charges.

Invitation Letters for International Teams

Q. Does AIAA send invitation letters to the participated Teams or not?

A. Invitation letters for international teams have been emailed to the advisor of record.

Use of Autopilots

Q. Can an autopilot be used to fly the plane?

A. No, this is specifically prohibited by the rules.

Configuration Changes

Q. Can we utilize detachable wings to customize each wing for a certain mission profile? Can we change propellers to customize to each mission as well?

A. Wing changes between missions are **not** allowed (all missions must be flown with the wings that pass tech inspection). Propeller changes **are** allowed.

Q. Is removing the skin of the fuselage considered as changing the configuration of the plane? What is defined as a change in configuration?

A. Yes, removable skins are a configuration change and are not allowed. It is not possible to anticipate all potential changes to an aircraft. With the exception of propellers, any significant internal or external change between missions that is intended to change the lift, drag, or flying qualities will in general **not** be allowed.

Mission 3 Payload Specification

Q. Are the current wiffle ball specifications the same as the ones that will be provided at the competition? Since the new wiffle balls are slightly heavier, will there be further changes to their weight or have they been finalized?

A. Yes, the specifications are the same. No further changes are expected. Keep in mind that the ball weight provided is an estimate from the manufacturer and could vary between balls due to manufacturing tolerances.

Ground Mission

Q. For the Ground Mission, rules state that after M2 payload loading, timing will pause to verify that the aircraft is secure. Will this be done by judges, or by our team's ground crew? Additionally, what specifically will be done to verify that the aircraft is secure?

A. The judge(s) will time the ground mission. A brief visual and tactile inspection will be performed by the ground judge to confirm the payload is secure enough for flight.

Q. Rules state that after scoring all flight missions, teams may attempt a single re-flight of each, and the larger of the two scores will be taken. Is there a limit to the number of successful scoring attempts for the ground mission?

A. There is no limit on the number of attempts for the ground mission. A queue rotation system will be used to determine the sequence that teams have access to perform the ground mission.

Q. Will there be a line where members have to be behind before time starts/stops? Will there be a designated loading area/box?

A. Yes

Q. Prior to the start of the time, can the plane start on its back? Does the plane have to be upright before time stops? Can the plane rest on a team supplied stand?

A. No, Yes, and Yes. The airplane must start resting on its landing gear on the ground, and time will not stop until it is back in the same position. Stands may be used during loading procedures.

Q. How will timing be rounded? Will a 60.4 second ground loading time be rounded down to 60 seconds for the sake of scoring?

A. In past DBF flyoffs, times have been recorded to the nearest tenth of a second.

Ground Crew

Q. Can the pilot and observer handle the payload and/or help load the plane?

A. Yes

DBF Q&A #1 - 11/11/2014

(Addressing questions received between 10/15/2014 and 11/4/2014)

“External” Payload Definition for Mission 3:

Q. We would like clarification on what constitutes "External" payload.

- If we leave this portion of the fuselage UNCOVERED, (fully built up balsa structure as shown, just without the covering) does this qualify as an "external" payload?
- Does this mean that the plane, fuselage and all, must be identical to what was flown in missions 1 and 2 before adding the external payload?
- Does the right and left view count as one view or two for the external pod in mission 3?
- Are we able to have an "internal" servo drive our "external" drop mechanism without violating the external release mechanism requirement for mission 3?
- Do the wiffle balls for mission 3 have to be exposed to air specifically, or is it just the mission 3 payload structure that has to be external to our airplane from M1 and M2?
- Can we put the wiffle balls and servos in line with the fuselage behind the compartment that holds the wooden block? This section of the fuselage would be open to airflow.
- Can the external pod be partially internal? For instance having a removable wall in which part of the external pod can slide into in order to carry more wiffle balls and mitigate a change in cg location?
- For a component to be "External" as defined above, does it have to be "completely" exposed to the air when viewed from at least 3 sides or is it enough if it is "partially" exposed?
- If an added payload fairing is completely exposed, do the actual balls have to be exposed to the freestream in three directions as well?

A. As defined in the rules the external payload shall:

- External is defined to be exposed to the air when viewed from at least three sides (top, bottom, left, right)
- The payloads must be exposed completely to the airstream from three sides, or “views”. No part of any structure, cage, or fairing may cover any part of the payload. Fairings in front or behind the payload are allowed if three sides are exposed. “Left and “right” are separate views in this context.
- A “pod” or “fairing” may not cover the payload.
- Supporting equipment, retraction mechanisms, and deployment mechanisms may be housed internally.
- All payload fairing and mounting provisions must be installed for all missions.
- Note: Certain statements in the rules have been edited to be consistent with this interpretation.

What is a “Servo”?

Q. We would like more clarification of what constitutes a “servo” for computation of the RAC

- Does a servo in the external pod for mission 3 go into our total servo count?
- Does the Electronic Speed Control driving our only motor count towards our total servo count?
- Most definitions state that servos provide rotational motion, in our case, to deflect control surfaces. Does the use of linear actuators, that do not provide rotational motion only linear motion, constitute the use of servo in terms of the number of servos used in the flight score?

A. As defined in the rules:

N_Servo is the number of servos used in the airplane. For the purposes of this contest, a "servo" can mean any mechanical or electronic device used to control the airplane or payload release mechanism. These will include but may not be limited to:

- Conventional R/C servo actuator
 - Speed controller
 - Electric motor not used for propulsion
 - Solenoid actuator
 - Electric relay
- Electronic Speed Controllers are specifically included in the servo count. For a multi-engine design with multiple speed controllers, each ESC will count. Single speed controllers that control multiple motors through a single throttle command will count as one servo.
 - Any mechanism that commands a motion will be interpreted as a servo, whether linear or rotary. Servos that are present for a specific mission will be included in the RAC for that mission.
 - One of the main criteria used to define a servo is that it is activated through a command from the R/C transmitter and receiver.
 - Springs and linkages that are activated by a "servo" do not constitute an additional servo.

Fail Safe Provision:

Q. If we can fly our plane without, for example, a rudder, will we still be able to satisfy the "fail safe" requirement with the other surfaces being deflected in accordance with the rules?

A. As stated in the rules: For aircraft not equipped with a particular control, then the safety inspector must be satisfied that the intended function of the fail-safe system will be carried out.

Payload“Loaders”

Q. Can a payload "loader tool" be pre-loaded for the ground mission, this "loader tool" would not be a part of our external payload structure.

A. Loaders are allowed, but they may not be “preloaded”. Payloads for the ground and flight missions will be provided by contest officials and will be available at the start of the mission in a standard arrangement. For example, they may be placed on a table, and/or in a box with an open top.

Use of holes in the Champro Balls

Q. Can we use the holes in the Champro 12" balls for fixing the balls on the drop system? Like fixing them on the pole which protrudes through the balls?

A. Yes

Completion/Attempt of All Missions

Q. Is it absolutely necessary to attempt all the three flight missions ? (say we want to skip mission 2 and do mission 3). If no, then is it compulsory to put the skipped mission's payload in the ground mission.

A. This is specifically prohibited in the rules:

- [The] Aircraft must be designed to be capable of performing all required missions.
- The three Flight Missions must be flown in order. A new mission can not be flown until the team has obtained a successful score for the preceding mission

The ground mission must be performed as described in the rules, using both Mission 2 and 3 payloads.

Ballast Weight for Mission 1

Q. I was wondering if we could fly the plane with any other additional weight. This would be to adjust the center of gravity if needed, and would be more of a structural component. I would like to clarify if the plane is absolutely not allowed to have any removable weights/objects during mission 1.

A. Ballast weight is allowed, but must be the same for all missions. It may not be removed after Mission 1 is completed.