Subspace Rocket Launch

Triton Rocket Club

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# Preface

## Vehicle Designation

Henceforth, this launch vehicle will be referred to as *No More Mr Nice Guy.* Taking a page from SpaceX, this vehicle is named after a ship from Iain M. Banks’ *Culture Series*.

# Section 1: Project Overview

## 1.1 Introduction

The Triton Rocket Club is pursing the goal of being the first undergraduate university organization to launch a rocket past the Van Karmen line, 100 km, which is commonly known as the edge of space. In working towards achieving this goal, the club has been building incrementally larger solid motor rockets, making improvements each time based on empirical data.

This document outlines the design of the final launch before the club attempts the space shot.

## 1.2 Design Teams

This section will outline the design teams for the project

## 1.3 Design Reviews

This section will outline the standard design review process for any system on the rocket

## 1.4 Launch Readiness Review

This section will outline the process for determining launch readiness of No More Mr Nice Guy.

## 1.5 Mission Success/Failure

How to determine if the mission is a success or failure. A successful mission will permit TRC to continue with the development of the Space Shot Vehicle.

# Section 2: Design Criteria

## 2.1 Altitude

The target altitude for *No More Mr Nice Guy* is 50 km.

## 2.2 Two Stage Design

The TRC Two-Stage Vehicle is designed with the goal of achieving a higher altitude with a smaller mass ratio. Furthermore, building a two-stage rocket provides a unique challenge for all the engineering groups. This allows for the organization to perform one of its main functions; the development of good engineers. The discussion below covers the design criteria for each department and team with in TRC in relation to building a two stage vehicle.

## 2.3 Propulsion

Propulsion for *No More Mr Nice Guy* should demonstrate remote ignition capabilities of the second stage.

## 2.3.1 First Stage

Initial ascent.

## 2.3.2 Second Stage

Secondary ascent. Apogee of at least 50 km.

## 2.3.3 Thermal

Propulsion thermal team is responsible for instrumenting the vehicle and measuring thermal data against models

## 2.4 Avionics

Avionics has a lot of stuff.

* Design

## 2.4.1 Flight Computer

## 2.4.2 RIO

## 2.4.3 Instrumentation

## 2.4.4 Telemetry

## 2.4.5 Power

## 2.4.6 RF

Avionics RF is responsible for communication between the rocket and the ground station.

## 2.5 Space Launch Vehicle

The Space Launch Vehicle is the design of both the first and second stage of *No More Mr Nice Guy.* The design should ensure that cost, in terms of materials, weight, and size, are minimized by using a two-stage vehicle as opposed to a single stage.

Possible to reduce mass by using COPV?

## 2.6 Structures

Rephrase to conform to highlight design criteria

Structures for *No More Mr Nice Guy* requires a launch tower that can accommodate a two-stage vehicle. The current launch tower is capable of housing a two-stage rocket. Holes must be drilled to adjust the launch rails to the appropriate rocket diameter. The logistics of transportation of the tower currently requires two trucks due to each half of the tower being 8’ tall and having a base of 3’ x 3’. Lifting the tower with a heavy rocket inside it will require a few people and ropes, potentially with the assistance of a winch.

## 2.7 Launch Operations

Launch Operations primary function is to ensure launch conditions are sufficient for launch. Launch Operations will also receive telemetry from the rocket and monitor its performance.

## 2.8 Payload

TBD if a scientific payload will be launched on *No More Mr Nice Guy.*

# Section 3: Data Analysis and Processing

What data are we getting back from this launch, why, and what are we going to do with it.

* Confirmation of design for Space Shot
* Identification of any failure modes
* Engineering challenge for students

# Section 4: Launch Facility

Details about the launch facility. Black rock? Must support altitude of 50 km.