

CanSat Regulations at ARLISS

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The updates from the regulation in 2017 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.

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 after putting the CanSat into the carrier, the team may take out the CanSat temporarily and maintain the CanSat.

1.9 Number of launches

A CanSat team may launch CanSat(s) as many times as possible, as long as the prescribed fee is paid. However, the CanSat team must understand that not all launches become possible, because of weather and other conditions.

For the teams participating in the competition(s), please see also 2.2.

1.10 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).

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.*

2.2 Launch opportunity

The data obtained only in first and second launches of the CanSat are considered as official records. The CanSat may be launched more than twice, but the results of the third launch or later are considered only as reference records, and are not eligible for the Accuracy Award.

2.3 Control record submission

A control-record report must be submitted for each of CanSat launches to the Comeback Competition 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
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

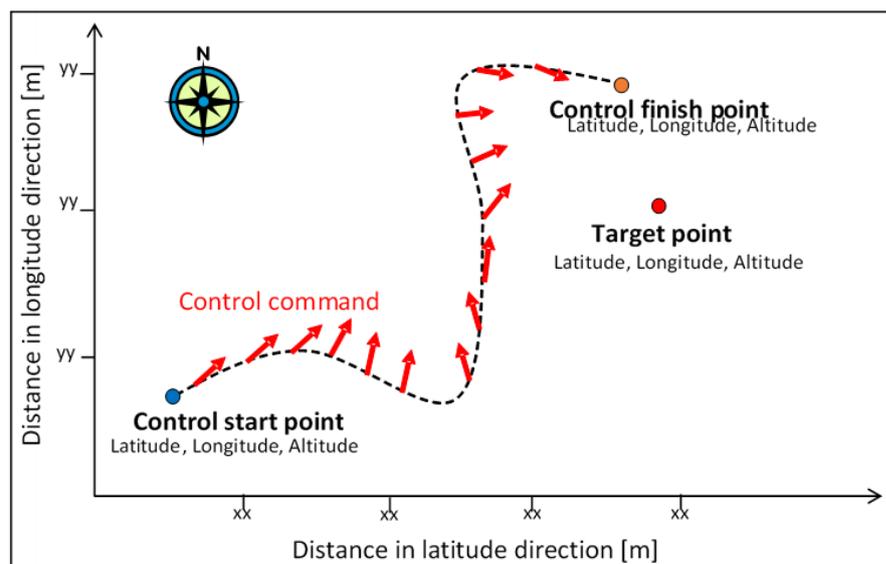


Figure 1. An example of visualization of a control record

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.

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