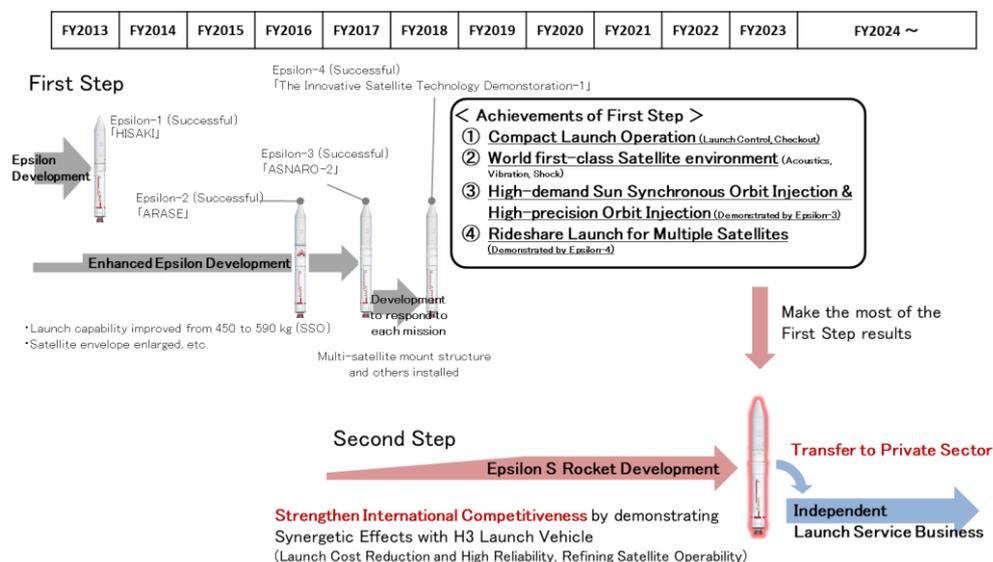


Outline of the Epsilon S Launch Vehicle

The Epsilon Launch Vehicle is built upon solid-propellant rocket technology that Japan accumulated over more than 60 years since the early days of small experimental vehicle “Pencil Rocket.” The vehicle is designated as a Japan’s mainstay rocket in the national Basic Plan on Space Policy (approved in April 1, 2016).

During the first step, JAXA developed both the demonstration and enhanced versions of the Epsilon rocket, and successfully launched all four vehicles, thus achieving capabilities of compact launch operation, world first-class satellite environment, and high-precision orbit insertion.

In the next second step, JAXA in joint effort with IA will develop the Epsilon S Launch Vehicle based on the first stage achievements, aimed at strengthening Epsilon’s international competitiveness in the satellite launch market by: (1) demonstrating synergistic effects with the H3 Launch Vehicle; (2) achieving lower launch costs while maintaining high reliability as our mainstay rocket; and (3) refining satellite operability. The goal is to establish a framework which enables a private business operator to independently advance the launch service business and actively join the expanding global small satellites launch market.



Epsilon Launch Vehicle Development ©JAXA

【Project Title】

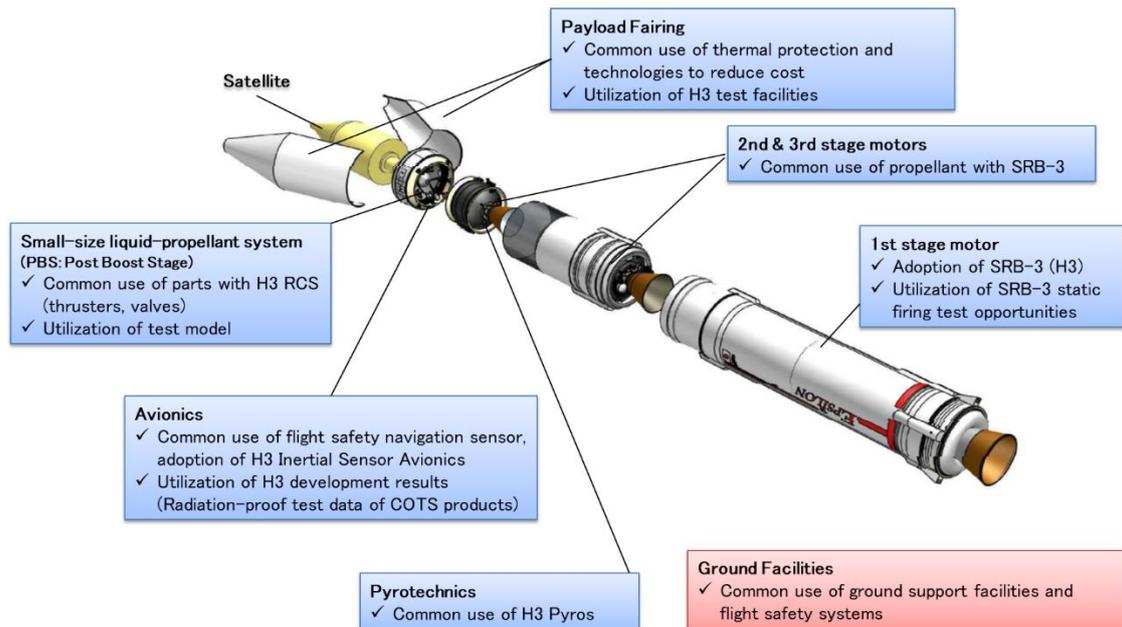
English Title: Epsilon S Launch Vehicle Project

Alias: Epsilon S

“S” stands for Synergy (with H3), Speed (Responsive), Smart (Higher performance), Superior (Competitive), and Service (User-friendly Launch Service).

【Demonstration of Synergetic Effects with the H3 Launch Vehicle】

H3 and Epsilon S launch vehicle share technologies, parts/components, instruments, etc. to achieve development efficiency and launch cost reduction.

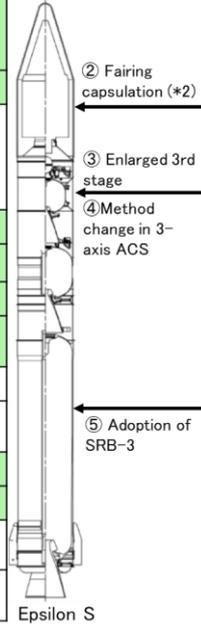


Synergy Effects with the H3 Launch Vehicle ©JAXA

【Main Features: Epsilon S Launch Vehicle】

- Launch Capability :
 - Sun Synchronous Orbit: Over 600 kg (Altitude: 350 to 700 km)
(Extra goal: Over 800 kg (Altitude: 350 km))
 - Low Earth Orbit: Over 1,400 kg (Altitude: 500 km, Orbit Inclination Angle: 31.1 deg)
- Expandability for Multiple Satellites Launch
- Orbit Insertion Accuracy:
 - Altitude Error: ±15 km or less, Orbit Inclination Angle Error: ±0.15 degree or less
- Satellite Environment: World First-class Acoustic, vibration and impact environments
- Launch Price: Competitive price range in the world market for small satellite launch.
- Launch Slot: Two launches or more in three months
- Period from Contract Conclusion to Launch: Within 12 months
- Period from Satellite Acceptance to Launch: Within 10 days
- Late Access (Final Access to Satellite): Until 3 hours prior to lift off

Rocket system		Enhanced Epsilon ①		Epsilon S Single configuration
		Basic Configuration	Optional Configuration	
Total length		approx. 26 m		approx. 27 m
Number of Stages		3 solid-propellant stages	3 solid-propellant stages + PBS ^{(*)1}	3 solid-propellant stages + PBS ^{(*)1}
Avionics		Common with H-IIA's (partial)		Common with H3's (partial)
3rd stage	Installing method	Within fairing (Covered) ②	Outside fairing (Exposed)	
	Propellant mass	approx. 2.5 tons ③	approx. 5.0 tons	
	ACS	Spin ④	Three axis attitude control system (Thrust vector control + PBS)	
2nd stage	Propellant mass	approx. 15.0 tons	approx. 15.0 tons	
	ACS	Three axis attitude control system (Thrust vector control + gas jet)	Three axis attitude control system (Thrust vector control + gas jet)	
1st stage	Motor	SRB-A ⑤	SRB-3	
	Propellant mass	approx. 65.9 tons	approx. 66.8 tons	
ACS		Three axis attitude control system (Thrust vector control + solid motor side jet)	Three axis attitude control system (Thrust vector control + solid motor side jet)	
Ground Facilities		Ground support facilities and flight safety systems to be shared with H3 Minimum renovation to respond to specifications of the rocket system		



(*1) PBS (Post Boost Stage): liquid propellant gas jet system to increase orbit injection accuracy
 (*2) Configuration of the 3rd stage being installed outside the fairing. This will enable all the stages to be checked before the installation of satellites, reducing the operation time from satellite acceptance to launch.

Comparison Chart: Enhanced Epsilon (Current) and Epsilon S Launch Vehicle©JAXA