



# FLIGHT ALTITUDE AND FLIGHT DURATION OF MODEL ROCKETS CREATED USING 3-D PRINTERS



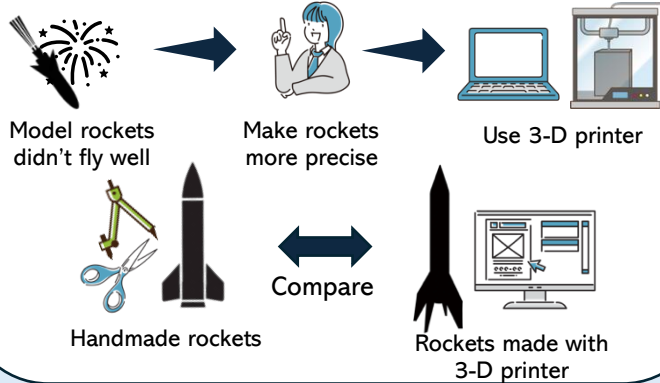
Juri Inoue, Saya Tsuboi, Advisor: Sota Takano

Seishingakuen High School , 4448-5 Kyutyu Fushimi, Kashima City, Ibaraki Prefecture, Japan

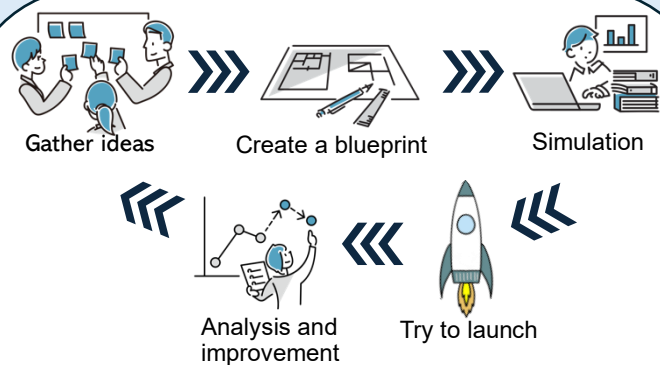


## PROBLEM

We joined a model rockets project called "Girls Rocketry Challenge" last year. Model rockets are small ones, and they are launched all over the world as a safe material for space education.

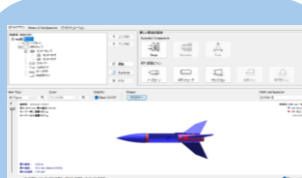


## FRAMEWORK



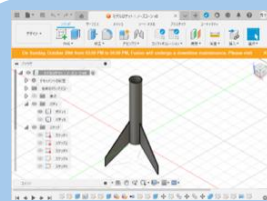
### Program

➤ Open Rocket



- designing rockets
- adjusting their centroids
- simulating how well it flies

➤ Fusion 360

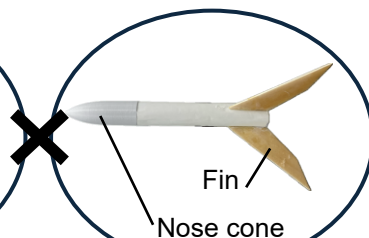


- designing 3-Dmodels
- changing model's density
- being printed by using slicer program

### Viewpoints

FlightAltitude

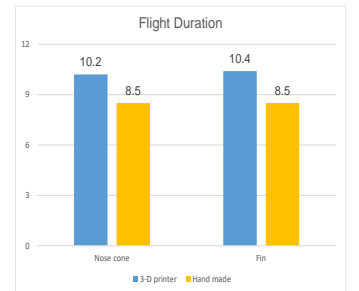
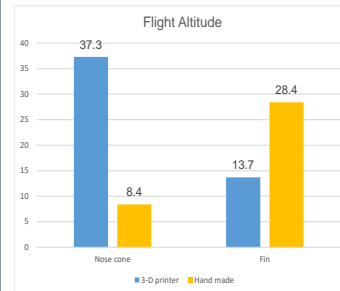
Flight Duration



## FINDING



Flight Duration		Weight	Flight Altitude		Weight
Nose cone	3-D printer	32.4	Nose cone	3-D printer	30
	Hand made	32.2		Hand made	22
Fin	3-D printer	30.7	Fin	3-D printer	20.9
	Hand made	32.2		Hand made	19.9



- Flight Altitude: 3-D printed nose cone model flew higher. 3-D printed fin one flew lower.
- Flight Duration: 3-D printed version stayed in the air by approx.2 seconds longer.



## INTERPRETATION AND CONCLUSION

We can say that the model rockets with the parts made by the 3-D printer recorded better results than those with the parts made by hand in 3 out of 4 sections. In a section of flight altitude: rocket whose fin made by the 3-D printer flew lower than hand made one. We think it was caused by position of the center of gravity. The weight and setting position of the fins made by the 3-D printer differed from the blueprints, which led to an unstable flight. In a section of flight duration: It is thought that the use of the 3-D printer allowed each part to be made more precise, which led the flight duration to longer.

### Future Plan

- Participating in a next competition
- Flight altitude: 50m
- Flight duration: 20s



## REFERENCES

"Japan Association of Rocketry"  
<https://www.ja-r.net/index.html>  
 (last accessed 2024.11.11)