E-DRS Connects Astronauts directly with Europe

ESA **DRS, planning status 1987***:"After launch, the two DRS satellites were to be positioned in geostationary orbit at about 59 degrees east and 44 degrees west, 36000 km above the equator. The DRS satellites should also be compatible with the data relay satellites of NASA and NASDA from Japan to maintain the connection to the space station and the many earth exploration satellites." (Enzyklopädie Raumfahrt, W. Engelhardt).*

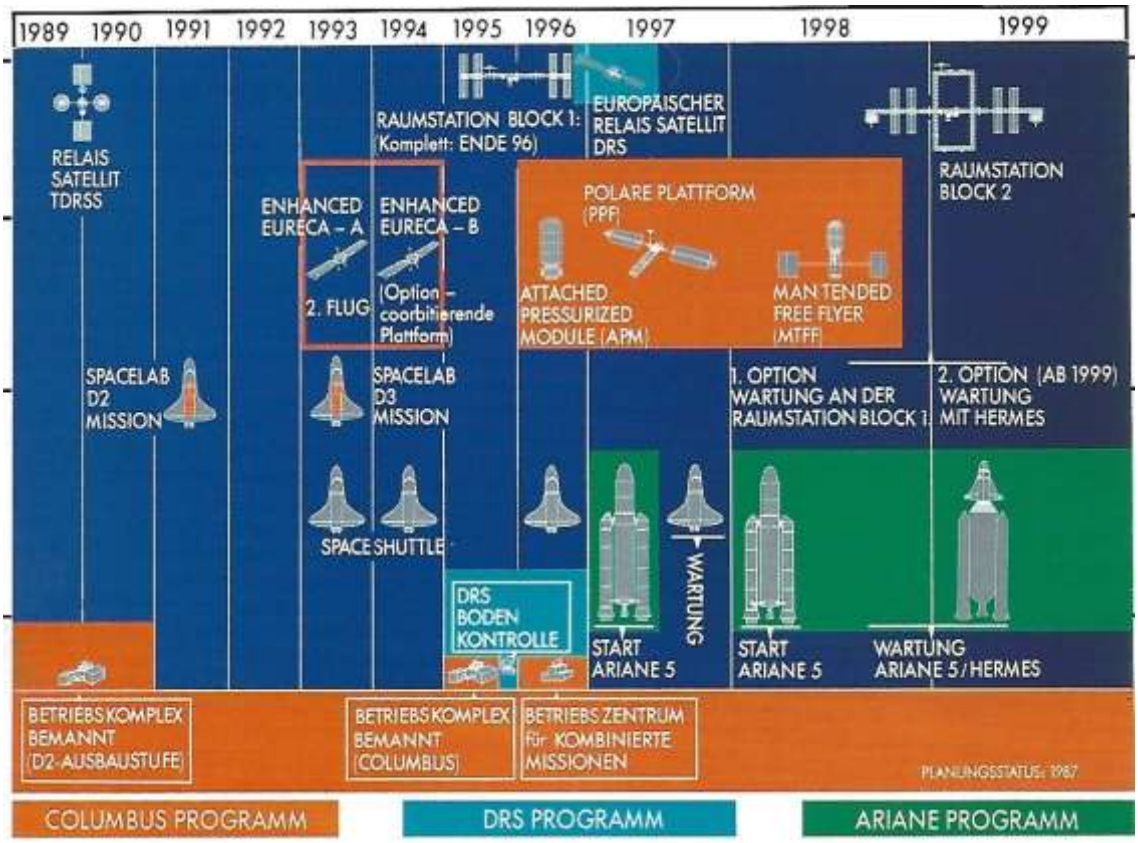

Fig. 1 Original DRS planning (1994-1997) and planned European In-Orbit-Infrastructure (Status 1987).

This earlier DRS project was planned to enhance European's participation in the international space station project and to support the than planned European "In-Orbit-Infrastructure" (IOI), see Fig. 1. Planning started in the early 1980's with a DRS operational target date in 1997. In one of the implementation studies a direct reception antenna at DLR Oberpfaffenhofen was foreseen (at the location of today's Galileo building) to enable direct contact with the new, than called Manned SpaceLaboratories Control Center (MSCC). The goal was to receive data rates of 2 Mbit/s at minimum directly at the MSCC. Smaller terminals for the decentralized USOC's throughout Europe for direct Experiment-data connections also were foreseen.
However it never came about because of budgetary reasons.

Having read the **January 2022** article "**ESA DRS (E-DRS) connects Astronauts directly to Europe**" [1], SpaceOps News (SON) was interested to learn what consequences this connection would have for Columbus Control Center (Col-CC) operations.
The E-DRS connection with the ISS is facilitated via a Columbus Ka-band antenna, dubbed ColKa mounted on the Columbus module. The upgraded system will provide speeds of up to 50 Mbit/s for downlink and up to 2 Mbit/s for uplink. [2]

An e-mail interview could be conducted with the operations experts in charge (Daria Margiotta, current Columbus Flight Director). Daria's answers will be designated as "*DM"* in the interview.

SON: What are the improvements for the Col-CC in terms of communication availability, security and privacy, data link accessibility, scheduling and transmission delay times?

DM: ColKa adds opportunities for data transmission on top of the regular TDRS passes. The data rate is also quite higher than the one allocated for Columbus (which must be shared station-wide). With 5-7 passes of 25 minutes in one day you can very well satisfy the needs for data traffic of our Columbus MPCC (Multi-Purpose Computer and Communication) payloads. Activities that involve crew participation are limited for the moment given the initial stage of operations, but ColKa may in principle provide also more communication chances between the crew onboard and the ground teams when TDRS's are not covering.
ColKa capabilities offer therefore more flexibility in scheduling ESA activities, although the complexity is added on the Flight Controllers at Col-CC to operate the system and book the link sessions towards the EDRS service provider (Airbus).
Security and privacy, accessibility, (and transmission delay times TBC) are the same already guaranteed by the MPCC system, which is using the NASA Ku Internet Protocol service and has been already an important enhancement in the Columbus communications since 2018.

SON: Is the ColKa data volume provided for the Columbus module exclusively or in addition to the TDRS allocated resources?

DM: ColKa for the moment is available only to ESA users of the Columbus module.

SON: It looks like, the direct connection via ColKa is downlink and uplink (command uploads) transmissions. How is the uplink coordinated with NASA?

DM: The operations of the antenna require Houston's approval and are regulated by Flight Rule, to avoid any interference with critical subsystem of the ISS (extra-vehicular activities, robotic arm operations mainly). Besides that, there is no need to request authorization from Houston for transmitting data up and down. Only the resources, i.e. bandwidth and power, required to activate the antenna and put it in the good configuration for transmission must be precoordinated via planning.

SON: How is the EDRS data link-planning coordinated for the Columbus timeline.

DM: The USOCs indicate which of the available passes and which data rate they wish to use, looking into the NASA timeline tool (OPTIMIS) where our planners have integrated the information. For the moment the selection is done manually by our planners around 2 weeks before the link session, but we are developing a GUI that will allow in the future to check the available passes and book a link session with a click (still under supervision of our planners).

SON: How is conflict resolution (if any) coordinated and decided?

DM: At the moment there is not much competition since we have just started to use ColKa, but the data rate can be normally shared among Columbus users without delaying too much one or the other user's request. There is no "first-come first-serve" concept, the link session will be assigned always based on the priority of the scientific objectives decided by ESA.

SON: As kind of a personal question: are there any plans to feed the relevant data also directly via on site antenna reception to the USOC's

DM: A personal question requires a personal answer: it would be very complicated and expensive to equip each USOC with a ground station and related architecture, not the most efficient concept from my point of view.

SON: What is the role of the "Space Cluster", Harwell UK, see Fig.2?

DM: Harwell hosts an EDRS satellite antenna, therefore acts as our ground station (same as White Sands for US communication systems).

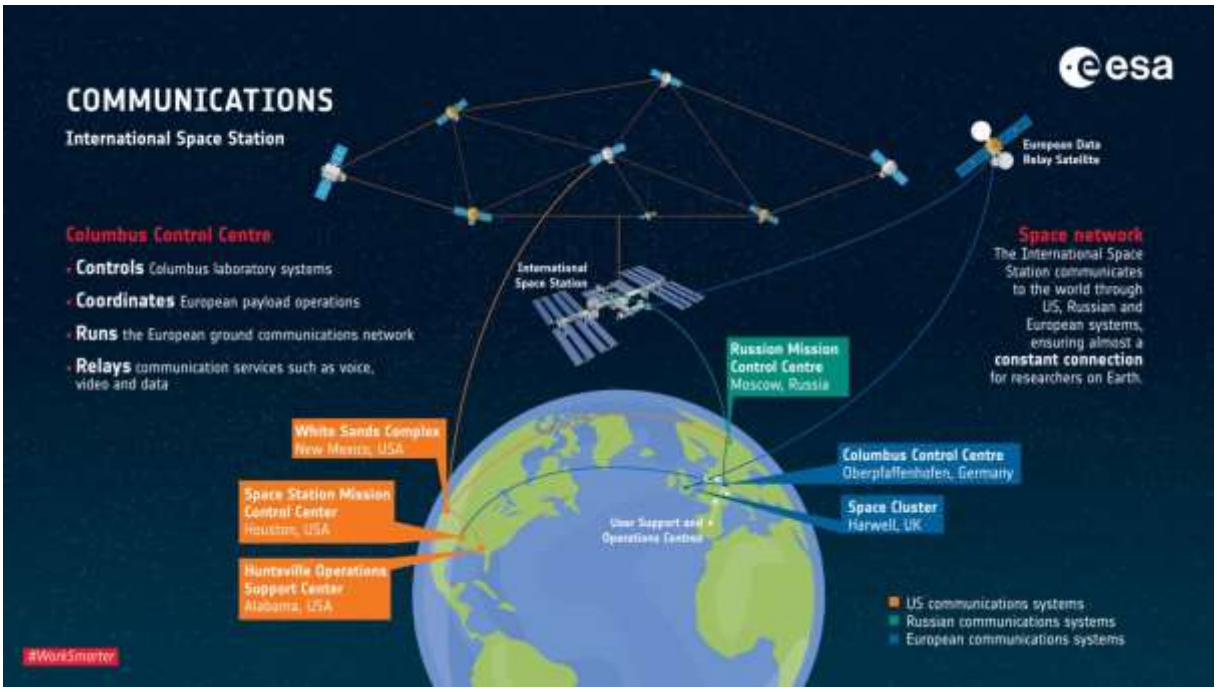

Fig. 2 Current (2022) ISS / EDRS Communications System, image curtesy of ESA [1]

References:

[1] E-DRS https://www.esa.int/Applications/Telecommunications_Integrated_Applications/Data-relay_system_connects_astronauts_direct_to_Europe.

[2] ColKa description:
https://www.esa.int/Applications/Telecommunications_Integrated_Applications/Space_station_to_forge_ultra-fast_connections