Australian Universities Rocket Competition 2018/2019

Flight Performance Marking Criteria

1 Overview

Each team's launch vehicle's flight performance will be demonstrated by its achieved altitude relative to the target apogee (10,000ft or 30,000ft AGL) as well as their launch vehicles successful recovery. Closeness to the target altitude will be assessed, with height above target being penalised just as severely as height below target. The condition of the launch vehicle after recovery will also affect the flight performance. Achieving the target altitude will be worth 80 marks of the total 100 marks achievable for this section.

Note that the AURC will only mark one flight at the competition launch event. This is done in order to ensure that teams that can only afford one flight of their competition rocket will not be disadvantaged relative to other teams which have the capacity to fly multiple times.

1.1 Flight Performance Calculation

The following formula will be used to calculate a team's altitude component of their flight performance score:

$$Point = 80 - \left(\frac{80}{0.25 * Altitude_{Target}}\right) * |Altitude_{Target} - Altitude_{Apogee}|$$

Successful recovery of the launch vehicle is worth 20 marks and is detailed in Section 2. The successful recovery of the launch vehicle will be based around an assessment of whether the rocket would be ready to launch again with very minor refurbishment.

1.2 Payload Penalties

In addition to the marks awarded for flight performance, penalties will be applied if a team's payload does not meet the following criteria:

- Payload mass.
  - Your payload must weigh no less than 4kg (with a 5% margin, i.e. 3800g is acceptable due to potential calibration errors surrounding the scales).
  - Note that the payload is defined as capable of being replaced with ballast of the same mass with no change to the launch vehicle's trajectory or recovery.
  - No penalties will be applied for payloads exceeding 4000g, this is a minimum requirement and not a target.
- Independent payload functionality.
  - Your payload must be capable of functioning independently to your launch vehicle, failure to do so will result in a payload violation.
  - A payload cannot be a launch vehicle sub-system and must be a separate entity capable of undertaking scientific experiments.
- Payload location and interface.
  - Your payload must be able to be safely taken out of your vehicle and weighed independently of your rocket, failure to do so will result in a payload violation.
  - In the interest of time for the competition, the whole weigh-in process should not take longer than 5 minutes per team. The 5% score penalty will apply after

this limit is exceeded. Teams are encouraged to practice/determine this variable with prior launches.

- Restricted payload materials.
    - The use of restricted payload materials, including live animals, hazardous materials or any other material violating CASA or AMRS regulations will result in a payload violation.
    - Safe payload recovery.
    - Your payload must comply with the latest AMRS and CASA safe recovery regulations. Contact your local rocketry club should you have any concerns about our proposed payload recovery method.

For each violation of the above payload criteria, a 5% penalty will be applied to the total mark achieved for the team's flight performance.

2 Successful Recovery Marking Criteria

The following points provide further information on what will be considered a "successful recovery". Note that these details are indicative only and the final decision on the success of the recovery and the associated marks will be at the discretion of the AURC marking team. The AURC marking team may choose to consult AMRS representatives for their input into deciding the level of success of a launch vehicle's recovery:

- Completely Successful Recovery (20/20 marks)
    - No visible structural damage to the airframe
    - Parachutes and recovery gear deployed as expected with no entanglements
    - All avionics still intact and fully operational
    - All fins still securely fastened to the airframe
    - No other pertinent damage or problems present that would prevent the launch vehicle from being immediately flown again
- Partially Successful Recovery (~10/20 marks)
    - Some minor structural damage to the airframe which will not require major modifications to the launch vehicles design to correct
    - Parachutes deployed but may be entangled or were deployed at an unexpected time
    - Avionics intact and may/may not be still operational
    - All fins still securely fastened to the airframe
    - Launch vehicle able to be repaired with equipment available at the range
    - Likely the launch vehicle would not pass an AMRS L1/L2/L3 certification attempt
- Failed Recovery (~0/10 marks)
    - Major structural damage to the airframe
    - No or poor parachute and recovery gear deployment
    - Avionics severely damaged
    - Launch vehicle drifted outside of the AMRS NOTAM zone during descent
    - Some fins may be missing or no longer securely fastened/severely damaged
    - Launch vehicle will require extensive repairs and potentially re-design at an offsite location (not at the range)
    - Launch vehicle would not pass an AMRS L1/L2/L3 certification attempt

3 Flight Performance - Total Marks Breakdown

The table below provides a summary of the marks achieved for each section of the Flight Performance criteria. The total Flight Performance score is shown at the bottom rounded to the nearest tenth of a mark.

Component	**Value**	**Comments**
Target Altitude (ft)		
Achieved Altitude (ft)		
Altitude Mark (/80)		
Recovery Mark (/20)		
Number of Payload Penalties		
Total Percentage Marks Reduction (%)		
Total Flight Performance Score (/100)		