

Ref: PT-MM-03587

FIRST / ESA / M / 0008.1

SPIRE-ESA-MOM-000099.1

20 November 1996

MINUTES OF THE SIXTH FSODG MEETING

The sixth meeting of the FIRST Science Operations Definition Group (FSODG) was held in ESTEC on November 13-14, 1996.

AGENDA

The agenda (attachment # 1) was adopted.

1. DEVELOPMENTS SINCE OPERATIONS REVIEW OF 2-3 OCTOBER

J. Steinz presented the major Project events:

- In the absence of any new official information about the overall Science Programme schedule, FIRST planned launch date remains mid-2007, with start of phase B in mid-2001. The instruments' schedule is already tight. The telescope (long lead item) is currently the most critical programme's element.
- It appears from the MMS (telescope level) and DSS (reflector level) analysis that the specified telescope performance cannot be met with the CFRP technology. Work on the alternative reflector technologies is proceeding satisfactorily. Final decision on selected technology (baseline plus one alternative) to be taken in December. (presentation to D/SCI on 26 November)
- small problems with the 4K and the 20K coolers are under investigation.
- stressed Ge:Ga detectors: situation is satisfactory. small delays being encountered.
- Ga:As detectors: (funding under GSTP-2). Proposal found satisfactory. work to start beg-December.
- The system studies to explore use of the XMM bus are to be completed at end November.
- The first draft of the SIRD will be issued end-November. Will be the basis for ESTEC/SSD independant costing of the Science Operations. MOC costs will be assessed by ESOC.
- FIRST baseline (including costs) for mission reconfirmation by SPC (June 97) to be established as follows:
 - all technical and cost elements available by end-January 1997 (SAG to make their recommendations by end-January)

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- Feb-March: iterate. Presentation to D/SCI end-March.
- end-April: ready for SPC.
- Final recommendations of the Science Operations Review Panel forwarded to D/SCI by the FIRST Project Scientist. Only (mild) reaction from D/SCI to Mission Planning/Mission scheduling criticism. (see agenda point 3)

2. REVIEW OF ACTION ITEMS FROM PREVIOUS MEETINGS

Meeting # 1: All actions closed.

Meeting # 2:

AI # 2/1: superseded by later work. It is decided to formally close AI # 2/1.

AI # 2/3: delayed till end-December 1997

AI # 2/5: definition of the mission profile (surveys, key programmes, open time, guaranteed time, etc.) to be discussed with SAG. due date delayed to 31/01/97 (first draft of the Science Management Plan)

AI # 2/7: MOC costing: due 31/01/97

All other action items have been closed.

Meeting # 3:

AI # 3/2: Investigate if all required instrument observing modes could be supported via the AOCS Fine Pointing Mode only (with suitable Ground Segment support). specify pointing accuracies required.

Subsequent to the FSODG meeting the topic was discussed between Robson, Estaria and Cornelisse. It was concluded that:

- Fine Pointing, slewing and line scanning are the only modes which *must* be implemented in the AOCS. The accuracies needed are known (Payload Definition Document)
- The current trend is towards more on-board autonomy/intelligence, therefore no restrictions/constraints should be placed on implementation. The Satellite System Specs describing the required AOCS modes (based on the model payload inputs) need not be updated.
- Proper trade-offs between on-board implementation and on-ground implementation will be performed in phase B.

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This formally closes AI # 3/2. All other action items have been closed.

Meeting # 4:

AI # 4/1: produce a Data Definition Document. due date delayed to end-june 1997.

AI # 4/9: maintain a list of ground segment open points/assumptions. Delayed to end-June 1997 (after mission reconfirmation)

AI # 4/13: Provide estimates on the manpower spent on ground segment and operations-related matters by LWS. Delayed to end-January 1997.

All other action items have been closed.

Meeting # 5:

The FSODG had a short meeting in the afternoon of October 3, 1996 following the Science Operations review on 2-3 October. The minutes of this meeting were issued by Estaria as a short PROFS note (see attachment # 2).

All actions items related to this meeting have been closed.

3. MISSION SCHEDULING SYSTEM

There has been much discussion on the Mission Planning/Mission Scheduling scheme proposed for FIRST, and in particular where to put the interface between the MOC and the First Science Centre (FSC) responsible for the planning of the scientific operations. Based on the ISO, XMM and FIRST models there are three possible options for the FSC:

1. perform "mission planning" only, i.e. pass to the MOC a "bag" of observations in no particular order, plus possibly "filler" observations. The MOC has a set of rules (agreed with the FSC) which, applied either manually or by software, will allow, based on the "bag" + filler observations, and after addition of spacecraft-related activities, to produce a complete schedule. This scheme was preferred by the MOC because it reduces the interactions between FSC and MOC e.g;

- PSF-type information is no longer required by the FSC.
- there is no risk that "constraints violations" discovered by the MOC invalidate an FSC-produced schedule.
- it gives the MOC more freedom to "shift around", within agreed limits, some observations in order to accommodate required spacecraft operations, e.g. antenna switching, reaction wheel biasing, etc.

2. perform "mission sequencing", i.e. pass to the MOC an ordered "sequence" of

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observations but with no absolute times attached to the observations. This is the scheme which was proposed for FIRST.

3. perform "mission scheduling". i.e. pass to the MOC a schedule where the scientific observations are defined in absolute time. This is the ISO scheme and the scheme now adopted for XMM, after XMM have abandoned option 1. J. Riedinger explained the rationale for the XMM decision (see attachment # 3). According to ISO and XMM, only this scheme can allow scientifically efficient schedule to be generated. The "rules" which would permit implementation of option 1 are too difficult to define taking into account all constraints and dependancies, they are also changing. It is also argued that it might be difficult to "scientifically" train MOC mission planners, or alternatively to locate "science" mission planners permanently at the MOC. These statements are disputed by several members of the FSODG.

The three options were discussed at length. No consensus could be reached on the best option to select. The following was agreed:

- option 2 (sequencing) is the worst of the three options and should be abandoned. To do proper "sequencing", it is necessary for the FSC to produce a "schedule", i.e. to implement option 3.
- The number of "fixed time" observations must be minimised (w.r.t. ISO). Fixed time mechanism to be used only when scientifically justified.
- some flexibility should be introduced in the definition of fixed time i.e.
fixed time = T +/- n minutes (as in XMM)
- "calibration" observations should only be defined as fixed time if this is required for scientific reasons.
- The option selected for FIRST mission planning/scheduling (1 or 3) shall work for the Satellite Commissioning and Performance Verification phases as efficiently as for the routine phase.
- whatever the option selected a set of powerful "safe" editors shall be provided in order to allow easy and safe modification of the MDB parameters.
- for the purpose of "costing", option 3 ("scheduling") is selected as baseline. (known model and option recommended by the science operations reviewers). The issue is to be re-examined later.

4. REFINED ICC AND FSC "COST" ESTIMATES

Bauer and King presented refined "cost" estimates for ICC and FSC expressed in man-years, by task and function and including a manpower deployment schedule.

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(attachments 4 and 5)

It was agreed that in order to work with a common basis a "model" schedule (including instrument activities) was required. -see AI # 6/1-

It was further agreed that activities should be grouped into the following major categories: (i) management and support, (ii) support for instrument development, (iii) software development, (iv) operational support, and that breakdown by task and function should be merged.

In addition ICC and FSC costing, shall include the costs of the post mission Archive. Pilbratt shall elaborate an Archive concept to be presented and discussed at the SAG meeting of 12-13 December 1996 -see AI # 6/2-

Bauer and King will provide revised "cost" estimates based on the discussion and including the Archive as defined through AI 6/2. -see AI # 6/3-

5. FINDAS

The results of the preliminary investigations on existing systems by the FSODG members were reported. K. Hjortnaes (ESTEC/WMS) and N. Peccia (XMM SOC Development Manager/ESOC) supported the discussion.

Much activity is taking place, worldwide, in the area of distributed, object-oriented databases and associated browsers.

- Documentation was distributed (Bauer) on the NASA "HORIZON" system based on ILLUSTRATE and INFORMICS. Features a link to WWW, JAVA Browser, is partly object oriented and runs on any hardware platform. An integrated "server" should be available end-1996.

- Roelfsema reported on several developments in Belgium (Belgium Telecoms: very large relational database), COBRA C Version 2, Telescope Management System at Westerbork observatory. All these systems have relevance to the FINDAS development. Some will become operational in the next few years. More information is required. -see AI # 6/4-

- Pilbratt reported on the existence of an ORACLE-based system already implemented by COLUMBUS and used by NASA. More information is required. - see AI # 6/5-

- Hjortnaes reported on studies carried out a few years ago through the TRP. The MATISSE and EIFEL systems, both completely object-oriented, evaluated at that time seemed to offer the best potential in terms of speed, environment (e.g. de-bugging tools) and methodology. To be followed. In addition a general information session on object-oriented database is required. -see AI # 6/6-

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- It is known that the Space Telescope European Coordinating Facility (ST-ECF) are currently developing an object-oriented database system for the management of ST data. To be followed - see AI # 6/7-
- The specs. for two GSTP-2 studies (9B.ESR.202 "Distributed Payload Exploitation Information Base" and 9B.ESR.213 "State of the Art in Archive Management") are currently being generated. A. Robson has sent the FINDAS description to the people in charge for inclusion into the study if possible/appropriate. To be followed -see AI # 6/8-
- N. Peccia presented the "Archive Management System" under development by ESOC for XMM. (attachment # 6). This system contains much of the functionality required from FINDAS (access to a large volume of data, Hierarchical Storage Management, External World Access, and Client-Server architecture). It could possibly, provide a back-up solution for FIRST although it is based on SCOS 1B (already somewhat obsolete), the amount of data is much less than what FIRST will generate (number of observations per day), addition of "new" search keys into the system would be difficult and on-the-fly processing of scientific data is impossible. First system delivery is foreseen in Jan 1998, second delivery in July 1998. To be followed closely. -see AI # 6/9-
- SSD are interested by a FINDAS-type approach for the implementation and management of the ISO post operations Archive. The ISO data could be used to build a realistic data model for a FINDAS prototype. It is likely that synergy between ISO-SOC and FIRST would be very beneficial to both groups. Functional requirements for a prototype could be elaborated in common. Prototyping activities should not start later than June 1997. It is suggested that a technical meeting between both groups be arranged. A. Robson will approach SOC management -see AI # 6/10-
- From the general discussion it became clear that the FSODG needed more background into the overall (complex) topic of object-oriented databases. In particular it is not yet completely clear that an object-oriented *implementation* is required although many requirements on FINDAS point towards object-orientation. K. Hjortnaes will organise an information session -see AI # 6/6-

6. FIRST DISTRIBUTED CONCEPT

Following recommendations from the science operations review panel on 2-3 October 1996, Estaria has investigated, based on the ISO Science Facility Operations Handbook (SFOH), all interactions in ISO between the components of the ISO SOC and between SOC and SCC. The purpose was to assess if the decentralised operations concept proposed for FIRST would also work in case of problems and contingency. The conclusion, supported by all members of the FSODG, was that it will. The corresponding technical note will be sent to the SOC (Taylor, Clavel, Kessler and Todd) for information. -see AI # 6/11-

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The FSODG members who are still actively involved in ISO operations noted that co-location of operations teams did not necessarily lead to improved communications between the various groups. It was also noted that outside stimulation contributed to several improvements to the current operations (communications systems, pointing, serendipity, etc.). This re-inforces the conclusion of the technical assessment, i.e. that co-location is not essential to the success of the mission.

7. REVIEW OF THE INSTRUMENT AO DOCUMENT

Schaap has produced Draft 0 of the Instrument Announcement of Opportunity and requested FSODG members to review and submit marked up copies. -see AI # 6/12- It was agreed that for the next issue;

- The Ground Segment concept shall be described in more detail (in particular role of ICCs and FSC).
- responsibility of the PIs shall be spelled out in more detail, in particular a list of expected deliveries should be provided.
- it should be stated if provision of the FSC is included or not in the AO.
- the chapter on instrument on-board autonomy should be expanded.
- it should be decided which documents shall be attached to the AO (e.g. SMP, SIRD, etc.) and which information shall be provided as extracts of existing documents in order to make the AO as self-contained as possible.

8. A.O.B.

The schedule for the production of the major operations-related document which was distributed at the meeting has been changed. The new schedule is attached to the minutes (attachment # 7)

There was no other AOB.

9. LIST OF ACTIONS

The following actions have been allocated as a result of this meeting:

- **AI 6/1: Schaap: Due date: 10 Dec' 1996**
Produce a "model" schedule including major instrument activities.

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- **AI 6/2: Pilbratt: Due date: 12 Dec' 1996**
Generate a concept for FIRST post mission Archive. Discuss with SAG.
 - **AI 6/3: Bauer and King: Due date: 31 Jan' 1997**
Update ICC and FSC "cost" estimates. Include post operations Archive.
 - **AI 6/4: Roelfsema: Due date: 14 Jan' 1997**
Contact COBRA C group and Westerbrook group to obtain more information about their systems and plans. (FINDAS). Gather and distribute to FSODG relevant documentation
 - **AI 6/5: Pilbratt: Due date: 14 Jan' 1997**
Contact COLUMBUS group to obtain more information about their Archive Management system. (FINDAS). Gather and distribute to FSODG relevant documentation
 - **AI 6/6: Hjortnaes: Due date: before end-December 1996**
Find latest up-to-date information about MATISSE and EIFFEL. Distribute relevant subset to FSODG.
Organise at ESTEC a half-day to one day presentation/information session to the FSODG group on object oriented databases (if possible 14 or 15 January 1997)
 - **AI 6/7: Estaria: Due date: 14 Jan' 1997**
Contact ST-ECF group to obtain more information about their Archive Management system. (FINDAS). Gather and distribute to FSODG relevant documentation
 - **AI 6/8: Robson: Due date: not specified**
Monitor progress of the two FINDAS-related GSTP-2 studies. Report results to FSODG
 - **AI 6/9: Estaria: Due date: not specified**
Follow up XMM Archive Management System implementation. Report results to FSODG
 - **AI 6/10: Robson: Due date: 10 Dec' 1996**
Approach ISO SOC Management to investigate possibilities of a joint FINDAS-based prototype development.
 - **AI 6/11: Estaria: Due date: 15 Dec' 1996**
Issue Technical note on the ability of the FIRST proposed decentralised ground segment concept to cope with problems and contingency situations.
 - **AI 6/12: Roelfsema: Due date: end-Dec' 1996**
Forward to Schaap marked up copy of Instrument Announcement of Opportunity (draft 0)

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10. NEXT FSODG MEETING

The next FSODG meeting will take place at ESTEC on the 14-15 January 1997. Half a day to a day will be dedicated to a presentation (AI # 6/6) on object-oriented databases. Start time: 9:00 on the 14th. End-time: lunch time on the 15th. Estaria will provide the agenda.

P. Estaria

P. Estaria

From: PESTARIA--ESTEC
To: HSCHAAP --ESTEC
BAUER --EXTERNAL bauer
PJOTR --EXTERNAL Peter Roelfsema
cc: JASTEINZ--ESTEC
KHJORTNA--INTERNAL

Date and time 96-11-05 09:29:44
AROBSON --EXTERNAL
KJK --EXTERNAL Ken King RAL
PILBRATT--EXTERNAL Goeran Pilbratt
JRIEDING--INTERNAL

FROM (my name)
Subject: 6th FSODG meeting.

Attachment # 1

Dear FSODG members,

The 6th meeting of the FSODG will take place, as planned, on 13-14 October 1996 in ESTEC room Fb022 (ISO barracks) starting at 9:00 on the 13th and ending at lunch time on the 14th. I propose the following agenda:

1. Developments since operations review of 2-3 October (Pilbratt + Estaria)
2. Review of Action Items from previous meetings.
3. Mission Scheduling System
(J. Riedinger will explain rationale for XMM approach - comparison with FIRST proposal - conclusion)
4. Refined ICC and FSC "cost" estimates
King (FSC) and Bauer (ICC) will present refined estimates based on list of tasks to be executed and rough deployment schedule. Manpower costs to be expressed in man-years. Estimates should also include other costs (infrastructure, hardware, etc.)
5. FINDAS (whole afternoon on 13 October)
 - . results of preliminary investigations (Bauer + Roelfsema + King)
 - . N. Peccia (XMM SOC development Manager) will present XMM Archive Management System - applicability to FIRST.
 - . K. Hjortnaes (ESTEC/WMS) will present results of preliminary ESTEC investigations.
 - . general discussion - first conclusions.
6. FIRST distributed concept.
based on the analysis of the ISO SCC-SOC-IDTs interactions (ISO SFOH Iss. 2)
I will present a preliminary assessment of the ability of the distributed concept to cope with operational emergencies.
discussion - first conclusions.
7. A0 review.
H. Schaap has distributed draft 0 and is expecting marked-up copies with comments from FSODG members. We will only discuss MAJOR issues if any (max. 1 hour)

8. A0B

Regards

End of Message

From: PESTARIA--ESTEC
 To: HSCHAAP --ESTEC
 BAUER --EXTERNAL bauer
 PJOTR --EXTERNAL Peter Roelfsema
 cc: JASTEINZ--ESTEC

Date and time 96-10-07 12:07:55
 AROBSON --INTERNAL Robson, Andy
 KJK --EXTERNAL Ken King RAL
 PILBRATT--EXTERNAL Goeran Pilbratt

FROM (my name)
 Subject: Post-review meeting

Attachment # 2

Dear FSODG members,

Here a short summary of the small meeting we had in the afternoon of the 3 Oct. following the review of the Science Operations Concept;

1) Concept document:

- agreed that there is no need to produce -as planned- Issue 1 of the doc. by end October (subsequently confirmed by J.A. Steinz)
- next revision should include a chapter on Quality Control, and elaborate the overall management structure required to ensure monitoring, control, and coordination, as well as definition of interfaces, and standards.

2) FINDAS:

- agreed that for the short term the following steps will be taken;
 - . Otto, Pjotr and Ken will try and identify systems (in operation and/or development) which are based on an approach similar to FINDAS, in their respective countries. Purpose: get info/tips/warnings/etc. from people who have already gone a similar route. In addition Pjotr will try and find out what it would cost to implement a prototype.
 - . Andy will investigate what can be learned from the available experience in ESOC. If interesting one ESOC expert can be invited to our next meeting
 - . I will contact Puget and find out more about his intentions to start on a FINDAS-like prototype.

3) Refined (cost) estimates:

- Otto (ICC) and Ken (FSC) will refine the estimates available. Should be expressed in man-years rather than MAUs. Shall be based on a (detailed) list of tasks to be executed and on a rough schedule.

4) Distributed concept:

- some of the reviewers expressed concerns that some of the required interactions between centres in case of emergencies and/or problems might be impossible/difficult in a distributed concept. J. Clavel will send me the latest version (Issue 2) of the SFOH detailing all interactions within the ISO-SOC. I will use as a checklist to compare against our concept in order to identify (if any) the interactions which might cause problems. Preliminary report at our next meeting.

5) A0:

- First Draft (H. Schaap) will be available end-October. The FSODG will review

6) Next meeting:

- Next FSODG meeting will take place in ESTEC the 13-14 Nov. (full day on the 13th, half day on the 14th). I will propose an agenda. All Actions items in points 2 to 4 above shall be completed in time for the meeting.

Regards

13/11/96

Attachment # 3**Scientific Mission Planning**

- On ISO: Weekly update of the MDB from the Science Team
 - ==> MDB unstable (changes in observation parameters leading to changes in observing times, changes in scheduling requests, changes in commissioned instrument modes)
 - ==> Concept of Long Rang Plan doesn't work (for this plus other reasons: contingencies, real PSFs, new DBOBs): concept has recently been abandoned for XMM
 - ==> PS-approval of each POF before submission
- Calibration revolutions
 - ==> Highly iterative scheduling process with IDTs
 - ==> First iteration often does not work despite Cal Liaison (takes 2-3 days iteration to generate satisfactory schedule)
- Instrument "features"
 - ==> Manual checking of POFs by IDTs before POF submission
- Changes in orbit phasing (automatic, contingency, planned)
 - ==> Concept of long range plan doesn't work
 - ==> Impact on target visibility (new DBOB)
- "Big" (core) programs
 - ==> Observations spread over months
 - ==> Require "manual" tracking for "degree of completion"
 - ==> Require understanding of what's to be done
 - ==> Require feedback from proposer while incomplete
 - ==> Suffer from EOL viewing constraint effects
 - ==> Several core programs need balancing scientifically
 - ==> Scheduling priorities change dynamically
 - ==> Determination of optimum scheduling parameters is iterative
 - ==> Observing times & parameters change

- The scheduling problem itself is dynamic
 - ==> Not difficult to automatically generate very good schedules as long as MDB is full (plenty highly graded observations) and PMPT parameters (or user-defined "cost functions") don't need adjustment (e.g. for EOL visibility effects or--worse--instrument degradation)
 - ==> Time when adjustment of PMPT parameters is necessary cannot be determined by S/W
 - ==> "Direction" in which PMPT parameters need adjustment cannot be determined by S/W as it strongly depends on the scientific contents of observations remaining in the MDB (i.e. what has already been achieved), "policy decisions" (what is to be achieved in the remaining time; for which there is no algorithm).
 - ==> Blindly "cranking the handle" might work in the beginning of the mission but as soon as horizon effects come into play that require "scientific judgement" it's not good enough

	1994	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
ICC Manager	1	1	1	1	1	1	1	1	1	1	1	1	1
FINDAS + Data Model	1	2	1	1									
Documentation + Requ.	1	1	1	1	1	1	1	1	1	1			
RTA/QLA + Data Bases		1	2	2	1	1	1	1	1				
CLUS + TP's + ACT's			2	1	1	1	1	1	1	1	1	1	
IA				2	2	2	2	2	2	2	2	2	1
Simulator + CIB s/w					1	1	1	1	1	1			
Calibr. + ILT's				2	2	2	2	2	2	2	2	2	2
Trend Analysis					1	1	1			1	1	1	
Time Estimator + Prop.						1	1	1	1	1	1		
FIV activities						1	1	1	1				
EE-Tests + Simulation								2	2				
Procedures								1	1	1			
Science Software								1	1	1	1	1	1
Quality Control										1	1	1	
MCC + FSC Interf.										1	1	1	
Science										2	4	7	

- No clerical support
- No computer system support
- No building

Attachment # 4

Costs - breakdown by task

Staffing														
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Yrs
Findep Setup														
Data Definition	0.1	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.3	0.3				5.1
HW&SW Implementation	0.2	1.0	2.0	4.0	4.0	4.0	3.0	2.0	2.0	1.0	0.5	0.5	0.3	24.5
Management			0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	10.0
Support to OTAC														
Issue Calls							0.3	0.5	2.0		2.0			4.8
Helpdesk							0.3	2.0	1.0	2.0	2.0	1.0	0.5	9.8
Publish Newsletter						0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	1.3
Provision of data to ESA/OTAC								0.1	0.2		0.2			0.5
Dissemination of data							0.5	0.5	1.0	1.5	1.5	1.5	0.5	7.5
Proposal Handling														
Reception of proposals							0.2	0.2	0.8	0.8	0.5			2.4
Proposal screening							0.2	0.2	0.3	0.3	0.5			1.4
Submission to OTAC								0.1	0.2	0.2	0.2			0.7
Generation of Database								0.2	0.2	0.2	0.2			0.8
Scientific Mission Planning														
Selection of Observations						0.2	0.2	1.0	2.5	2.5	2.5	2.5	1.3	12.7
Provision of Observations to MOC						0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.3	3.2
														0.0
Support to surveys														
Definition			0.1	0.2	0.2	0.2	0.2	0.2	0.2					1.3
Coordination								0.2	0.5	1.0	1.0	0.5	0.3	3.5
Processing of survey inputs						0.2	0.2	0.2	1.0	1.0	0.5	0.5	0.3	3.9
Publication of survey results									1.0	3.0	3.0	3.0	1.0	11.0
Implementation of SW														
Liason with KCCS and MOC	0.5	0.5	0.5	1.5	1.5	3.5	3.5	3.5	0.5	0.5	0.5	0.5	0.3	17.3
Provision of infrastructure														0.0
Total (yrs)	0.6	2.5	4.1	8.2	8.2	12.9	14.1	17.1	19.3	19.9	20.8	15.7	7.4	150.8
Costs														
Infrastructure				500	500									1,000
Computing facilities			50	250			250		100					650
Recurrent	8	25	41	82	82	129	141	171	193	199	208	157	74	1,508
Travel & Subsistence	6	19	31	62	62	97	105	123	144	149	156	118	55	1,121
Staff	60	188	306	615	615	963	1,054	1,253	1,444	1,489	1,560	1,178	551	11,310
Total (KAU)	74	231	425	1,509	1,259	1,199	1,550	1,582	1,881	1,836	1,924	1,452	680	15,639
Non-Staff Costs	14	44	122	894	644	226	496	259	437	347	334	275	129	4,289

Costs are based on Staff costs of 75KAU per year.

Costs - breakdown by function

Staffing	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Yrs
Management														
Principal Investigator	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.3	0.3	0.2	3.6
Project Manager	0.2	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	10.7
System Engineer		0.5	0.5	1.0	1.0	1.0	0.5	0.5	0.2	0.2	0.2	0.2	0.1	5.9
Quality Assurance														
QA Engineer		0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.3	0.3	4.0
Support														
Administration	0.2	0.2	0.2	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	8.6
System Manager				0.3	0.3	0.5	0.5	1.0	1.0	1.0	1.0	0.5	0.3	6.3
S/W Engineer(s)				2.0	2.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	1.5	31.5
Science Team														
Project Scientist	0.2	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	9.7
Instrument Scientists		1.0	1.0	1.0	1.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	1.5	26.5
Support Astronomers				1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0	1.5	24.0
Operations Team														
Operations Manager								0.5	1.0	1.0	1.0	1.0	0.5	5.0
Mission Planners									2.0	2.0	2.0	2.0	1.0	9.0
Support								1.0	1.0	1.0	1.0	1.0	1.0	6.0
Total (yrs)	0.8	3.1	3.1	6.2	6.2	12.9	14.2	17.0	19.2	19.2	15.0	17.2	9.8	150.5
Costs														
Infrastructure					1,000									1,000
Computing facilities				50		250	250		100					650
Recurrent	3	31	31	62	62	129	142	170	192	192	180	172	96	1,508
Travel & Subsistence	6	23	23	61	61	97	107	128	144	144	135	129	74	1,131
Staff	60	233	233	611	611	968	1,065	1,275	1,440	1,440	1,346	1,290	736	11,306
Total (KAU)	74	257	257	804	1,754	1,449	1,564	1,573	1,876	1,776	1,660	1,591	907	15,594
Non-Staff Costs	14	54	54	193	1,143	476	499	296	436	338	314	301	172	4,255

Costs are based on Staff costs of 75KAU per year.

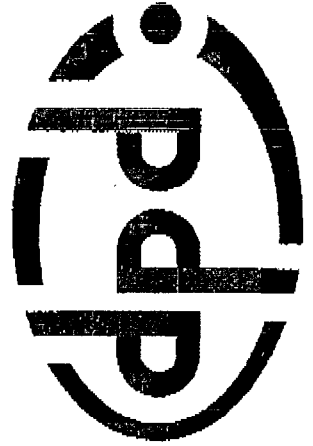
Attachment # 6

SOFTWARE DESIGN OF THE XMM SOC ARCHIVE MANAGEMENT SUBSYSTEM

AMS

Nestor Peccia

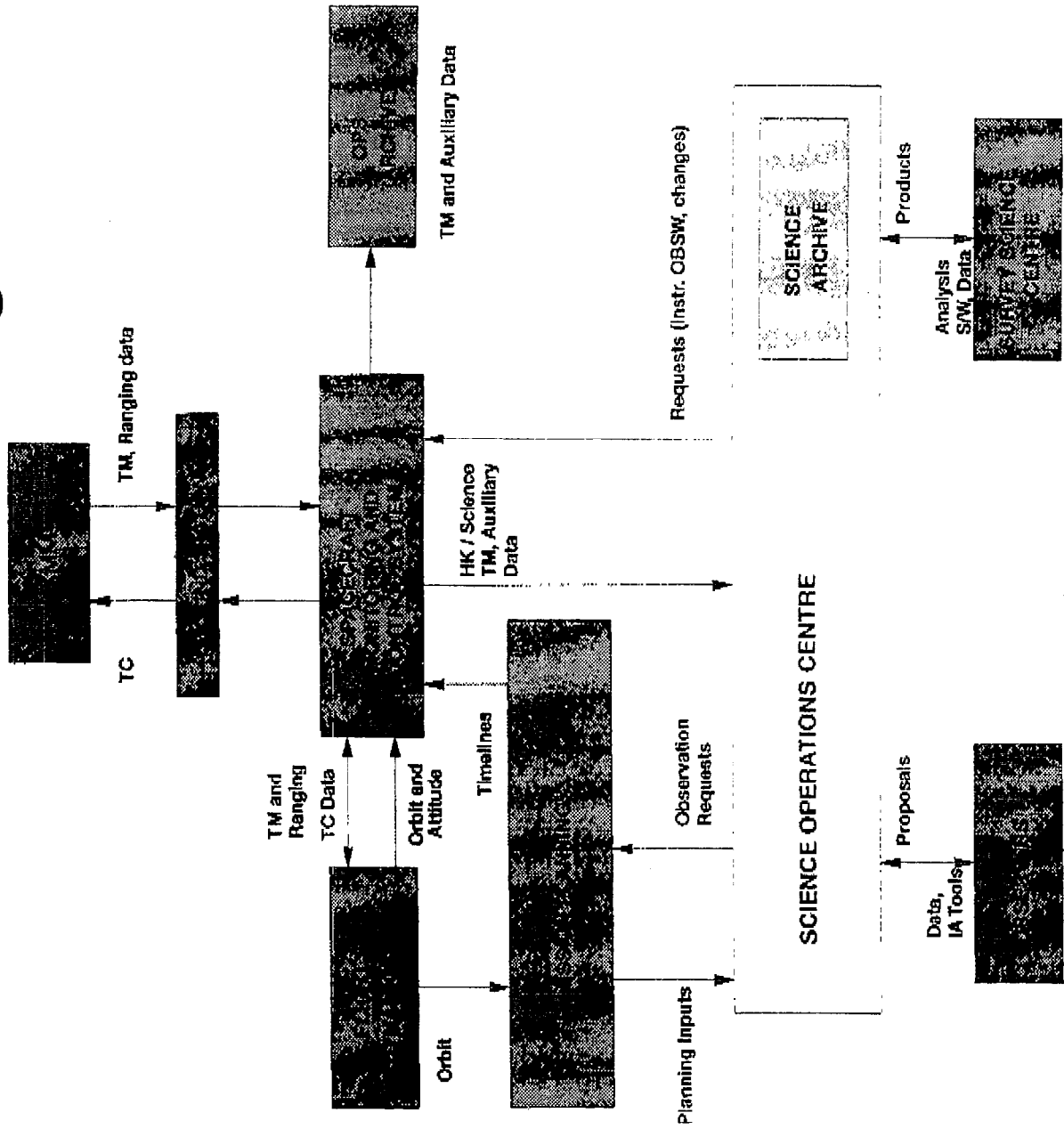
**European Space Operations Centre (ESOC)
Darmstadt, Germany**



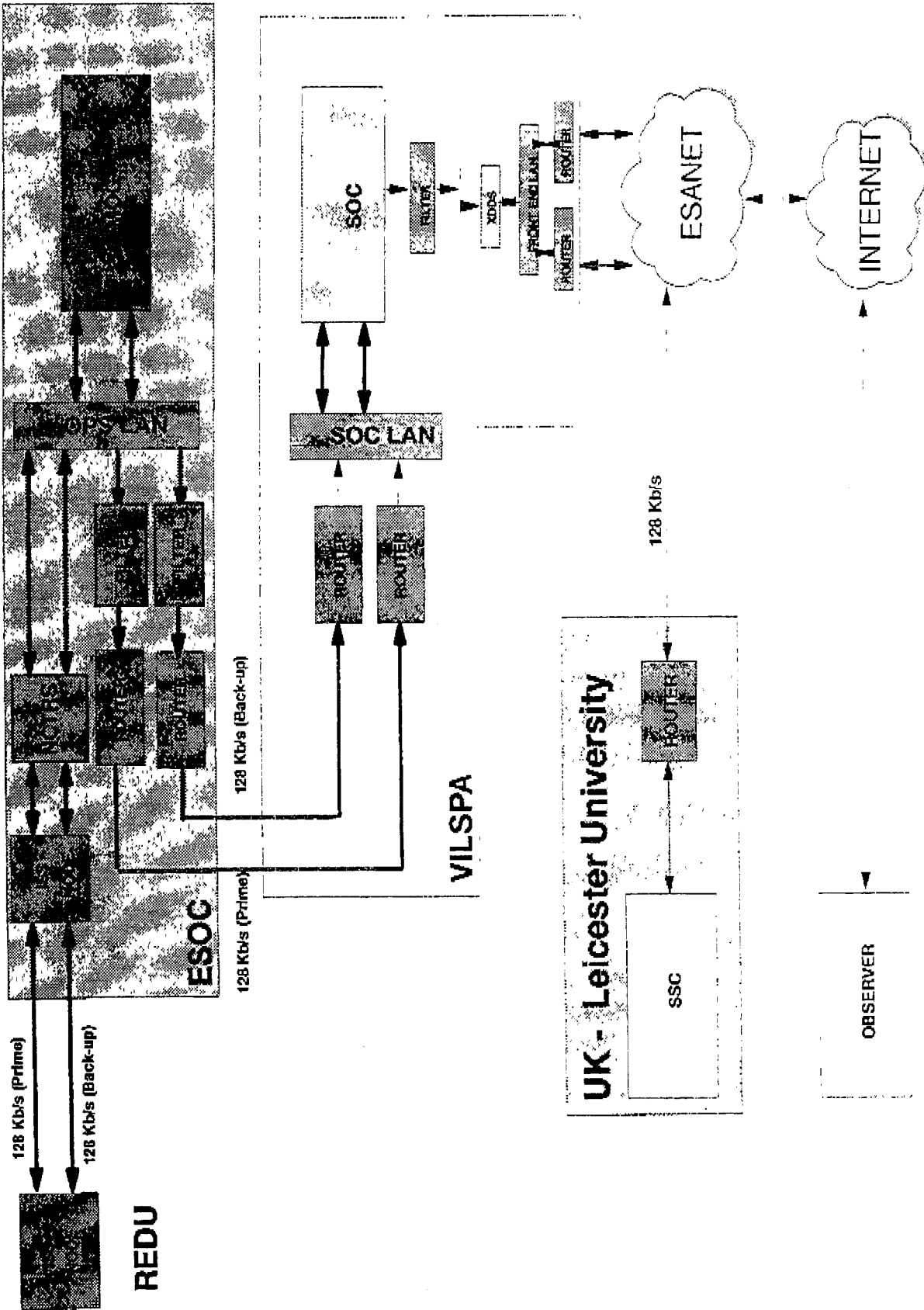
Overview

- **XMM Ground Segment**
- **SOC Functional Overview**
- **SOC Architecture**
- **XSCS Software Architecture**
- **AMS Description**
- **AMS Architecture**
- **HSM**
- **External World Access**
- **Client - Server Architecture**
- **Schedule**

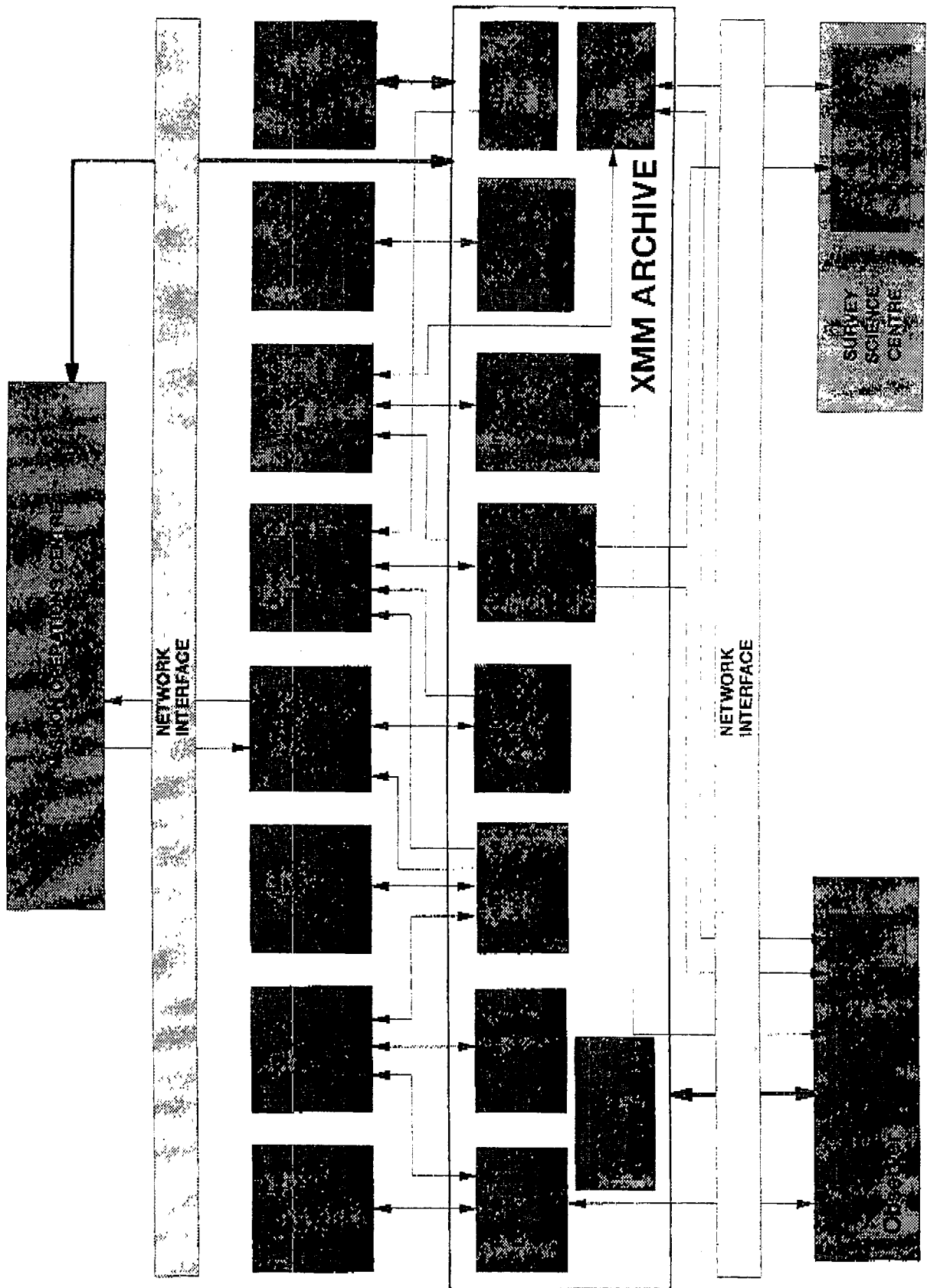
XMM Ground Segment



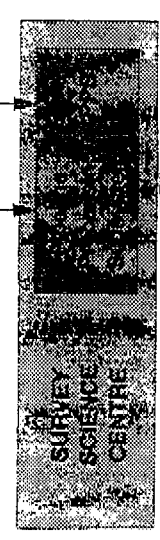
XMM Ground Segment



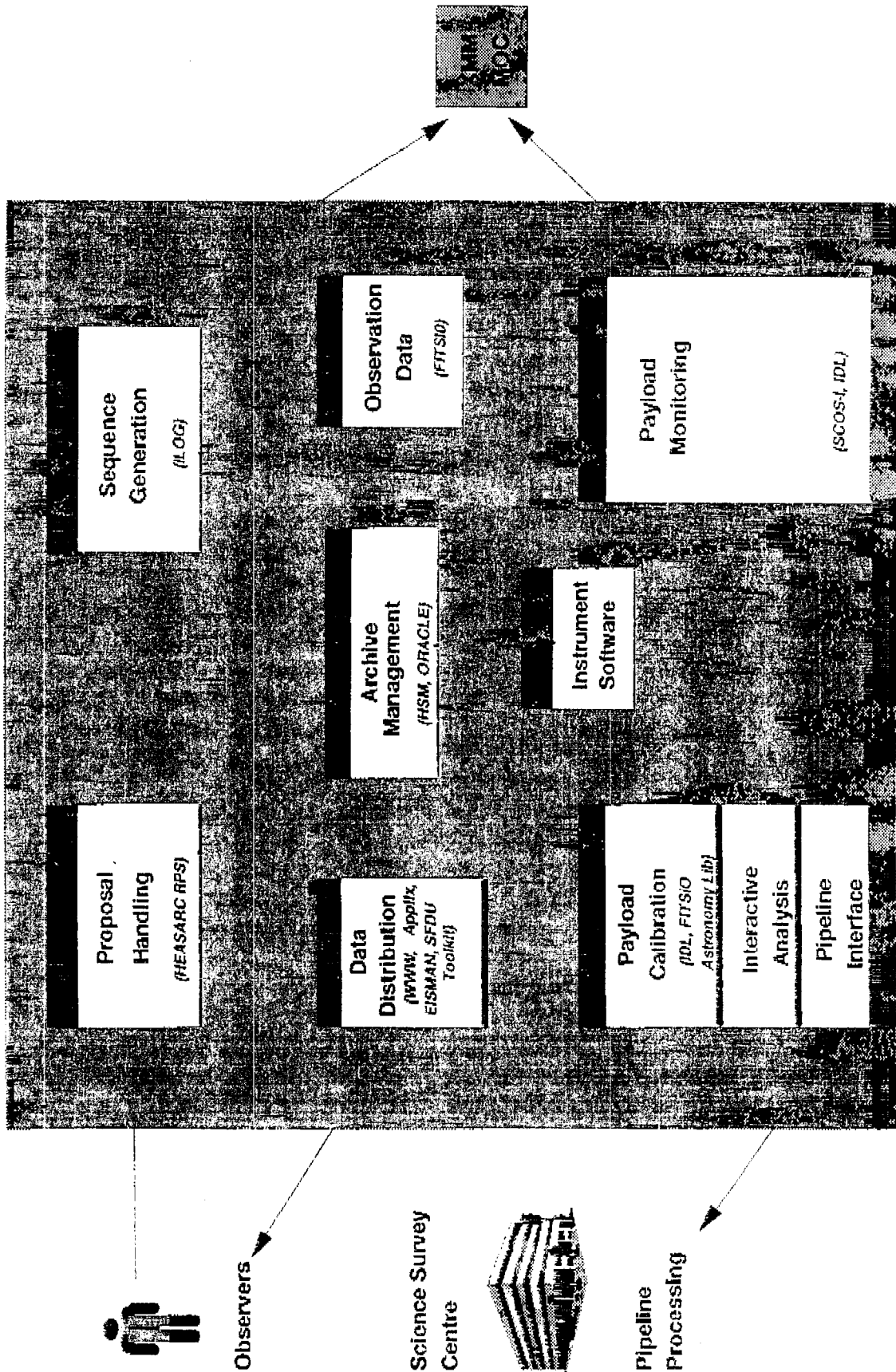
SOC Functional Overview



Software Design of the XMM SOC AMS

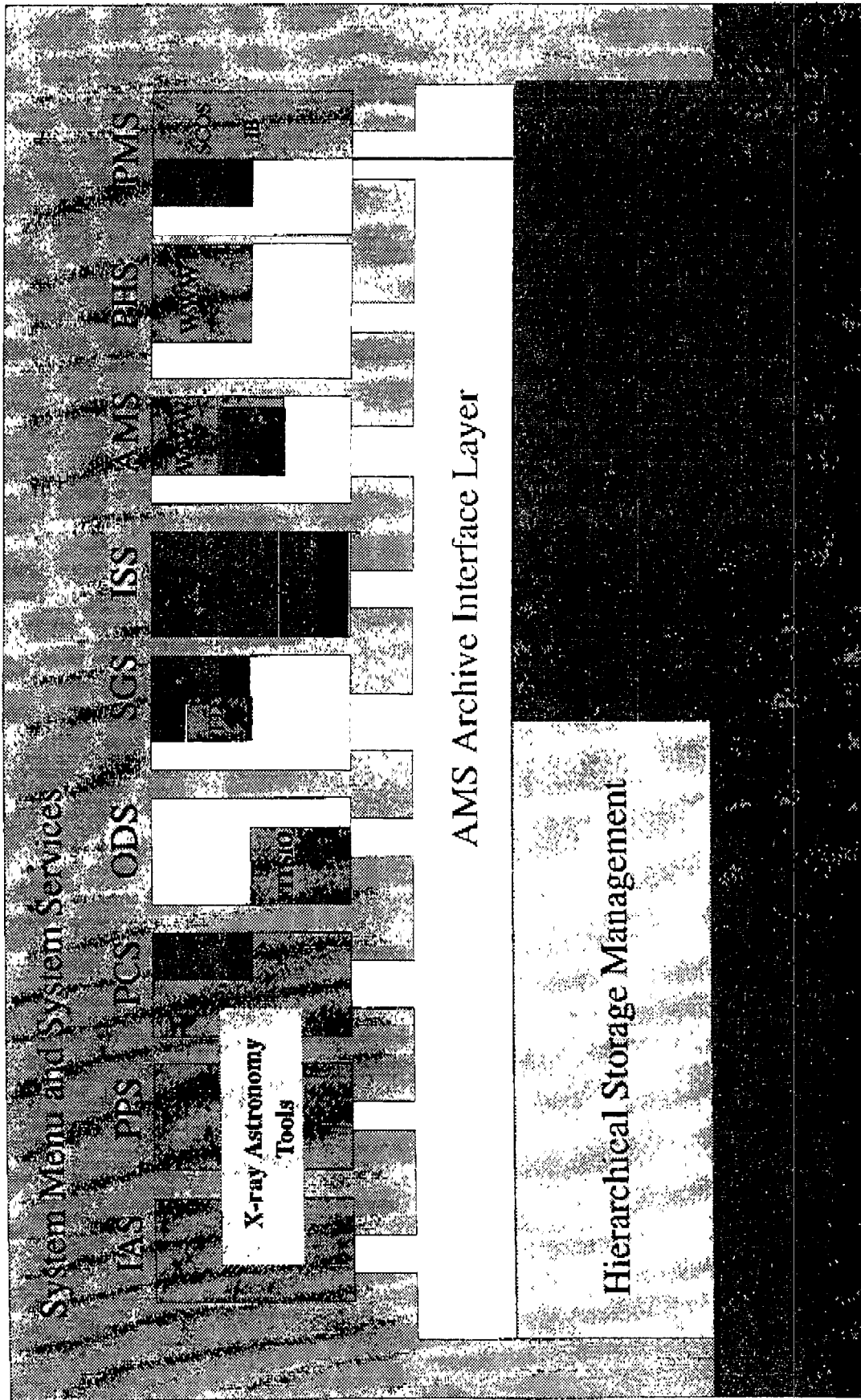


SOC Architecture



Software Design of the XMM SOC AMS

XSCS software Architecture



bespoke software

XMM SOC AMS DESCRIPTION

UNIX files

PSF, POS, Proposals, Proposals Status, Timeline and Summary, Proposal generation Form, Observation Data Files (includes HK TM and Science TM), Slew Data Files (includes HK TM and Science TM), IAS / PPS Software, Calibration Data, Calibration Products, Current Calibration File, Target List, IAS / PPS Products, TC History, OAD Data (APH, DBOB, etc.), Summary data, Ground Calibration Data, AIV data, Reports, Search results, Status Messages, Test Data, Observation Log

Configuration Files, Source Code, etc.

PR, Newsletter, XMM Express, etc.

Commercial Database (ORACLE)

Public Tables

Subsystem Tables

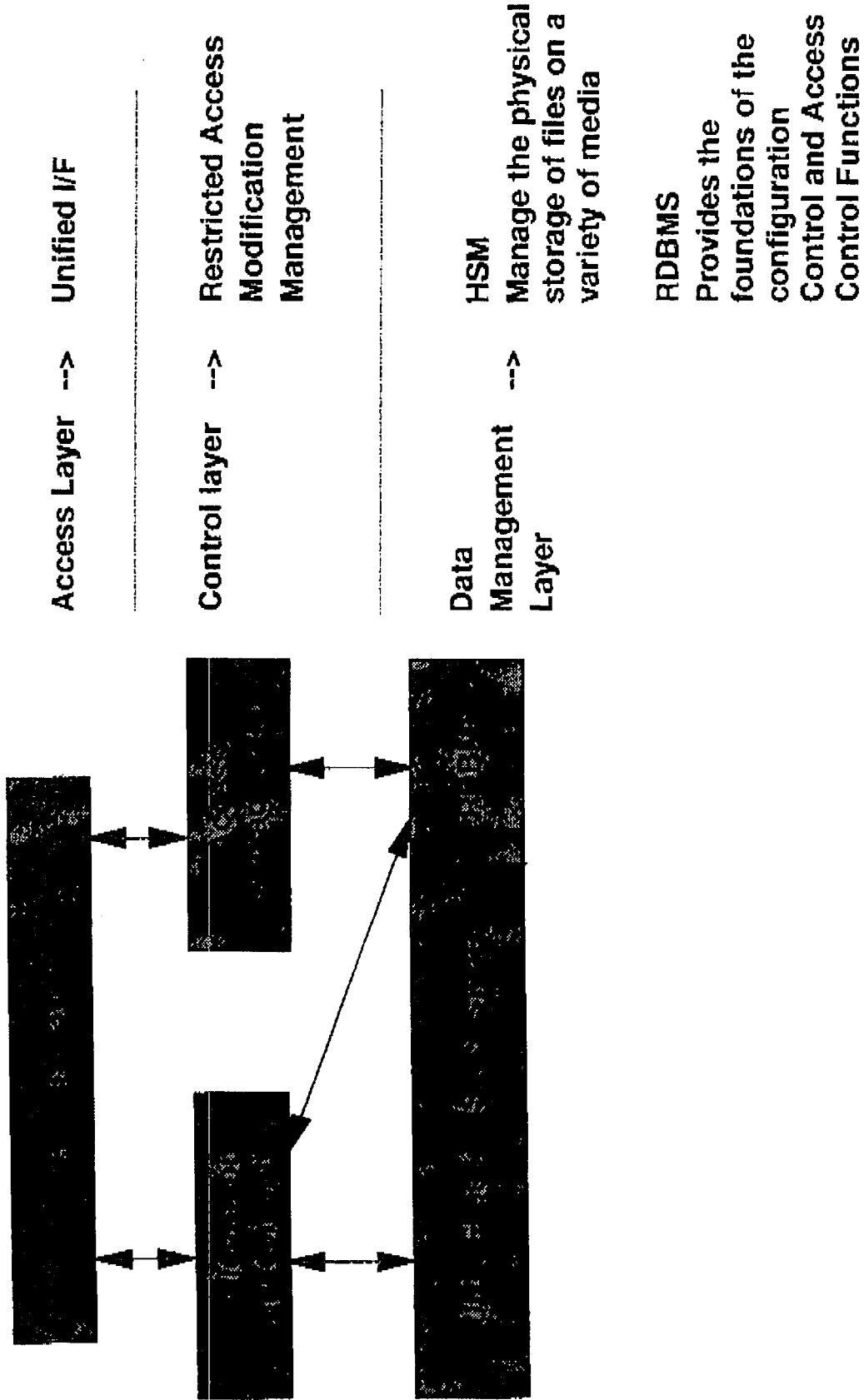
Private Tables

Accessed by S/W Support



Software Design of the XMM SOC AMS

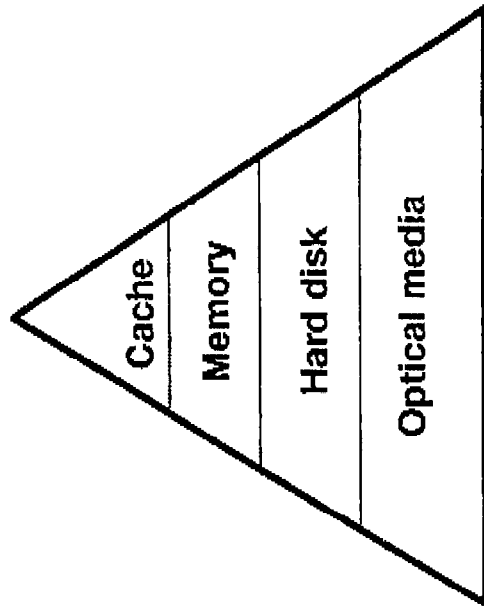
XMM SOC AMS ARCHITECTURE



Software Design of the XMM SOC AMS



Hierarchical Storage Management System - HSM



• ATTRIBUTES

- Optimised Data Access
- Simplified disk space management
- Built in media management
- Built in peripheral management
- Back-up capability Built-in HCI

• BENEFITS

- improved functionality
- reduced development costs and performance
- reduced operator overheads
- easy integration

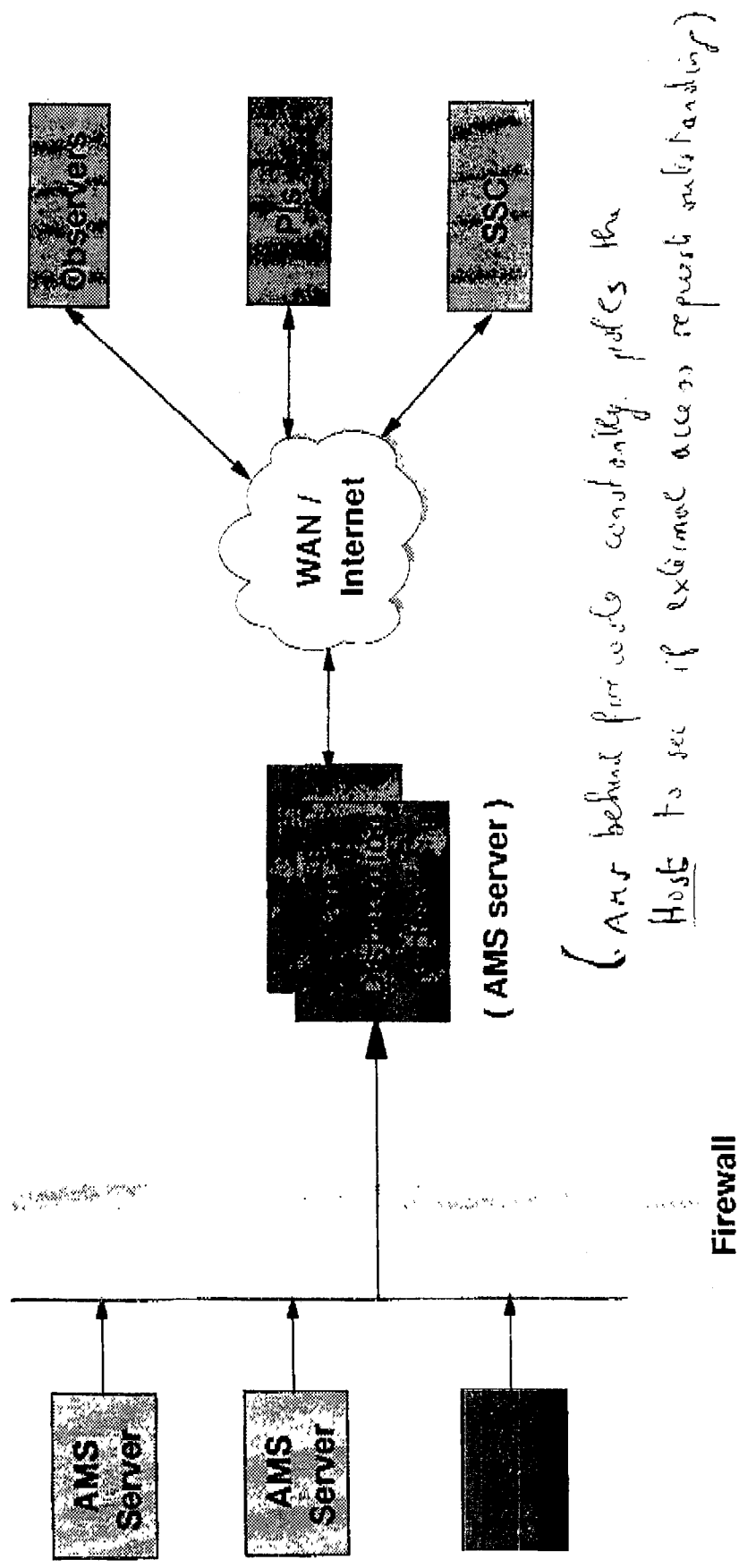
• CANDIDATES

- TMASS
- EPOCH
- UNITREE
- FILESERV
- AMASS

Software Design of the XMM SOC AMS

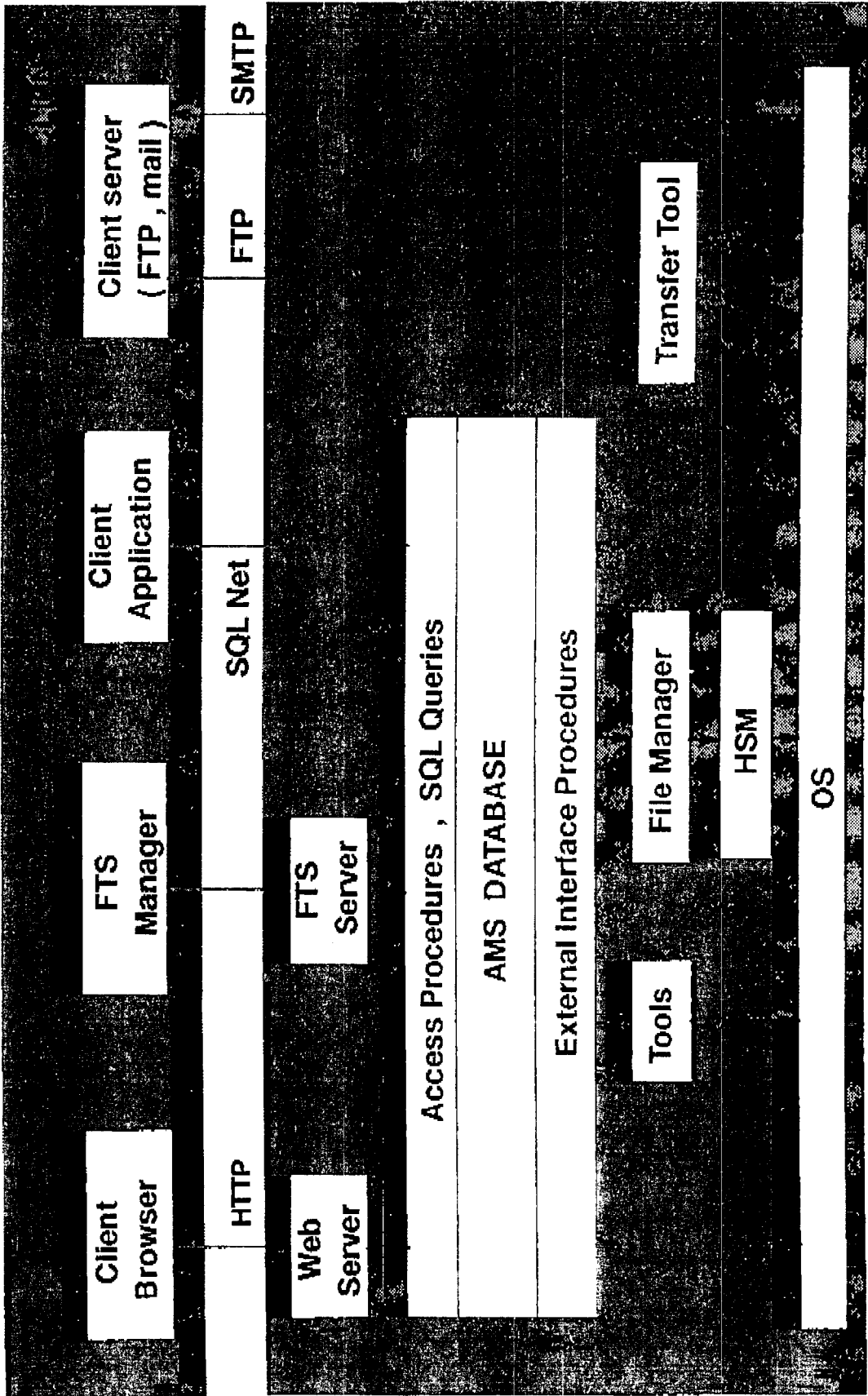


External World Access to the XMM SOC



XMM SOC AMS

Client - Server Architecture



XMM SOC AMS schedule

- **AMS Browser Prototype** **June 1997**

- **AMS 1st Delivery** **Jan 1998**
 - Supports PHS delivery (database storage, retrieval and query of proposals)

- **AMS 2nd Delivery** **July 1998**
 - Supports additional functionality

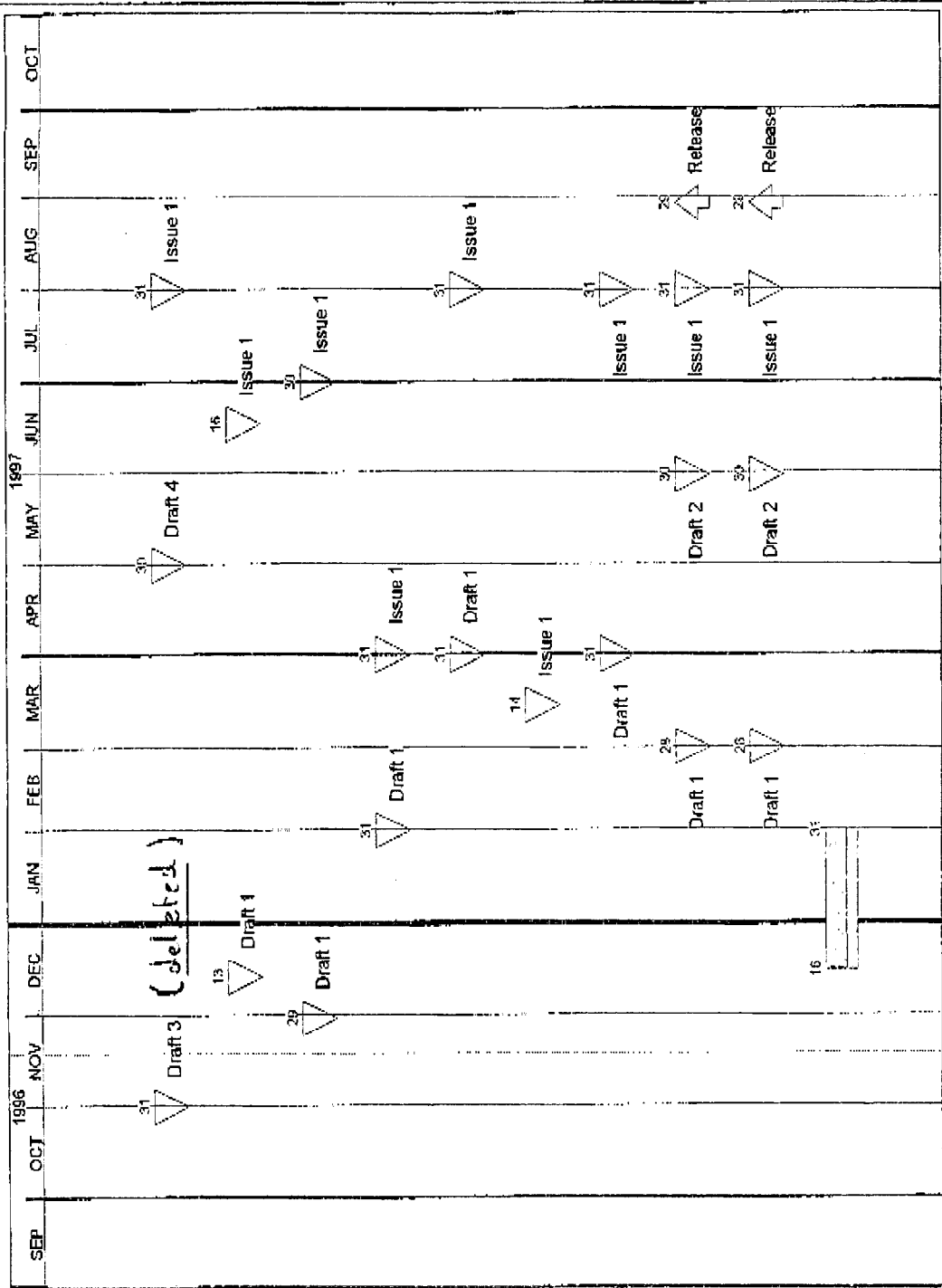
- **AMS 3rd Delivery** **Jan 1999**
 - Final delivery including Data distribution System and browser elements

Software Design of the XMM SOC AMS



Attachment # 7

FIRST Operation Requirements & Concepts



MILESTONES
Sc. Operations Concept and Ground Segment Doc. (PE)
MIRD (PE/AR)
SIRD (PE)
Science Management Plan (GP)
Operation Requirements for Scientific Instruments (PE/HS)
Mission Requirements Doc. (GP)
Instrument Performance Specification (GP)
Instrument Interface Doc. (IID-B)
Announcement of Opportunity (HS)
Costing (Project)

Prepared by : R. Orenius
 Approved by : J.A. Steinz
 Status date : 16-NOV-96

ESA/ESTEC - Scientific Projects Department
FIRST Project Office



Schedule Information :
 Schedule Status : Draft
 Release No. : 0.2

Legend:
 Planned : [Symbol]
 In Progress : [Symbol]
 Completed : [Symbol]
 Delivery : [Symbol]
 Milestone or Event (with current date) : [Symbol]


esa
european space agency

european space research and technology centre

FIRST PROJECT TELEFAX

Priority : NORMAL	Originating signature :	Authorised by :
-----------------------------	-------------------------	-----------------

Date : 20 November 1996

Page: 1 of 1

Ref. : PT-03601

+ att.: 31

From : P. Estaria, ESTEC/PT

 To : FIRST Science Operations Definition Group :

ESOC -- A. Robson (MOD)

Fax.: (49)-6151-903409

RAL -- K. King

Fax.: (44)-1235-446667

MPE -- O. Bauer

Fax.: (49)-89-3299-3569

SRON -- P. Roelfsema

Fax.: (34)-1-813-1353

ESTEC -- H. Schaap (PT)

ESTEC -- G. Pilbratt (SA)

Cc. : ESOC -- A.F. Smith (MOD), N. Peccia (MOD)

ESTEC -- K. Hjortnaes (WMS), J. Riedinger (SAX)

w/o attachment:

ESTEC -- J.A. Steinz (PI), B. Taylor (SA)

 Subject : Minutes of the 6th FSODG Meeting

Please find attached the minutes of the 6th FSODG meeting. There are seven attachments to the minutes.

Regards,

P. Estaria