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Infrastructures and Systems to Enable Ambitious Future Exploration and Utilization of Space (3)

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VEHICLE HEALTH MANAGEMENT FOR NEXT GENERATION SPACE TRANSPORTATION VEHICLES

Abstract

Vehicle Health Management (VHM) is the capability to efficiently perform monitoring, checkout, testing and predicting of space transportation vehicles, subsystems and components before, during and after operation. This paper introduces the possible evolution and key technology of VHM for present and future next generation space transportation vehicles.

VHM for next generation space transportation vehicles has two separate areas of emphasis. The first area is to use VHM to support the planning and scheduling of post-operational maintenance. In this role, VHM is used to record data in-operation; that data is not accessed until post-operation, at which time it is used to help determine when vehicle systems are in need of repair or replacement. The purpose for pursuing "post-operation VHM" is to increase safety and reliability while simultaneously reducing costs.

The second area of emphasis is to use VHM to support vehicle flight operations. In this role, VHM actively perform real-time status determination, diagnostics, prognostics and management during operation, and is intended to take fault-tolerant response including system/subsystem reconfiguration in the case of component or system degradation, imminent failure to prevent catastrophic failures. These systems will be referred to in this paper as "in-operation VHM".

The improvement necessary to meet these future mission requirements can be concluding the diagnostic and prognostic algorithms used to real-time determine if a system or component is about to fail by experts system. VHM system can cue off of space transportation vehicles, subsystems and components failure or near-failure.

VHM for next generation space transportation vehicles provides integrated view of the health state of the overall "System".