Such information as the models provide can not only be utilized to design future spacecraft, but can also be used to derive requirements for an inspection system. For example, the micrometeoroid impact features shown in Table 1 strongly indicate that in order to use an inspection system to revalidate future MMOD models, the system must be capable of detecting very small flaws in the range of 0.2 to 6.0 mm on surfaces of varying shape and specularity under orbital lighting conditions. This must take place while satisfying safe clearance requirements, as well as other requirements for mobility and safety such as smooth motion, collision free scanning, and so on.

Table 1. Summary of LDEF Impact Features [2].

Feature Size (diameter)	Clamps, Bolts, & Shims	Tray Flanges	Experimental Surfaces	Totals*
< 0.3 mm	-	-	2911	3069
> 0.3 mm	-	-	763	763
< 0.5 mm	1318	1923	19342	27385
> 0.5 mm	161	419	2539	3119
Totals	**1479**	**2342**	**25555**	**34336**

* Note: the "Total" is greater than the sum of the individual column entries for the "<0.3 mm" and the "<0.5 mm" rows because some of the features contributing to the total were detected on intermediate surfaces such as between the tray flanges and the experimental surfaces.

routine and repetitive ones. A number of candidate tasks have been identified based on our interactions with engineers at the Johnson Space Center (JSC) and various scientists working on LDEF. These include inspection of (1) truss strut damaged by micrometeoroids, (2) cracks in structures, (3) shield area damaged by micrometeoroids, (4) thermal blankets, radiators, or solar panels damaged by micrometeoroids and atomic oxygen, (5) thermal/mechanical interfaces at ORU installation sites, (6) deployable mechanisms for incorrectly positioned latches, connectors, and other mechanical devices, (7) the SSF shuttle docking port before each docking, (8) damaged fluid and power lines in a utility tray , (9) effects of fluid leaks on optics, and (10) magnetic fields, plasma fields, and contaminant levels, especially hydrazine concentration.

Table 3. Experimental Results for Remote and Direct Micrometeoroid Inspection

Flaw Size	Remote Surface Inspection	Direct Inspection
Large Marks, 10 Pixel (2.7 Mm)	Time-To-Completion: 178 Sec Accuracy: 93%	Time-To-Completion: 57 Sec Accuracy: 97%
Small Marks, 1 Pixel (0.27 Mm)	Time-To-Completion: 308 Sec Accuracy: 91%	Time-To-Completion: 118 Sec Accuracy: 94%