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STATUS OF MSG-2 AND PREPARATION OF MSG-3, MSG-4

This paper reports on the current MSG programme development status following the entry into service of MSG-1 in January 2004. CGMS members are invited to take note.

STATUS OF MSG-2 AND PREPARATIONS FOR MSG-3/4

1 INTRODUCTION

An overview of the mission objectives and basic capabilities of the MSG system was presented in previous paper (Reference (1): CGMS-XXV EUM-WP-04). The development status was subsequently reported in the subsequent updates of this paper. As result of completion of the MSG-1 system commissioning tests in 2003, with the System Commissioning Results Review and the Routine Operations Readiness Review completed in December 2003, the MSG-1 system was declared operational and MSG-1 was renamed Meteosat-8. Its operational status is addressed under EUM-WP-02. This paper addresses the status of the remaining development work part of MSG Programme, namely the status of preparation of MSG-2, MSG-3, MSG-4 and the transition plans for the old to new generation of Meteosat satellite after the successful commissioning of MSG-2.

It is important to note that in June 2004 at the 55th EUMETSAT Council, following the lifting of the last ad referendum vote, the Resolution on the MSG Programme Extension entered into force. It includes the additional MSG-4 satellite, the GERB-4 Instrument, and the extension of the MSG operational service until 2018.

2. MSG-2 ACTIVITIES

2.1 Overall

The launch of MSG-2 has been re-planned in various steps due to the non-availability of the launcher. February 2005 was the target launch date for which the satellite and all other MSG-2 Programme elements started the preparation for launch in spring 2004. At the time the MSG-2 System Readiness Review started in October 2004, the launch date was postponed to June 2005. The delay of the launch was essentially driven by the return to flight of Ariane 5 in the ECA version, which eventually took place successfully in February 2005. The launcher for MSG-2 is an Ariane 5 GS version: despite this version was considered less affected by the on going reviews and modifications of the Ariane 5 ECA, as a matter of fact it suffered similar delays. The first flight of the Ariane 5 GS took place in August 2005. The MSG-2 launch is now scheduled for December 2005.

After the configuration for the flight on board the Ariane 5 GS was proposed in December 2004, a number of additional and complex analyses had to be undertaken for confirming the suitability of the proposed launch configuration at satellite level. This was especially in view of the fact that the configuration of the shock attenuation devices successfully used for the flight of MSG-1 could not be implemented for MSG-2 due to accommodation constraints inside the Ariane 5 GS. The final preparation of the MSG-2 launch campaign was initiated after ESA provided in early June 2005 the preliminary conclusion of the Shock Damage Risk Assessment (SDRA) activities, with the recommendation to launch. At that point the earliest launch date was end of August 2005. The satellite was shipped to Kourou on 21 June 2005 and the MSG-2 launch campaign commenced.

In July 2005, Arianespace encountered additional problems in the preparation of an Ariane 5 GS vehicle to be launched before MSG-2. Metallic particles found inside the propellant feed

lines of the upper stage (EPS) of the launch vehicle caused the need to disassemble and replace the EPS stage of this launcher. A new planning associated with the residual work to be done on the Ariane 5 GS for the configuration flying for the MSG-2 flight, with specific structural reinforcements to be introduced into the upper stage of the launcher led to postpone the MSG-2 launch date to December 2005. This is the current plan at the time of releasing this document.

In line with the contingency plan already established, EUMETSAT decided, in agreement with ESA, to break the launch campaign by mid July 2005 and to configure the MSG-2 satellite for storage in Kourou until the launch campaign is restarted towards the end of October 2005.

2.2 MSG-2 satellite

EUMETSAT reviewed with ESA the satellite readiness status at the end of March 2005 and concluded that the only remaining issue for the MSG-2 readiness for launch was the shock compatibility with the environment provided by the launcher. The subsequent positive conclusion of this complex task has been highlighted in section 2.1 above.

A summary of the progress achieved with regard to the open issues identified at the time of the Satellite Readiness for Shipment Review, which concluded at the end of October 2004, is reported in the text here below:

- Disconnect of Non Essential Load (DNEL), which occurred on board Meteosat-8 early in October and caused the temporary disconnection of the payloads on board. The DNEL experienced on board Meteosat-8 is linked to a false detection coming from a Single Event Transient affecting a LM 139 circuit, which is implemented in the main bus under voltage detection circuit. The conclusion of the investigations, supported by the results of specific radiation tests performed on this circuit in a representative configuration, is to keep the detection circuit unchanged on MSG-2, and active on board Meteosat-8.
- Gain degradation of the Intermediate Frequency Processor (IFP) units observed in June 2004 during MSG-2 testing. The IFP degradation is due to humidity absorption and oxidation of one internal filter substrate, which tends to saturate on ground and then to partially recover once in orbit. Measurements were performed before and at various points during the launch campaign. Results indicate that even under worst case conditions sufficient margins exist for a launch in 2005.
- Anomaly experienced on board Meteosat-8 around mid of June 2004 and affecting one of the Gauging Sensor Units (GSU). The output of GSU-3 was showing no fuel level information and subsequently no reference signal. During an attempt as per ESA/Alcatel request to switch on the GSUs in April 2005 on board Meteosat-8 for investigating the anomaly, an anomaly of GSU-4 was also detected, with high similarity with what had been observed with GSU-3. Thorough investigations and a number of tests have allowed an understanding of the failure mechanism, which is attributed to a chemical reaction between the Mono Methyl Hydrazine (MMH) and materials used in the GSU, finally resulting in a low resistance and a short circuit. Test results confirm that the anomaly presents no safety

issue on board the satellites. Based on that, a “use as is” conclusion for MSG-2 has been agreed. A way forward for MSG-3 and -4 is being analysed, targeting possible improvements without affecting the achieved qualification of these units.

- Launcher Shock Compatibility Status.
The final conclusions of the Shock Damage Risk Assessment Task Force were made available by early July, as addressed in Section 2.1.

The MSG-2 satellite arrived safely at Cayenne airport on 21 June 2005. During the first part of the MSG-2 launch campaign up to 8 July 2005, when the satellite entered into short-term storage, the testing of the satellite system, SEVIRI and GERB was successfully completed.

2.3 Launch Service for MSG-2

The evolution of the launch planning is described in Section 2.1 above. The residual schedule uncertainties are considered linked to the production activities of the launcher and to the launches to take place before MSG-2. The baseline configuration remains an Ariane 5 GS vehicle, with MSG-2 as lower passenger and Insat 4A, a telecommunication satellite, as co-passenger.

The RAMF (Final Mission Analysis Review), took place beginning of June. Its conclusion at the time of preparing this document is still pending upon the delivery of the final Coupled Load Analyses. Initial results presented in early September did not identify any issues with respect to the satellite qualification.

2.4 Operations Preparations, Ground Segment for MSG-2 and overall System Readiness

The overall system readiness of the MSG-2 System, involving satellite, launch service, Ground Segment and Operations preparations, was assessed at the System Readiness Review, which was successfully concluded in early November 2004. It included outputs of the Satellite Readiness for Shipment Review and of the Launch and Early Operations Phase (LEOP) Readiness Review.

The operational system validation work was successfully completed according to plan, and the Ground Segment is ready for the two MSG satellites in orbit configuration

A first part of Commissioning rehearsals started by end June 2005. The test cases included Satellite hand-over from ESOC, platform tests, payload activation, Radio Frequency and dissemination tests. The rehearsals progressed well with only minor, non-blocking issues. It served also for the training of the team including the key personnel backups. Some delta rehearsals are planned in November, focussing on the changes implemented since the previous rehearsals.

Training is progressing as planned, extending now until about end October. Simulation campaigns are executed in order to refresh the team on the approach to satellite contingency operations. A system configuration cool-down is planned around one month before the launch.

3 MSG-3 ACTIVITIES

3.1 MSG-3 Satellite

The MSG-3 satellite integration and system test phase is completed. The satellite has been kept in storage in the clean room in an intermediate storage configuration. After the return from the MSG-2 Launch Campaign, MSG-3 will be placed in its final long-term storage.

4 MSG-4 ACTIVITIES

4.1 MSG-4 Satellite

After the full approval of the MSG Programme Extension with MSG-4 was reached, the Secretariat could sign the MSG-4 Agreement with ESA in November 2004. The Rider for the provision and operations with GERB-4 was also signed with RAL in the same timeframe. Activities at Industry level for the satellite and for the GERB-4 Instrument could be kicked off already in 2003, after the 52nd Council meeting, with dedicated Preliminary Authorisations to proceed. By mid 2005, the satellite platform subsystems have all been delivered and are integrated. Some schedule delay was experienced in the Mission Communication Payload due to problems in the Central Part Procurement, which has been in the meantime largely recovered, with a delivery planned for end of 2005. SEVIRI will also be delivered to the satellite Prime in December 2005.

The work was interrupted by the preparation for the MSG-2 launch campaign and its execution in Kourou. It will be resumed after the return of the Integration and testing team from the MSG-2 launch campaign.

The satellite is planned to be ready for entry into storage by mid 2007.

4.2 GERB-4 instrument

Apart from the progress in manufacturing the GERB-4 subsystems, work continued in RAL on resolving various issues encountered during the GERB-4 production.

The telescope mirrors, which initially showed surface pitting and therefore the risk of stray light effects, were repolished and subsequently found acceptable for silver coating. Past issues on the descan mirror mechanism and the detector blackening process have been resolved satisfactorily.

5. TRANSITION OF SERVICES

Following the successful launch and commissioning of MSG-2, to be renamed Meteosat-9 before the start of routine operations, it is planned to end the MTP/MSG parallel operations phase.

MSG-2 (Meteosat-9) is planned to become the prime operational spacecraft at

0°longitude, with Meteosat-8 the in-orbit spare at 3.4°W (where it is currently located). The in-orbit spare spacecraft will be in a hot-standby configuration, capable of being activated in a matter of hours.

MSG-2 (Meteosat-9) will provide all the SEVIRI-based operational services, the DCP acquisition service, and the LRIT direct dissemination service. Meteosat-8 will provide the in-orbit backup for the SEVIRI-based services, Meteosat-6 will provide the in-orbit backup for the DCP acquisition service. There is no in-orbit backup foreseen for the LRIT direct dissemination service. All operational services will be disseminated via EUMETCast, additionally LRIT direct dissemination will be available from Meteosat-9 using the original LRIT dissemination scheme as the baseline.

The transition period with parallel operations of Meteosat-7 and Meteosat-8 will last until about mid 2006. By that time also MSG-2 commissioning will be completed, according to the current schedule.