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Portfolio Paper

Cowl Opening

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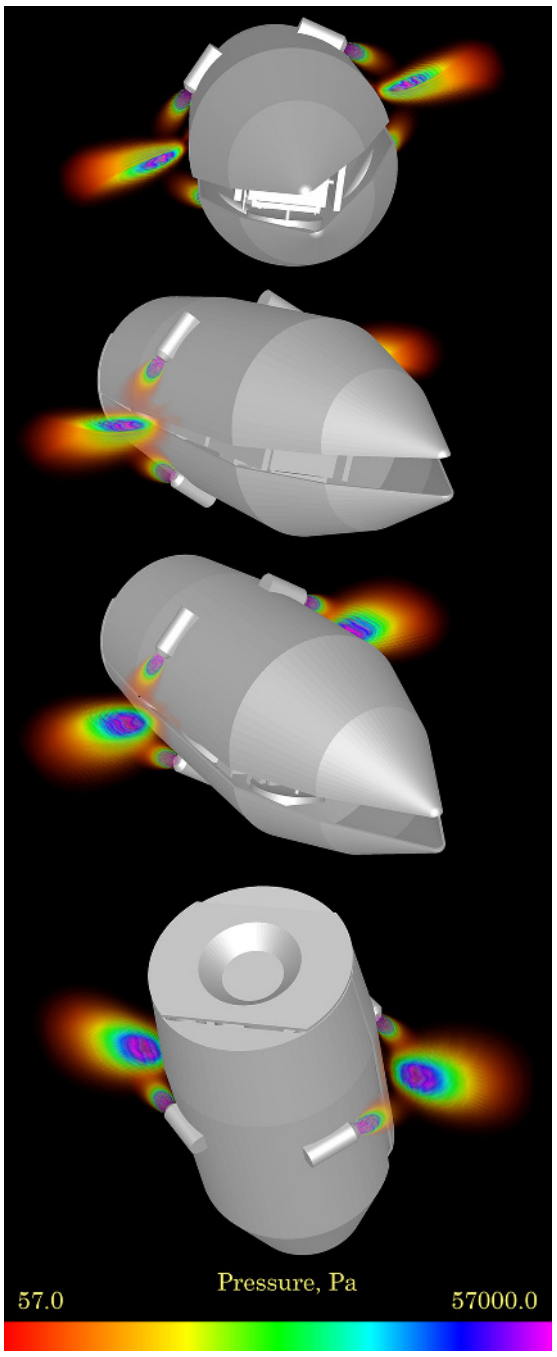

Fig. 1. Pilot engines jet interacting. Pressure distribution.

The force exposure definition problem on a space vehicle at the moment of its opening to output a satellite (Fig. 1) was simulated using the GasDynamicsTool CFD package and the ScientificVR® package provided the visualization.

The pilot engines to open the cowl lids are installed at the direction towards to each other. As a result, when the cowl lids are opened, the satellite is exposed by the air stream, produced by the tractive force of the pilot engines working, and the air stream of the jets interacting. This can lead to the satellite displacement and further trajectory removal.

The velocity force of the air stream springing the cowl up at the height of its opening can be disregarded, as it is essentially lower than the velocity force of the jets from the pilot engines working[(1), (2)].

The visualization of the pressure distribution through the air stream was performed using the semitransparent voxel technology[(3)].

On the images presented the pressure range is limited (57 – 57000 Pa) in order to show the process of the jet interaction. It can be enlarged, if there is a necessity to show the whole process of a gas current.

The voxels are colored according to a pressure value. The red color is for low values, and the violet color is for the high ones.

References : (1) Okhitin, V. N. et al., Combustion of Energetic Materials, (2002), 1072-1089. (2) Thiagarajan, V. et al., J. of Visualization, 9-1 (2006), 91-100. (3) Bruno, F. et al., J. of Visualization, 9-3 (2006), 319-330.