

STATUS OF PREPARATIONS FOR METOP B

The document describes the status of preparations for the launch of the EPS Metop-B satellite, foreseen for April 2012. Preparation activities include the satellite Assembly integration and test (AIT), Launch and early operations phase (LEOP) and launcher procurement, ground segment upgrades, system integration and Verification and validation (V&V) and operational preparations.

Status of preparations for Metop B

1 INTRODUCTION

This document describes the status of preparations for the launch of the EPS Metop-B satellite, foreseen for April 2012 from Baikonur with a Soyuz launcher. Preparation activities include the satellite AIT, LEOP and launcher procurement, ground segment upgrades, system integration and V&V and operational preparations.

2 SATELLITE

Satellite activities are managed by a joint ESA/EUMETSAT team, the Single Space Segment Team (SSST). At present, the activities related to Metop-B satellite preparation towards the launch are on time compared to the baseline schedule.

2.1 Service Module (SVM) and Payload Module (PLM) Activities

The Service Module (SVM) was equipped with its reworked Thrusters and went through the Thermal Vacuum test in the SIMMER chamber of Intespace. The test was globally successful and the major achievement was the verification of the Thrusters in cold conditions with the reworked Flow Control Valves (FCV). However some issues have been found during the test:

Intempestive de-suspension of wheels in case of a strong braking; this anomaly needs to be further investigated.

Two thermostats had a non nominal behaviour and may have to be changed (TBC).

The Payload Module (PLM) has been taken out of storage and the HRPT Amplifiers have been re-installed after their repair at TESAT and successfully tested. The full set of instruments has been mounted and the functional tests have been performed without any problem on the instruments. However an anomaly was detected on the Solid State Recorder (a memory component seems defective). In case of confirmed failure the SSR of Metop-C may have to be used.

The PLM is now being readied for transportation to Toulouse, where it will be coupled with the SVM. Following the coupling, satellite health checks will be performed and the satellite will be tested with the EUMETSAT and LEOP Control Centres to ensure that it can be correctly controlled in-orbit.

2.2 Instrument Activities

2.2.1 Microwave Humidity Sounder (MHS)

Following its refurbishment at Astrium UK, the MHS FM5 instrument has been integrated on the Metop-B Payload Module. The open work identified today is the refurbishment of some RF cables (an issue that was identified during FM4 investigations) which is planned to be performed in November 2011.

2.3 Infrared Atmospheric Sounding Interferometer (IASI)

The status of the IASI PFM-R instrument on Metop-B is nominal.

2.4 Global Ozone Monitoring Experiment (GOME-2)

The GOME-202 instrument underwent a main and supplemental calibration campaign at the end of 2010 and beginning of 2011. Some anomalies were identified concerning the unexpected higher variability of some critical measurements, e.g. for radiance and irradiance along with issues related to the calibration facility. These issues are most probably not related to a single flight model but are rather generic. The investigations now focus on the understanding of the various contributors to the overall error with the aim of characterising and minimising them.

A second issue identified during the calibration was the unexpected change in the instrument slit function, probably due to a tiny bending of optical components (i.e. 0.25 μm gratings curvature). The anomaly is considered as a “feature” of the GOME-2 instruments, and efforts now focus on identifying the potential worst case change of shape of the slit function. Nevertheless, the root cause of the change needs to be established and its stability under flight conditions verified.

On Metop-A, an observed degradation of the GOME-203 instrument throughput was investigated by a working group. However, the findings are not conclusive regarding the root cause of the observations, and the loss of throughput now has to be regarded as another characteristic of the GOME-2 instruments.

In summary, based on the current knowledge, it is not considered that these issues will impact the decision to launch GOME-202. Nevertheless, the potential level of deviation with regard to the primary mission goals and the impact on the products is still to be determined.

2.5 Advanced Scatterometer (ASCAT)

The status of the ASCAT PFM instrument on Metop-B is nominal.

2.6 Global Navigation Satellite System Receiver for Atmospheric Sounding (GRAS)

The status of the GRAS FM2 instrument on Metop-B is nominal.

2.7 NOAA Instruments (AVHRR, HIRS, AMSU-A, SEM)

The AVHRR (A307) has been re-calibrated and re-delivered to Metop industry. During the re-calibration some issues regarding the dynamic range and inter-channel co-registration were raised. The analysis of the engineering aspects led to the conclusion that the stability of the optics is not a concern and that the expected performance of the instrument following its launch would be within acceptable tolerances.

The re-calibrated SEM (FM5) is integrated on Metop-B PLM.

The status of the AMSU-A1, AMSU-A2 and HIRS instruments on Metop-B are nominal.

2.8 A-DCS and Search and Rescue

The status of the A-DCS and S&R instruments on Metop-B are nominal.

3 LAUNCHER SERVICE

The launch date for Metop-B is currently scheduled from the 9th April 2012, and will be limited to a one month slot in mid-September 2011. Launch vehicle procurement is expected to be completed in December 2011, with pre-shipment reviews completed in January 2012.

The final mission analysis for Metop-B is expected to be completed in November 2011.

4 LAUNCH AND EARLY OPERATIONS PHASE (LEOP) SERVICE

The LEOP service contract with ESOC was kicked off in March 2010.

The project involved an upgrade of ESOC's ground segment and porting of the Mission Control System (MCS) to new hardware, as well as a revised mission analysis to deal with the fact that Metop-B will be injected 16 kms below the nominal Metop orbit.

The Verification and Validation Readiness Review (VVR) collocation meeting took place on the 18th June. The review was successful, with one area of concern which is the readiness of the ported MCS in time for SSVT testing in October. A number of Software Problem Reports were produced following the VVR, and these have to be closed out before the SSVT.

Various verification and validation activities are on-going:

- The Portable Satellite Simulator (PSS) was successfully connected to ESOC MCS from CNES NMC, with a green light for shipment to Kerguelen;
- NDIU testing is OK;
- RF compatibility tests with Metop-A have been successfully performed;
- Connectivity tests between ESOC and EUM are on-going;
- Satellite database delivery made and ingested.

A number of iterations have taken place with respect to mission analysis and particularly the handover conditions, taking into account SIOV and EUM operational constraints. The drift phase of Metop-B to its operational position is now targeted to last between 5 and 14 days.

5 GROUND SEGMENT

The existing EPS Ground Segment, which supports ongoing Metop-A operations, was upgraded to handle Metop-A and Metop-B, in parallel with a NOAA satellite. At the same time, the ground segment was also upgraded to handle the addition of the Antarctic Data Acquisition.

6 SYSTEM ACTIVITIES

6.1 Meteorological Product Evolutions

Since the launch of Metop-A, the Secretariat is working on the development of EPS Day-2 products. A number of products have gone operational (soil moisture, polar cap winds, and IASI L2 CO), whereas two others are being developed or trialled:

Global Normalised Differential Vegetation Index is in trial dissemination since September 2009;

The GRAS Product Processing Facility (PPF) has been further developed to allow open loop / wave optics processing of the occultation data, necessary to reach deeper into the troposphere. A prototype was developed, with test data made available for application testing by partners in September 2010. Long term validation testing will start in September 2011, following core user feedback on data format and content. An operational release is foreseen after the commissioning of Metop-B.

6.2 EPS System Preparation Activities for Metop-B

The System Integration Verification and Validation Readiness Review (SIVVRR) was held successfully in November 2010, allowing the formal start of system verification and operational validation activities on the validation ground segment GS-2.

Testing proceeded according to plan, with some operational restrictions imposed with respect to e.g. use of the CDA antennas. A number of anomalies were found, although only one major anomaly is open and this should be fixed in September 2011. The results of this testing are currently being formally evaluated by the System Integration Verification and Validation Review (SIVVR).

In parallel to the Metop-B work, the ground segment was also upgraded to handle the addition of the Antarctic Data Acquisition. Metop-B system testing has confirmed that the system will be able to handle one prime satellite operating with ADA, in parallel with a second satellite operating nominally with Svalbard dumps only. Until Metop-B is declared as the prime operational satellite, Metop-A will operate with ADA and Metop-B will only dump over Svalbard.

There are a number of test slots foreseen on the Validation ground segment (GS-2) between the SIVVR and the Launch and Operations Readiness Review (LORR) in December 2011. These slots will be used to validate complex Metop-B contingency scenarios and allow ground segment regression testing.

To ensure that EUMETSAT's and ESOC's ground segments can control the actual Metop-B flight model, a Satellite System Validation Test (SSVT) between Metop-B in Toulouse, and the LEOP and EUM Satellite Control Centres, will take place in October 2011.

The Satellite In-Orbit Verification (SIOV) implementation plans and corresponding procedures are nearing completion in coordination with satellite partners. The Operations Team rehearsals are planned for Jan – March 2012. The Calibration / Validation (Cal / Val) plans for all Metop-B instruments have been updated (based on the Metop-A plans), and will also be reviewed as part of the SIVVR in September 2011.

6.3 Main System Milestones in the Launch to Metop-B

The main system milestones in the launch of the Metop-B satellite are as follows:

System Milestone	Date
Ground Segment Design and Implementation Review	July 2010 (Done)
System Integration, Validation and Verification Readiness Review	November 2010 (Done)
System Integration, Validation and Verification Review	September 2011 (On-going)
Launch and Operations Readiness Review	December 2011
Launch of Metop-B	April-June 2012 (Nominally 2 nd April)

7 CONCLUSION

Preparation activities for the launch of the EPS Metop-B satellite in April 2012 are proceeding as planned. Although “normal” development and AIT problems have been found, none of these are anticipated today to impact the launch date or preparations.