**BEPICOLOMBO - REHEARSING FOR SUCCESS A-ROLL**

**Suggested web copy**

The European Space Operations Centre (ESOC) flight team in Darmstadt, Germany, is carrying out simulations for the launch and early orbit phase of the BepiColombo mission to Mercury.

The rehearsals, which began in June and will continue until August, take place in ESOC’s mission control centre with industry experts on hand.

The simulations will include normal operating conditions as well as introducing failure scenarios for the team to correct and ensure a successful mission.

The BepiColombo launch window opens October 15, continuing until the end of November, and will be Europe’s first mission to Mercury. The joint mission between ESA and the Japanese Aerospace Exploration Agency (JAXA) will explore one of the hottest planets in our Solar System and the closest planet to our Sun.

The A and B-roll includes interviews with Andrea Accomazzo, BepiColombo Flight Director, ESA (English, Italian); Elsa Montagnon, BepiColombo Spacecraft Operations Manager, ESA (English, French), James Windsor, Avionics and software engineer, ESA (English) and Orson Sutherland,

Mercury Transfer Module manager, ESA (English, B-roll only).

**A-ROLL**

**TAPE STARTS: 10:00:00**

**VT STARTS: 10:00:10**

**10:00:10**

**[MISSION SIMULATION GVS, CONTROL CENTRE AT ESOC, DARMSTADT, GERMANY]**

An important mission to Mercury is underway at ESA’s European Space Operations Centre in Germany. Decisions are made, controls are sent. Everyone is focussed.

But this is no ordinary mission because their spacecraft hasn’t actually left the ground. Instead, it is one of numerous pre-launch mission simulations preparing the BepiColombo team for a seven-year journey to Mercury.

**10:00:43**

**[INSET CLIP: Andrea ACCOMAZZO, Bepicolombo Flight Director, ESA]**

*“At the current time we are here in the main control room where our rehearsal is ongoing. There was an unforeseen event happening during the rehearsal so the team, part of the team has moved out of the control room and they are having a briefing to analyse the situation and decide on the way forward. This is exactly what we train for.”*

**10:00:59**

[**CONTROL CENTRE GVS SHOWING ELSA MONTANGON]**

The launch and the spacecraft’s first few days in space are always critical and BepiColombo’s Spacecraft Operations Manager worked on the successful Rosetta mission. And she knows from experience that after training for planned scenarios, you must also train for the unexpected.

**10:01:19**

**[INSET CLIP: Elsa MONTAGNON, Bepicolombo, Spacecraft Operations Manager, ESA]**

*“The failures can be anything. The failures can be a problem on the spacecraft, a problem on the ground, it can be a problem with computers, a problem with ground software, communication lines, ground stations, rooms, control rooms here. They can even be a problem with the operators themselves. The important objective of the simulation campaign is to train the decision making process among all the experts that compose the mission control team.”*

**10:01:49**

**[ENGINEERING TEST BENCH ROOM GVS, ESOC]**

The test runs are performed until August over several days, in real time, during 12 hour shifts. ESA and industry experts are also on hand with access to an engineering test model of the spacecraft. It uses the same software as on BepiColombo and this software - the brains of the spacecraft - runs the main on board computer. It may not be as powerful as a smart phone, but it’s smart enough to gather all the operational and scientific data, store and transmit it back to the control centre. And the closer it gets to the Sun, the more challenges it faces.

**10:02:30**

**[INSET CLIP: James WINDSOR, Avionics and Software Engineer, ESA]**

*“If a unit is getting too hot, if one of the payloads is getting too hot, in order to stop that payload from being damaged we’ll switch it off, we’ll send an emergency message back to the Earth, reporting that there’s an issue. We need ESOC to take action, to investigate why items are getting too hot and then to recover the unit and the spacecraft.”*

**10:02:53**

**[BEPICOLOMBO ANIMATION]**

Once BepiColombo arrives at Mercury, two orbiters and their instruments will explore its composition and magnetosphere. Training for flight procedures is essential for this science to take place. And by the time BepiColombo comes to the launch, everyone on the team will be mission ready.

**10:03:14**

**[ENDS]**

**BepiColombo – Rehearsing for Success B-ROLL**

**10:03:14**

**[TITLE] Andrea Accomazzo**

**BepiColombo Flight Director, ESA [English]**

*“In preparing for a mission like this we have to carefully train all the aspects. What we actually do in the rehearsal, we do in preparation of a launch, we train the teams to work together, we train the teams to work with the flight procedures and also we train the teams as much as we can in flight conditions. So normally when we test before we test with many work arounds. What we try to simulate here is actually to replicate as much as possible flight conditions and we typically do 20 or 30 of these rehearsals before a flight.”*

*“At the current time we are here in the main control room where our rehearsal is ongoing. There was an unforeseen event happening during the rehearsal so part of the team has moved out of the control room and they are having a briefing to analyse the situation and decide on the way forward. This is exactly what we train for.”*

**10:04:20**

**[TITLE] Andrea Accomazzo**

**BepiColombo Flight Director, ESA [Italian]**

The role of flight director in the mission.

An overview of the mission

**10:05:43**

**[TITLE] Elsa Montagnon**

**BepiColombo Spacecraft Operations Manager, ESA [English]**

*“Starting four months before launch, we start what we call the simulations campaign. During this campaign twice a week we exercise flight scenarios. At the beginning of the simulation campaigns we go through the planned scenarios nominally but then once we’ve exercised the scenarios nominally once, we start injecting failures. The failures can be anything. The failures can be a problem on the spacecraft, a problem on the ground, it can be a problem with computers, a problem with ground software, communication lines, ground stations, control rooms here. They can even be a problem with the operators themselves. The important objective of the simulation campaign is to train the decision making process among all the experts that compose the mission control team.”*

*“The simulations campaign is the first time that all the experts involved in the BepiColombo spacecraft design, integration, testing and operations, work together as a single team. The campaign is essential for this group to learn to work as a single team, to train the decision making process. The campaign is also very important for us to fine tune all plans and procedures. It’s the first time that we exercise the flight plans and procedures in a realistic context taking into account communications constraints, ground station and timing.”*

**10:07:27**

**[TITLE] Elsa Montagnon**

**BepiColombo Spacecraft Operations Manager, ESA [French]**

An explanation of the mission simulation exercise.

**10:08:26**

**[TITLE] James Windsor**

**Avionics and Software Engineer, ESA [English]**

*“We have 11 instruments on board the spacecraft and when we are at Mercury these instruments are gathering data and then they will store it in effectively a large hard dive which we have on board the spacecraft. That data is then collected over a number of hours and when we have a visibility with the spacecraft in Mercury, typically it’s every 16 hours we can talk to the spacecraft at Mercury, the data is then downlinked using a very large high gain antenna. It’s a very powerful antenna in order to have a data rate of about 340 kilobits per second. If you compare it to your home internet this is nothing, it’s a very slow data rate, but it’s very fast considering we are very close to the Sun and we might get some interference from the energy from the Sun so it’s as powerful as we can have with the resources we have on board the spacecraft.”*

**10:09:31**

**[TITLE] Orson Sutherland**

**Mercury Transfer Module Manager, ESA [English]**

*“Right so at Earth the solar flux is 1.4, more or less 1.4 kilowatts per square metre. As we approach Mercury, which is the most innermost planet of the Solar System, that solar flux has risen 10 times. So now we have 14 kilowatts per square metre. Now you might think that’s is a good thing in the sense that it gives you more energy to turn into electricity to be able to run your thrusters. But it turns out that that immense flux that we’re getting rom Sun also drives the temperature of spacecraft very high and in particular our solar arrays which are sensitive to high temperature and need to be protected. Now we do that in a number of different ways. We keep as much of the open surface covered in little mirrors that we call OSRs - optical surface reflectors - or with specially developed white coatings which help to reject the heat from the Sun. But perhaps the biggest mechanism that we use to keep the solar array cool is to offpoint. Rather than pointing the solar arrays directly to the Sun, we point them at a very shallow angle. And what that does is it means it keeps the thermal energies under control while still giving us the necessary energy to turn into electric power for the thrusters. Now the reason why the solar arrays are so big is because we’re offpointing by so much, that in order to get a sufficient cross section of the solar array, the solar array needs to be big.”*

**10:11:09**

**[ESOC BepiColombo Mission Simulation GVs]**

GVs of the mission simulation exercise in the control room of ESOC (European Space Operations Centre) in Darmstadt, Germany]

**10:12:11**

**[Engineering Test Bench Room GVs]**

GVs of ETB room near the control centre. This contains an engineering model of BepiColombo.

**10:13:07**

**[ENDS]**