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OVERVIEW OF NASA'S ADAPTIVE STRUCTURES PROGRAM

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NASA's research program in Adaptive Structures was initiated seven (7) years ago to provide the technology required for large (20-50 meters in dimension) precision (**submicron**) structures for observations from space. The current approach of designing thermally stable passive structures cannot meet the requirements and moreover the systems cannot be validated by ground tests. Adaptive Structure provides the capability to adjust the **quasi-static** dimensions of the structures, **preload** joints, add active damping and provide the actuation forces necessary to attenuate the undesired dynamic motions. The technology is applicable to space platforms with various pointing instruments as well as for **micro-spacecraft**.

From the initiation of base research, Precision Segmented Reflector (**PSR**) and Control/Structures Interaction (**CSI**) focused programs, laboratory demonstration was emphasized. Testbeds were established at Langley Research Center, Jet Propulsion Laboratory and Marshall Space Flight Center to demonstrate the research developments by NASA, Universities and Industries. A testbed was developed by Massachusetts **Institute** of Technology (MIT) as part of a NASA Center for Space Engineering Research grant focused on Controlled Structures Technology. The paper will present the research developments in actuators, sensors, controllers and the results of the ground test programs.

In cooperation with the Wright Patterson Air Force Base (**WPAFB**), a successful active damping experiment on a 12 meter truss in a KC-135 aircraft was performed. As part of the NASA In-Step program, several technology experiments with Adaptive Structures are being developed. One is the Middeck Active Control Experiment (**MACE**) experiment by the Massachusetts Institute of Technology and the other is the Jitter Suppression Experiment by McDonnell Douglas.

The technology has been incorporated as part of a small Active Fold Mirror (**AFM**) on the Wide Field Planetary Camera to be flown within the year to correct the optical errors in the **Hubble** Telescope.

Highlights of the NASA's Adaptive Structures research and applications will be presented along with future technology and research requirements for both small inexpensive spacecraft and large precision systems.