CGMS-XXVII
PRC-WP-02
Prepared by CMA
Agenda Item: B2

The Status of FY-1C Satellite

Summary and purpose of paper

This paper describes the states, operation and anomalies of FY-2 A is still in the orbit but it works discontinuously.

The Status of FY-2A Satellite

The first Chinese geostationary meteorological satellite FY-2A was launched on 10 June 1997. On 17 June FY-2A was successfully located at 105°E.

From 1 Jan. 1998, FY-2A satellite was put into operation, images have been acquired and transmitted to users after satellite checking out. It was interrupted on 8 April due to the defect of satellite de-spin subsystem. Since 6 July 1998, FY-2A has been put into part time operation.

Until 15 Aug. 1999, 7162 visible images, 7126 infrared and water vapor images have been obtained. 31000 telecommands have been sent, about 25000 of which were sent by S-band control system. FY-2A satellite is still working now in part time.

1 Status of FY-2A Satellite

- At 20:01 June 10 1997, FY-2A was launched by Long-March 3 in Xichang Satellite Launching Center. At 20:24:27 it came into transfer orbit.

- On 17 June FY-2A was located at 105°E. Then the de-spin subsystem was switched on, the rotating speed of satellite was adjusted to 100 rpm, and S-band telecommand and telemetry subsystems were switched on.

- On 21 June 1997, the first VIS image was acquired and S-VISSR image was generated.

- On 22 June 1997, The Space Environment Monitor was turned on to start exploring space environment.

- On 23 June 1997, the Turn Around Ranging system was switched on, measured the distances between satellite and three ranging stations. The UHF transmitter was switched on and the DCP link test had been done.

- On 24 June 1997, the S-FAX link was switched on.

- On 5 July 1997, the cover of radiation cooler of radiator was thrown away. Commands were sent to turn on/off the heating and de-contaminating of the primary and secondary radiation cooler repeatedly.

- On 10 July 1997, the heating and de-contaminating of the primary and secondary radiation cooler have been completed.

- On 13 July 1997, the first IR and WV images were acquired. All functions on image acquiring, data broadcasting, data collecting and space environment monitoring have been realized.

- On 1 August 1997, the Australia Ranging Station (TARS-2) was connected.

- From 1 Jan. 1998, FY-2A was put into formal operation atomically according to "FY-2A Satellite Operational Schedule".

- At 20:17 April 8 1998, the S-band antenna couldn't point at the Earth due to the defect of de-spin subsystem. It was switched off by C-band ground system. FY-2A operation was interrupted.

- On 10 April, FY-2A de-spin subsystem was re-switched on by C-band. It worked for about 17hours and 37 minutes.

- On 12 April, FY-2A's de-spin subsystem was switched on by C-band and it worked for about 3 hours and 19 minutes.

- On 22 April, FY-2A's de-spin subsystem was switched on by C-band and it worked for about 59 hours and 42 minutes.

- From 2 June to 5 July 1998, FY-2A S-band de-spin subsystem was switched on several times for making part time operational experience.

- From 6 July to 7 August 1998, de-spin subsystem was switched on for about 4.5 hours per day for operation.

- From 8 Aug. 1998 to 18 May 1999, de-spin subsystem was switched on for about 6.5 hours per day for operation.

- Since 19 May 1999, de-spin subsystem was only switched on for about 2.5 hours per day for operation.

2 Operation

Since 1 Jan 1997, FY-2A satellite and the whole ground system had been commanded and scheduled by SOCC to operate automatically to acquire VIS, IR and WV images. After images were registered by S/DB subsystem in CDAS, the S-VISSR images were generated and transmitted to users.

From 1 January to 8 April 1998, China Central TV (CCTV) used FY-2A Satellite images in weather forecast program every morning, noon and evening (GMS images for backup).

Since 6 July 1998, FY-2A has been put into part time operation. FY-2A images have been broadcasted again since 14 Dec. 1998.

2.1 FY-2A Operational Schedule

2.1.1 Quasi Operation

- From 1 Nov. 1997, FY-2A began to 24-hours quasi-operate according to "FY-2A Satellite Operational Schedule". It acquired Earth images every first half-hour, broadcasted WEFAX images 16 times and had Turn Around Ranging 4 times every

day.

2.1.2 Operation

- From 1 Jan. 1998, FY-2A was put into operation. It acquired Earth images 26 times, broadcasted WEFAX images 16 times and had Turn Around Ranging 4 times every day except that satellite was doing orbit, attitude or equipment test. 2 of 26 S-VISSR images were for measuring wind.

- The whole ground system stopped operation every Tuesday from 01:00 UTC to 03:45 UTC because of system maintaining.

- Some equipment in satellite must be switched off during autumn and spring eclipse period (92 days per year) due to the limitation of energy. Therefore images acquiring was reduced from 26 to 23 times and WEFAX broadcasting was reduced from 16 to 14, without changing the Turn Around Ranging and system maintaining time period.

2.1.3 Part Time Operation

During the part time operation period, the FY-2A satellite and ground system still operated atomically according "FY-2A Satellite Part Time Operational Schedule". It would be stopped to acquire the images if electrical current of de-spin subsystem was over limitation.

- From 6 July to 6 August 1998, FY-2A satellite S-band antenna had been switched on for 4.5 hours from 11:00 to 15:30 (B.T) every day. At 12:00，13:00，13:30，14:00，and 15:00(B.T) it acquired 5 images without being broadcasted.

- From 7 August to 6 Oct. 1998, FY-2A satellite S-band antenna was switched on for about 5 hours from 8:30 to 13:30 (B.T) every day. At 9:00，10:00，11:00，12:00，and 13:00(B.T) it acquired 5 images without being broadcasted.

- From 7 Oct. To 13 Dec. 1998, FY-2A satellite S-band antenna had been opened about 6.5 hours from 8:20 to 15:00 (B.T) every day. At 9:00，10:00，11:00，12:00，13:00，13:30，and 14:00 (B.T) it acquired 7 images without being broadcasted.

- From 14 Dec. to 1998 to 18 May 1999, FY-2A satellite S-band antenna had been opened about 6.5 hours from 10:30 to 17:00 (B.T) every day. At 11:00，12:00，13:00，13:30，14:00，15:30，and 16:00 (B.T) it acquired 7 images and broadcasted them.

- From 19 May to 20 Aug. 1999, FY-2 satellite S-band antenna was switched on for about 2.5 hours per day, and broadcasted S-VISSR.

- From 21 to 30 Aug. 1999, FY-2 satellite S-band antenna was switched on for about 1.5 hours per day, and braodcasted once per day.

2.2 Statistic of Operation

2.2.1 images statistic

- On 21 June 1997, the first VIS image was acquired.
- On 13 July 1997, the first VIS, IR, WV image were acquired.
- Up to 31 Dec. 1997, 2957 visible images, 2922 infrared and water vapor images were obtained.
- From 1 Jan to 8 April 1998, the FY-2A operation period, 2347 VIS, IR, WV images were acquired.
- From 2 June 1998 to 15 Aug. 1999, 1813 VIS, IR and WV images had were acquired.

2.2.2 operational statistic

- From January 1 to April 8 12:00 UTC 1998, the number of expectant images was 2378 according to "FY-2A Satellite Operational Schedule" and the total number of actual acquired images was 2347, 73 of which were not in good quality. The number of expectant broadcasted WEFAX was 1451 and the actual number was 1429. The total number of TARS was 383. The operation statistics of acquired images, broadcasted WEFAX and Turn Around Ranging are shown in Tab. 1 and 2. This statistics do not include the period of satellite checking out and quasi-operation.

Tab. 1 The Statistics of Successful Operation

	Jan.1998	FEB.1998	Mar.1998	Apr.1998
S-VISSR (%)	99.24	99.71	98.13	99.42
WEFAX (%)	98.76	98.15	98.34	99.05
TRRR (%)	92.74	98.21	95.97	93.33

Tab.2 Images Acquired from Jan 1998 to Apr 1999

	Jan.1998	Feb.1998	Mar.1998	Apr.1998
Expectant Aquired Images	791	709	730	172
Actual Acquired Images	785	707	685	170
Bad Images	14	11	45	3

- From January to April 1999, FY-2A de-spin subsystem was switched on for about 6.5 hours per day. The number of expectant acquired images was 811 according to "FY-2A Satellite Part Time Operational Schedule". The total number of actual acquired images was 789, 29 of which were not in good quality.

Tab.3 Images Acquired from Jan 1999 to Apr 1999

	Jan.1999	Feb.1999	Mar.1999	Apr.1999
Expectant Aquired Images	225	196	211	179
Actual Acquired Images	223	186	203	177

Bad Images	0	6	8	15

3 Obit and Attitude Control

At beginning FY-2A was located at 105°E. But later on it was located at 104.5°E due to the interference between the telecommand of FY-2A and the communication link of Asia Satellite-1.

Since FY-2A being located, 15 times of East-West orbit position control, 2 times of attitude control and 1 time of rotate speed control had been done.

3.1 Orbit Control

The East-West Orbit Control was done on 14/7/1997, 17/8/1997, 6/10/1997, 17/11/1997, 11/12/1997, 5/2/1998, 27/3/1998, 25/5/1998, 22/7/1998, 23/9/1998, 16/11/1998, 12/1/1999, 22/3/1999, 7/5/1999 and 15/7/1999.

3.2 Attitude Control

The attitude control was done on 27/3/1998 and 12/1/1999.

3.3 Rotate Speed Control

The rotate speed control was done on 17/11/1997

4 The Major Anomalies in Operation

4.1 Image Quality

The brightness of west half of visible full disk images is higher than the east half.

During spring and autumn eclipse season, the IR and WV detectors of FY-2A satellite suffered interference from solar direct refraction. Every image had 80 white lines. The position of white lines moved with the solar position. And visible images were also disturbed slightly.

4.2 Defect of De-spin Subsystem

Due to the electrical current of motor of de-spin subsystem is higher than the normal value. The S-band antenna works discontinuously. It causes the interruption of the satellite operation.