

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

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EVOLUTION OF THE COLUMBUS ANOMALY RESOLUTION PROCESS AND TOOLS; ADAPTING  
TO OPERATIONAL EXPERIENCES AND NEEDS

**Abstract**

The European Columbus module is in Orbit for over 6 years and is operated and maintained on behalf of the European Space Agency (ESA) under the Industrial Operations Team (IOT) contract. Any malfunction or deviation from the expected system and/or payload behaviour needs to be reported by the flight control team in order to trigger support from the spacecraft and payload developers for anomaly resolution. All anomalies with the Columbus system or with European payloads operated in Columbus are handled via a dedicated anomaly resolution process. This process was set up for reacting to anomalies and coordinating a real-time or near real-time response via a Columbus Anomaly Response Team (CART) including the flight control team. The CART's primary objective is to respond to anomalies by using the baseline configuration and the agreed operations products, to define work around and to continue operations with or without performance or functional degradation. Once the system or the payload is recovered, temporarily or permanent, or put in a safe configuration, the anomaly is forwarded to a System Problem Report (SPR) and handled under the jurisdiction of the Material Review Board (MRB) and, if required, with the approval of the Engineering Control Board (ECB). Procedures are furthermore in place for anomalies that impact the International Partners (IPs) where the anomaly response is coordinated in a Multilateral Anomaly Response Team (MART). Over the last 6 years the anomaly resolution process and tools have been steadily adapted in response to the experiences and needs to optimize the anomaly resolution. Major changes in the anomaly resolution have led to the introduction of a dedicated tool allowing for better tracking of anomalies, as well as special tracking of recurrent anomalies. Together with several other smaller process and tool improvements, the current anomaly resolution allows for a faster and more efficient and closer to real-time anomaly resolution at CART level, without involving off-line processes like MRB or ECB, when it can be avoided. This is reflected in the recently renewed CART process which allows a more active resolution of anomalies in the real time environment. This paper provides an overview on changes made to the anomaly resolution process and tools, which are based on the gained experiences and lessons learned during the last years, and will also address how these changes and adaptations fit the changing environment from freshly started operations of Columbus to long term operations for the future.