

STS-100 ORBITER POST LANDING INSPECTION
Debris Assessment
2 May 2001

After the 9:11 a.m. local/pacific time landing on 1 May 2001, a post landing inspection of OV-105 Endeavour was conducted at the at Edwards Air Force Base on runway 22 and in the Mate-Demate Facility (MDD). This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 92 hits of which 13 had a major dimension of one-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-100 Orbiter damage hits by area:

	HITS > 1-inch	TOTAL HITS
Lower Surface	4	42
Upper Surface	0	0
Window Area	8	48
Right Side	0	0
Left Side	0	0
Right OMS Pod	1	2
Left OMS Pod	0	0
TOTALS	13	92

The Orbiter lower surface sustained 42 total hits, of which 4 had a major dimension of one inch or larger. The majority of the lower surface damage sites occurred on the right-hand wing glove. Impacts in this area are most likely from LO2 feedline ice/frost or foam debris.

Although the number of hits on the left-hand lower surface were less than the right-hand lower surface, the largest lower surface tile damage site was located on the left-hand wing glove forward of the main gear door. This shallow damage site measured 2.5-inches long by 1-inch wide by 0.125-inch deep, and is probably the result of impact by low density foam material.

The OMS pods tiles had a typical amount of damage. No unusual tile damage or evidence of tile movement, as seen in lift-off films E-17 and -18, was observed on the OMS pods. However, a four-inch long segment of gap filler material was protruding from the left-hand OMS pod tiles by approximately 0.5-inch.

A segment of Ames gap filler, located just aft of the nose gear wheel well, was protruding 0.5-inches. There was no indication of entry heating or tile damage. A second Ames gap filler from the nose gear door was found on the runway after wheel stop, to the left of the Orbiter approximately 10 feet outboard from the Orbiter wing glove. The gap filler showed signs of entry heating.

This is the third flight using the forward up-firing RCS jet plumes to help protect the windows from BSM particulate impingement during SRB separation. Hazing on windows 3 and 4 appeared to be greater than observed for the first two flights with the windows protection system. Quantitative evaluation of the window hazing will be provided through optical testing at KSC.

An AFRSI blanket was slightly de-bonded and protruding from the area immediately aft of the forward-firing jets in the forward RCS group.

Moderate hazing was noted on the upper portion of windows 2, 3, 4 and 5. In addition to hazing, streaks were observed on windows 3 and 4. The streaks are the result of impacts by RTV adhesive used on the forward RCS paper covers.

Damage sites on the window perimeter tiles were more than usual in quantity. There were a total of 48 hits on the window perimeter tiles with eight having dimensions greater than one inch. Damage to the window perimeter tiles on the forward facing windows is attributed to impact by RTV adhesive used on the forward RCS paper covers.

The main landing gear tires were reported to be in typical condition for landing on a concrete runway. Ply under-cutting was observed on the outboard edges of both left-hand main gear tires.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 were reported to have functioned normally. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. No debris was found beneath the umbilicals.

There was less than usual tile damage on the Orbiter base heat shield. The SSME Dome Heat Shield closeout blankets were in good condition. Slight fraying was observed on the SSME #3 blanket from the 10 to 12 o'clock position. Two large damage sites (approximately 3-inches by 3-inches) on the body flap upper surface tiles adjacent to the body flap stub, appear to be failed repairs.

A post landing walk-down of the runway was performed by the rollout measurement team and no flight hardware was found. All components of the drag chute were recovered and appeared to have functioned normally. Both reefing and line cutter pyrotechnic devices were expended.

In summary, both the total number of Orbiter TPS debris hits and the number of hits one-inch or larger were well within established family. The potential

identification of debris damage sources for mission STS-100 will be based on the laboratory analysis of Orbiter post landing microchemical samples, inspection of the recovered SRB components, film analysis, and aerodynamic debris particle trajectory analysis. The results of these analyses will be documented in the STS-100 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

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