SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations (1)

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THE THEMA ENVIRONMENT. A METHODOLOGY APPROACH TO TREND ANALYSIS FROM COLUMBUS PAYLOADS EXPERIENCE TO SUPPORT HUMAN SPACE EXPLORATION

Abstract

This paper presents the formal approach to trend analysis and the Trends and HEalth Managment Analyzer (THEMA) environment that ThalesAleniaSpace Italia has defined, implemented and adopted in the frame of the sustaining engineeering tasks for ISS Columbus module and its payload SOLAR, FSL and EDR as well as Cupola and Nodes23 elements.

A considerable portion of the on orbit operations of the International Space Station (ISS), especially now that the Assembly Complete configuration has been achieved, is focused on the maintenance aspects that become even more critical in the human space exploration studies where dependencies from Earth for new replaceable units can be vital for long distance mission like Moon or Mars bases.

In all these scenario the optimization of the "time" factor from when an anomaly is detected up to the replacement of the failed unit plays an important role in the maintenance strategies but a capability to predict a maintenance need could enable an even much more effective planning and execution of the on orbit maintenance.

A trend analysis approach is proposed to have an advanced degradation detection of equipment status when still within the operational ranges and well before approacing its Caution and Warning thresholds.

Trend analysis leads the concept of the "on-condition maintenance" to support spare unit pre-positioning or anticipated replacement, to support the definition of operational/software workarounds when unit is not replaceable, or to tune the on orbit operations to preserve degrading unit lifetime.