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FIRST EXPERIENCE WITH COLUMBUS DMS MODERNIZATION, COL KA OPERATIONS AND IP-BASED COMMUNICATION

Abstract

The next chapter in European human spaceflight operations was opened on January 27th, 2021 when the Columbus Ka-Band Unit (COL Ka) was installed outside the Columbus module on the International Space Station (ISS). Only for the second time since European ISS operations have started, flight controllers at Columbus Control Centre (Col-CC) of the German Space Operations Center (GSOC) and across Europe worked hand-in-hand with both EVA and IVA astronauts, guiding COL Ka installation activities and performing successful functional checkouts of the new hardware.

This kicked off intense months of commissioning activities of the COL Ka software and hardware, on-board Multi-Purpose Computer and Communication (MPCC) equipment, data relay via the EDRS-A satellite, and ground systems of this new IP-based communication infrastructure. All these elements are entirely designed and owned by the European Space Agency (ESA). The commissioning activities established for the first time an end-to-end data transfer from COL Ka to the ground station in Harwell, UK (and the backup site at DLR Weilheim ground station of GSOC in Germany) including the data routing to Col-CC and payload users via the Interconnection Ground Subnetwork (IGS) and Internet, and vice-versa. The new operational systems and interfaces between all involved operational teams were put to test. Problems encountered during EVA and commissioning were worked by the flight control team with support of the engineering and safety communities, in order to prepare COL Ka for nominal operations.

Simultaneously, flight controllers at Col-CC prepared the deployment of the key element of the Columbus Data Management System (DMS) and Communications (COMMS) on-board infrastructure modernization effort: A new LAN switch (CLSW Mk2) integrates the existing legacy DMS and the new-generation IP-based communication infrastructure into one coherent, state-of-the-art system architecture while respecting modern IT security principles. Due to the invasive nature of this Columbus core hardware upgrade, a considerable part of Col-CC preparation activities have been spent on preparing for the updated DMS and COMMS software systems. The upgrade to the CLSW Mk2 and associated software

eventually allows for easier and leaner, IP-based payload operations with enhanced bandwidth capabilities via MPCC and COL Ka, all while making extensive use of commercial off-the-shelf (COTS) hardware and software for system operations and end users alike.

This paper will report on the progress of and first experience with the COL Ka commissioning, end-to-end IP-based communication, and DMS modernization activities at GSOC/Col-CC.