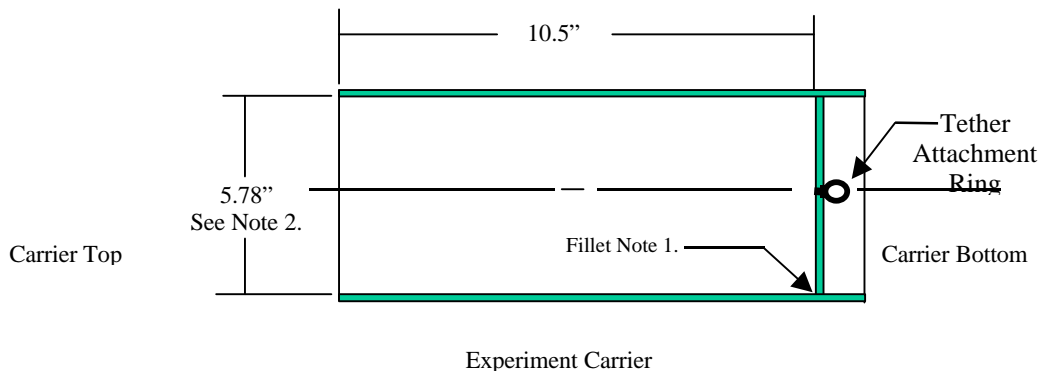


Use of the CanSat Carrier for the September 1999 ARLISS Launch Project

Following is a list of requirements for use of the CanSat Carrier with the ARLISS rocket launch in September 1999 from the Black Rock Nevada rocket test range. The intent of this year's launch is for all CanSat teams to utilize the Carriers in a uniform manner, as specified in this document. This program is designed to provide the participants both hands-on experience and experimental opportunities in preparation for future low earth orbiting CanSat launches and operation.

Carrier Description

The Carrier is a cylinder shown Figure 1.



Notes

1. There is a small epoxy fillet in this corner. Payloads must round bottom corner ~ 1/8 radius to fit corner.
2. The 5.78" ID requires that payload inserts allow at least 0.005" clearance for payload holder for CanSats. More than 0.005" can be shimmed at the launch site.

Figure 1 Carrier Dimensions

This Carrier is secured within the ARLISS rocket airframe as shown in Figure 2.

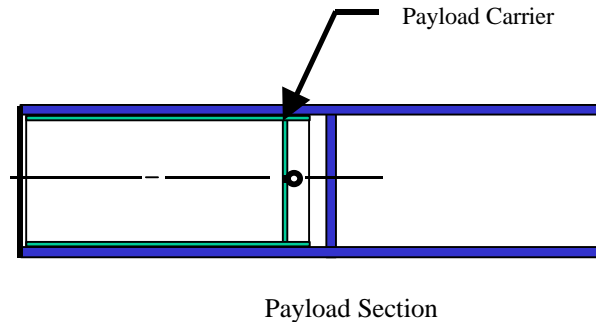


Figure 2. Carrier in Payload Section

The CanSats are ejected from the rocket as the final event in the following sequence:

- 1.) The on-board flight computer detects motor ignition and lift-off.
- 2.) The flight computer detects motor burn-out; rocket enters coast phase.
- 3.) Flight computer detects apogee; a pyrotechnic charge separates the booster section of the airframe from the payload section; the two components descend separately under parachute.
- 4.) Six seconds later, the flight computer initiates a second explosive charge in the payload section. This charge destroys four shear pins, propelling the nose cone clear of the airframe where it will descend under its' own parachute, and ejecting the Carrier rapidly downward.
- 5.) The downward travel of the Carrier is abruptly stopped by a 10 meter Kevlar tether, the deceleration force causes the CanSats to be ejected from the Carrier, and each experiment will then descend under its' own 36" dia. parachute at a rate of approximately 12 ft/sec.

Separate Carriers for Launchers and Experimenters

Three Carriers will be built for each rocket. Two of these Carriers will be given to the payload experimenters and the launch rocket provider will retain one. The Carrier retained by each launch rocket provider will be the only Carrier allowed to fly because each Carrier must be custom-fit into it's respective payload section - no two rockets are exactly alike, and the Carriers are therefore not interchangeable. The interior

dimensions of the Carriers are identical, and this should make it a simple matter to transfer the experimental payloads to the Carrier that will be used in the launch.

(Note: It is very important that the payload not be allowed to distort the concentricity or circumferential dimensions of the Carrier. Successful deployment of the experiments requires a precise fit. Likewise, a minor anomaly can lead to failure.)

It is advised that the payload experimenters use only one of the Carriers for prototyping and keep the second Carrier for final fit check of the payload. The experimenters will deliver the payload to Black Rock for integration into the rocket provider's Carrier on Friday, September 9. The only modifications that can be requested for the rocket provider's Carrier will be longitudinal screws as shown in Figure 3 for securing the experimenter's payload. The experimenter should provide a template for precise location of these holes in the launch Carrier bulkhead.

(NOTE: Anywhere a screw or bolt is put through the plywood bulkhead, a washer should also be used for strength.)

Form Factor for CanSat

The form factor for the CanSats is that they must have at least the exterior of a cola can like Pepsi Cola or Coke. The standard shape form factor is the Pepsi Cola can. Any cola type can or brand may be used as long as it has the same form factor as the Pepsi can. It was found that some other types of cola cans are not all exactly the same size and shape as the Pepsi can. Assuming US and Japanese Pepsi Cola cans are the same.

Internal Use of the Carrier

The experimenter may use the total internal volume of the Carrier as shown in Figure 1. No changes may be made to the exterior of the Carrier, ie screw holes, etc. The experiment may not extend beyond the top of the Carrier. The experimenter may request that up to four screw holes be provided through the bulkhead of the Carrier to secure the payload in the Carrier as shown in Figure 3. The experimenter should provide a template for precise location of these holes in the launch Carrier bulkhead.

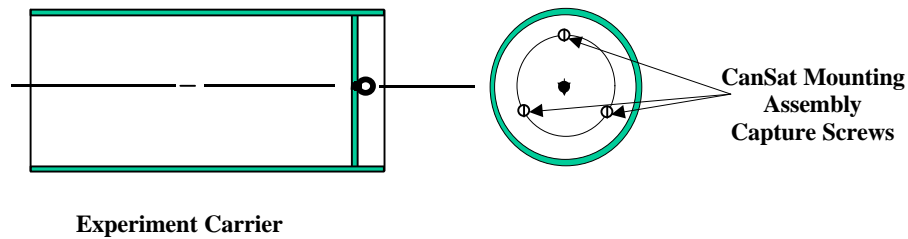


Figure 3 Screw Holes in the Carrier

Contents of Container after CanSat Ejection

No active components are to remain in the Carrier after ejection of the CanSats. The final weight in the Carrier after ejection needs to be kept to a minimum for proper descent of the payload section of the rocket.

Design of the CanSat Payload

The total weight of the CanSat payload can not exceed four pounds including the weight of the 3 CanSats, 3 parachutes, batteries, switches, screws and anything else contained in the Carrier. This includes any launch mechanism or CanSat holder material that may remain in the Carrier after ejecting the CanSats.

Ejection Mechanism of the CanSats from the Carrier

The Carrier will be expelled downward from the rocket payload section by a small explosive charge. The Carrier will be attached to the payload section by a tether. When the tether reaches its taught length from the payload section, there will be a deceleration force on the CanSats that will eject the CanSats from the top of the Carrier in the direction of descent.

The launch provider has validated this ejection mechanism by performing numerous ground tests and one successful test flight. The experimenters are not to provide any additional mechanism for ejection from the Carrier unless approved by the ARLISS technical committee coordinated by Prof. Twiggs, at btwiggs@leland.stanford.edu.