

## **On Mission of netuacat Rocket Measurements of Noctilucent Clouds:-**

1) Picture from ground:-



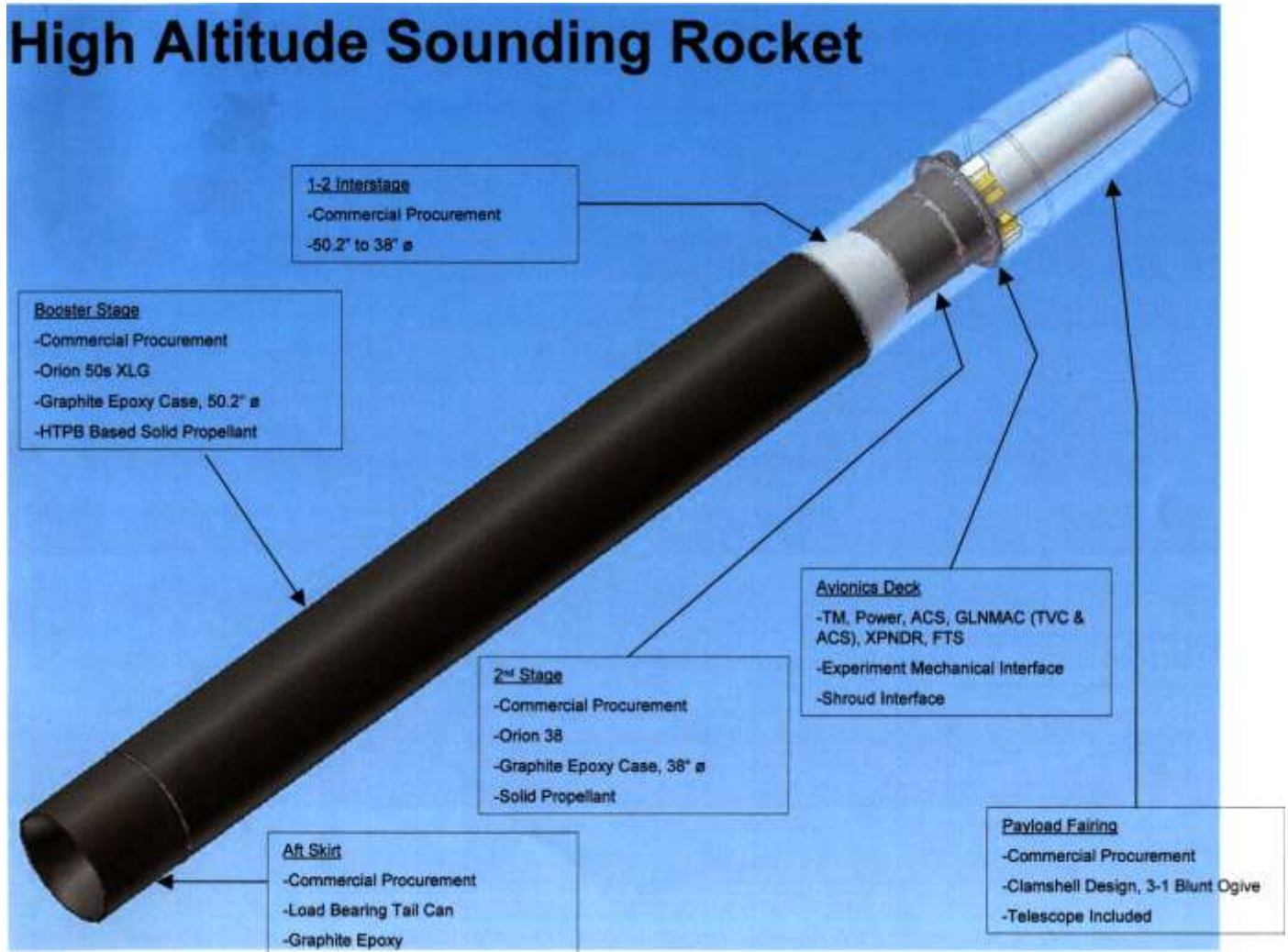
2) Picture of unusual behavior of noctilucent clouds at 85Km above earth.



- 3) Picture of noctilucent cloud from arctic centre.



## High Altitude Sounding Rocket



- 1000 lbs. to 3000 km
- 40 min. observing time
- 40-50 inch diameter
- Recovery capability to be included
- High re-entry velocities (~ 7 km/s)

### Goal:

\$5M including rocket, nose cone, payload sub-systems, operations

## High Altitude Sounding Rocket

### Astronomy / Planetary / Solar

- Increased “hang time” of 40 minutes and larger diameter (~ 1 m) telescopes will provide greater sensitivity (e.g., observing extra-galactic and other faint objects become feasible) and higher angular resolution.
- Longer observing times introduce:
  - new class of experiments (e.g. IR Payloads that need to cool down)
  - ability to track temporal evolution of solar phenomena
  - larger number of targets to be observed on a given flight
- Provides competitive observational capabilities not available on Hubble (e.g., rockets can carry out “diffuse” experiments, observe objects near the sun, such as Venus, Mercury, comets)

## High Altitude Sounding Rocket

### Geophysics

#### (Magnetosphere/Ionosphere/Thermosphere/Mesosphere)

- Ability to penetrate the aurora and cusp acceleration regions ( $> 2500$  km), and linger within these regions at low velocities
- Provides ability to observe high altitude regions with constellations of well-instrumented sub-payloads
- Observe magnetosphere-ionosphere coupling resonances and wave interactions with periods of 10's of minutes
- Study inner radiation belt and slot region from Wallops
- Observe evolution and impact of magnetic storms on mid-latitude geospace for considerably longer times
- Instrumentation testing (e.g., high velocity environment during re-entry in lower ionosphere provides for GEC prototype tests).

## High Altitude Sounding Rocket

## Other Mission Types

- **Microgravity Experiments**

- 40 minutes of “ideal” micro-gravity environment (without vibrations common on human-tendered platforms such as ISS and Shuttle)
- Provides for considerably larger and longer combustion experiments

- **Planetary Probe Development and Engineering**

- (Re-entry testing, Aerobraking, Smart Landers, Aero-capture, etc.)
- All benefit from much higher “re-entry” velocity (near 8 km/sec) achieved on ascent/descent when apogee is significantly increased.

What Brain Chamber has novelty in rocket science:-

### **Rocket Boom Deployment Mechanism.**

#### **1) Pivot starting technology:-**

This is purposely used as during lift of rocket it is connected to the boom of rocket. During deployment of rocket it possesses the rotational movement. Along with rocket boom also starts rotating.

This system controls on electric charge given by super capacitor.

Weight:- Depends on R&D

Material:- As per Space requirement.

#### **2) Super Capacitor:-**

When charge of super capacitor is insufficient for deployment then its back up power station system gets started. As backup power station possesses energy from during deployment of first boom. As when the electric actuator moves its ram towards atmosphere then it charges the super capacitor. The said charge is used to deploy next boom this is purposely used as the energy accumulated during first boom deployment out of that 98% energy get utilize for generating electricity hence we can manipulated te force exerted on boom during

deployment. Hence by taking this account we can have relation between velocity & force.

Hence when rocket moves or constantly changes its velocity. This will help us to deploy second boom with specific velocity for specific angle with specific force.

Specification:-

$V = 1700 \text{ m/s}$  max speed

- a) Weight:-
- b) Specification:-

### 3) Boom Deployment:-

Boom deployments of four booms are connected to control panel. This panel consists of

- 1) Distance sensors
- 2) Pivot starting technology
- 3) Electric actuators
- 4) Super capacitors
- 5) Vacuum sealed control panel

Deployment is carried out sequentially & it can't require any extra supply from rocket. It is self operated mechanism.

Total weight of whole system goes up to.....Kg.

The deployment carries four steps. When first boom has released with rotation motion then it moves down. During this movement the control system detects, velocity, speed, momentum & angle of boom when it releases 20% of total length. According to its deployment the second boom releases. The decision of releasing second boom depends on artificial neural network. This will help us to maintain velocity & angle of rocket similarly 3<sup>rd</sup> & 4<sup>th</sup> boom get release. At last final position of booms are perpendicular to rocket.

#### **4) Electric Actuator:-**

- a) As per Space specification and qualification
- b) Dia.
- c) Material

Desired electric actuator works in reverse condition. When boom deploys outward it has to be attached with actuator. It is just like a transducer. When boom comes in contact with atmospheric thrust, it produces pull on electric actuators which is further connected to transducer which converts mechanical energy into electrical energy.

This electric energy goes to control system. The electrical energy from control system moves to super capacitor.

This electric actuator is attached to boom with pivots mechanism of shaper. Which makes the linear displacement of boom in downward direction with spin for actuator. Actuator remains stable in all condition. It will also work as a shock absorber.

#### **5) Design Criteria:-**

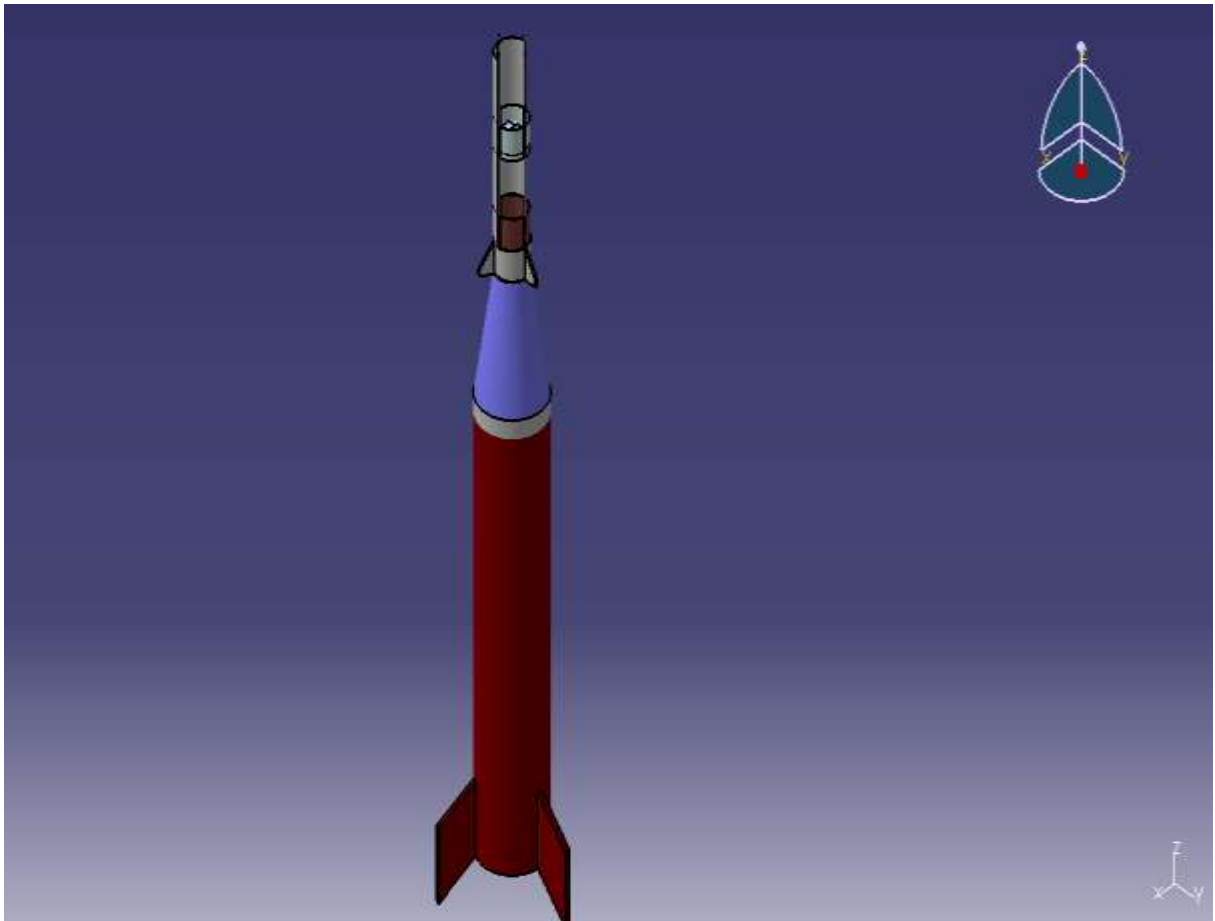
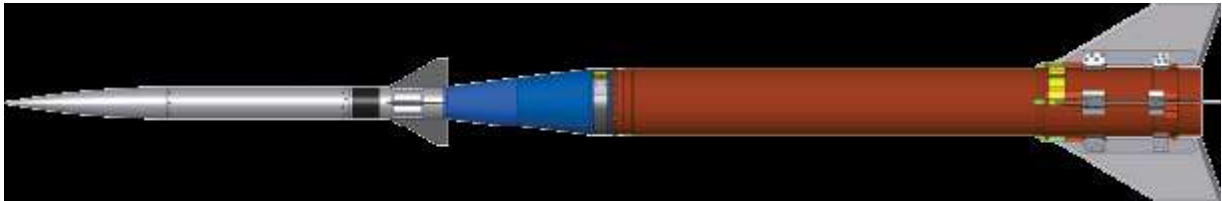
The basics drawings will tested by applying boundary conditions in ANSYS software and rest of the evaluated on practical basis.

Fully aerodynamic shape should be considered in all design which is going too exposed to atmosphere. Fins facility is provided as it will help to rotate boom individuating with more speed than the rocket speed. The fins are provided to specific area around the area above control panel.

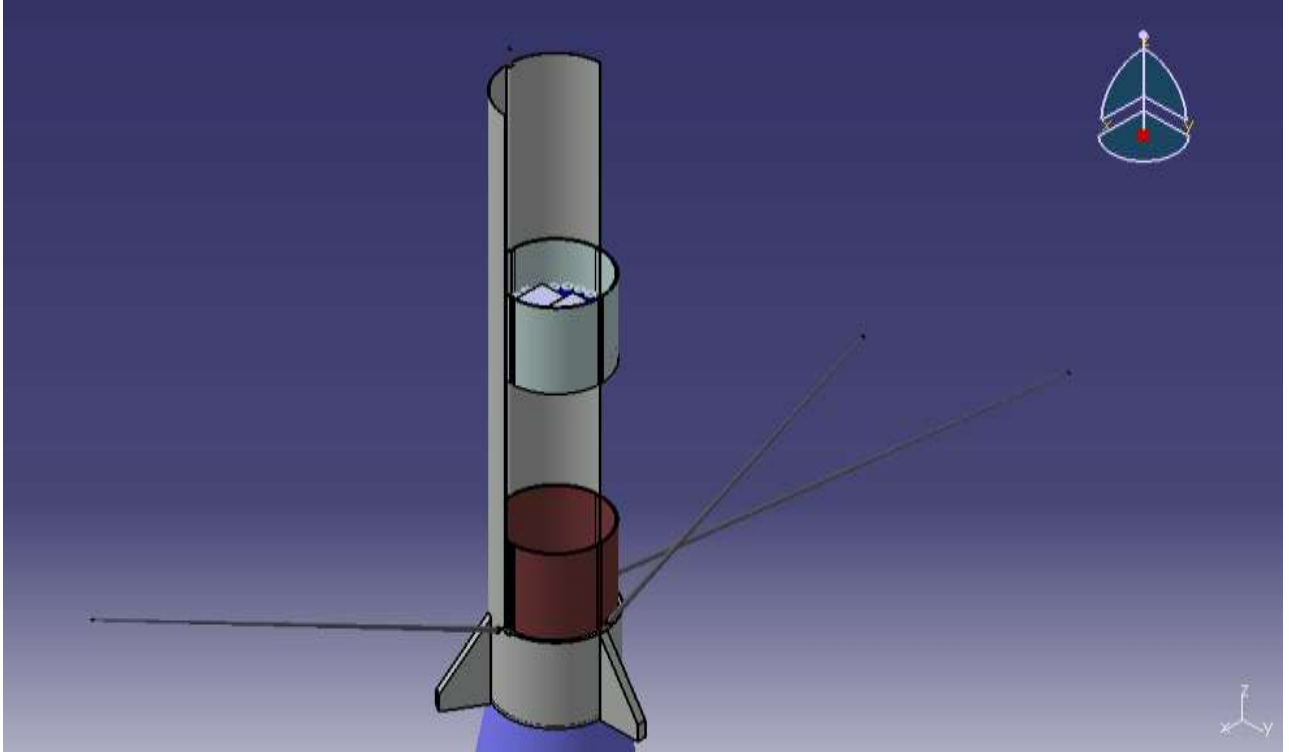
- 6) Control System:-
  - a) Time Calculation
  - b) Artificial neural network
  - c) Transducers
  - d) Super capacitors with charging & discharging unit.

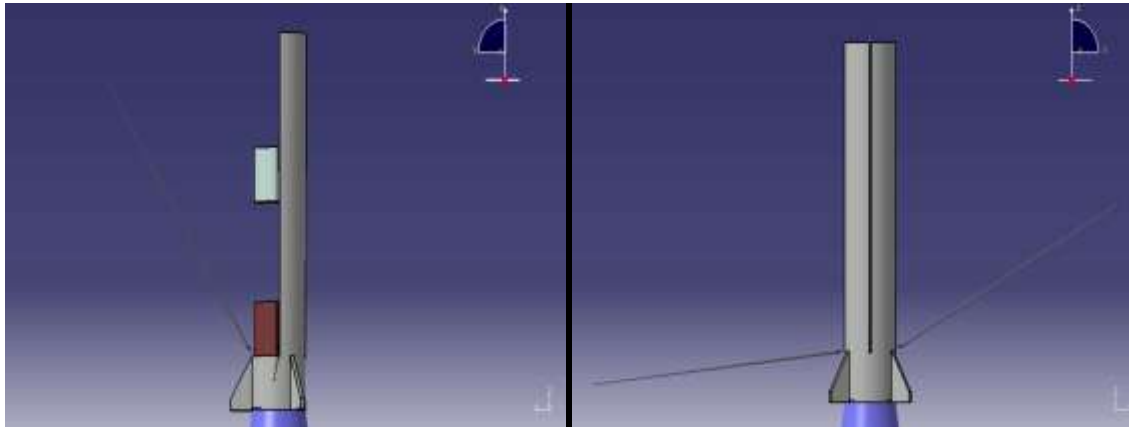
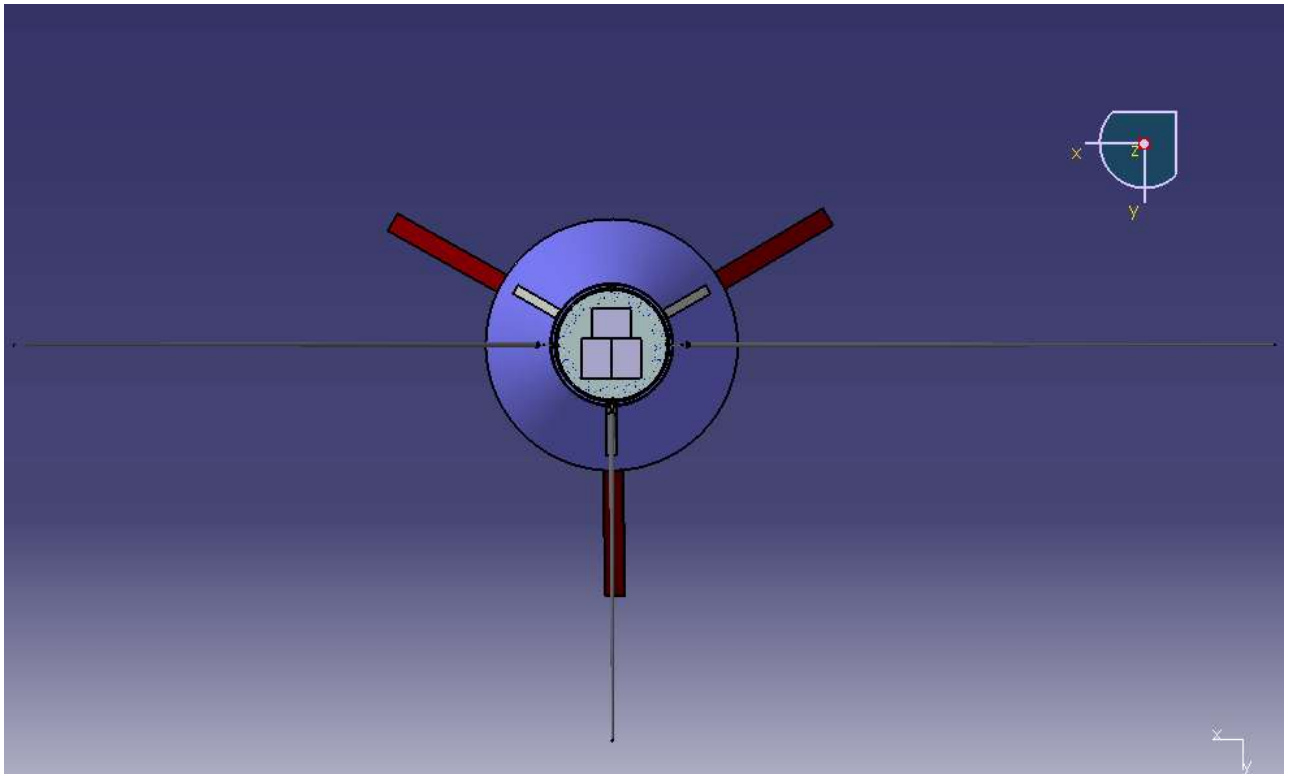
Control system is research based system. It has Artificial neural network technology. As this technology takes its own decision during displacement of boom. The booms can get released as per the situation in between 25 to 30 Km. If the said system is designed accurately then the failure chances are very less.

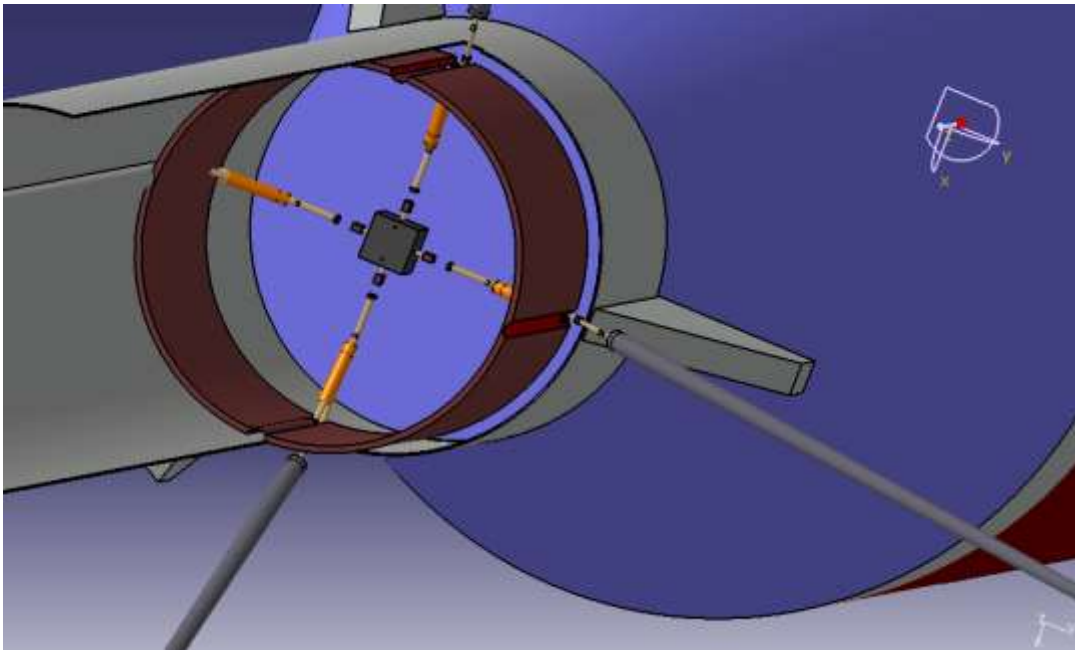
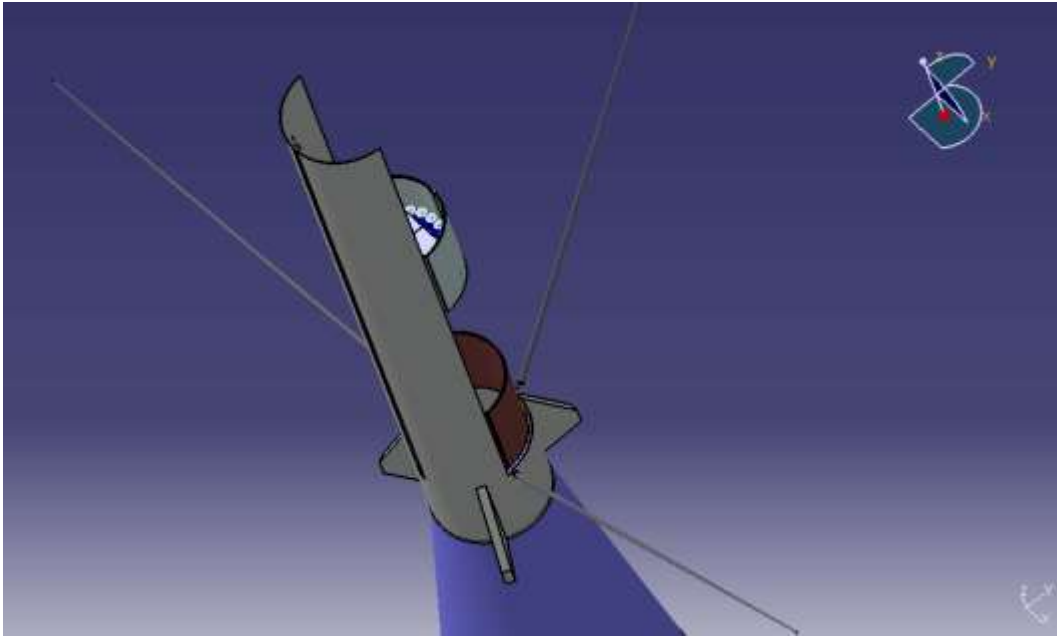
It will also take the decision of pivot starting technology. It will also help us to charge & discharge rate of super capacitor.

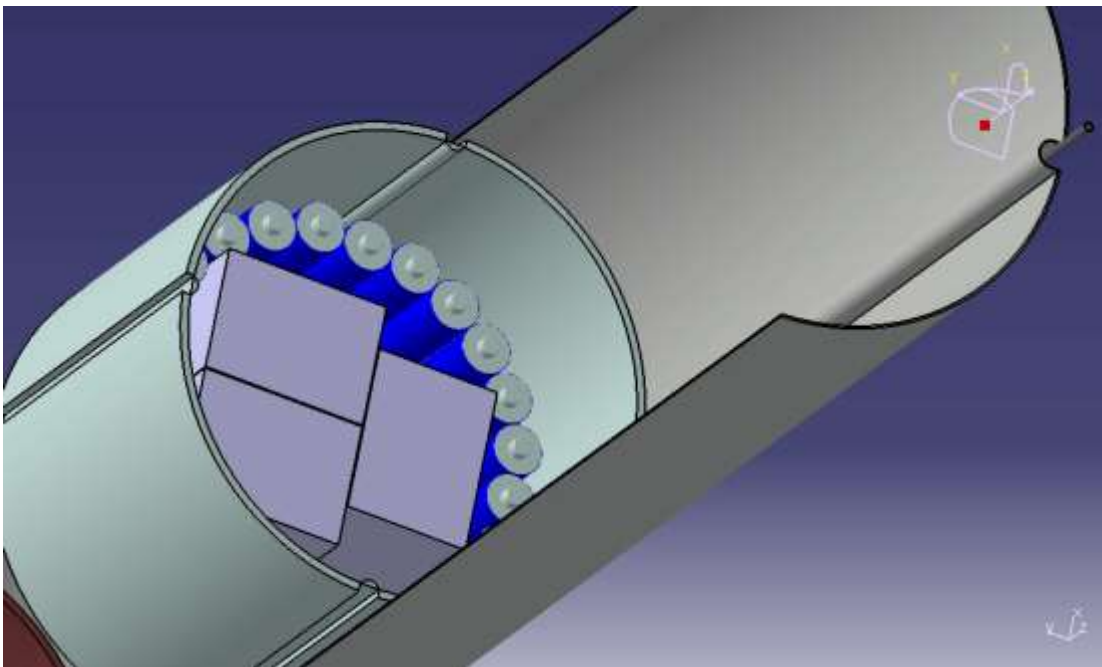
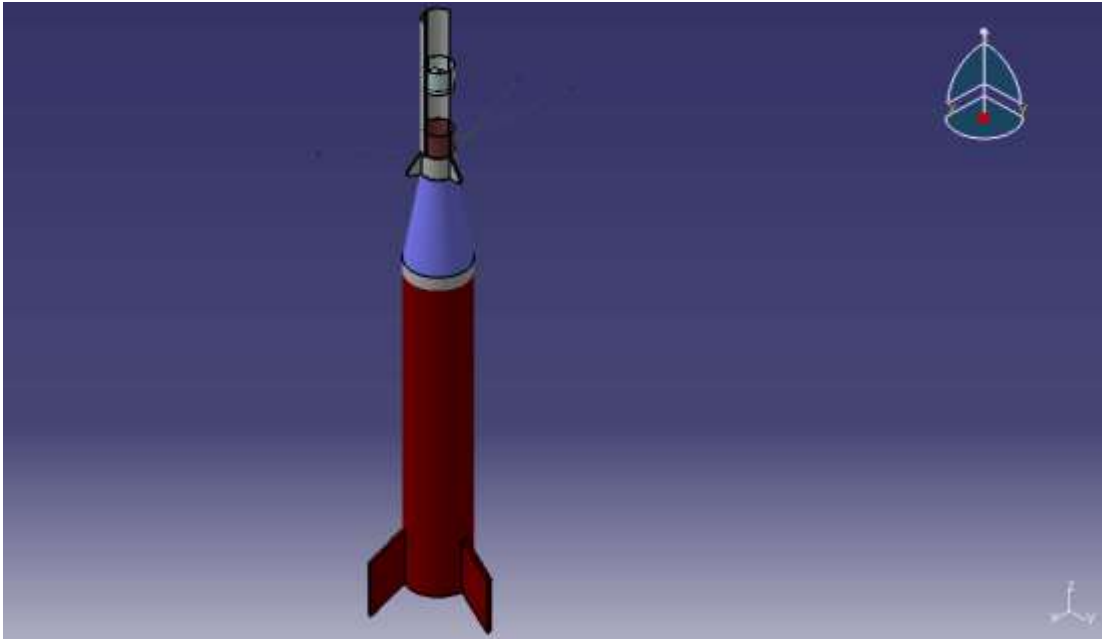




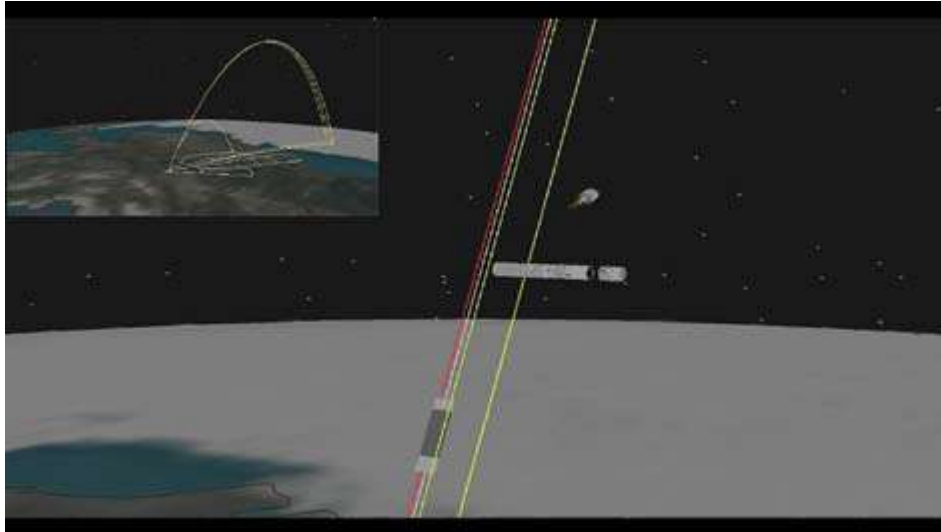








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Rocket launching activity at arctic centre which moves around 85Km above earth surface with tune speed of 2500m/s.

The angle requires launching the activity without change in specific path of rocket is designed by Brain Chamber Researchers.

### **Some drawbacks in designing**

- **NLC located in high latitude summer mesosphere.**
- **Lowest neutral temperatures in atmosphere.**
- **Possible indicators of anthropogenic change**
- **Region of very intense radar echoes**
- **Complex aerosol chemistry, dynamics, electrical charge distributions.**

## Future...

We are hoping to include Feature Articles  
Carried out by us in future  
issues of the Rocket Report.

