

STATUS OF THE METEOSAT SYSTEM

This document reports on the status of the Meteosat satellite system and related Services.

CGMS Members are invited to take note.

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1 INTRODUCTION

This document provides a summary of more recent operations of the Meteosat satellites together with details of EUMETSAT's support to Indian Ocean Data Coverage. Detailed information about routine satellite operations are not included in this document since they are provided in the EUMETSAT Quarterly Operations Reports which are regularly distributed to all CGMS Members. Hence, only a summary of events and items of interest occurring in more recent months are presented in this document.

EUMETSAT is currently operating three satellites, Meteosat-5, 6 and 7. At the time of writing (October 2002), the 0° Service is provided by Meteosat-7, with Meteosat-6 as an in-orbit spare at around 10° East (MSG-1 is now located at around 10° W). Meteosat-5 is located over the Indian Ocean at 63°E and provides the Indian Ocean Data Coverage (IODC) Service.

Details of Meteosat Operations can be found at the EUMETSAT WEB site:
<http://www.eumetsat.de>

2 SYSTEM STATUS

This paper summarises the status of Meteosat operations in the period Mar 2002 – Aug 2002. The main events occurring in that period were:

<u>Date</u>	<u>Event</u>
07 - Apr	Meteosat-6 Eclipse Season Ends.
09	Meteosat-7 E-W Station-keeping manoeuvre.
11	Meteosat-7 Eclipse Season Ends.
23	Meteosat-5 E-W Station-keeping manoeuvre.
30	Meteosat-5 Spin-up manoeuvre.
12 - May	Meteosat-6 & 7 Moon Eclipse.
11 - Jun	Meteosat-6 Attitude manoeuvre.
17	Meteosat-7 Inclination manoeuvre.
18	Meteosat-5 E-W Station-keeping manoeuvre.
08 - Jul	Meteosat-6 E-W Station-keeping manoeuvre.
10	Meteosat-5 Moon Eclipse.
23	Meteosat-7 E-W Station-keeping manoeuvre.
28	Meteosat-5, 6 & 7 Battery Reconditioning Starts.

3 SERVICE PERFORMANCE

The following tables show the overall performance of the operational services in the period Mar 2002 – Aug 2002. The figures are extracted from the Operations Monthly and Quarterly Reports. All the performance figures are expressed in percentages.

0° Service Performance

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Image Acquisition	98.85	98.23	99.87	99.65	99.53	99.33
Dissemination (Wfx+HR)	99.41	99.96	99.97	99.85	99.72	99.70
FSDR	99.38	99.58	99.57	100.00	100.00	99.87
DCP	*	*	98.70	99.88	98.73	99.92
MPEF distribution	98.47	99.84	100.00	99.48	98.53	99.59

* Statistics not available due to S/W H/W problems

63° Service Performance

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Image Acquisition	98.48	98.26	99.93	99.31	99.39	99.38
Dissemination (HR)	99.65	99.80	99.96	99.96	99.65	99.56
MPEF distribution	98.03	100.00	99.98	99.31	98.36	100.00

Rapid Scanning Service Performance

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Image Acquisition	95.31	99.76	92.78	90.74	98.01	92.90

The poorer performance in May, June and August was caused mainly by significant outages of the communications system to the PGS at Fucino. The (non) availability of the Terrestrial Link contributed to most of the RSS outages.

4 RF INTERFERENCE

The current level of RF interference observed on the dissemination transponders is very low, with very few High Resolution test format bit errors being reported by the User Station Display Facility in Darmstadt.

For the DCP channels, some interference was observed on Regional channels 13, 16, 17, 18 and 27.

5 ARCHIVE & RETRIEVAL SERVICE

5.1 MARF Availability

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Ingestion Availability	100.00	100.00	99.99	99.99	100.00	100.00
Product Availability	99.66	99.98	96.06	97.03	97.79	98.92
Retrieval Availability	100.00	95.00	91.13	100.00	100.00	100.00

5.2 MARF Transcription Status

These figures are the percentages of images that have been transcribed:

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Image transcribed files	87.73	88.36	88.99	89.39	89.58	94.13

Note: The transcription status of products has reached 100% already in the last reporting period. The monthly figures will therefore be omitted in this and future reports.

5.2.1 MARF Customer Enquiries

These figures are actual numbers of customers and numbers of image prints:

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
External Customers	20	27	30	19	25	27
Internal Customers	14	6	8	11	8	12
Image Prints	5	2	9	6	25	21

5.2.2 User Enquiries

These figures are the actual number of enquiries:

	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02
Member state enquiries	89	89	91	59	85	84
Non-member state enquiries	35	49	47	49	47	35

6 SYSTEM STATUS

6.1 Space Segment

6.1.1. Meteosat-5

Meteosat-5 has been used in support of the Indian Ocean Data Coverage service since the formal start of EUMETSAT support to the INDOEX experiment on 1 July 1998. No DCP or MDD services have been provided via Meteosat-5.

There was a gain change performed on 4th of February during the reporting period. The new gain settings are: IR1 Gain 5, WV2 Gain 7, VIS1 & 2 Gain 5.

The orbital inclination of the satellite at the end of this reporting period was 5.19° and increasing. The remaining hydrazine fuel on board is estimated to be 5.23 kg, of which a 4kg reserve will be required to de-orbit the spacecraft at the end of its useful life. The on-board fuel reserve limit of Meteosat-5 will be re-evaluated towards the end of 2004.

Orbit			Attitude	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
5.2381	63.1252	-0.0226	339.4400	84.3580

Meteosat-5 Orbital Parameters for 1st September 2002

The spacecraft configuration status has remained stable since the failure of Power Amplifier 3 in July 1998.

6.1.2. Meteosat-6

Meteosat-6 has been used in support of Rapid Scanning Service, since the formal start on the 18th of September 2001.

There were no gain changes performed during this reporting period. Gain settings remain at: IR1 Gain 4, WV2 Gain 6, VIS1 & 2 Gain 5.

The inclination of the satellite at the end of this reporting period was 2.21° and increasing. The remaining hydrazine fuel on board is estimated to be 8.62 kg, of which a 4kg reserve will be required to de-orbit the spacecraft at the end of its useful life. The on-board fuel reserve limit of Meteosat-6 will be re-assessed during 2005.

Orbit			Attitude	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
2.2675	-9.0404	-0.0059	351.2070	87.4980

Meteosat-6 Orbital Parameters for 1st September 2002

The spacecraft configuration status remains stable. By 14 October 2002, Meteosat-6 was relocated at 10°E, following the launch of MSG-1, with a drift rate of 0.95°/day.

6.1.3 Meteosat-7

During the reporting period, Meteosat-7 has been used to provide the nominal 0° operational service.

Black body calibrations are performed once per day on slot 24 outside eclipse season. Up to 4 black body calibrations are performed during eclipse season.

The routine reception of DCP messages was transferred to Meteosat-6 during Meteosat-7 eclipses when Power Amplifier 2 was de-configured. This was due to the depth of the eclipse and the available battery capacity.

There was a gain change performed on 19th of June during the reporting period. The new gain settings are: IR2 Gain 7, WV1 Gain 10, VIS1 & 2 Gain 6.

The inclination of the satellite at the end of this reporting period was 0.31° and decreasing. The remaining hydrazine fuel on board is estimated to be 16.13 kg, of which a 4kg reserve will be needed to re-orbit the spacecraft at the end of its useful life. It is estimated that the fuel available is enough to allow nominal orbit and attitude control until the year 2005.

Orbit			Attitude	
Inclination	Longitude	E/W Drift	Right Ascension	Declination
0.2435	-0.0571	-0.0129	291.8660	89.9310

Meteosat-7 Orbital Parameters for 1st September 2002

The spacecraft configuration status remains stable.

6.2 Ground Segment

In general, the availability of all the ground segment facilities has been good during the reporting period.

The MDD uplink in Toulouse suffered from a long outage at the beginning of the year due to two hardware failures at the same time. The problem was solved by on-site maintenance.

One of the Land Based Transponders (LBT) in Kourou suffered from two successive failures in the HPA system. LBT2 will be out of service until its HPAs are repaired, the ranging system is now configured to use LBT1 for Meteosat-6 and Meteosat-7 4-way ranging.

Routine operations within the Primary Ground Station in Fucino Italy, have typically included the weekly activation of the Back-up Ground Station in Cheia Romania, and the weekly activation of the Back-up Spacecraft Control Centre in Fucino. All other operations, including the Rapid Scan support with Meteosat-6, and Eclipses with Meteosat-5, 6 and 7 respectively were carried out as scheduled without significant problems.

6.3 MARF

Several upgrades to the MARF archive management system, a product called Veritas NetBackup, were implemented during the reporting period primarily to bring the performance of the archive sub-system into line with expectations. These upgrades were seen to be required

when the system performance was degraded under very heavy loading. This can be illustrated by the archiving of live image data from Meteosat-5, 6 and & 7 (raw and rectified), of rectified data from

Meteosat-2, being a 'by-product' of ordering image data for the MPEF reprocessing, and, in parallel, of raw data from the ongoing transcription of ADC and X-ADC data (see also below).

There were two small exceptions to the usual 100% archiving performance of the MARF during this period. Firstly, development work on the Validation (V-)MARF impacted the acceptance and forwarding to the Operational (O-)MARF of Rapid Scan data from Meteosat-6. This was a consequence of the known risk of using redundant and development equipment to support this operational service and resulted in just two products not being archived. Secondly, a scheduled maintenance activity could not be finished in the time window during which incoming products may be buffered by the sending facility and as a result six products were lost. These losses were the first to be recorded in the last three years of MARF operations.

The number of external MARF orders remained relatively stable through the period but the volume of data dispatched still shows an upward trend. Several customers are submitting multiple orders of the maximum permitted size and there were several requests for the MARF to supply image data to user station operators who wished to complement their local archives with image slots missing due to local problems. In order to consider an efficient solution for the latter type of enquiry an experimental arrangement has been set up in which data are placed onto a file server when they are 24-hours old (i.e. when they qualify as archived data under the terms of the EUMETSAT data policy) and remain on the server for a period of a few days. Users may then retrieve image data from the server using FTP according to their needs. So far only two test users have been informed of this facility but, if it proves popular and efficient, then it may form the basis of a more permanent operational implementation.

The transcription of all meteorological products has been completed for some months and, during July, the transcription of image data from the Atlantic Data Coverage (ADC) period was also completed. The transcription of data from the so-called Extended Atlantic Data Coverage (XADC) is now also well under way. The only remaining transcription will then be the images from Meteosat-1 and the earliest years of Meteosat-2 which still present frustrating obstacles to successful processing.

6.4 MPEF

In July 2002 the product extraction times were changed to be in line with the main synoptic hours. Simultaneously the extraction frequency of Cloud Motion Winds with High Resolution Visible data was increased to every 90 min.

6.4.1 Products from Rapid Scan Imagery

The derivation of meteorological products from Meteosat-6 Rapid Scan data became operational in July 2002. The service is performed on a best effort basis and is dependent on the availability of the Rapid Scan data. Currently the following products are derived: Atmospheric Motion Vectors, Clear Sky Radiances and the Climate Data Set. Further information including availability of the products can be found on the EUMETSAT WEB-pages.

6.4.2 Reprocessing

As a response to user requests a Reprocessing MPEF (RMPEF) has been developed in order to produce products from historical data. In support of the ECMWF ERA-40 project Meteosat 2 data from May 1982 until August 1988 and Meteosat-3 data from August 1988 until end of 1990 will be processed. The reprocessing of Meteosat-2 has been completed and the completion of the Meteosat-3 data is foreseen for January 2003. Evaluation of the new data from the early years shows significantly improved quality and coverage compared to the original products derived at the Meteorological Information Extraction Centre at ESOC (European Space Operations Centre).

In addition to the products derived for ERA-40 a Meteosat Surface Albedo (MSA) product has been developed and implemented into the RMPEF. The derivation of MSA with Meteosat-7 data for the 0° mission for the year 2001 will be completed by the end of 2002 and for the year 2000 by the end of January 2003. During the 1st Quarter of 2003 data for 1997 until 2000 for the 0° mission will be processed. Additionally, Meteosat-5 data for 2001 over the Indian Ocean will be processed during 1st Quarter of 2003.

7 PROJECTS

7.1 Rapid Scanning Status

The generation of Rapid Scanning MPEF products started the final validation phase using ECMWF as the only target for deliveries.

A program developed to overlay coastlines onto VIS and IR channel rapid scan JPEG or GIF files has been made available to the users on the EUMETSAT web site.

Following testing of longer scan patterns (7, 14 and 25 days) a new baseline of 3.5 weeks has been established.

The dissemination of MPEF products is now performed routinely as part of the RSS mission. The new Internet connection was installed and connected to the operations infrastructure, at the same time as it supports the whole EUMETSAT Internet traffic (due to the bankruptcy of the EUMETSAT Internet provider), the redundant internet line is to be installed in July 2002. A big performance boost was noticed when moving to the new Internet line.

Major outages of the Rapid Scanning Service can be foreseen before the end of this year for two reasons – the launch of MSG-1 and the associated shift in longitude of Meteosat-6, and the re-engineering of the MTP Control Centre to accommodate the EPS Control Centre.

For the shift in Meteosat-6 longitude, it is planned to locate Meteosat-6 at 10°E after the launch of MSG-1. The Meteosat-6 longitude drift will be started shortly after the launch of MSG-1, and will take place at a drift rate of 0.95°/day. The RSS will be continued on a best effort basis during a major part of the drift. However, this mode cannot be tested in advance and the performance particularly in the area of geometric accuracy might be degraded. In the vicinity of the MET-7 position and for the drift-start/stop manoeuvres the RSS has to be stopped. This will lead to following planned RSS outages: a 3-day period starting 23rd of September, a 7-day period starting the 1st of October, and one day on the 15th of October.

For the MTP Control Centre re-engineering, a period is planned during the establishment of the new Core Facility configuration when the Validation Core Facility configuration currently used to support the RSS will not be available. This period is currently planned to last for 2 weeks, starting the 4th of November. To prepare these activities an additional three-day interruption of RSS is necessary the week before, starting the 28th of October.

7.2 EUMETSAT ATOVS Retransmission Status (EARS)

Implementation of an EARS Early Operations Phase is progressing well and an initial Service is expected to commence in November 2002. More detailed information on the implementation of EARS can be found in document **CGMS-XXX-EUM-WP-20**.

7.3 Regional Meteorological Data Communications Network Project

The implementation of the RMDCN (Regional Meteorological Data Communications Network Project) at EUMETSAT was completed for the Meteosat system and became operational in June 2002. The use of RMDCN for EPS is already foreseen whereas for MSG the RMDCN connectivity will be established after the end of MSG commissioning in 2003.