Nuclear Thermal Propulsion Rockets

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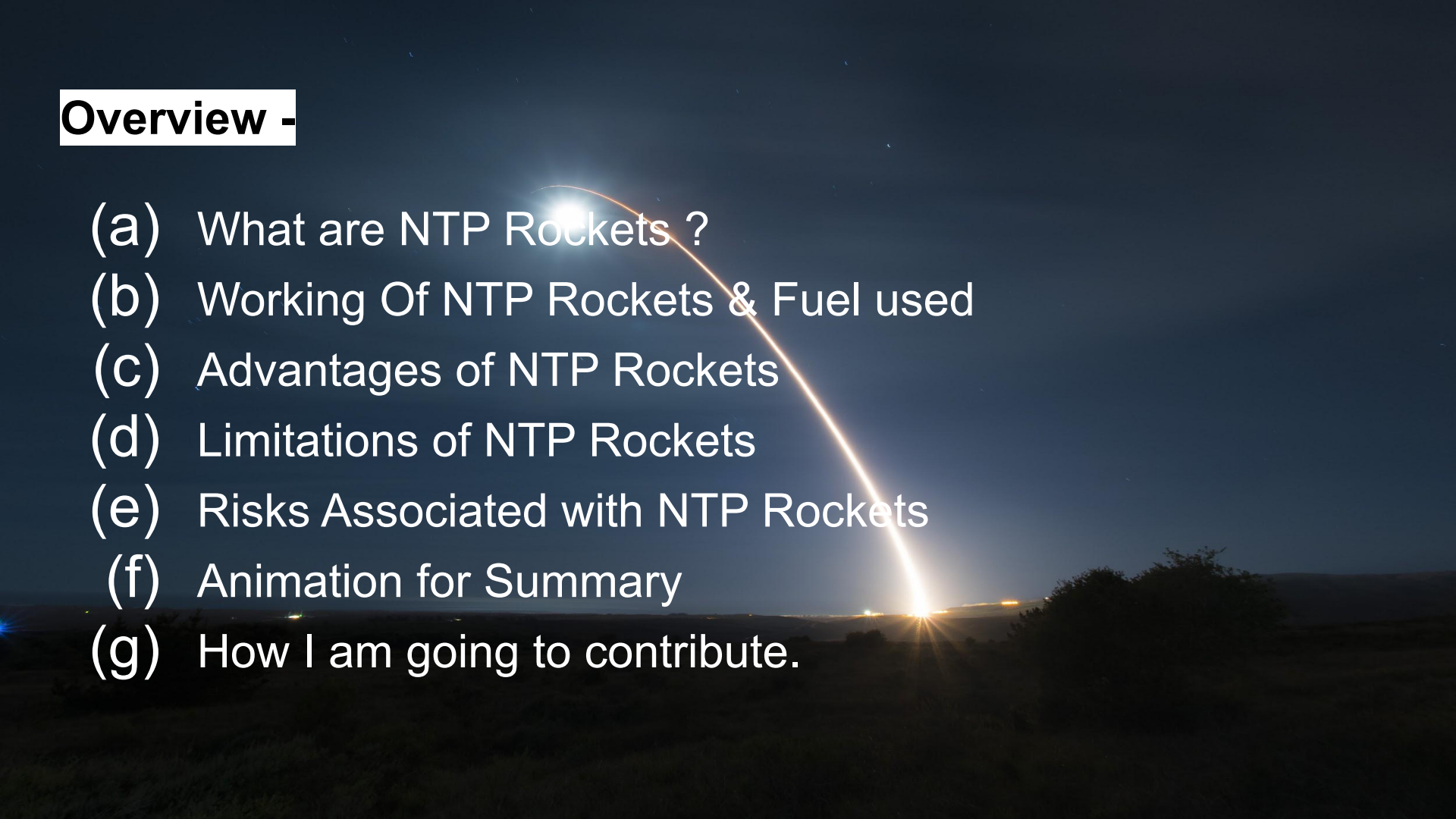
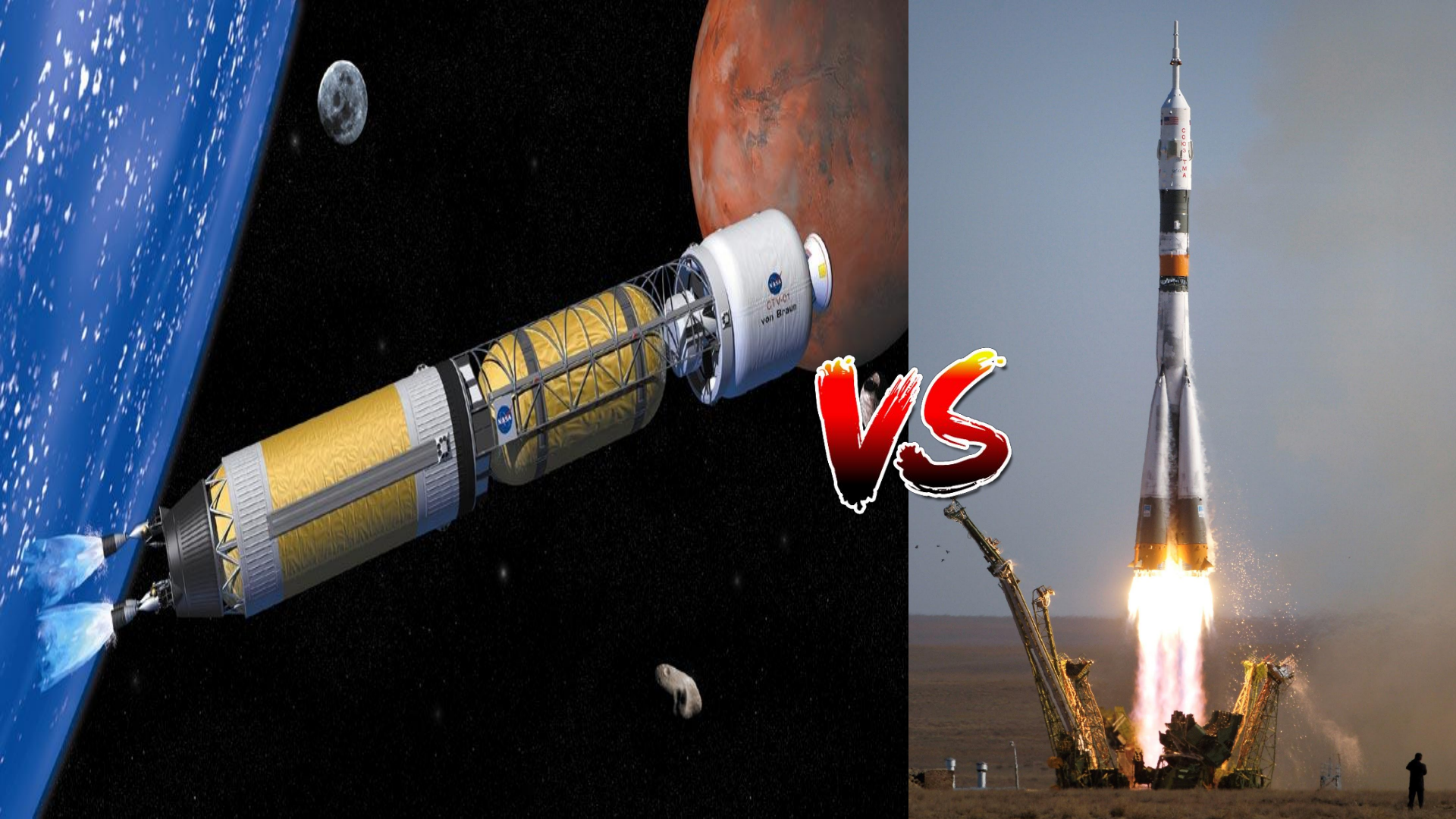


Overview -

(a) What are NTP Rockets ?
(b) Working Of NTP Rockets & Fuel used
(c) Advantages of NTP Rockets
(d) Limitations of NTP Rockets
(e) Risks Associated with NTP Rockets
(f) Animation for Summary
(g) How I am going to contribute.


CTV-01
von Braun
VS

What are NTP Rockets?

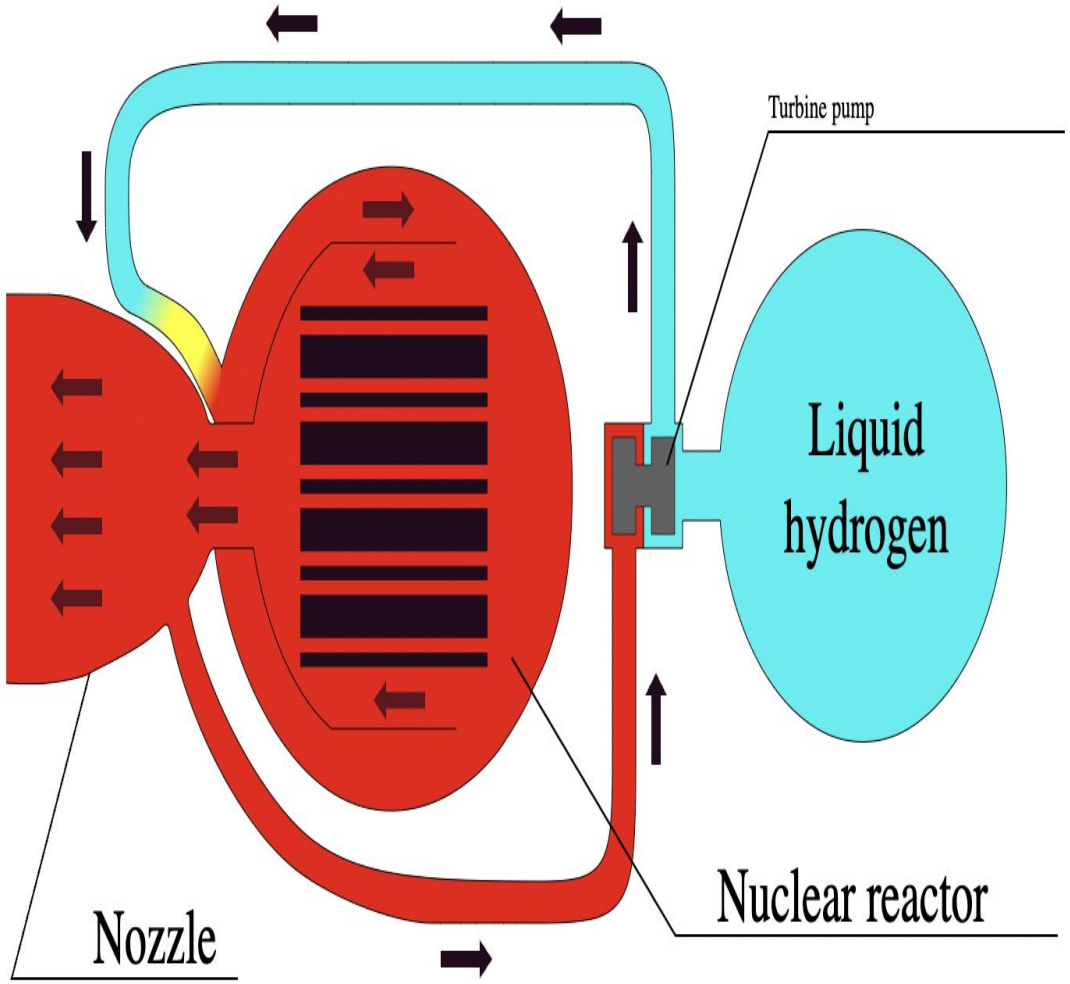
A nuclear thermal rocket (NTR) is a type of thermal rocket where the heat from a nuclear reaction, often nuclear fission, replaces the chemical energy of the propellants in a chemical rocket, usually liquid hydrogen is used as the working fluid.

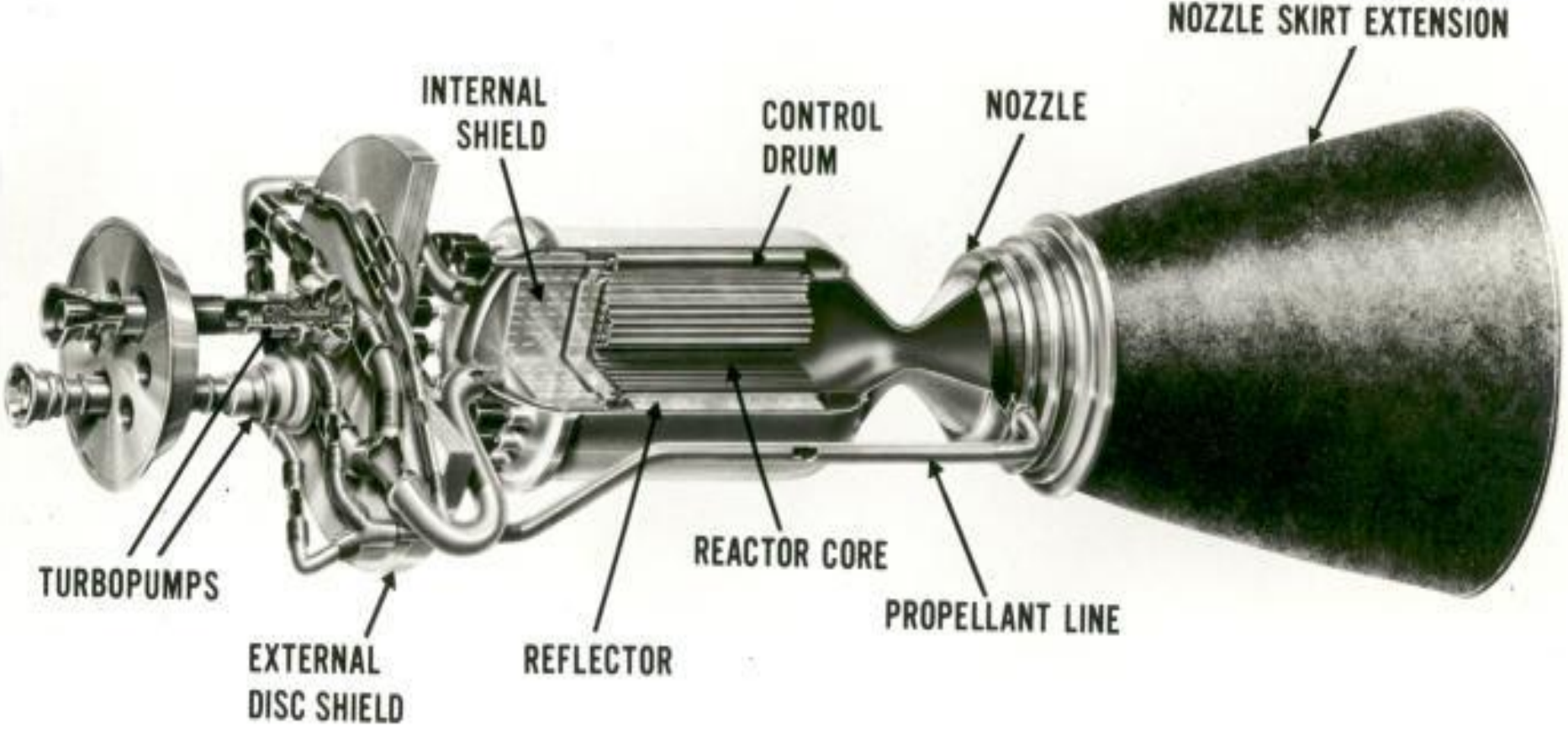
Nuclear thermal propulsion (NTP) systems aren't new, NASA has been working on its development since the early 1960s.

Working -

liquid hydrogen, is heated to a high temperature in a nuclear reactor and then expands through a rocket nozzle to create thrust.

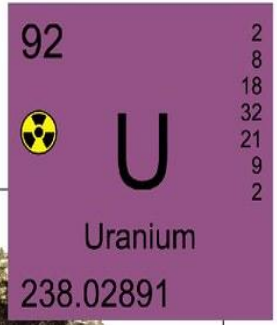
NTR are more efficient as they use low molecular mass propellent.




NOZZLE SKIRT EXTENSION
INTERNAL SHIELD
CONTROL DRUM
NOZZLE
TURBOPUMPS
EXTERNAL DISC SHIELD
REFLECTOR
REACTOR CORE
PROPELLANT LINE

FUEL

Uranium



A piece of natural uranium ore

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

As of July 20z18

* NTP Systems Are More Efficient Than Chemical Rockets *

1} NTP rockets are more energy dense than chemical rockets and twice as efficient.

2} Lighter gases are easier to accelerate. (Low molecular mass)

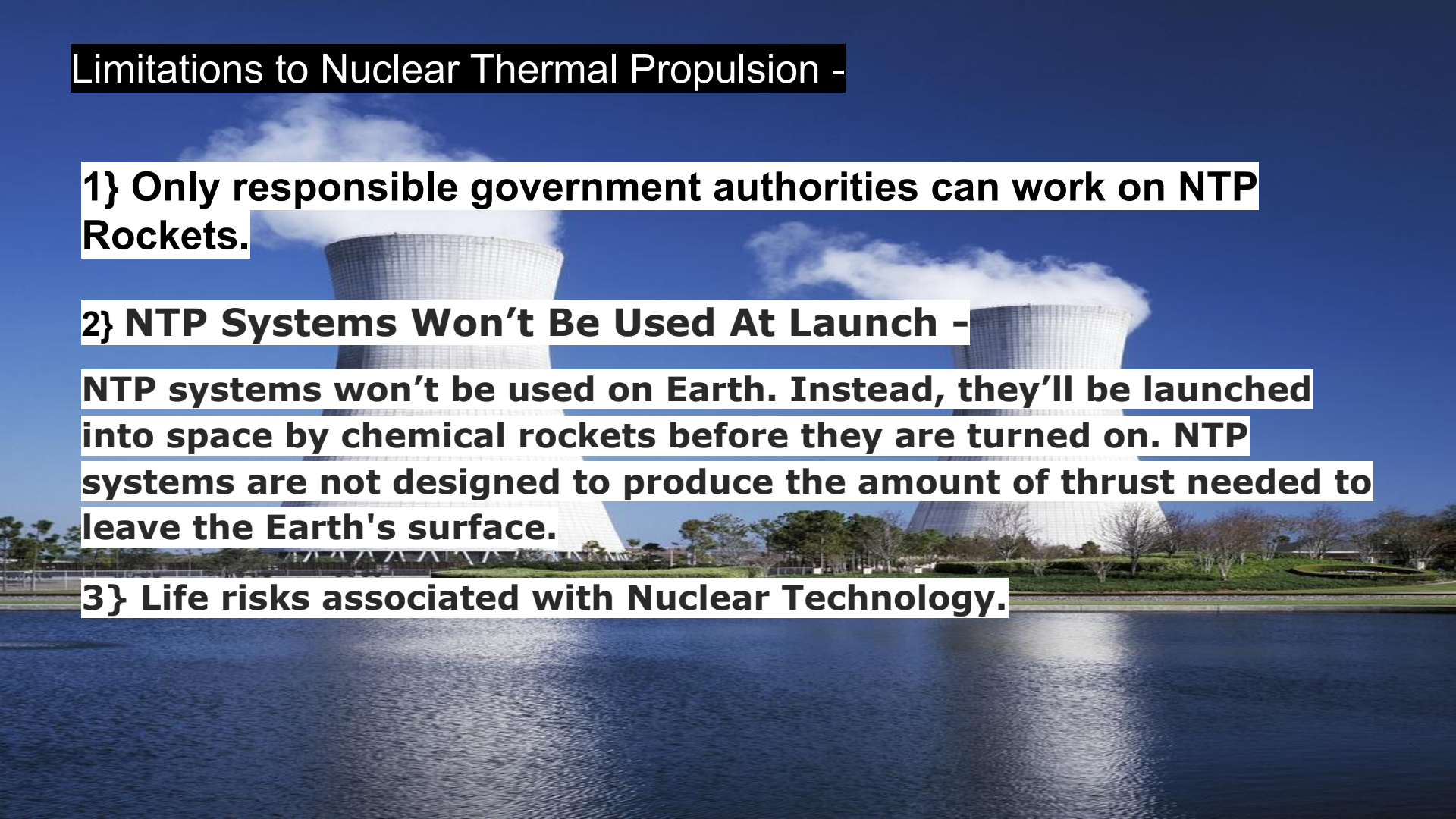
3} When chemical rockets are burned, they produce water vapor, a much heavier byproduct than the hydrogen that is used in a NTP system. This leads to greater efficiency and allows the rocket to travel farther on less fuel.

4} NTP Systems Will Provide Greater Flexibility -

NTP systems offer greater flexibility for deep space missions. They can reduce travel times to Mars by up to 25% and, more importantly, limit a flight crew's exposure to cosmic radiation. They can also enable broader launch windows that are not dependent on orbital alignments and allow astronauts to abort missions and return to Earth if necessary.

5} NTP Systems Are Focused On Using Low-Enriched Uranium -

DOE is working with NASA to help test, develop and assess the feasibility of using new fuels that require less uranium enrichment for NTP systems. This fuel may be made using new advanced manufacturing techniques and can potentially help reduce security-related costs that come with using highly enriched fuel.



Limitations to Nuclear Thermal Propulsion -

1} Only responsible government authorities can work on NTP Rockets.

2} NTP Systems Won’t Be Used At Launch -

NTP systems won’t be used on Earth. Instead, they’ll be launched into space by chemical rockets before they are turned on. NTP systems are not designed to produce the amount of thrust needed to leave the Earth's surface.

3} Life risks associated with Nuclear Technology.

Risks involved with NTP Rockets -

1} An atmospheric or orbital rocket failure could result in the dispersal of radioactive material into the environment.

2} Collision with orbital debris, material failure due to uncontrolled fission, material imperfections or fatigue, or human design flaws could cause a containment breach of the fissile material.

3} Nuclear Waste Disposal.


Worst Nuclear Accidents in History
“FAILURE IN COOLING SYSTEM”
Fukushima
2011
Chernobyl
1986

References -

1] https://en.wikipedia.org/wiki/Nuclear_thermal_rocket

2] https://www.energy.gov/ne/articles/6-things-you-should-know-about-nuclear-thermal-propulsion

HOW I AM GOING TO CONTRIBUTE ?

I am currently working with **ORBITX INDIA AEROSPACE (p) LTD**

And will continue it as a **Student Project at Space Technology Incubation Centre (ISRO) , National Institute of Technology, Agartala, Tripura**


THANK YOU


Q&A