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December 11, 1964

SUBJECT: Supplement to Evaluation of R/V Debris

Subsequent to the R/V debris evaluation letter dated 11/30/64, additional orbital temperature information was released in PIR-TCSD-8151-385 by S. Caltabiano. Per this PIR, minimum orbital temperatures of -190°F were expected to occur over a small segment of the circumference.

By analysis (PIR-SM-8156-475, by L. Arnold, 9/24/63, Secret), with no yaw around, local shield cracking would be predicted due to an orbit cold temperature of -190°F . The cracks would occur close to the saw-cuts, in a meridional direction, with the worst cracks occurring at the aft-most saw-cut (portion recovered). Due to the circumferential temperature distribution, the predicted cracks would be confined to the small segment of the circumference at this cold temperature (approximately 20 degrees of circumference). Very few cracks in this region would be expected since they would relieve the local stress levels as they occur.

The minimum temperature region was located on the debris and the cracks examined for charring along the edges down to the phenolic glass. Only one such crack was found in this region and upon examination of the rest of the shield circumference, only two or three other similar cracks could be found, randomly spaced around the circumference. Most of the cracks still had virgin material at the base next to the phenolic glass, indicating that these cracks occurred during the latter portion or subsequent to the re-entry heating period.

Based on the analytical predictions and on the fact that several cracks had charring along the edges down to the phenolic glass, the conclusion is reached that these cracks occurred in orbit. The random locations probably occurred due to the fact that the vehicle was stabilized in orbit for only the first four or five days. For the remaining days in orbit, the vehicle was probably tumbling. If, during this latter time, the vehicle was stabilized for three to five orbits, other portions of the circumference could also have been subjected to this cold temperature, thus producing the additional cracks. In any event, these meridional cracks, local to the saw-cuts, produced by in orbit cold temperatures, are not considered detrimental to the over-all flight capability of the shield system.

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