CGMS-XXX
WMO WP-18
Prepared by WMO
Agenda item: D.3
Plenary

EQUATOR CROSSING TIMES

(Submitted by WMO)

Summary and purpose of document

To inform CGMS Members of the WMO activities related to equator crossing times.

ACTION PROPOSED

(1) CGMS Members to note the WMO activities related to equator crossing times and comment as appropriate;

(2) CGMS Satellite Operators to update Table 1 for polar-orbiting satellite equator crossing times on an annual basis.

DISCUSSION

Background

1. CGMS-XXIX (October 2001) discussed equator crossing times as a result of a CGMS Task Force Meeting held in January 2001. The Task Force had discussed coordination of data formats and frequency planning for all polar-orbiting satellites including their equator crossing times. CGMS-XXIX noted the number of satellites using similar morning equator crossing times (e.c.t.) but felt the issue was of a political nature and not appropriate for CGMS to discuss. However, it did agree that such issues could be addressed in the WMO Consultative Meetings on High-Level Policy on Satellite Matters. Thus, CGMS XXIX agreed to three action items 29.04-6:

Action 29.04 CGMS Members to update Table 3 – "Coordination of Data Formats and Frequency Planning for Polar-Orbiting Satellites", with a view to using this table as a reference in the preparation of discussions on mission planning in the polar orbit and contingency during the WMO Consultative Meeting on High Level Policy planned in Geneva in February 2002. Deadline: December 2001.

Action 29.05 EUMETSAT to provide CGMS Members with an outline of a discussion paper on mission planning in the polar orbit and contingency by the beginning of December 2001.

Action 29.06 CGMS Members to respond and provide inputs to this document by mid-January 2002 in view of using this paper as an input to the discussions on mission planning in the polar orbit and contingency planned during the WMO Consultative Meeting on High Level Policy planned in Geneva in February 2002.

2. The CGMS paper was presented to the second session of the Consultative Meetings on High-Level Policy on Satellite Matters (CM-2) held in February 2002. CM-2 discussed the issue of equator crossing time planning as presented by CGMS. The CGMS presentation included the current status of planning for operational polar-orbiting satellites, and their data formats and frequency and highlighted the recommendations that had been made at a CGMS Task Force on Coordination of Data Formats and Frequency Planning for Polar-Orbiting Satellite Meeting held in January 2001.

3. CM-2 believed that CGMS sought reactions to two relevant issues:

- Development of a global plan for equator crossing times in the morning and afternoon orbits; and
- Development of common ground receiving stations.

4. CM-2 noted the complexity of the issue and that more indepth analyses would need to be performed. However, it was unanimous in its belief that an optimized equator crossing time plan based on the totality of user requirements was essential. Such an optimization would also allow the development of contingency plans for the polar orbit. With regard to equator crossing times, CM-2 suggested that the Executive Council and WMO Congress be informed of the need to formally articulate system requirements for an optimized equator crossing time plan. CM-2 also felt it very important that the direct broadcast service from all satellite operators should strive to have standardization in terms of frequency, data format and content where possible and thus allow commonality amongst ground receiving stations.

5. Additionally, CM-2 recognized that due to the large volumes of data expected from the satellite systems, alternative dissemination methods (ADM) that would complement and supplement the existing direct broadcast service would be a necessity for the future space-based component of the GOS. It appreciated the ongoing initiatives within CGMS and CBS to address

the issue and encourage them to give the issue highest priority. Further activities with regard to ADM can be found in WMO WP-22.

6. When discussing polar orbiting contingency planning, the fifty-fourth session of the WMO Executive Council (EC-LIV) (June 2002) noted that the CGMS Working Group on Global Contingency Planning had first discussed the principles for such plans. The CGMS Working Group had noted that the basic WMO requirement for the polar orbit was for two satellites - one in the AM and one in the PM orbit. The CGMS Working Group had agreed that in order to meet WMO's requirement for contingency planning a constellation of four polar-orbiting satellites would be required, two in the AM orbit capable of serving as backup to the other and two in the PM orbit also capable of serving as backup to the other.

7. EC-LIV was pleased to note that both ROSHYDROMET and CMA, taking into account their respective national requirements, would be willing to consider the possibility of using the PM orbit for their future Meteor 3M and FY-3 series to assure the necessary redundancy in order to meet WMO's contingency requirements.

8. It should be noted that this commitment to consider the use of the PM orbit would partly alleviate the equator crossing time issue for the AM orbit. However, Table 1, used for the discussion at CM-2, still highlights the need for continued coordination of equator crossing times. It is recommended that CGMS satellite operators, especially those new R&D satellite operators contributing to the space-based component of the GOS, provide updates to the table on an annual basis.

Table 1
Polar orbiting satellite equator crossing times
Status as of 7 December 2001

Satellite	Service	Start	EOL	Eq. Cross-time	Freq (MHz)	BW MHz	Data rate (Mb/s)
Metop-1	LRPT	2006	2011	0930	137.9125	.150	.072
Metop-2	LRPT	2010	2015	0930	137.9125	.150	.072
Metop-3	LRPT	2015	2020	0930	137.9125	.150	.072
Metop-1	AHRPT	2006	2011	0930	1701.3	4.5	3.5
Metop-2	AHRPT	2010	2015	0930	1701.3	4.5	3.5
Metop-3	AHRPT	2015	2020	0930	1701.3	4.5	3.5
Metop-1	GDS	2006	2011	0930	7800	63	70
Metop-2	GDS	2010	2015	0930	7800	63	70
Metop-3	GDS	2015	2020	0930	7800	63	70
NPP	HRD	2005	2009	1030	7750-7850	30.8	20
NPP	SMD	2005	2009	1030	8025-8400	232	300
NPOESS-1	LRD	2010	2015	0930	1706.5	3.5	3.5
NPOESS-2	LRD	2011	2016	1330	1706.5	3.5	3.5
NPOESS-3	LRD	2013	2018	0530	1706.5	3.5	3.5
NPOESS-4	LRD	2015	2020	0930	1706.5	3.5	3.5
NPOESS-5	LRD	2017	2022	1330	1706.5	3.5	3.5
NPOESS-6	LRD	2018	2023	0530	1706.5	3.5	3.5
NPOESS-1	HRD	2010	2015	0930	7750-7850	30.8	20
NPOESS-2	HRD	2011	2016	1330	7750-7850	30.8	20
NPOESS-3	HRD	2013	2018	0530	7750-7850	30.8	20
NPOESS-4	HRD	2015	2020	0930	7750-7850	30.8	20
NPOESS-5	HRD	2017	2022	1330	7750-7850	30.8	20
NPOESS-6	HRD	2018	2023	0530	7750-7850	30.8	20
NPOESS-1	SMD	2010	2015	0930	25500-27000	384	400
NPOESS-2	SMD	2011	2016	1330	25500-27000	384	400
NPOESS-3	SMD	2013	2018	0530	25500-27000	384	400
NPOESS-4	SMD	2015	2020	0930	25500-27000	384	400

Satellite	Service	Start	EOL	Eq. Cross-time	Freq (MHz)	BW MHz	Data rate (Mb/s)
NPOESS-5	SMD	2017	2022	1330	25500-27000	384	400
NPOESS-6	SMD	2018	2023	0530	25500-27000	384	400
NOAA-15	APT	1998	2001	0730	137		.072
NOAA-15	HRPT	1998	2001	0730	1702..5		.688
NOAA-15	GAC	1998	2001	0730	2247.5		
NOAA-16	APT	2000	2004	1400	Failed		.072
NOAA-16	HRPT	2000	2004	1400	1698		.688
NOAA-16	GAC/LAC	2000	2004	1400	1698/1702.5/1707		
NOAA-M	APT	2002	2005	1000	137		.072
NOAA-M	HRPT	2002	2005	1000	1698		.688
NOAA-M	GAC/LAC	2002	2005	1400	1698/1702.5/1707		
NOAA-N	APT	2004	2008	1330	137		.072
NOAA-N	HRPT	2004	2008	1330	1698		.688
NOAA-N	GAC/LAC	2004	2008	1330	1698/1702.5		
NOAA-N’	APT	2008	2012	1330	137		.072
NOAA-N’	HRPT	2008	2012	1330	1698		.688
NOAA-N’	GAC/LAC	2008	2012	1330	1698/1702.5/1707		
FY-1C	CHRPT	1999	2001	0830	1698-1710	5.6	1.3308
FY-1D	CHRPT	2002	2004	0900	1698-1710	5.6	1.3308
FY-3A	AHRPT	2004	2007	1010	1698-1710	5.6	4.2
FY-3B	AHRPT	2006	2009	1010	1698-1710	5.6	4.2
FY-3C	AHRPT	2008	2011	1010	1698-1710	5.6	4.2
FY-3D	AHRPT	2010	2013	1010	1698-1710	5.6	4.2
FY-3E	AHRPT	2012	2015	1010	1698-1710	5.6	4.2
FY-3A	MPT	2004	2007	1010	7750-7850	35	18.2
FY-3B	MPT	2006	2009	1010	7750-7850	35	18.2
FY-3C	MPT	2008	2011	1010	7750-7850	35	18.2
FY-3D	MPT	2010	2013	1010	7750-7850	35	18.2
FY-3E	MPT	2012	2015	1010	7750-7850	35	18.2
FY-3A	DPT	2004	2007	1010	8025-8215 / 8215-8400	120	93
FY-3B	DPT	2006	2009	1010	8025-8215 / 8215-8400	120	93
FY-3C	DPT	2008	2011	1010	8025-8215 / 8215-8400	120	93
FY-3D	DPT	2010	2013	1010	8025-8215 / 8215-8400	120	93
FY-3E	DPT	2012	2015	1010	8025-8215 / 8215-8400	120	93
Meteor 3M	Raw	2001	2004	0915	466.5	3	0.080
Meteor 3M	Raw	2001	2004	0915	1700	2	0.665
Meteor 3M	Raw	2001	2004	0915	8192	32	15.36
Meteor 3M	LRPT	2004	2008	1030	137.89 / 137.1	0.15	0.064
Meteor 3M	HRPT	2004	2008	1030	1700	2	0.665
Meteor 3M	Raw	2004	2008	1030	8192	2	15.36