

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

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TREND AND HEALTH MANAGEMENT ANALYZER (THEMA): A STEP FORWARD TO AN
INTEGRATED ANALYSIS ENVIRONMENT

Abstract

The crucial role of trend analysis and health management in Space applications has been the subject of many studies performed by NASA and ESA and is held in high regard by Thales Alenia Space Italy (TAS-I). The common objective is to improve know how of as flown Space Systems, to understand current space system status and predict degradation behaviour in long time. This abstract will briefly illustrate the THEMA (Trend and HEalth Management Analyzer), an advanced environment currently used in TAS-I several Space Programs, like ISS elements and its payloads and recently in enhancement to fully support other products and mission phases. The THEMA logic flow will be presented, emphasizing the improvements offered to Mission Support Operations activities. Finally the benefits provided to the Company and a list of possible future enhancements will be given. THEMA environment has been initially developed to provide a multi program system able to collect, store, represent, analyse and correlate a selected set of parameter for the International Space Station elements and its payloads. The tool has been developed on top of an advanced authentication core, with in mind efficiency, flexibility and modularity. The idea is creating an environment where it is feasible to handle and manage as flown data in a near real time, but also off line via dedicated analysis of years of operations. The environment is a TAS-I in-house advanced telemetry data handling and trend analysis environment to support Operations, applicable to any equipment or complex system generating health status and/or performance data. It supports predictive analysis and maintenance concept in terms of Spare Pre-positioning, SW/Operative actions to prevent or mitigate degradation effects for not replaceable unit, tuning of operations for a more effective utilization and to preserve lifetime THEMA is also extended to perform post-processing as result of test activities and on orbit data post-processing correlation, starting from raw data. An extension is the integration with IDEHAS (Integrated Engineering Harness Avionics and Software), the current environment conceived to support this end-to-end processes and to ensure definition, maintenance and update of data in a single, consistent environment for harness, avionics, software and operations, then extended to FDIR analysis integrated with the FMECA. THEMA provides an efficient and powerful way to manage health data and to perform trend analysis, allowing quick data retrieval and analysis also for long period of time. Finally real-time update and report generation meet the resource optimization objective.