

## **Columbus Operations in the Time of Corona**

German Zoeschinger, DLR Mission Operations Service Manager  
at the Columbus Control Center (Col-CC) at Munich/Oberpfaffenhofen

Interview: Joachim J. Kehr, Editor, Journal of Space Operations & Communicator

In March 2020 the first Corona virus wave reached Bavaria, culminating in a “lock-down” from 20 March 2020 onwards until May, in June the restrictions were slowly eased step by step, however never returned to the Corona-free “unrestricted” time before the Corona pandemic. Unfortunately at the beginning of November a “second wave” of high infections developed, leading to a tightening of restrictions again.

From March 2020 onwards concepts had to be developed also for all Satellite control centers to maintain the integrity of operations i.e., secure functioning of satellite systems and experiments, communications and if applicable the health of crewed missions.

SpaceOps News (Joachim Kehr, SoN) had the opportunity to conduct an e-mail interview with German Zoeschinger, DLR Mission Operations Service Manager at the Columbus Control Center (Col-CC) at Munich/Oberpfaffenhofen about his experience and lessons learnt during this critical time.

The major impacts could be expected in the following areas: (1) operations teams and their presence in the control room, (2) interactions with the “outside world” like meetings, S/W and hardware maintenance, interface coordination requiring travel and (3) social aspects and availability of operations personnel. The decentralized arrangement of Columbus international operations might have been advantageous for smooth voice and video conferencing and coordination – nevertheless strictly depending on the availability of personnel.

The following questions come to mind.

SoN: How are the operations teams set up at Col-CC?

The Columbus Flight Control team consists of two positions that we need to staff 24/7, which are Flight Director and Columbus System Specialist. A third position responsible for the Columbus onboard planning needs to be staffed 8/5 with optional weekend work. Our Flight Control team members also do a substantial amount of their work off-console preparing operational products and so-called Increments that are half-year slices of the ISS onboard activities and are driven by the crew rotation scheme. In addition a Ground Control Team is managing the Col-CC ground infrastructure and the data and voice connections to the International Partners and to the ISS.

SoN: What were your guiding principles when implementing measures at Col-CC?

The most important aspect that we were looking at was how to ensure a permanent console coverage in the Control Rooms to be able to continue Columbus operations. We need to guarantee that our team size is not falling under a critical limit, that is not allowing us to staff our positions in the Control Room. Would this be the case we had to configure the Columbus module into a safe mode, stop all payload operations and transfer the remaining critical tasks to the ISS Flight Controllers in Houston.

Each Flight Controller who is infected in the private life would lower the team size, but these would be single events driven by the overall infection rate. Looking at the team size aspect the much bigger issue is, if an infected Flight Controller was in contact with several other colleagues before he knows about the infection through a positive test result. In such a case all the direct contacts in the team would have to be put into quarantine and in case of a positive test results of a direct contact also the relevant second level contacts would have to be

quarantined. This could immediately lower the team size under the critical limit to allow further Control Room staffing.

To avoid such a scenario the amount of contacts within the Flight Control Team needed to be minimized to the most extent.

SoN: Which generic measures did you implement?

The easiest and first measure that we implemented was to restrict onsite presence to just the persons working in the Control Rooms. All team members doing off-console work were sent to Home Office.

The second step was to stop all contacts between team members of consecutive shifts. Normally the team members of the on-coming shift do their handover next to their colleagues of the off-going shift. Since we have two main Control Rooms available we developed a process that the on-coming shift uses the other Control Room and perform the handover via black phone or voice keyset with their colleagues. Also the telemetry and command consoles had to be reconfigured between the shifts for the Control Room change.

But we still had direct contacts within the team members of one team and the team composition normally changed from one shift to the next, meaning that there were still many different contacts over several days...

The next idea was to build fixed teams consisting of the same team members always. One fixed team would work together in the Control Room but would not have contact to any other of the fixed teams. For an infection or quarantine case this would limit the affected persons to the members of one fixed team, i.e. a maximum of three team members. We quickly saw that it was not possible to develop shift plans under this constraint, since the overall amount of Flight Controllers is not big enough and there were too many other constraints to be taken into account, like meetings and vacations.

We then did an analysis of the rooms that provide limited Control Room functions, like telemetry and command consoles and voice keysets. After we outfitted additional rooms and configured them accordingly we were able separate the team members of one shift into different rooms, so that every team member at console is working in an isolated room now. The on-coming shift is using another set of Control Rooms so that no direct contacts within the Flight Control Team need to take place at all for nominal operations. "Control Room" might not be the right term for all of the rooms. But since the FCT positions have different requirements it was not necessary to equip all rooms with all Control Room functions (number of consoles and monitors, access to different networks etc.).

Finally we managed to reduce the work related contacts within the Flight Control Team to zero by restricting onsite access to the Control Room workers only, isolating the team members into different rooms and having the rest of the team working in Home Office.

SoN: How did you manage the availability of "system relevant" personnel taking their social background into account under lock-down and "home schooling" conditions and keep them safe?

We have a really international team working at Col-CC. Many of our colleagues are coming from other countries in Europe and even farther away. It is important that the team members understand the measures that we are implementing at Col-CC and support them. We can not and do not want to control the private lives of our colleagues and we trust them that they are transferring the principles of our work related measures into their private environment.

SoN: How would one account for personnel outages?

We are used to deal with “personnel outages” and we have a priority scheme for our work that we are coordinating and agreeing together with ESA based on the constraints that we have. Our first goal is to avoid outages through Corona cases by eliminating the need for personal contacts at work. The next step would be to adapt our work volume to the reduced team size. We also have a close look that vacation periods are evenly distributed over the year and not clustered in a certain time frame like Christmas. We also have to rely on the flexibility of the team to jump in and take shifts for others if needed, which worked well until now, since the whole team shows a huge motivation and dedication for the project.

The international team structure implies that team members are also travelling into their home countries and then the quarantine rules for coming back from risk areas apply. For these foreseen outages of shifts the shift plan is adapted in advance. The shift load of the team members is then balanced out later.

SoN: Did you need approval for your operations safety concept by external authorities (e.g. “Gewerbeaufsichtsamt”, “Gesundheitsamt”)?

The Corona related DLR regulations are worked out by the DLR Crisis Team and they build the frame we are using for our Col-CC measures. We are making sure that all our measures are compliant with the overall DLR rules and also with the ESA and the Bavarian regulations. For specific cases we are directly coordinating with the DLR Crisis Team and agree on potential deviations from DLR rules.

SoN: Was the idea of having control-room features in the office or even at home for “keeping distance” during control room activities considered?

Secure remote telemetry access for Columbus and ISS data requires high security standards. Even though the current distributed setup of Columbus operations already allows remote access to certain operations products like Flight Notes and Timelines it is not yet possible to access telemetry data remotely.

This possibility would provide much more flexibility to deal with the current restrictions. Technical evaluations for remote telemetry access have started now, whereas commanding to Columbus and ISS will be done from Control Rooms only for security reasons.

SoN: What was the highest impact on operations at the Col-CC due to the CoVid-19 lock-down?

Thanks to our highly motivated teams we were able to cope with all the restrictions in a way that there were no impacts to onboard operations because of reorganizing the work at Col-CC.

SoN: Are there procedures generated during the Corona crises which will stay even beyond 2021?

Easy answer: In March there were still several administrative processes in place, which required real physical paper handling. Meanwhile all of them can be handled electronically – and this will stay.

More complex answer: Columbus operations used to be done in a distributed setup from the beginning. The core of ISS and Columbus operations is the work that is performed by the Flight Controllers in the Control Rooms all over the world. This core work did not have to change at all due to the Corona pandemic. All the adaptations that were necessary, were related to off-console work, and also because of the distributed Columbus setup, these were small and minor. The main problem was to identify the right communication tools and upgrade them in a way to have the tools match the demand. Also, the fact that all business travels have been stopped and the meetings are totally replaced by electronic communication for now, it is still possible to continue with operations. As a last point – ignoring all social aspects - it became clear how little benefit an onsite office provides compared to a home office setup in the Columbus operations environment.

SoN: How did you keep up the moral among the team having only minimum contact among each other?

Actually this is the biggest problem of the Pandemic. All the work related issues are handled by the teams in a professional and passionate way, but the social aspects of working together in a team is difficult to address when face-to-face contacts are not possible any longer. After the first lock-down we organized a survey within the team to hear what their assessment of the situation was. The perception was dependent a lot on a team member's personality, some of the team members could cope with it easily whereas others had more problems with it. But in general the lack of social contact was brought up by almost everybody.

We try to overcome this by mimicking the occasions for informal face-to-face contacts in the communication tools. One way doing this is to setup up a "coffee-telecon" every day at a fixed time and invited everybody to join. Participation is not mandatory and topics should be open, similar to meeting in a cafeteria after lunch. We were also translating some social events, like Increment Plaque hangings in the Control Room, into the communication tools. We actually realized that much more participants were joining than in a real physical event. Also our all-hands meetings with the team worked well as a web conference.

SoN: Any other important messages?

I believe the passionate and responsible commitment of the entire operations team ensuring operations to continue as undisturbed and safely as possible - even with severe personal restrictions and an increased risk of infection, deserves the highest recognition and promotion.

German Zoeschinger, we thank you for the detailed answers – we hope you will cope with the ongoing "second wave" of the infections hitting Europe again right now. With the experience gained during the beginning of the crisis you might serve as an example for similar operational organizations.

We wish you and all the international teams success for keeping Columbus and the ISS "afloat" and productive.