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EPS PROGRAMME AND DEVELOPMENT STATUS

This document presents the status of the EPS programme as of end of August 2000.

EPS PROGRAMME AND DEVELOPMENT STATUS

1 PROGRAMME SCOPE AND COOPERATIONS

The EUMETSAT Polar System (EPS) is the European contribution to the Initial Joint Polar System (IJPS) established with NOAA, and the first European contribution to the follow-up Joint Polar System (JPS) expected to be formed with the US "Converged" NPOESS system. The IJPS and JPS will provide global meteorological and climate data from a series of European and American sun-synchronous polar orbiting satellites, replacing the current NOAA K-L-M series.

EPS is an end-to-end system dedicated to the acquisition, processing and dissemination of observational data from the morning orbit. It provides also capabilities for cross-support and data exchange with the NOAA POES system which covers the afternoon orbit service. The EPS system is composed of a space segment, based on three successive Meteorological Operational (Metop) satellites, and a ground segment. The application component of the ground segment that will generate a variety of level-2 products, is based on the combination of central facilities and a distributed network of satellite applications facilities developed and hosted by several EUMETSAT Member States.

The first Metop satellite (Metop-1) is being developed in the framework of the Metop-1 Programme of the European Space Agency (ESA), in cooperation with EUMETSAT. The development and procurement of the three Metop satellites is under the responsibility of a joint ESA-EUMETSAT Single Space Segment Team. In addition, EUMETSAT is directly responsible for the delivery of the MHS, IASI, ARGOS-DCS, AVHRR/3, HIRS/4, AMSU-A and SEM payloads. MHS is directly procured from industry, while the IASI advanced infrared sounder and ARGOS-DCS are procured through Centre National d'Etudes Spatiales (CNES). The other instruments are contributed by NOAA, under the IJPS co-operation agreement, which covers also the establishment and operation of the IJPS and provision of MHS instruments to be flown on NOAA N and N'.

The EUMETSAT EPS Programme is the legal framework for the development and implementation of the EPS System. Its financial envelope covers contributions to the development of the Metop-1 satellite and the IASI-1 instrument, co-funded by ESA and CNES, respectively. It also covers other major procurements including those of the MHS sounders to be flown on the NOAA-N, N' and Metop satellites, two recurring Metop satellites and IASI instruments, three launch services and the EPS Ground Segment. Last but not least, it covers operation of the EPS System over 14 years.

EUMETSAT has established Cooperation Agreements with ESA, for the development and procurement of the three Metop satellites; with NOAA, for the exchange of instruments, data and operation cross-support; and with the CNES, for the provision of IASI and ARGOS-DCS payloads.

2 PROGRAMME STATUS

The ESA Metop-1 Programme and the EUMETSAT EPS Programme, which form the basis for the development and implementation and operations of the EPS System as part of the IJPS, were approved in 1998 and 1999, respectively. The Metop-1 industrial activities started in 1998 under an Authorisation to Proceed, with the formal signature of the Phase C/D Contract being completed in December 1999.

The Cooperation Agreement between EUMETSAT and ESA was also formally signed in December 1999. The Cooperation Agreements between EUMETSAT and CNES regarding IASI and ARGOS have been approved by the EUMETSAT Council and are expected to be formally signed later this year.

EUMETSAT and NOAA have reached in principle agreement regarding the provision of the AVHRR, AMSU-A, SEM and S&R payloads for Metop-3, considering accommodation and development constraints. Metop-3 is expected to carry the same instruments as both Metop-1 and 2 with the exception of the HIRS instrument. HIRS will no longer be needed after the long loop assessment of IASI. Formalisation of this in principle agreement is expected to occur during 2000. In parallel NOAA and EUMETSAT are discussing the implementation of data denial. The objective is to meet the US DoD requirements within the EPS design and development constraints.

EUMETSAT has started discussions with Starsem (a joint European – Russian company) for the launch of the Metop satellites by Soyuz launchers from Baikonour in Kazakstan. Soyuz has an enviable reliability record stretching back to the 1960's and represents a cost-effective option. Though discussions are still at an early stage, it is hoped that a contract will be signed with Starsem in the first half of 2001.

3 EPS DEVELOPMENT STATUS

3.1 Space Segment

The Metop satellite is a 4.5-ton class satellite carrying a payload of about 900 kg. Its orbit is sun-synchronous with an inclination of 98.7^{o} and an Equator local crossing time at 09.30 hrs. It communicates with ground in S, L and X bands, for command and control, local (direct broadcast) dissemination and global acquisition.

The satellite design is based on the heritage of the SPOT-5 and ENVISAT programmes. The payload consists of a suite of 10 instruments, including a visible and IR imager (AVHRR/3), microwave (MHS, AMSU-A and GRAS), IR (HIRS and IASI) and UV (GOME-2) sounders, a C-band dual swath scatterometer (ASCAT), data collection (ARGOS) and S&R transponders and the Space Environment Monitor. The satellite is also equipped with a solid state recorder (SSR) enabling to dump all payload data at full resolution, including AVHRR/3 data.

Metop is equipped with two direct broadcast facilities: Low Resolution Picture Transmission (LRPT) at 137 MHz and High Resolution Picture Transmission (HRPT) at approximately 1700 MHz.

The LRPT system is designed to replace the APT system on the existing series of NOAA satellites and contains 3 channels of compressed AVHRR imagery at 1 km resolution; full resolution HIRS, AMSU-A and MHS sounding data; SEM instrument data; and associated satellite housekeeping, positioning and administrative data.

The HRPT system will be an upgrade of the existing NOAA HRPT system to accommodate an improved data bandwidth, incorporating complete IASI, GOME-2, ASCAT, GRAS and ARGOS-DCS data in addition to the LRPT data sets and full resolution AVHRR data instead of the compressed imagery set on LRPT.

Both the LRPT and HRPT data streams include the capability of selectively encrypting instrument data (based on virtual channels).

The Metop EM programme is now well advanced with successful integration of the AVHRR, HIRS, AMSU-A, SEM, A-DCS and S&R payloads completed. Integration of the other instruments is currently on-going and the integrated EM payload module environmental test campaign is due to start at the end of the year. In parallel, activities on the satellite structural model are progressing and the formal structural test campaign is expected to start in March / April 2001.

Three flight models of the MHS instrument (a follow-on to the AMSU-B instrument) have now completed their respective acceptance reviews. Two models have been delivered to the NOAA spacecraft contractor, Lockheed Martin, and the PFM instrument is currently mounted on the NOAA-N spacecraft. The FM2 and FM3 instruments remain in their storage containers waiting for integration on NOAA-N' and Metop-1, respectively. EUMETSAT has recently concluded and signed a contract with the MHS instrument contractor, Astrium Ltd, for the provision of a fifth MHS flight model (plus a set of spares) for Metop-3.

The IASI instrument is considered to be a critical instrument for the EPS Programme and expected to provide a significant advance in the capability of atmospheric temperature sounding. Development of this instrument is progressing, with over half of the instrument sub-systems having successfully completed their CDRs.

3.2 Ground Segment

The EPS Overall Ground Segment (OGS) is composed of the Core Ground Segment (CGS), which performs the acquisition, control, pre-processing and dissemination functions, and additional facilities, including the U-MARF multi-mission archiving facility, the network of Satellite Applications Facilities (SAFs) and external support facilities, e.g. for external calibration / validation. The CGS will be procured as an end-to-end system from a Prime Contractor leading a European industrial consortium.

The ITT for the CGS was released at the end of August 1999, and EUMETSAT is currently in the final stages of the competitive selection process for the Prime Contractor and its consortium. Kick-off the industrial activities of the CGS Contract is expected later in the year.

The location of the northern latitude Command and Data Acquisition (CDA) station has been selected at Svalbard on the Spitzpergen archipelago, north of mainland Norway. EUMETSAT signed a contract for the provision of the CDA site facilities in July 2000 with the Tromsø Satellite Station of Norway, which operates the satellite communication facility on the island.

Being located at 78°N, Svalbard has a major geographical advantage of having visibility of all Metop satellite over passes (14 per day), therefore obviating the need for an operational 'blind orbit support' to be provided from another station. Two dedicated EPS antennas will be located at Svalbard, allowing to operate two Metop satellites in parallel and also to provide a 'blind orbit support' for the NOAA POES satellites. It is planned to start construction work for the antenna foundations in late spring 2001, when weather conditions permit.

3.3 System

Part 2 of the EPS System Requirements Review was successfully held in January/ February 2000, validating the overall System architecture and development logic. The successful review allowed the detailed System design and definition activities to commence. Particular emphasis is now being placed on the overall System Verification and Validation plan, together with the completion of all detailed System-level analyses.

A wrap-up System PDR is planned in the second half of 2001, following the CGS PDR. It is then planned to hold the System CDR in 2002, following both the Metop satellite and CGS CDRs.