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DECLIC OPERATIONS AND GROUND SEGMENT: AN EFFECTIVE WAY TO OPERATE A PAYLOAD IN THE ISS

Abstract

DECLIC is a multi-user facility to investigate critical fluids behaviour and directional solidification of transparent alloys. As part of a joint NASA/CNES research program, the payload has been successfully operated onboard the ISS since October 2009 ([1], [2]).

The operations and the ground segment have been prepared and developed so that the payload is operated in an effective way, by using most of the functions proposed by the NASA's POIC (Payload Operations and Integration Center) [3].

For example, the internet is used as a connexion mean between the POIC and the CADMOS facility, located in Toulouse (France), from where DECLIC is operated. The commands are sent via a secured connexion (VPN) while the telemetry is received via an UDP connexion.

The operations have then been prepared in order to face the two main limitations of the chosen way of connexion :

- Because the internet is not an operationnal network, and also in order to reduce the operations costs by avoiding having people on console 24/7 at CADMOS, the alarms are processed by operational teams at POIC who are able to issue emergency commands if needed.

- Because the UDP is a connexionless protocol, some telemetry packets are lost (typically much less than 1%). But, mainly because of the bandwidth limitations onboard the ISS, and because the DECLIC payload generates very large amounts of data (more than 1 TB since the begoinning of operations), Removable Hard Disk Drives (RHDDs) are used to return the whole data to the ground as a reference data : the telemetry data is only used for real-time operations and rough analysis by the scientists.

This example, and few others (the use of existing softwares, a webserver development so that the scientists can have a realtime view of the payloads from their lab etc...) will be detailed in the paper showing how we have made the DECLIC operations effective and successfull.

The paper will also discuss how DECLIC will take advantage of future ISS space-to-ground communications and HOSC ground systems services upgrades to further enhance the science collection opportunities of the experiment.

REFERENCES

[1] G Pont and Al. "Declic, First Results on Orbit" IAC-10-A2.5.1(2010).

[2] G Pont and Al. "DECLIC, Soon Two Years of Successfull Operations" IAC-11.A2.5.4(2011).

[3] M Schneider and Al. "Payload Operations Integration Center Remote Operations Capabilities" AIAA 2001-5029 (2001).