

Ref: PT-MM-02065

3 April 1996

MINUTES OF THE FIRST FSODG MEETING

The FIRST Science Operations Definition Group (FSODG) held its first meeting March 21-22, 1996 in ESTEC. The group's composition is the following:

- SAG and PHOC Rep. O. Bauer (MPE)
- BOL Rep. K. King (QMC)
- HET Rep. P. Roelfsema (SRON)

- FIRST Project Scientist G. Pilbratt (ESTEC/SSD)

- FIRST Project P. Estaria (ESTEC/PIP)
- H. Schaap (ESTEC/PIP)

- D/OPS Rep. A. Robson (ESOC/SMD)

Agenda

The Agenda was adopted.

1. Introduction to the tasks of the FSODG

Presented by Estaria. Based on the attachment to the Agenda (3 pages dated 9 February 1996 Title "FIRST SCIENCE OPERATION DEFINITION GROUP"). Objective, tasks, deliverables and organisation of the FSODG were agreed with the following amendments;

- an additional task "Produce Ground Segment Implementation Guidelines" is added to the list of seven tasks already allocated to the FSODG.

The schedule of the FSODG activities is updated as follows;

- 15/06/96: Preliminary findings of the FSODG available for a presentation to the SAG at their meeting of 25-26 June 1996.

- 31/07/96: Mission Concept/Ground Segment Document with cost (ROM)
(taking SAG comments into account)

- 31/10/96 (Draft) Mission Concept/Ground Segment Document (with preliminary cost estimate)

- 31/01/97 Mission Concept/Ground Segment Document (with refined cost estimate)
(this will allow time for the necessary iterations required in view of the two following major milestones: June 1997: Mission Reconfirmation. September 1997: Instrument AO)

- Summer 97: Instrument to Ground Segment Interface Document
Instrument Design guidelines
Ground Segment Implementation guidelines
(final) Technical memo (impact of mission concept/ground segment design on the Satellite System Specs)

The following was also agreed:

- Ground Segment costing will only address GS overall cost to ESA (based on a 3-year mission) but impact on National Agencies needs to be addressed.
- Costing must include the cost of the post-launch FIRST Archive.
- The documents produced by the FSODG in summer 97 shall be in a format which will allow their incorporation into the AO with no or minimal editing (ESA's responsibility)

2. FIRST programme status

Presented by Pilbratt. Main points;

- The Science Management Plan (SMP) will be issued in February 1997. This will allow a second iteration with the SPC (if necessary) before mission reconfirmation.
- The end of the two parallel industrial studies (cryostat and cryo-cooler options) is foreseen for end-October 96.
- Instrument selection (following AO in September 1997) is planned for June 98.
- The FSODG must keep in mind that the current FIRST payload is only a "model" payload.
- Estimates for the cost of the overall FIRST operations have not been updated since FIRST "red" Report. Figures were 65 MAU overall, 32-33 MAU for the Science Operations (now largely obsolete)

3. Mission Concept/Ground Segment

Most of the meeting was dedicated to this point

The members of the FSODG with direct ISO experience distributed at the meeting written summaries of "lessons learned from ISO". M. Anderegg's (ISO Payload and Missions Operation Manager) input was made available to the group prior to the meeting. These contributions were not discussed as a separate agenda item but used as a basis for discussion of agenda points 3 and 4.

To kick off the discussion Estaria presented 3 ground segment related diagrams which were updated in real-time by the group. (see AI # 1/1) As a result of the discussion it was agreed that the FIRST Ground Segment could be conveniently split into three major functional "blocks":

1. Proposal Handling and Mission Planning/Mission Scheduling - BLOCK 1 -
 2. R/T operations of spacecraft and payload. - BLOCK 2 -
 3. Science Data Processing. - BLOCK 3 -
- with a FIRST Archive (possibly distributed) as the link between the major blocks and their individual components.

This model was refined and the next level of decomposition was explored in subsequent discussions. The main components within each block were identified (using XMM and ISO as models). It was agreed that the results of the discussion will be written up as follows;

- a) Proposal Handling - BLOCK 1- King and Pilbratt
Proposal Handling = Proposal Selection System + Observation Entry System.
- b) Mission Planning - BLOCK 1- Robson
(includes scientific mission planning and mission scheduling)
- c) Scientific Data Processing - BLOCK 3- Bauer + King

(includes QLA facilities, Interactive Analysis, Pipeline Processing, Product Distribution System, Payload Calibration System - based on ISO and XMM models-)

d) FIRST Archive and Archive Management System Roelfsema

The following assumptions were used for the discussion:

- The scientific instruments will be switched off during long eclipses (this should occur a few times during the mission). In the case of the cryo-cooler option the need to re-stabilise the detectors implies a PV-type scenario after long eclipses for a few orbits (TBC). This additional requirement must be taken into account.
- For the development of the operational scenario, typical observation times should be assumed to be ISO-like i.e. from a few tens' of mins. to a few hours.
- Access to all Telemetry is essential for Science Data Processing
- Instrument RTA shall be part of BLOCK 2. It shall be implemented using the facilities available for spacecraft monitoring (based on SCOS II).
- A basic instrument QLA shall also be part of BLOCK 2.
- SPEVAL, as currently implemented for ISO, is too limited for scientific instruments' "Trend Analysis"
- The concept of TDFs in ISO is good. The same functionality could be implemented for FIRST via TM packets + pointers to relevant components of an "observation".
- The TDATA functionality in ISO should be implemented for FIRST via the ICS mechanism, e.g. through a specific mnemonic giving the relevant observation "step"

4. Instrument design for operations and data processing

Note: this paragraph written by H. Schaap

Presented by Schaap based on the attachment to the agenda (3 pages dated 9 February 1996 Title "FIRST SCIENCE OPERATIONS DEFINITIONS")

Instrument design for Operations and Data Processing.

Main conclusions were reached in four area's as follows:

Instrument design

- There should be an identical redundancy concept for each of the instruments
- Identical processors should be used
- Programming language(s) should be identical i.e. ADA and Assembler
- A Keep Alive Line (KAL) should be used
- There is no need for a hardwired On Target Flag (OTF) to the instruments.
A status bit in the AOCS HK is good enough
- Uplinked command blocks should be buffered by the User
- The meeting also raised the point of making instruments more autonomous in the sense that for example one instrument might perform an internal calibration whilst another would be the "PRIME" instrument. In retrospect however this would make an instrument rather more complicated instead of simpler

Instrument operation

- To avoid uplinking lengthy command sequences, instruments should be commanded at the "MACRO" level.

This would make commanding less susceptible to TM link problems

- As the task of memory comparison is identical for subsystems like AOCS and instruments, one should envisage using the same tool.
- The command history file should be made available to the IS's
- There seems to be a good reason to run one instrument/revolution. In that way an instrument team could do the science scheduling and hand-over an optimised file
- There should be one and one-only TM parameter database. Its baseline should probably be defined by ESOC.
- Instrument command blocks should be limited to two structures only i.e. ICS's and MPS's (No PCS's or IRAM's as in ISO)
- There should be identical data displays for the various levels of testing
- A common test sequence language should be used for the various levels of testing the instruments. Should this be impossible than a translation tool should be developed to facilitate transformation from one level to another
- For the Satellite Commissioning Phase one could think of transporting the CCE to the Groundstation site and perform the instrument commissioning with the CCE (Personally I think this is a non-starter)

EGSE concept

- CCE and IS should be co-located for ease of communication
- The CCE area should have links to the outside world (Email and data transfer)
- The Go/Nogo mechanism from ISO should not be implemented (HLCL)
Instead the CCE operator should continue the test based on verbal (intercom) input

Testing

- The meeting felt that testing of the instruments and in particular:
 - * EMC testing
 - * "Warm" testing
 - * Instrument stimulation (External / internal)
 - * Which tests at which time in the schedule
 should be deferred to the PWG

5. Satellite System

The purpose of this agenda item was to assess if inconsistencies do exist between the conclusions reached in items 3 and 4 and the "FIRST Satellite System Specification" - Issue 1 dated 24 July 1995. This was not discussed. The discussion is postponed till the next meeting. (see AI 1/6)

6. Conclusions

In the course of the discussion, and in addition to the items mentioned under the previous points, some major conclusions emerged. They are attached to the minutes (att. 1). Some still need to be confirmed and/or elaborated. Att. 1 is a self standing document which will be expanded and updated as the FSODG work progresses. There is therefore some duplication between these minutes and the attachment.

7. Planning of FSODG work

Point 9 records all Action Items to be carried out by the members of the FSODG until the next meeting.

The next meeting will take place in ESTEC on 9-10 May 1996. It will start at 9:00 on the 9th and finish at 13:00 on the 10th. Estaria will propose an agenda.

The third meeting of the FSODG will take place in ESTEC on 10-11 June 1996. It will start at 13:30 on the 10th and finish at 17:00 on the 11th. At the end of this meeting all the input required to present the findings of the FSODG to the SAG on the 25-26 June 1996 must be available.

8. AOB

There was no AOB.

9. List of Actions

The following actions have been allocated as a result of the 1st FSODG meeting. They are all due by the next meeting.

- AI 1/1: Estaria: Update the three diagrams presented at the first meeting: (1) FIRST Ground Segment overview. (2) Mission Operations Centre Responsibilities. (3) SOC functional overview.
- AI 1/2: King and Pilbratt Write up: Proposal Handling
- AI 1/3: Robson: Write up: Mission Planning
- AI 1/4: Bauer and King Write up: Scientific Data Processing
- AI 1/5: Roelfsema Write up: Archive and Archive Management System
- AI 1/6: All: Review FIRST Satellite System Specs. Identify inconsistencies with conclusions of FSODG.

P. Estaria

P. Estaria

Ref: PT-TN-02067

3 April 1996

FIRST SCIENCE OPERATION DEFINITION GROUP**ISSUE 1.****Main points from first meeting****(1) Type of Mission:**

SAG (via Project Scientist) must define/confirm the type of mission i.e. "survey", "PI-type", "Observatory" (the actual baseline).

If "open time" is available what is the relative percentage of time allocated to it ?

(2) Instrument Operations Philosophy:

SAG/Project to define the scenario for instrument operations: "simultaneous" observations or only one "prime" instrument, "serendipity" mode for non-prime ?, one Instrument per orbit ?

(3) Operations Team

FIRST operations to be carried out by an integrated, co-located, "satellite" team. Remove the ISO SCC-SOC operational separation.

(4) Commonality between instruments:

SAG to pursue identification of potential design/implementation commonality

All instruments shall use the same redundancy concept

All instruments shall use a Keep Alive Line (KAL)

All instruments shall use same u-processor and S/W development environment (e.g. ADA)

All instruments shall use same TM/TC protocol for communication with ground.

All instruments shall use same protocol for on-board memory management (load/dump/compare)

All instruments shall buffer uplinked command blocks

All instrument command blocks shall be limited to two structures only (ICSs and MPSs)

All instruments shall use same TM Parameter Data Base definition

One group (TBC) implements "common" on-board S/W functions (e.g. I/Os, kernel) for all.

(5) Commonality between AIV and Operations:

Do not attempt commonality in H/W and S/W across instruments in AIV.

All instruments must use in AIV a TM DataBase identical to the operational TM Database (structure to be defined by ESOC)

Displays must be common between all levels of testing. Extension to operational displays whenever possible.

(6) Instrument commanding environment

All instruments shall use the same language (ETOL-like) for definition of all instrument and system level tests. AOTs and Calibration observations must be easily translatable into this language.

(7) FIRST Archive

FIRST Archive to be the central repository for all FIRST data. Easy, safe, controlled access must be feasible. Access to TM is essential for Science Data Processing. Archive may be distributed.

(8) Expertise

Experience and knowledge cannot be transferred by documentation.

Work to be carried out where expertise lies.

Team build-up must be done early.

Team co-location is highly desirable.

(9) Use of On-board Mass Memory Unit

MMU strongly recommended. would store complete schedules (e.g. one orbit). would store scientific data ==> only one Ground Station, reduces number of shifts in operations.

(10) Mission Planning

Overall Mission Planning (i.e. spacecraft + science planning and scheduling) should be functionally combined. Implementation does not need to.

(11) Flexibility

Static mission concept does not work. "controlled" changes will be required. This should be safe and easy.

Note: flexibility is **not** equivalent to open-ended requirements on corresponding software. (*my comment*).

(12) Simulators

spacecraft and instrument simulators are required. They should be "integrated".

(13) Concept of AOTs

ISO concept of AOT is good. Should be maintained, but AOTs must be few and simple.

(14) Instrument commanding

ISO concept of instrument commanding via ICSs (validated in AIV) is good. Shall be maintained for FIRST.

instrument "macro" commanding must also be investigated.

(15) instrument command verification

Complete verification of correct execution of each single command is exceedingly difficult. Practically impossible with macro-commanding. Also not strictly necessary. Requirements on CV must be relaxed.

(16) On-Target-Flag

The OTF does not need to be distributed to the instruments. Only needs to be available in the TM.

(17) EGSE concept

- CCE and Instrument Stations should be co-located for ease of communication.

- The CCE area should have links to the outside world (E-mail and data transfer)
- The High Level Communication Link (HLCL) used in ISO as GO/NOGO mechanism should not be used. Verbal (intercom) communication shall be used.

(18) Instrument Testing

Instrument testing is an important topic but not part of the FSODG work. It should be deferred to the PWG.

Not discussed at the meeting

(these points were not directly discussed at the meeting but addressed in the various "ISO lessons learned" summaries)

(1) LEOP and other mission phases

Conducting LEOP and the other mission phases from two different locations is very costly in terms of money, (extra) infrastructure, manpower and configuration control.

(2) Different Ground Segment Operating Systems

Maintaining more than one OS in the Ground segment is very costly in terms of money, manpower, maintenance costs and extra complexity.

(3) Handling of instrument prime and redundant lines

ISO IDCS implementation is too cumbersome. Must be changed for FIRST (use same scheme as for CTU- A/B, ACC-A/B and STR-A/B)

(4) ESA "label" on distributed products

The decision whether or not the Agency will want its "label" on the output products distributed to the Community will have an impact on the science operational set up.



esa

European Space Agency
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FAX Form

Priority :	Originating signature :	Authorised by :
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AGENDA

Date : 20th February 1996

Ref. : AR/rdc/63

From : A. Robson, VILSPA

To : FSODG Members

Subject: SCIENCE OPERATIONS DEFINITION GROUP : MEETING 1

The first meeting of the FSODG will be held in ESTEC starting at 09:00 on 21 March 1996 in Room Fb 022 (meeting room of the ISO/FIRST barrack). The meeting should finish by lunch-time on 22 March.

The attached objectives and tasks were agreed with Hans Steinz and Brian Taylor.

I would like to propose the following agenda:

1. Introduction to the tasks of the FSODG - P. Estaria
2. FIRST programme status - G. Pilbratt
3. Mission Concept/Ground Segment
 - identification system elements from creation of observational proposals, through mission planning and scheduling to data recovery and processing for delivery to observers
 - grouping of elements into subsystems, taking into account where knowledge resides, simplest interfaces, etc
4. Instrument design for operations and data processing
 - identification of elements to be operated
 - operation on-board or by ground, criteria?

- common features instruments and instrument-peculiar features
- commonality and differences between in-orbit and ground testing

5. Satellite System

- inconsistencies between 3, 4 and Satellite System Specs. Are there any?. Can they be easily removed or are they fundamental?

6. Conclusions

- draw conclusions from 3, 4, 5 after all have been discussed

7. Planning of FSODG work

- short term, to next meeting
- to completion of objectives/tasks

8. AOB

Note : The FSODG members are invited to prepare before the meeting, a summary of the lessons they have learnt from ISO or any other relevant projects.

One could introduce these "lessons" into points 3, 4, 5 of the agenda or add a separate agenda item as the group wishes.

Best regards,



A. Robson

DISTRIBUTION

FIRST SCIENCE OPERATIONS DEFINITION GROUP

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A. SMITH SMD ESOC

9 February 1996

FIRST SCIENCE OPERATIONS DEFINITION GROUP

Objective

- Define a scientific operations concept which minimizes overall cost of scientific operations.

Tasks

- (1) - Define overall mission operational concept
- (2) - Identify main functional components (e.g. Proposal Handling, Mission Planning, Scientific data processing)
- (3) - Allocate components to implementers:
3 basic options:
 - a) Decentralised to the PIs (i.e. each PI Institute establishes its GS and processed its data)
 - b) Centralised : done by a single Institute (e.g. Geneva for INTEGRAL)
 - c) Centralised: done by ESOC (e.g. XMM)
- (4) cost: This requires a level 0 iteration via some sort of high level (SIRD - SIP) and (MIRD - MIP) mechanism
- (5) iterate (1) to (4) to lead to a basic FIRST Ground Segment concept
- (6) - Define (common) Instruments operational interfaces with the Ground Segment (e.g. RAM patching, commanding, telemetry processing)
- (7) - produce Instrument design guidelines

Groups' composition

- | | |
|--------------------------|-------------------------|
| - BOL Rep. (QMC) | K. King |
| - HET Rep. (SRON) | P. Roelfsma (TBC) |
| - PHOC Rep. (MPE) | O. Bauer |
| - Project Scientist | G. Pilbratt |
| - Science Community Rep. | TBD |
| - FIRST Project | P. Estaria
H. Schaap |
| - ESOC (MOD/SMD) | A. Robson |

Deliverables

- (1) Mission Concept/ Ground Segment Document
- (2) Cost of scientific operations (appendix to (1))
- (3) Instruments to Ground Segment Interface Document
- (4) Instrument Design Guidelines
- (5) Technical memo
(impact on Satellite System Specs, e.g. "non" simultaneous instruments operations)

Schedule

31/07/96:

- (Initial) Mission Concept/Ground Segment Document with cost (ROM)

31/09/96

- Mission Concept Document with cost (10 % level ?) - for Mission Reconfirmation-

31/01/97 (in time for AO)

- Final Mission Concept Document/Ground Segment
- Instrument to Ground Segment Interface Document
- Instrument Design Guidelines
- Technical memo (impacts)

Organisation

- Foresee one meeting per month (TBC) - at least till 31/09/96
- meetings are "working" meetings, i.e. members are expected to produce real work *before, during and after* the meetings.
- logistical support to be provided by FIRST Project (Estaria and/or Schaap)
- 1st meeting (week 18-22/03 - TBC -) Location ESTEC - duration 1 1/2 day (meeting to be organised by A. Robson who will produce the agenda)
- members of the Definition Group to write a short summary of applicable "lessons learnt" from ISO or any other relevant Projects (to be discussed at the first meeting)

Notes

- JAS will propose to Pr. Bonnet to have the Mission Reconfirmation (currently Nov. 96) postponed to June 97.
- BGT + JAS will propose to the SAG (whose next meeting was foreseen in Sept. 96) to have one end-June 96 to review what our group will have come up with by then.

20 FEB '96 16:48 VILSPA 34 1 8131302
09 FEB '96 13:45 ESA ISO PROJECT

P.6/6

ESA ISO PROJECT

P.3/3

- Pr. Bonnet has (somehow) accepted to delay the AO by 6 months in response to a request from the french delegation
- FIRST Science Management Plan (produced by the Project Scientist) would go to the SPC for the first time in Feb. 97. If needed second version in June 97