

第5回サブオービタル飛行に関する官民協議会

～ 2023年12月8日 ～



*Naga Tomo*

東京理科大学発スタートアップ  
**SPACE WALKER**  
サブオービタルスペースプレーン  
の開発状況

©Google

Company Name	SPACE WALKER Inc. ( <a href="https://space-walker.co.jp/corporate-profile">https://space-walker.co.jp/corporate-profile</a> )	
Establishment	■ December, 25 <sup>th</sup> , 2017	
Business Locations	■ <b>HEAD QUARTER:</b> Shimbashi 3-16-12 3Flr, Minato, 105-0004 Tokyo, Japan	
	■ <b>SPACE TRANSPORTATION DEPT.:</b> <ul style="list-style-type: none"> <li>Office in TOKYO UNIVERSITY OF SCIENCE                      Noda Campus, Building No.3, 2<sup>nd</sup> Flr                      (Yamazaki 2641, Noda, 278-8510 Chiba, Japan)</li> </ul>	
Capital	■ 439 mil. ¥ (Including Capital Reserve   as of October 31, 2023)	
Activities	■ Design, Manufacturing and Operation of Reusable Suborbital Spaceplanes ■ Manufacturing and Sales of Space Development Related Components	

# 1. Suborbital Spaceplane

- ✓ Unmanned Dual Mission for Science and Small Satellite Launch
- ✓ Common Shape for Space Tourism Service

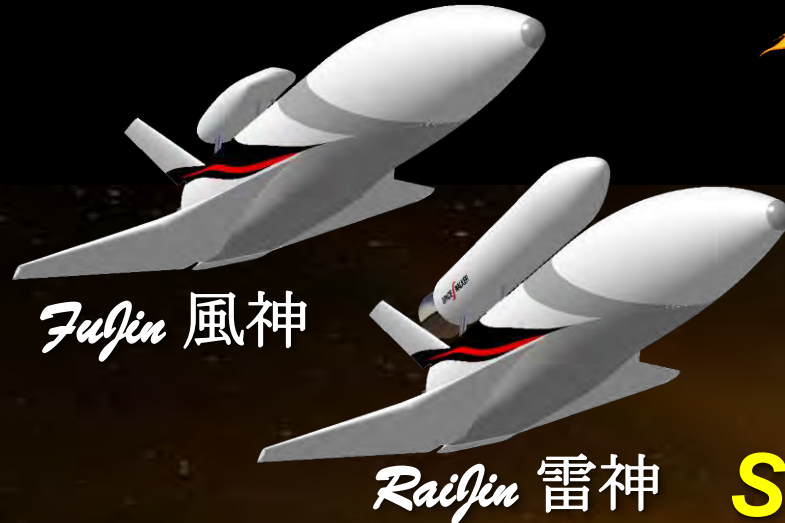
2040s~



2030



2028



2026



Experimental  
Winged  
Rocket  
WIRES#015

## Suborbital Spaceplane

$\mu$  Gravity Science / Small Satellite Launch

Partnership



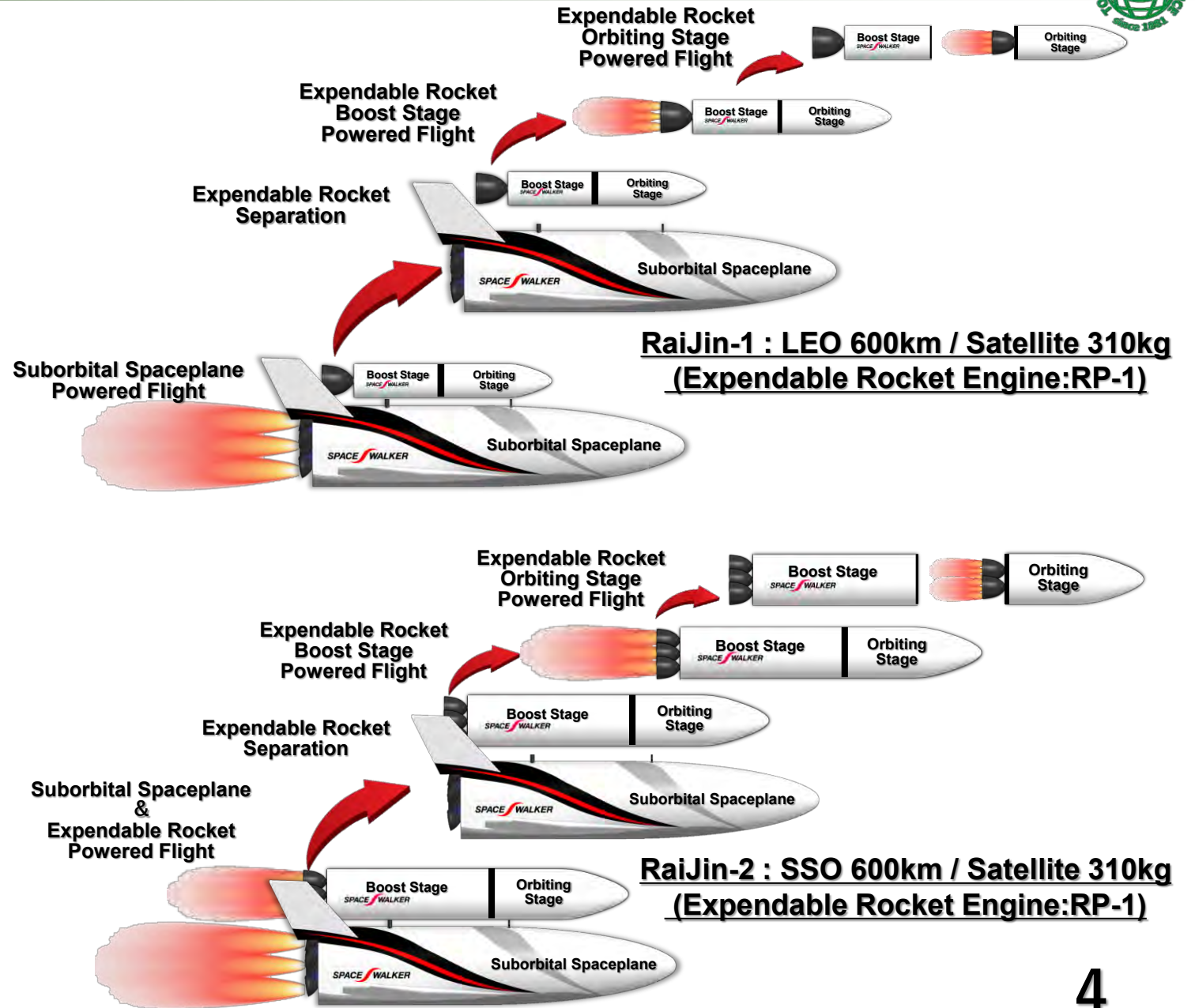
## RaiJin (雷神) Mission

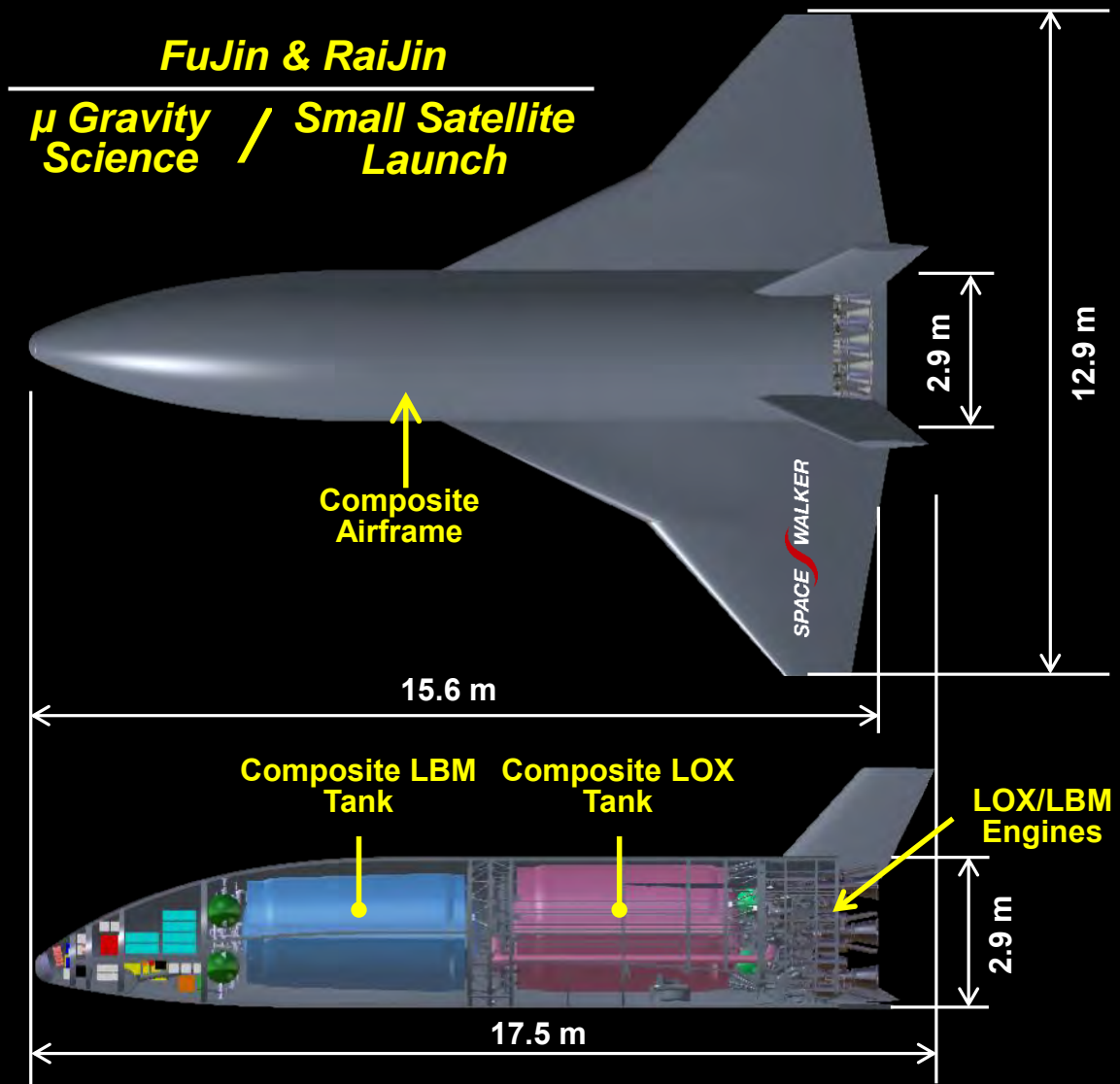
- Small Satellite of 310 [kg]
- Low-earth Orbit and Sun-synchronous Orbit of 600 [km]



Elon Musk's Starlink  
Satellite-Internet Service

<https://www.wsj.com/articles/elon-musks-starlink-satellite-internet-service-battles-dish-over-airwaves-11657359181>



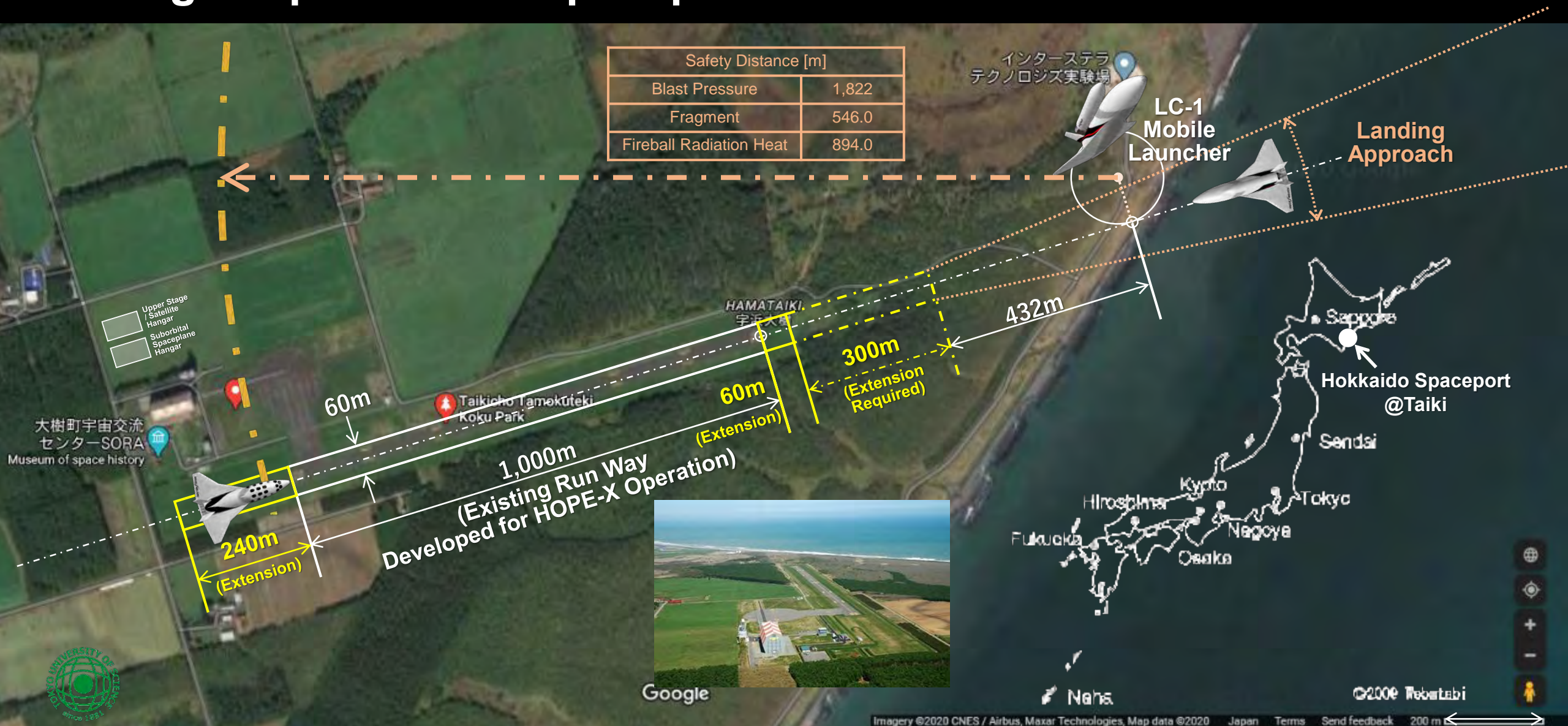


Mass [kg]		FuJin <sup>*1</sup>	RaiJin <sup>*2</sup>	NagaTomo <sup>*3</sup>
Dry			13,081	13,015
Propellant	LOX		24,687	16,844
	LBM <sup>*4</sup>		8,967	6,099
Propulsion Gas	He		4	2
	N2		95	68
RCS Gas	N2		176	176
Initial Mass			47,010	36,204
External Mass		500 <sup>*5</sup>	6,999 <sup>*6</sup>	-
Total Initial Mass		47,510	54,009	36,204
No. of Engines			7	5

Note:   
<sup>\*1</sup> 100kg Payload to 150km Altitude   
<sup>\*2</sup> 200kg Satellite into Sun-synchronous Orbit of 700km Altitude   
<sup>\*3</sup> 6 Passengers with 2 Pilots/Crews   
<sup>\*4</sup> Carbon Neutral Liquid Bio-methane Propellant   
<sup>\*5</sup> Payload and External Carrier   
<sup>\*6</sup> Expendable Upper Stage



# ● Flight Operation at Spaceport of Hokkaido in Taiki Town



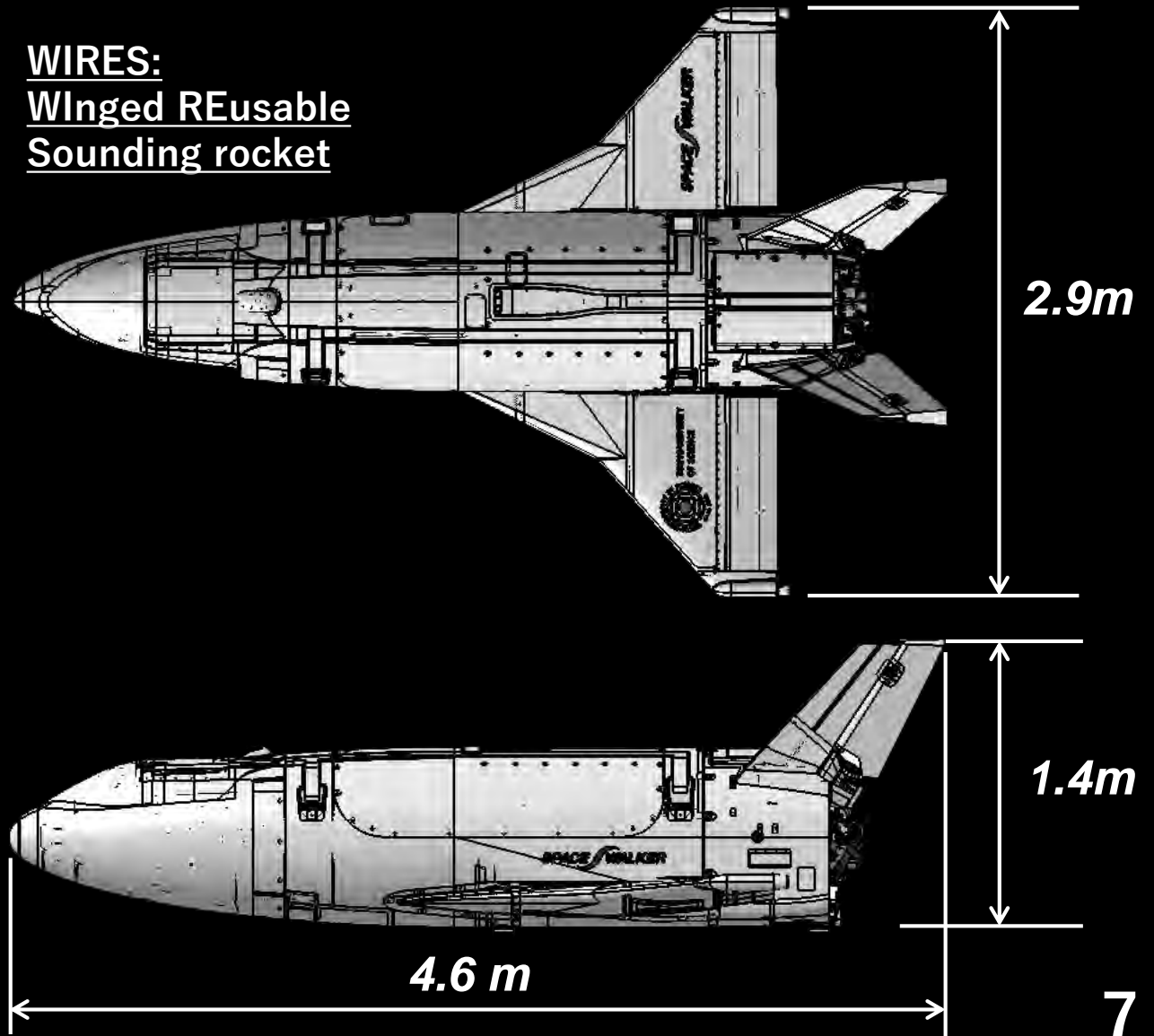
## 2. Experimental Winged Rocket WIRES#015

Major Dimensions		
Initial Mass	1,000	[kg]
Max. Thrust	17.8	[kN]
Combustion Time	30	[s]
Max. Altitude	5.5	[km]

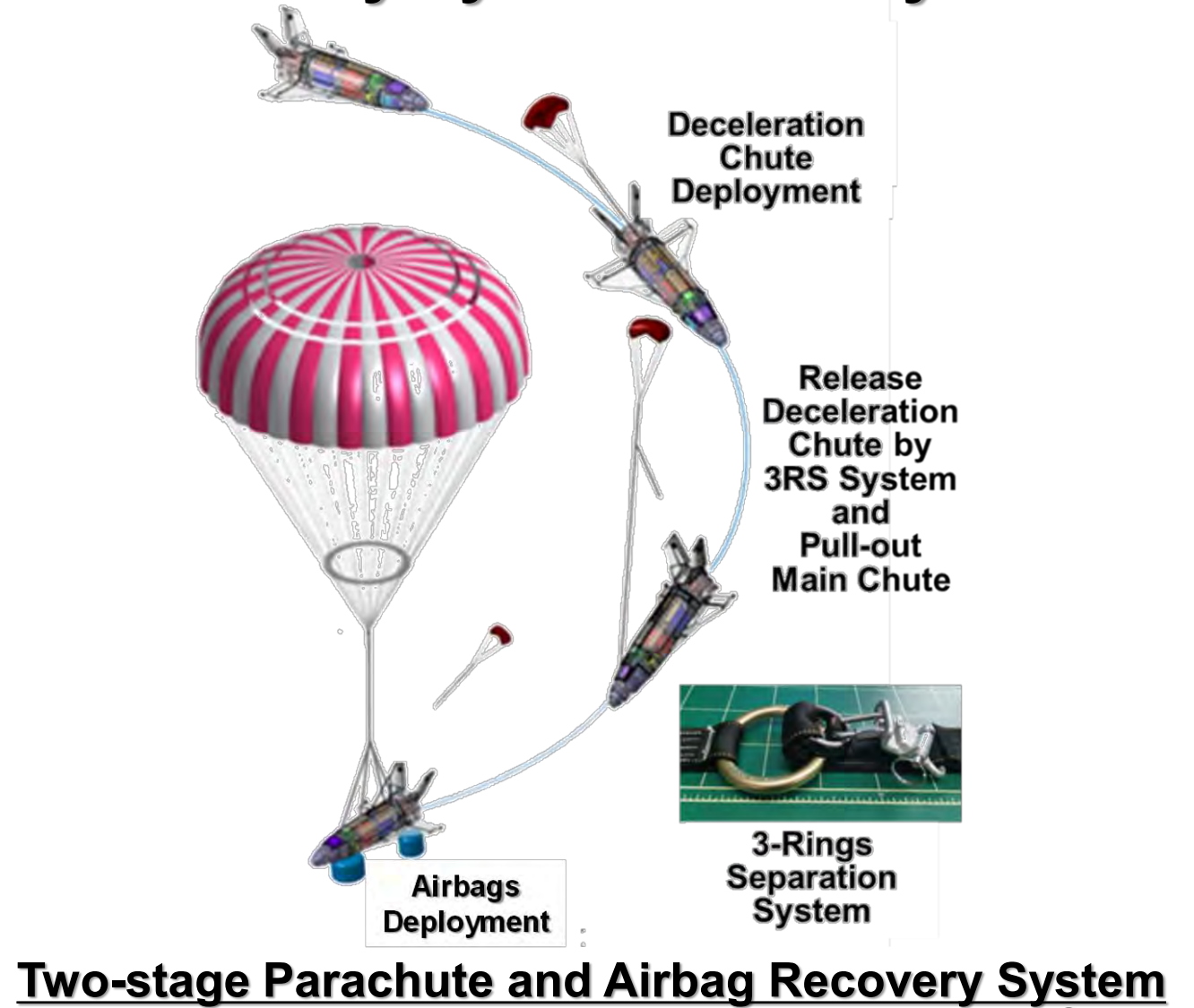
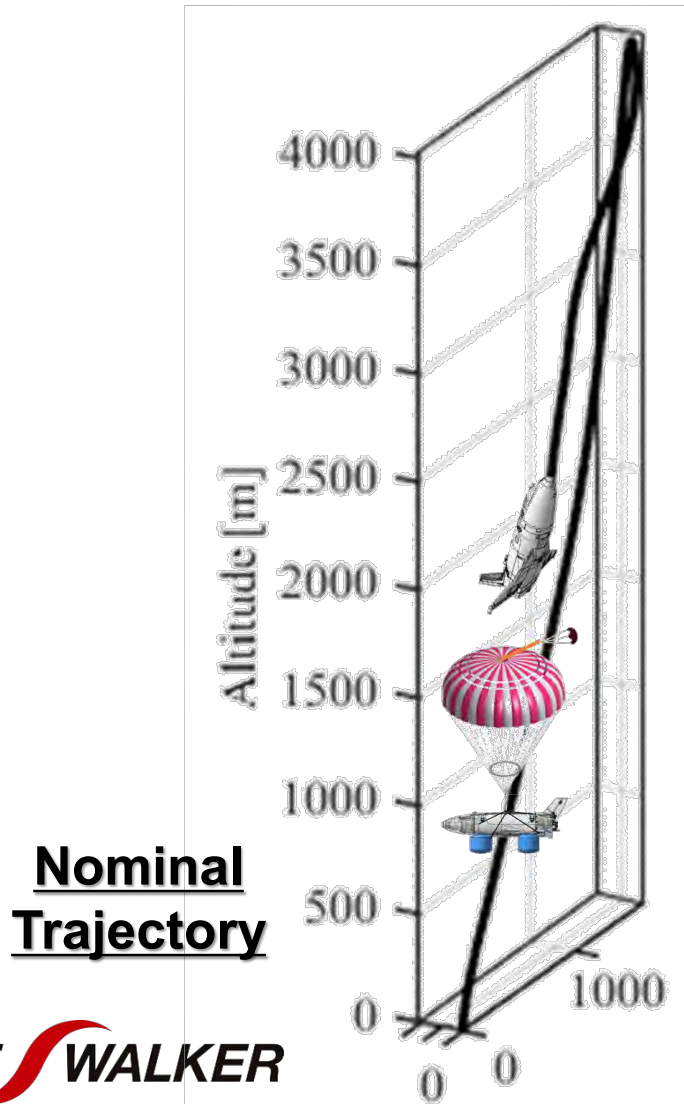
### Demonstration Issues

- LOX/LBM Engine (JAXA/IHI)
- Cryogenic Composite LOX and LNG Tanks
- Non-linear Attitude Control System Using DI Theory
- Real Time Guidance System Using Genetic Algorithm

WIRES:  
Winged REusable  
Sounding rocket



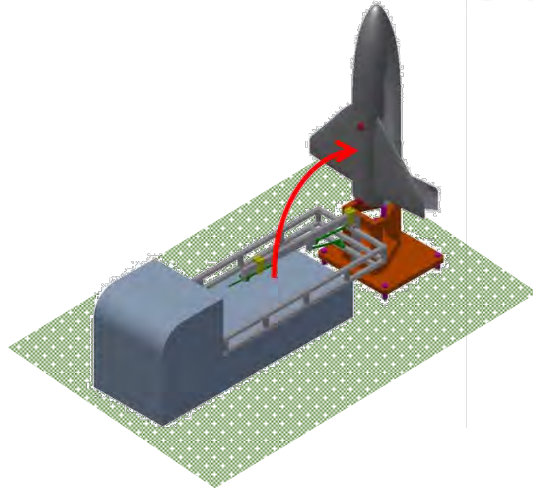
# ● Nominal Flight Trajectory and Recovery by Parachute System



**Two-stage Parachute and Airbag Recovery System**



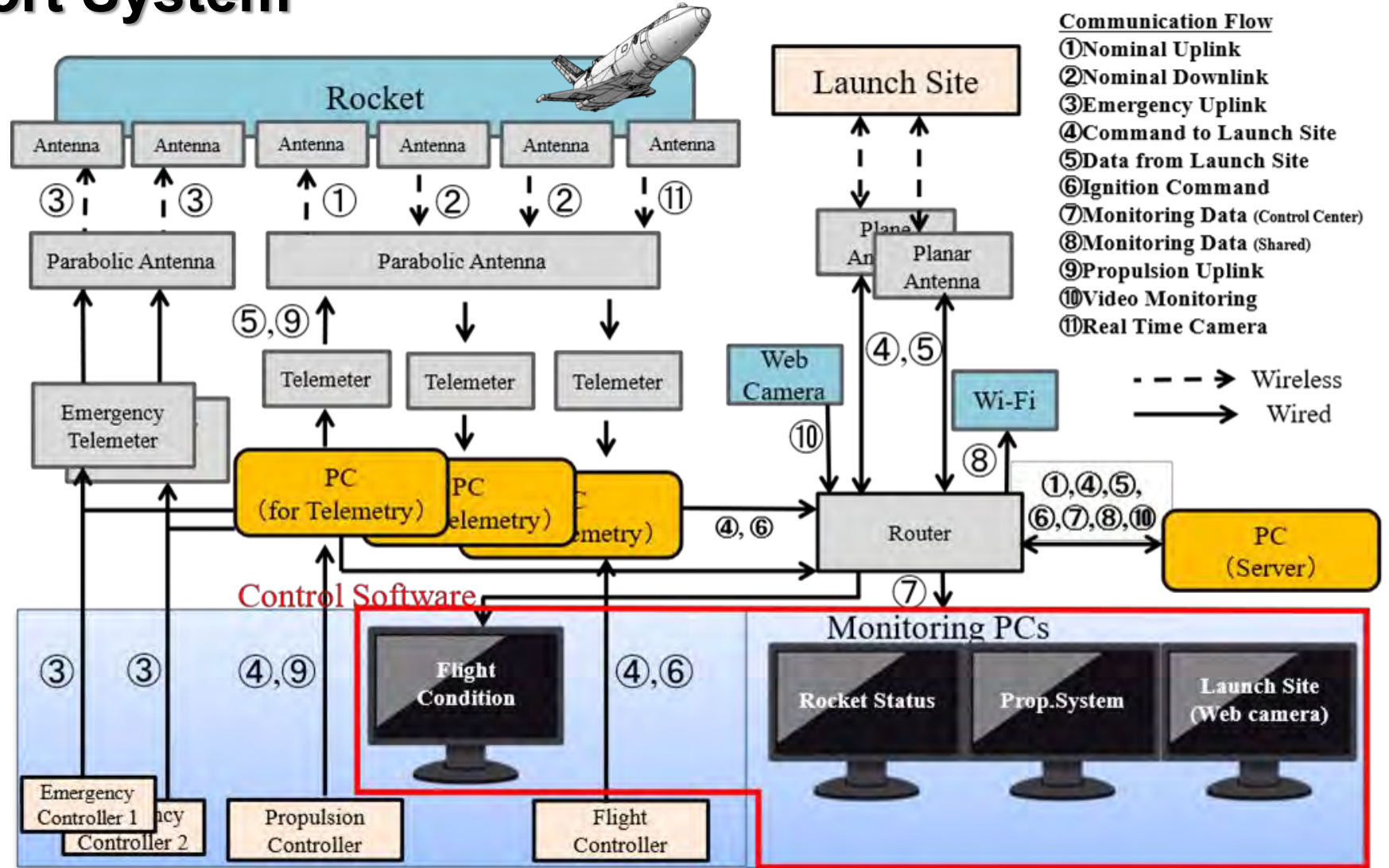
# ● Ground Support System



Mobile Launcher



Mobile Flight Control Center

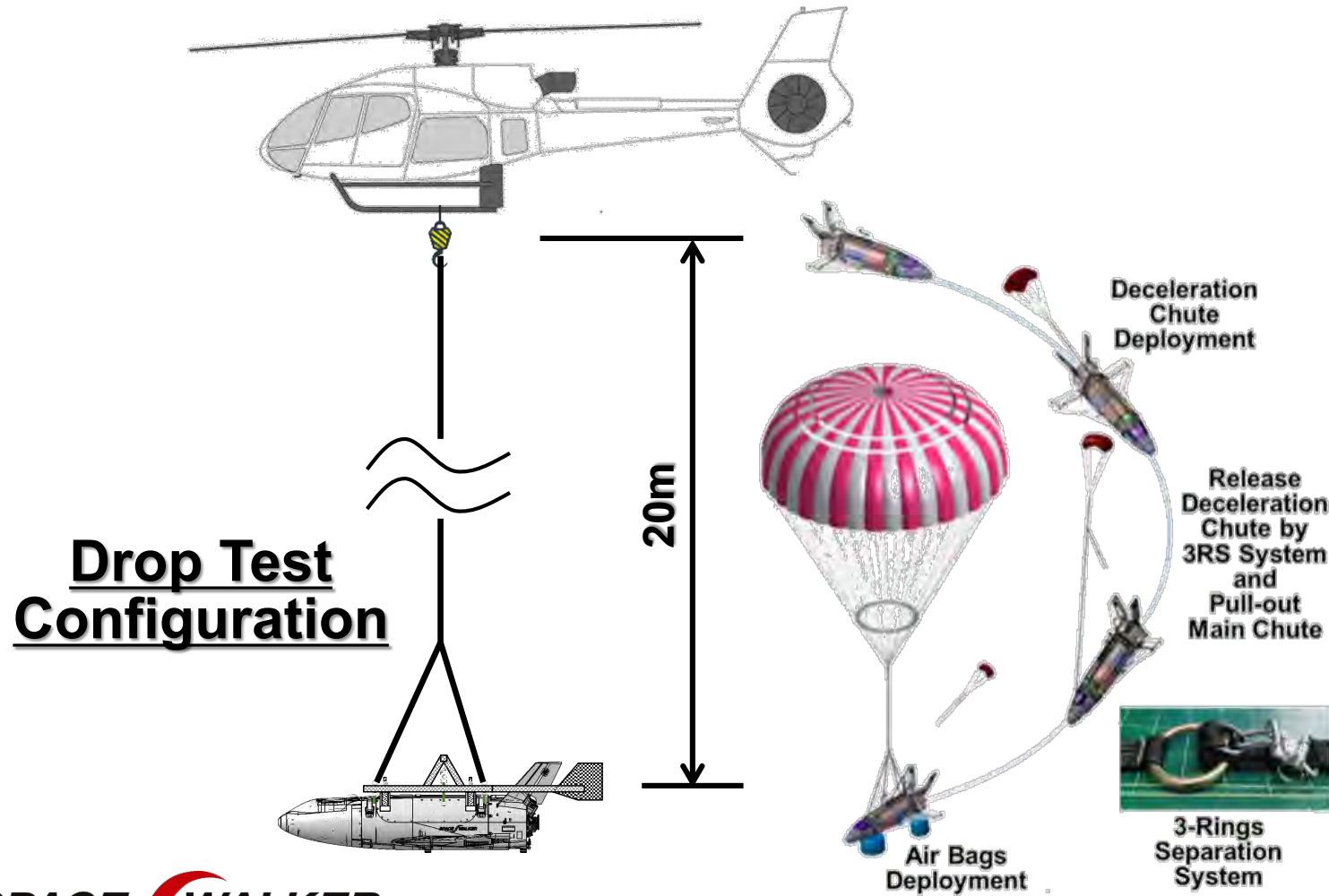


## ● Telemetry Command and Down Link

- Final Combustion Test of LOX/LBM Engine at Aioi Works (IHI Corporation/Hyogo Prefecture on March 7<sup>th</sup> , 2023)



# ● Two-stage Parachute and Airbag System Drop



**Drop Test Vehicle**

- Flight Demonstration Area  
(Military Area in Hijyudai/Oita Prefecture)

