CanSat Regulations at ARLISS

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The updates from the regulation in 2018 are shown in red.

1 Regulations for all CanSats at ARLISS

1.1 Configuration

The mass and the size of an entire CanSat, including appendages, must meet the mass and size restrictions in Table 1. In addition, the CanSat should be easily released out of the cylindrical carrier. *(For example, any projectional portions should not interfere with the release.)*

Table 1. Restrictions of CanSat mass and size (including all appendages)

	Mass	Size
Open Class	1050g or less	Diameter: 146mm or less Height: 240mm or less
350-ml Class	350g or less	Diameter: 66mm or less Height: 240mm or less

Modifying of the carrier is prohibited. Any parts should not be left in the carrier.

1.2 Countermeasures against lost

A CanSat must have function(s) of facilitating the search in the desert for all the launched parts. Any parts of CanSat should not be left in the desert after CanSat's mission.

Example of measures: Position information transmission, a beacon, florescent color paint, etc.

1.3 Deceleration mechanism

A CanSat must have appropriate mechanism(s) that reduces the speed of the CanSat near the surface of the ground for keeping people safe.

Examples of measures: Parachute, paraglider, fixed wings, etc.

Supplemental information: Parachute/paraglider opening shock is huge; thus, the strength of connecting parts between the appendage and the CanSat bus should be carefully verified through appropriate tests prior to the launch.

1.4 Strength against launch load

A CanSat must be tested prior to the launch to confirm the system operation even after the quasi-static load, vibration, and shock during the launch are applied.

Recommended test conditions

Load direction: vertical

Quasi-static acceleration: 10G

Sinusoidal sweep: 15G from 30Hz to 2000Hz, or equivalent random vibration

Shock load: 40G

1.5 Wireless communication device setting at the time of launch

All wireless communication devices onboard a CanSat must be turned off with either software control or hardware switch in the period between a launch and a release from a rocket. However, this rule is not applied for FCC certified devices with the output less than 100mW. A team that plans to do experiment inside the rocket must tell your mission to AeroPac in detail. AeroPac will decide whether mission is available or not.

1.6 Ground station up-link/down-link

Two-way communication (up-link and/or down-link) between a ground station and a CanSat is permitted. However, the team that participates in the Comeback Competition must implement completely autonomous control where no human intervenes both in the ground station and the CanSat.

1.7 Radio channel adjustment

A team that uses wireless communication device(s) must submit the communication device specifications including frequency to the ARLISS coordinators. In case crosstalk is concerned, the ARLISS coordinators arrange the frequency, and network or device identifier adjustment; all the teams must obey the adjustment.

1.8 Maintenance after loading

After loading a CanSat into a rocket once, the unloading of the CanSat before the launch shall not be permitted, except the following condition. If the rocket should not be launched over one hour in case of delay due to weather after putting the CanSat into the carrier, the team must follow the AeroPac instruction and may take out the CanSat temporarily and maintain the CanSat.

1.9 Launches

The maximum chance of launching rocket is two times per each team and the fee must be paid in advance. It is unacceptable for the Japan team who failed the quality examination to launch rockets for the sake of safety.

1.10 Loaded item

A CanSat team using liquid must be aware of not using flammable or ignitable liquid and be sure that liquid is hermetically sealed without any leak.

1.11 FAA (Federal Aviation Administration) rules

1. A CanSat that weights from .55 lbs to 55 lbs (.249kg to 24.9 kg) that has wings or rotors is considered as an Unmanned Aircraft System (UAS) - a model aircraft - under FAA rules. The CanSat team must register the UAS CanSat at the FAA website directly. The team must demonstrate before flight that it has registered.
2. All of the launched parts of the UAS should be kept under visual observation during flight. To ensure the UAS is under observation, the UAS must have a GPS with a telemetry system capable of reporting position during the entire flight. AeroPac will launch UASs up to 16,000 ft MSL (12,000' AGL) and will be deployed up to several miles from the launch site. The UAS must have a telemetry system capable of covering this recovery area.
3. UASs will be flown for educational purposes and no longer need Section 333 Exemption to fly as part of

their coursework.

4. The UAS should strive to remain within the FAA authorized waiver area for ARLISS (a 4 statute mile radius from the launch site).
5. During the Arliss period, around the launch site in Black Rock Desert will be special district where any kinds of radio frequency is available. Therefore, it is possible to use wireless communication devices which is not certified by FAA. However, it is unacceptable for the Japan team which failed the quality examination to launch rocket.

2 Additional Regulations for Comeback Competition

2.1 Comeback Competition

In the Comeback Competition, CanSats aim to reach the target point on the ground using autonomous control. All mechanical parts for flight/locomotion should be attached on the CanSat when it is launched by a rocket. On the other hand, ground station facilities can assist the CanSat navigation through two-way wireless communications, as long as no human intervenes both in the ground station and the CanSat. If the CanSat is not perfectly autonomous, your team cannot join the comeback competition.

2.2 Control record submission

A control-record report must be submitted for each of CanSat launches to the Comeback Competition. Please be sure to specify your control record in local time.

Committee prior to the deadline prescribed by the Committee. The control-record report must clearly visualize the relations between the CanSat's positional trajectory and the control commands. The control-record report must facilitate the Committee's understanding that the CanSat's positional trajectory is actually the result of the active autonomous control. Figure 1 shows an example of the control-record visualization. In addition, the control-record report must include at least the following information.

1. Concise explanations of control mechanisms and algorithms
2. Control start time and position,
3. Control finish time and position where the CanSat autonomously stops on the ground. If team retired because of some kinds of trouble, team will submit the log until where team retired.
4. One-line distance between
   - i. The control start position and the target position
   - ii. The control end position and the target position
   - iii. The control start position and the control finish position

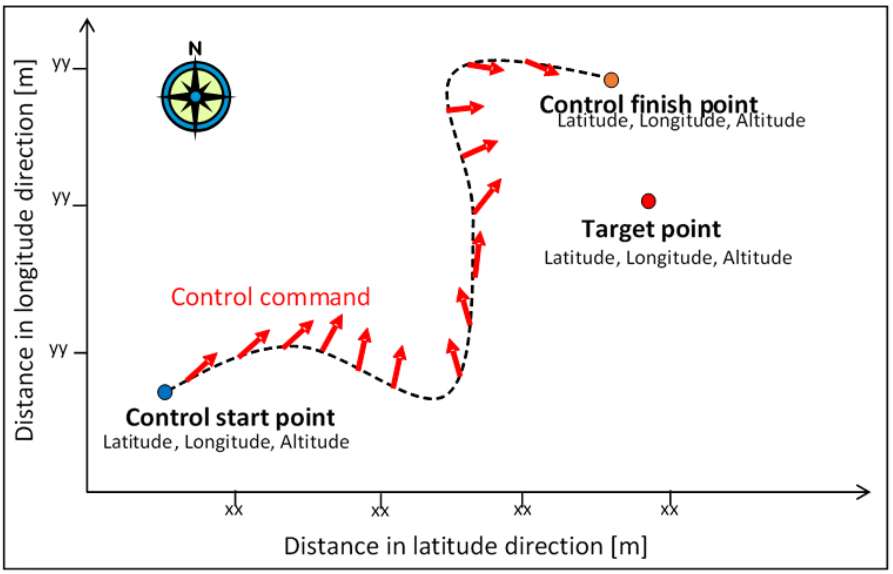

Figure 1. An example of visualization of a control record

2.2 Goal

1. AeroPac prepare the goal for Arliss every year. For your reference, the last year's goal is the picture below.

2. Team records will be measured from the central of goal to controllable part attached to CanSat's main body.

   Bad cases : Record will not include things injecting from CanSat (strings, ball, etc.)

3 Mission Competition

Mission Competition rewards the CanSat whose mission, technology, and achievement inspire other teams for further innovations. As for technologies, only technologies which are not directly related to Comeback Competition are evaluated. CanSat teams can join **both** Comeback Competition and Mission Competition simultaneously. However, if a team wants to navigate its CanSat through 2 way wireless communications from the ground station, the team can only participate in the mission competition.

4 Award

4.1 Technical System Award

1. Entry

   All teams will participate for Technical System Award

2. Evaluating item

   Technical System Award evaluates originality of the method, novelty and difficulty of the technology.

3. Vote and Points

   Each team has one vote and put score from 0 to 4 for 3 evaluating item.

4.2 Best Mission Award

1. Entry

   All teams will participate for Best Mission Award

2. Evaluating item

   Best Mission Award evaluates realization and significance of the mission.

3. Vote and Points

   Each team has one vote and put score from 0 to 4 for 2 evaluating item.

4.3 Accuracy Award

1. Entry

   Accuracy Award will be additional entry for the team participating comeback competition.

2. Evaluating item

   Accuracy Award evaluates distance and time to reach the goal. The order of priorities is distance from goal

to finishing time.

4.4 UNISEC Award

1. Entry

   All teams will participate for UNISEC Award

2. Vote

   Professor will chooses one team for UNISEC Award

5 Overall Winner

1. Evaluating item

   Overall Winner evaluates comprehensively from every point.

2. Vote and Points

   Each team, management team, and professors have one vote each and determine first to third place.

   The detail score will be like this. (1st place : 5 points, 2nd : place 3 points, 3rd : place 1 point)

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