

Numerical Analysis of aerodynamic characteristics on H3 launch vehicle

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● Abstract

From the viewpoint of international competitiveness, develop a new launch system with low cost and high performance.

● Reasons for using of JSS2

Aerodynamic data and load analysis results are necessary to confirm the feasibility in the H3 launch vehicle critical design phase. Therefore, we obtain aerodynamic characteristic data by CFD using JSS2.

In the past, aerodynamical development was dependet on databases, but due to technological innovation, highly reliable caluculation using CFD became possible. Consequently, computational approch is applied in this project.

● Achievements of the Year

Under the ground wind environment at launch site, it is confirmed by the wind tunnel test that the variable air force acting on the aircraft is affected by the launch facility due to the wind direction. Based on these wind test results, design work for improving wind resistance is underway. Because of the progress of detailed design, due to the change of the mast shape and the addition of the mast attachment, the unsteady CFD analysis was carried out and the influence on H3 rocket variable air force was confirmed.

As an analysis case, we conducted seven cases of three-dimensional CFD and eight cases of semi-two-dimensional analysis using wind direction / mast shape as a parameter. From the unsteady pressure fluctuation data, fluctuating aerodynamic force at the time of change of shape / wind direction was acquired and its influence was evaluated.

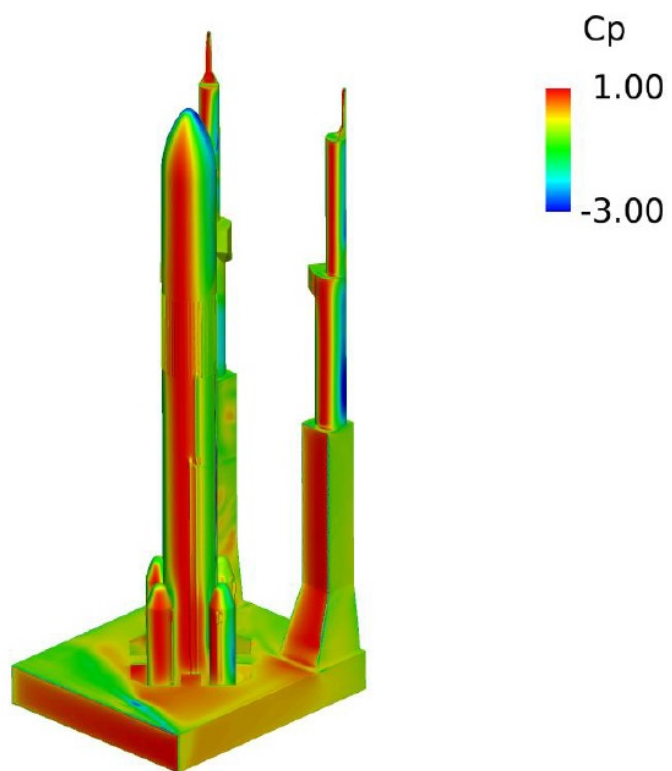


Fig.1 Cp distribution at test

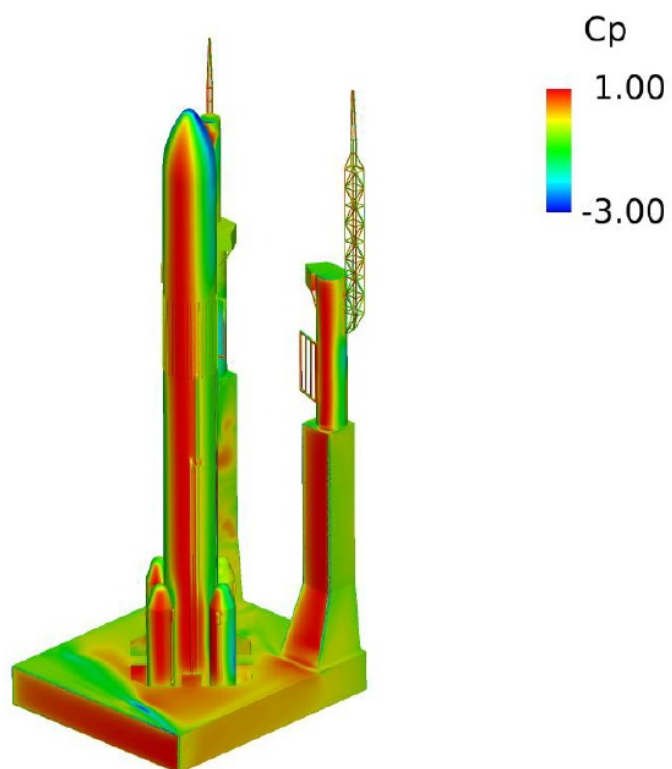


Fig.2 Cp distribution at flight

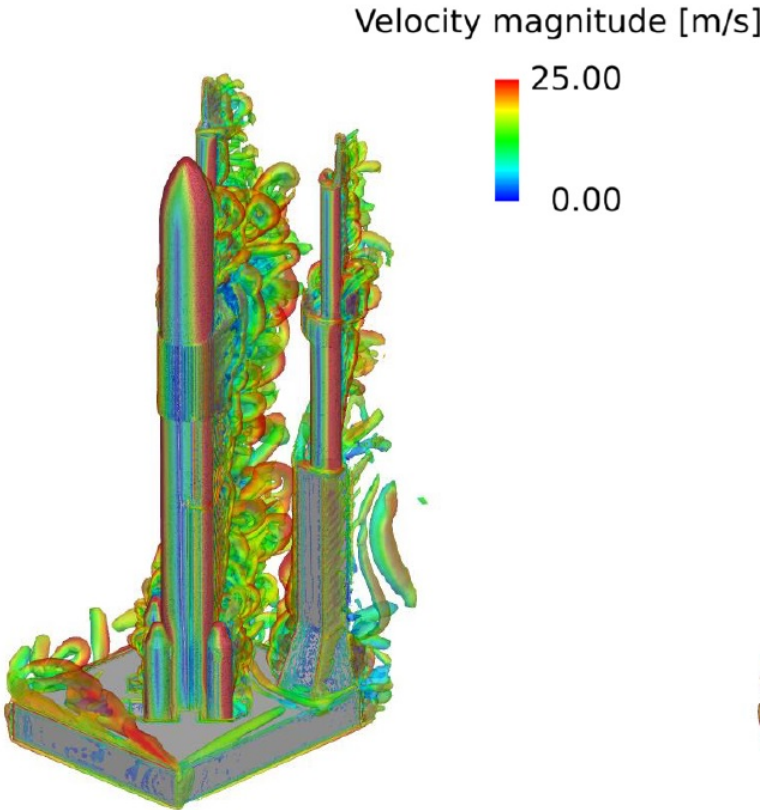


Fig.3 Velocity distribution at test

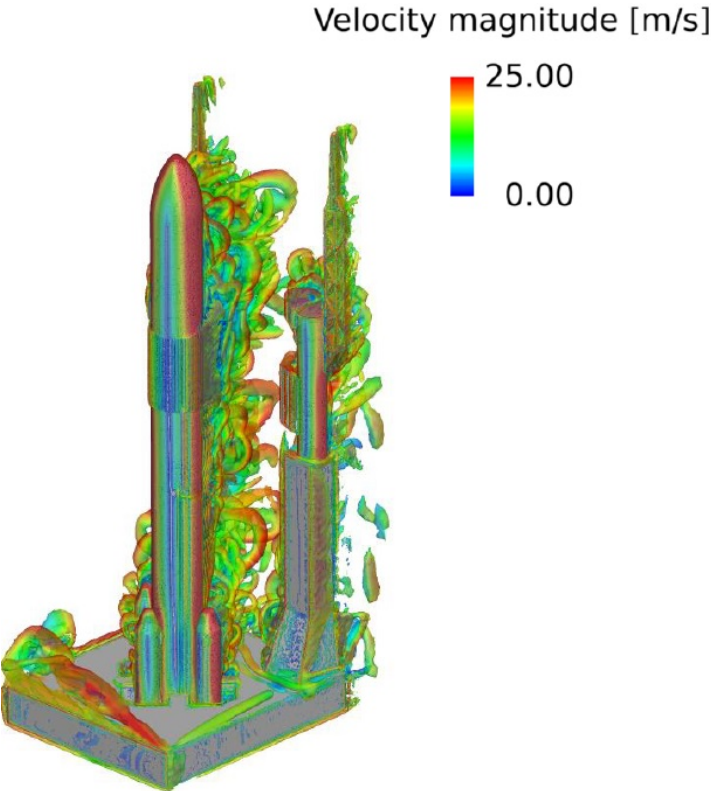


Fig.4 Velocity distribution at flight

● **Publications**

N/A

● **Usage of JSS2**

● **Computational Information**

Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelizatio
Number of Processes	960
Elapsed Time per Case	170.00 hours

● **Resources Used**

Fraction of Usage in Total Resources*1 (%): 1.50

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	12,599,432.26	1.67
SORA-PP	18,825.57	0.24
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	254.63	0.18
/data	6,978.99	0.13
/ltmp	4,296.88	0.32

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	0.50	0.02

*1 Fraction of Usage in Total Resources: Weighted average of three resource types (computing, file system, and archiver)

*2 Fraction of Usage: Percentage of usage relative to each resource used in one year