HYPERSONIC VEHICLES DISCLAIMER : SPEED KILLS



Conditions change around the vehicle with the increase in speed or the Mach number



Mach Number = Speed of vehicle/Speed of sound in that medium



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Timeline of Hypersonic Vehicles

Humans are explorers and pioneers, and to know what lies in the vastness of the universe, we need speed.

V-2/WAC CORPORAL

First object of human origin to achieve hypersonic flight

YURI GAGARIN IN VOSTOK 1

First human to travel at hypersonic speed



April 12, 1961

WILLIAM J. KNIGHT IN X-15A-2

First manned aircraft to reach hypersonic speed

APOLLO 10

Fastest crewed atmospheric reentry vehicle

Oct 3, 1967

May 26, 1969











Hypersonic Missiles



HYPERSONIC GLIDE VEHICLES A maneuverable glide vehicle capable of speeds greater than Mach 5. Flies above 100,000 feet.

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HYPERSONIC CRUISE MISSILES



Capable of sustained, powered and manoeuvring hypersonic flight. Engine operations, and pressure and temperature constraints limit flight altitudes to 70,000 to 100,000 feet.

Biggest Challenges

Hypersonic flight has been talked about and researched for more than 60 years, but it remains rare outside of very limited applications. Heating at the stagnation point

Fluid structure interaction

Manoeuvrability and stability



1.

2.

3.

4.



food for thought



food for thought

Stagnation point

Turbulence



Milestones in Flight History Dryden Flight Research Center



X-15A-2 Damage After Mach 6.7 Flight October 3, 1967





Hypersonic Propulsion

Why is it important to design and build the most efficient engines to travel at hypersonic speed?



ROCKET ENGINES TURBOJET/TURBOFAN ENGINES



Rocket Engine

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USA

NASA

- Carry fuel and oxidiser separately
- Not being able to cruise for longer duration
- Lesser control over aerodynamic forces







Turbojet/Turbofan Engine

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- Takes subsonic as input and gives supersonic
- Lots of turbo machinery involved





SCRAM-jet Engine

- Air breathing so no external oxygen tank required
- Fuel efficient
- Simple design
- Takes supersonic or anything above, convert it into supersonic and gives hypersonic













