ASTRO(2004)6
Att : Astro(2003)10,corr.
Astro(2003)11
Astro(2003)12,corr.
Astro(2003)13
Astro(2003)14,corr.
Astro(2003)15
Astro(2003)16,corr.
Astro(2003)9, rev.1
ANNEX
Attachments 1 & 2
Paris, 13th August 2004

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Report of 116th Meeting

held on 8th and 9th October 2003
at the Space Expo Centre, Noordwijk (NL)

Those present:

Members of the Working Group:	C. Turon (Chair) C. Aerts P. Caraveo J. Cernicharo P. De Bernardis C. Done A. Goobar T. Henning R.J. Ivison J.-P. Kneib M. McCaughrean E. Meurs D. Queloz (part time) M. van der Klis Pedro T. P. Viana (Apologies were received from P. Schneider who was unable to attend)
SPC:	R. Pellinen (chairman, part time)
SSAC:	M. Grewing (chairman, part time) X. Barcons, J. Christensen-Dalsgaard, L. Drury
Invited experts:	I. Roxburgh, L. Lindegren
ESA:	S. Volonte (Executive Secretary) A. Gimenez, J. Louet, J. Clavel, M. Kessler, F. Jansen, C. Winkler, A. Parmar, F. Favata, M. Perryman, G. Pilbratt, J. Tauber

8 October

The AWG Chair, Catherine Turon, welcomed the Chairman of the SPC, Prof. R. Pellinen, and the Chairman of the SSAC, Prof. M. Grewing. She then invited all the attendees to introduce themselves. She informed the AWG that both the SPC and SSAC chairmen would address the group in preparation of the discussion on the restructuring of the Science Programme.

1. Adoption of Agenda (ASTRO(2003)9)

In order to allow the SPC and the SSAC chairmen to address the AWG immediately at the beginning of the meeting, items 3. (misson extensions) and 4. (restructuring of the Science Programme) were interchanged. The Agenda was then **adopted.**

2. Approval of minutes of the previous meeting (ASTRO(2003)8)

The Draft report of the 115th AWG meeting had been sent to the Members prior to the meeting. After some corrections, the minutes **were approved.**

3. Mission extension

3.1 XMM-Newton

Following the extensive presentations made at the previous AWG meeting by himself and by the chairman of the XMM-Newton User's group, the Project Scientist F. Jansen reported with the aid of a PC presentation, on the updated status of the mission, also highlighting new scientific results (for details see item 5.3 in the attached ANNEX).

He then presented a consolidated proposal for a four-year rolling extension of operations (2 years + 2 years for planning purposes) for the period 2004-2008 (see hand outs circulated at the meeting), subject to review and re-approval by SPC after two years While the Executive had identified cost saving measures to mission operations, the present proposal was based on continuing with the current concept. However, after internal evaluation and further detailed technical studies, the Executive would make a final decision as to the cost saving measures.

The AWG commended the XMM-Newton team for the excellent science return from the mission and the improved efficiency in the operations. ***The AWG formulated the recommendation on the XMM-Newton extension of operations given in ASTRO(2003)11.***

3.2 Integral

With the aid of a PC presentation, the Project Scientist C. Winkler presented an extensive report on the mission status and science highlights of Integral (for

details see item 5.4 in the attached ANNEX). Handouts were circulated as well as a special issue of Astronomy & Astrophysics on "First Science with Integral".

The extension of operations was then introduced by the Project Scientist. Currently, operations have been approved for an initial period of 2.2 years (i.e. until the end of 2004) for a design lifetime of 5 years (end of 2007). However, assuming that the mission can be extended further than the 5 years and would still deliver good scientific results, a proposal for a four-year rolling extension of operations similar to XMM-Newton was being proposed for the period 2005-2008.

The AWG congratulated the Integral team for the current status of the mission.

After some discussion, the AWG expressed satisfaction with the level of the initial scientific return. However AWG manifested its intention to be consulted regarding the science case for the latter two years of operations.

AWG formulated the recommendation contained in ASTRO(2003)10.

4. Restructuring of the Science Programme

Address by the SPC and SSAC Chairmen

Professor Pellinen briefed the AWG on the situation of the Science Programme. He summarized the financial status of the programme resulting from recent events such as the delayed launches of Rosetta and Smart 1 and the ESA support provided to the Herschel and Planck payloads. Furthermore, some mission cost estimates had increased with respect to those approved in Andenes. These issues are summarized in the attached hand outs (Attachment 1). The financial consequences were a shortage of funding of over 100 Meuros in the year 2003 that was being compensated for by a loan from the ESA Council. However the loan would have to be reimbursed by the end of 2006, within the existing Level of Resources of the Programme. As a result, the Cosmic Vision plan approved by SPC in Andenes in May 2002, was no longer affordable and had to be restructured to adhere strictly to the new financial boundaries.

A special SPC workshop had been held on 25 September to discuss the reconstruction of the programme and provide the advisory bodies with guidelines for carrying out their task. The advisory groups were asked to take an updated look at the missions' scientific merits, taking into account the international situation, including any relevant competing or complementary missions. The conclusions of the workshop are summarized in Attachment 2.

The questions to be addressed by the advisory groups are listed below:

- How much later than 2012 could missions be acceptably slipped given the consequences for definition of future missions?

- Recalling that Eddington was a "reserve" mission before the definition of the Cosmic Vision programme, is there any reason to change its priority with respect to the other missions?

- Would a de-scoped BepiColombo mission retain its scientific priority? If so, what de-scope options are tolerable?

- For which missions is early implementation essential to retain scientific priority and impact?

A further issue to be addressed by the advisory groups was the need to establish a wedge of uncommitted resources in the later part of the reconstructed programme in order to allow new missions to be started.

In addition, the SPC Chairman requested the AWG to address the following specific questions (listed in Attachment 1.):

- Evaluate the scientific relevance of Eddington in 2009 or even 2010, i.e. one/two years beyond current launch date.

- If something has to be de-scoped in Astronomy, what options are scientifically acceptable ?

- If a mission has to be cancelled, which are the priorities among Eddington, GAIA and JWST ?

- If a mission is cancelled, what are the possibilities to restore balance with Solar System science ?

- Evaluate the scientific relevance of LISA Pathfinder and LISA within the ESA Science Programme.

In closing his intervention, the SPC chairman asked that, in formulating its priorities for the reconstructed plan, the AWG provide clear and strong recommendations.

Referring to the programmatic and financial context of the Cosmic Vision plan approved by SPC in Andenes, Prof. Grewing, SSAC Chairman, summarized the circumstances that had led to the present critical situation. He emphasized the increasing load on the Science Programme budget due to payload costs, the need to find further savings for a timely reimbursement of the loan and the impact on the various projects with particular attention to the Eddington mission.

Both chairmen answered questions raised by AWG members. In particular, it was underlined 1) that Eddington was no longer a “reserve” mission since the Andenes meeting in May 2002, but an element of the programme; 2) that, also in 2002, GAIA was redesigned to fit a reduced envelope (with 165 M€ savings with respect to the original cost of 585 M€). Finally, the AWG chair, C. Turon, thanked the SPC and the SSAC chairmen who left the meeting.

Following the guidelines provided by the SPC chairman, the AWG then carried out the reassessment of the Eddington and GAIA missions (the AWG decided not to re-discuss JWST as this mission had already been approved by SPC).

4.1 Eddington

The Eddington Project Scientist, F.Favata, supported by Prof. I. Roxburgh, member of the Eddington Science Team, briefed the AWG on the status of the mission (see ANNEX, section 8.3, for details). He provided information on the on-going competitive definition studies. Both industrial contractors had converged on a design based on a set of 3 telescopes and associated CCD focal plane arrays, accommodated on a copy of the Herschel-Planck platform. The concepts were technically feasible within the schedule constraints of the procurement of the platform. The total mission cost would be known in the spring 2004 timeframe. In the ensuing discussion, clarifications were provided by J. Louet, Head of Science projects, regarding the cost assumptions used at the SPC meeting in Andenes, to include Eddington in the Cosmic Vision plan.

4.2 GAIA

M. Perryman, GAIA Project Scientist, supported by Dr. L. Lindegren, member of the GAIA Science Team, provided an update on the status of the various GAIA study activities (see ANNEX, section 8.2, for details). He recalled the Andenes assumptions for a launch not later than 2012 but confirmed that the present study schedule was geared to a technically feasible launch in mid 2010. He outlined the data processing and analysis concept and the planned involvement of the scientific community through an AO for the GAIA data processing system. After L. Lindegren provided clarification on the connectivity of data, J. Louet commented on the technical feasibility of the schedule based on a start of the competitive definition study activity in mid 2004.

4.3 Discussion and recommendation

This item was postponed to the afternoon of 9 October. In opening the discussion, the Chair C. Turon, recalled the SPC guidelines and the specific questions raised by the SPC Chairman to the AWG as well as the criteria for evaluation used by the AWG in 2000 and 2002. The AWG confirmed the scientific excellence of the missions under discussion as well as their readiness and technical feasibility. Nevertheless in the spirit of the reconstruction effort, ***the AWG expressed clear priorities regarding the reconstruction of the programme as reflected in the recommendation given in ASTRO(2003)13.***

5. Satellites in orbit

Due to lack of time, this item was not discussed. It is summarized in the attached ANNEX, section 5.

9 October

6. Selection of Eddington Science Team and Payload Consortium

By way of introduction and to place the discussion into context, the Project Scientist summarized the presentation of the Eddington mission made at the plenary session on 7 October.

6.1 Evaluation of proposals

Payload consortium

Only a single proposal had been received for a large consortium of 41 institutions in 11 member states, led by INTA, Madrid. On the basis of the terms of the Eddington Science Management Plan and the criteria spelled out in the AO, the Project Scientist reported on the evaluation carried out by the ESA technical evaluation group. The AWG also heard the evaluation reports of the designated AWG members. Although the expertise represented in the consortium was judged adequate, the AWG considered that the organization and management structure needed significant improvements before the proposal could be accepted. The AWG requested that a revised, improved document be presented before a final recommendation could be formulated.

Eddington Science Team

The evaluation was carried out by designated AWG members. Referring to the AO, the Chair recalled the role and responsibilities of the SWT as well as the criteria for evaluation of the 14 proposals received for membership in the Eddington Science Working Team (SWT). After a brief review of the candidates, the Chair presented a proposal for membership based on the evaluation carried out by designated AWG members. After some discussion a consensus was reached and the final composition was unanimously agreed.

6.2 Recommendations

Payload consortium

The detailed conclusions of the evaluation carried out by the AWG are formulated in the ***recommendation given in ASTRO(2003)16 attached***.

SWT membership

The proposed team was considered of very high quality having the broad spread of expertise and the mix of experience required to successfully provide the scientific support needed for a successful implementation of the mission.
The SWT membership with a summary of the expertise of each proposed scientist, is presented in the recommendation ASTRO(2003)15 attached.

7. Projects under development

7.1 Herschel

With the aid of a PC presentation, the Project Scientist, G. Pilbratt, summarized the status of the project (see attached ANNEX, section 7.1) and a preliminary plan proposed by the SWT for the implementation of the mission's observing programmes in the spirit of the terms of the already approved Science Management Plan (SMP). Elements of the observing plan included the division and scheduling of the guaranteed and open time and the consolidation of observing time in the form of key projects. The AWG expressed concern that the proposed plan would give preferential treatment to Guaranteed Time (GT) holders and would introduce deviations from the SMP. AWG favoured an approach with no proprietary period for key projects, similar to HST Treasury or SIRTF Legacy programmes. However, it was recognized that with the limited lifetime of the Herschel mission such an approach would be difficult to implement. Therefore, the ***AWG passed the resolution contained in document ASTRO(2003)14*** requesting the Project Scientist and the SWT to prepare a revised proposal to ensure that as much of key project data as possible enter the public domain as soon as feasible.

7.2 Planck

The Project Scientist, J. Tauber, with the aid a PC presentation, reported on the status of the project (see ANNEX, section 7.2). Referring to the loss of the 100 GHz channel in the LFI instrument, he briefed the AWG on the potential inclusion of 100 GHz Polarisation Sensitive Bolometers (PSB) in the HFI instrument, to be procured via JPL. The AWG strongly endorsed the use of PSBs on Planck and passed the ***resolution contained in ASTRO(2003)12.***

The Project Scientist then discussed the revision of the current Planck Science Management Plan (SMP) approved in May of 1997. Since then, a number of significant changes had occurred, which affected some of the principles laid out in the document. As a consequence, the Planck Science Management needed updating to reflect the new situation. The Project Scientist outlined the principal changes which consisted in the inclusion of a fully funded ESA Planck Science Office whose role was to manage the scientific operations of the satellite (this task was originally the responsibility of the instrument consortia but proved to be unworkable), the removal of an AO to the community for early access to the Planck data during the proprietary period (there was no scientific driver nor justification to involve the external community at such an early stage when the data would not be fully understood, hence not usable) and its replacement by an Early Release Compact Source Catalogue to be issued for early use by the community, and some cosmetic changes reflecting the new situation (schedule and reflector procurement updates, clarification of nomenclature etc).

The AWG took note of the proposed changes. It requested the Project Scientist to proceed with the updating of the Science Management Plan along the lines

proposed, and to submit the revised document to AWG, SSAC, and SPC for approval in early 2004.

7.3 **COROT**

Due to lack of time, this item was not dealt with. However, it was agreed that the Executive secretary would circulate the status report prepared jointly by the COROT project manager and project scientist. The status report is attached in the ANNEX, section 7.3.

8. Projects in preparation

8.1 JWST

The Executive Secretary informed the AWG that ESA was preparing the JWST Science Management Plan for approval by SPC in February 2004. The schedule was dictated by the need to issue the AO for membership in the NIRSpec science team in time to have this team in place at the start of the industrial implementation phase in May 2004. For the status report, see ANNEX, section 8.1.

8.2 Astro-F

See ANNEX, section 8.4.

9. Future mission studies

This item was introduced by J Clavel (see ANNEX, section 9.)

9.1 IRSI-Darwin

No comment

9.2 XEUS

No comment

9.3 ISS payloads

No comment

10. Membership for 2004

Due to the lack of time, this item was not discussed. However, the chair requested AWG members to provide written proposals by e-mail within the week to her and to the Executive Secretary. The candidates would then be reviewed by both and a list of proposed new members would be sent to AWG for final approval by mail.

11. Any other matters

There were no other matters to consider.

12. Date and place of next meeting

The next meeting (117th AWG) was confirmed for 15-16 January 2004 to be held at ESA Headquarters, Paris.

ASTRO(2003)10, corr.
Noordwijk, 9th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Recommendation on the extension of the Integral mission

At its 116th meeting held on 8-9th October 2003 in the Space Expo Centre, Noordwijk (NL), the Astronomy Working Group (AWG) was briefed on the first year of operations of the Integral Observatory and was asked to approve a rolling 4-year mission extension until December 2008.

The AWG expresses its general satisfaction with the current status of the mission and its initial science returns. It is recognized that complementarity with XMM-Newton provides a powerful and unique tool for the exploration of many high-energy phenomena and the AWG anticipates important, high-profile advances within this extension period.

The AWG recommends approval of the 4-year rolling extension and, in two years time, the AWG expects to review and endorse the science case for the latter two years of the requested 4-year extension.

ASTRO(2003)11
Noordwijk, 9th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Recommendation on the extension of the XMM-Newton mission

At its 116th meeting held on 8-9 October 2003 in the Space Expo Centre, Noordwijk (NL), the Astronomy Working Group (AWG) was briefed on the status of ESA's XMM-Newton satellite, and was asked to approve an extension of the XMM-Newton operations until 31 March 2008, i.e. for a further 2 years beyond the existing recommendation.

The AWG commends the current excellent science return from this ESA cornerstone project. This is a world class mission, and is now efficiently delivering data to the community. **The AWG strongly recommends the proposed extension**, and anticipates that the current level of productivity will continue over the expected lifetime of the mission.

The AWG urges the Executive to continue their efforts to review any possible source of cost savings.

ASTRO(2003)12,corr.
Noordwijk, 9th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Resolution on Planck

At its 116th meeting held on 8-9 October 2003 in the Space Expo centre, Noordwijk (NL), the Astronomy Working Group (AWG) was briefed on the status of the Planck payload development, and was informed of the potential inclusion of 100 GHz Polarization Sensitive Bolometers (PSBs) in the HFI instrument.

The AWG restates the importance of securing 100 GHz polarization capabilities for Planck. Mapping the polarization of the Cosmic Microwave Background with high accuracy is one of the most important goals of current Observational Cosmology and promises extremely important results for Fundamental Physics. At this frequency, the foreground contamination from our Galaxy is minimal and PSBs are optimal for this measurement.

The AWG strongly endorses the use of 100 GHz PSBs on Planck. This will result in significantly improved quality of the data, which will be of extreme interest per-se and in view of future missions devoted to CMB polarization.

ASTRO(2003)13
Paris, 13th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Recommendation on the reconstruction of the Cosmic Vision Programme

At its 116th meeting held at the Space Expo centre, Noordwijk (NL), on 8-9 October 2003, the Astronomy Working Group was asked to reappraise its position with regard to the GAIA and Eddington missions in the context of the severe budgetary problems facing the ESA Cosmic Vision Programme, as presented to the Scientific Advisory Structure at the 7 October 2003 plenary meeting.

The AWG was asked to consider whether there were any reasons to alter the priorities established in previous assessments of the astronomy programme and whether any significant descopes could be identified which might help relieve the pressure on the science programme.

In this statement, a very brief overview of the scientific relevance of the two missions is given, followed by the AWG's assessment of their readiness, and finally the AWG's priorities for implementation.

GAIA:

GAIA is a scientifically outstanding large mission, unique in the international context, and an essential element of ESA's astronomy programme. By obtaining microarcsecond astrometric parameters and multicolour photometry for up to 1 billion stars, as well as radial velocity data for a substantial fraction of them, GAIA will yield unprecedented 3- and 6-dimensional maps of a large fraction of the Milky Way, enabling us to view its structure in great detail and decode its formation history. The same data will also yield major advances in many other fields of astronomy, including the discovery of very large numbers of extra-solar giant planets, supernovae, and small bodies in the Solar System, an accurate calibration of the cosmological distance ladder, and the extremely precise measurement of fundamental physics parameters through gravitational light bending.

Progress in developing the GAIA mission since its selection in 2000 has been excellent, with significant efforts made to address key areas, including the large mosaics of specialised focal plane CCD arrays at the heart of the satellite and the comprehensive analysis algorithms and systems that are required to deliver uniform, high-precision data products. Crucially, a major redesign effort by the GAIA team resulted in significant cost savings (165Meuro), bringing it well within a Cornerstone envelope while preserving the full scientific capabilities of the mission. Equally importantly, the GAIA costs appear well-contained, inasmuch as no hardware contribution to the payload will be sought from the national agencies.

Eddington:

Eddington is a well-focused smaller mission which uses high-precision photometric monitoring of large samples of stars to address two important scientific goals, namely the discovery of large, unbiased samples of exoplanets through the method of planetary transits, with particular emphasis on terrestrial planets in the habitable zone, and the detailed investigation of stellar structure and evolution via asteroseismology. Europe has established strong international leadership in both fields and the Eddington mission will play a vital part in maintaining this high scientific and public visibility.

The great majority of the science return from Eddington is unique and unlikely to be compromised by competing missions. The more limited NASA Kepler mission should deliver results competing with those of Eddington with regards the detection of extra-solar Earth-like planets, but the unbiased approach of Eddington should result in a broader view, placing these potentially habitable planets in the more general context of a diversity of planetary masses, systems, and environments.

The Eddington mission plan is relatively low risk and with a good state of technological readiness. Substantial efforts have been made to develop a mission that delivers optimal science results in both the exoplanet and asteroseismology fields, while maintaining the costs roughly within the originally proposed Flexi-mission envelope level. Again, these costs appear to be well-contained, on the basis that no hardware payload contributions from the national agencies will be necessary.

Priorities:

The AWG remains strongly convinced of the scientific excellence of both GAIA and Eddington, and firmly reiterates its desire to see both missions implemented in a timely manner. Both missions have engaged large numbers of scientists working in the European astronomy community, with clear emphasis on areas of existing European leadership, specifically in high-precision astrometry, asteroseismology, and exoplanet detection and characterisation. Both missions have well-defined and relatively low-risk payloads, with no hardware contributions from the ESA national agencies required. Finally, both missions have made significant and successful efforts to maintain the full scientific capabilities upon which they were selected, while remaining within the budget envelopes as originally proposed.

Nevertheless, in the spirit of the reconstruction effort triggered by the budget crisis, the AWG has arrived at the following prioritisation:

i. Top priority for the AWG is GAIA, with a launch not later than 2012

The nature of this mission is such that there is a long post-launch timescale over which the final data products are derived, validated, and catalogued, and a launch date later than 2012 would risk losing the existing highly-specialised astrometric experience in the European astronomy community. Moreover, it would endanger the European world leadership in this field.

ii. Second priority for the AWG is Eddington, with a launch not later than 2009

In view of the competition in the field of extra-solar terrestrial planet detection from Kepler, such a launch date is necessary to ensure that Europe maintains its high profile in exoplanet detection and does not miss the opportunity to play an important role in exploring the characteristics of Earth-like planets, thereby also ensuring the maximum public impact of the mission.

The AWG also discussed possible technical descopes to the two missions and was unable to identify any that would make substantial cost savings. It is to be noted that GAIA was already subjected to a redesign leading to a substantial cost decrease. GAIA relies on a single, large focal plane mosaic without which it would do precisely nothing. In its present design, Eddington relies on three telescopes, each viewing the same field with an identical focal plane detector but with a different filter: trade-off studies have already eliminated one telescope from the original four-telescope configuration, but indicate that deleting another would reduce scientific performance significantly without commensurate cost savings.

Some near-term cost savings could be made by slipping one or other of the missions. The AWG considers acceptable a launch not later than 2012 for GAIA, even though 2010 is the desired date. Similarly, the AWG considers acceptable a launch not later than 2009 for Eddington, even though 2008 is the desired date. However, the AWG strongly resists larger delays on the basis of the arguments presented above, and because it feels that extending launches beyond 2012 would have a very negative impact on the ESA science programme, closing out the possibility of starting new missions within a reasonable future.

Finally, the only possibility for substantial cost savings in the astronomy programme would be to cancel an entire mission. **The AWG opposes such a solution in the strongest possible terms**, but if for some reason it is the only option open to the SPC, it must be clearly stated that a cancellation of GAIA is totally unacceptable.

ASTRO(2003)14,corr.
Paris, 13th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Resolution on the proposed implementation of the

Observing Programme of the Herschel mission

At its 116th meeting held at the Space Expo centre, Noordwijk (NL), on 8-9 October 2003, the Herschel Project Scientist, Gøran Pilbratt, presented the Astronomy Working Group (AWG) with a preliminary proposal for the implementation of the Herschel observing programme with emphasis on Key Projects. The proposal was drawn up based on the terms of the already approved Herschel Science Management Plan (SMP) and agreed upon by the Herschel Science Team after lengthy deliberation.

Elements of the plan include the division and scheduling of the guaranteed and open time, as well as the consolidation of time into Key Projects: all observational applications, including those using guaranteed time, will be subject to approval by a Time Allocation Committee.

The AWG expressed some concern that the plan as presented would appear to give preferential treatment to the Guaranteed Time (GT) holders, who already hold a substantial 32% fraction of the total time allocation, in particular the decision to give priority to GT Key Projects ahead of those granted in Open Time (OT) applications. In addition, the Key Projects carry a 1 year proprietary period: an approach similar to the HST Treasury and SIRTF Legacy programmes, with no proprietary period, would be preferable.

Recognising the strictly limited lifetime of the mission, the AWG urges the Project Scientist and Science Team to find ways of ensuring that as much of the Key Project data as possible enters the public domain as soon as possible, to give maximum opportunity to the general community to make follow-up proposals and observations.

The AWG requests that the Herschel Project Scientist and Science Team go ahead and complete the final detailed document based on their proposal, along with modifications taking the AWG's concerns into account. This document should then be presented to the AWG for approval at its next meeting.

ASTRO(2003)15
Paris, 10th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Recommendation on the selection of the EDDINGTON Science Working Team

The AWG, at its 116th meeting held on 8-9 October 2003 at the Space Expo centre, Noordwijk (NL), having heard the reports of its designated members and taking into account the terms of the Eddington Science Management Plan to ensure an appropriate balance of role and responsibilities within the Eddington Science Working Team**, recommends that the following candidates be appointed as members of the Eddington Science Working Team for an initial term of 3 years:**

- C. Catala (Paris)
- C. Aerts (Leuven)
- J. Christensen-Dalsgaard (Aarhus)
- I. Roxburgh (London)
- H. Rauer (Berlin)
- D. Queloz (Genève)
- K. Horne (St. Andrews)
- G. Micela (Palermo)
- G. Piotto (Padua)

The proposed team is considered of very high quality, having the broad spread of expertise required for the successful implementation of the mission, as well as a mix of experience (with both more senior and more junior scientists).

A summary of the expertise of each proposed scientist follows :

Systems Scientist: Claude Catala (Paris Obs.)
One of the key persons in the COROT team. CC conjugates a deep understanding of the science with an equally deep understanding of the instrumental capabilities and limitations. Such mix of skills is rather unique and will be essential for the further development of the mission. CC is also a strong team player.

Data Analysis Scientist: Conny Aerts (Leuven Univ.)
CA has a long and proven experience in the analysis of asteroseismic data and in the organization of large teams. She has assembled and leads the 'ENEAS' consortium, putting together all the European research institutions interested in asteroseismology.

Asteroseismology Scientist: Joergen Christensen-Dalsgaard (Aarhus Univ.)
An uncontested expert in the field of helio- and asteroseismology with an impressive track record and one of the original proposers of the Eddington mission. In addition to the expertise of the Aarhus group, he brings into the team his deep expertise in the exploitation of the SOHO helioseismic data.

Asteroseismology Scientist: Ian Roxburgh (QMW, Univ. London)
One of the original proposers of the Eddington mission, IR has a long and very active track record in the field of asteroseismology. He has been very active in all previous phases of the Eddington mission as well as a key person in its development up to now.

Exo-planetary Scientist: Heike Rauer (DLR Berlin)
A young and active planetary and cometary scientist who also has expertise in exo-planetary system search by transits. She is involved in COROT and responsible for a small-scale ground-based effort for transit searches (the Berlin Exoplanet Search Telescope). HR will bring needed expertise in solar system planetology in the team together with her experience in ground-based searches.

Exo-planetary Scientist: Didier Queloz (Geneve Obs.)
A well-known figure in the field being one of the two discoverers of the first exo-planet (55 Peg). Very active in the field, he is also the Project Scientist of a new-generation ground based instrument (HARPS).

Interdisciplinary Scientist: Keith Horne (St. Andrews Univ.)
KH has a long track-record in the analysis of photometric light-curves for a range of scientific goals applied to a wide variety of objects such as cataclysmic variables, AGN and QSOs. He is also starting a ground-based search of giant planet transits.

Interdisciplinary Scientist: Giuseppa Micela (Palermo Obs.)
A stellar activity expert, strongly involved in different projects at various wavelengths, she will provide the needed support to ensure that the effects of activity-induced noise on the Eddington science is properly understood and its effects correspondingly mitigated.

Ground-based support Scientist: Giampaolo Piotto (Padua Obs.)
A dedicated observer with a long-standing track record in ground-based accurate photometry of crowded fields. GP will bring this expertise in coordinating the large-scale ground-based effort necessary to prepare and support the Eddington observations.

ASTRO(2003)16,corr.
Paris, 13th October 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

Evaluation of the proposal for the Eddington Payload Consortium

The AWG, at its 116th meeting held on 8-9 October 2003 at the Space Expo centre, Noordwijk (NL), heard the report of the ESA technical evaluation group and the reports of the designated AWG members. Taking into account the terms of the Eddington Science Management Plan and the evaluation criteria given in the Eddington Announcement of Opportunity (AO), the AWG arrived at the conclusions summarized below.

In line with the AO, the Eddington Payload Consortium is asked to provide support to ESA in the development of the Eddington mission in the following areas:

1) Support in the technical definition and in the monitoring of the development of the Eddington mission, in particular of the payload;

2) provision of software for the on-board science data processing and for the ground-based data processing;

3) support to ESA for the payload calibration, both during the development and during the operations of the mission;

4) detailed characterization of the Eddington detectors (response, aging, radiation effects, etc.).

In addition, a number of minor tasks (e.g. software verification, instrument software simulator) were included in the AO.

With the exception of the flight science software, none of the items supplied by the payload consortium are schedule- or budget-critical for the Eddington project.

A single response to the AO was received, with a relatively large consortium led by Dr. M. Mas Hesse of INTA (Madrid). The consortium comprises 41 institutions in 11 member countries.

The expertise present in the consortium is considered adequate to fulfil the tasks described in the AO. However, the organization and management structure of the proposal needs significant revision before it can be accepted, with the proposed management structure appearing needlessly complex for the planned activities. It is also suggested that the consortium could be more efficient if reduced in size.

Also, the proposal is quite heterogeneous in its level of detail, depending on the work-packages and on the involved teams. Before acceptance, it needs revising to bring all its parts to an adequate and common level of quality. The proposed work-plan and organization for some of the work packages need to be made more specific and detailed.

Finally, the proposed funding in each country and manpower for each team and work package must be made more explicit.

In conclusion, the AWG requests that the proposal, revised along the lines identified above, be presented at the next AWG meeting before a final recommendation for approval can be formulated.

ASTRO(2003)9, rev.1
Paris, 19th September 2003

EUROPEAN SPACE AGENCY

ASTRONOMY WORKING GROUP

116th Meeting

to be held on 8 and 9 October 2003
(commencing at 14.00 hrs on the 8th)

at the SPACE EXPO Centre
Keplerlaan 3
NOORDWIJK (NL)

DRAFT AGENDA

8th October (14.00 hrs)

1. Adoption of Agenda (ASTRO(2003)9, rev.1)

2. Approval of minutes of the previous meeting (ASTRO(2003)8)

3. Mission Extension
   - 3.1 XMM-Newton
     - 3.1.1 Mission status
     - 3.1.2 Extension of operations
   - 3.2 Integral
     - 3.2.1 Mission status
     - 3.2.2 Extension of operations

4. Restructuring of Science Programme
   - 4.1 Eddington
   - 4.2 Gaia
   - 4.3 Discussion and recommendation

5. Satellites in orbit
   - 5.1 HST
   - 5.2 ISO

./..

9th October (09.00 hrs)

6. Selection of Eddington Science Team members and payload consortium
   6.1 Evaluation of proposals
   6.2 Discussion and recommendations

7. Projects under development
   7.1 Herschel (status and key programmes)
   7.2 Planck (status and modification of Science Management Plan)
   7.3 Corot

8. Projects in preparation
   8.1 JWST
   8.2 GAIA
   8.3 Eddington
   8.4 ASTRO-F

9. Future mission studies
   9.1 IRSI-Darwin
   9.2 XEUS
   9.3 ISS payloads (EUSO, Lobster, Rosita)

10. Membership for 2004

11. Any other matters

12. Date and place of next meetings

The meeting is foreseen to end at 17:00 hrs.

ANNEX

Project and Study Scientist Reports for AWG # 116

25-09-2003

Report compiled by
- Jean Clavel, Astrophysics Missions Division,
- Martin Kessler, Science Operations & Data Systems Division.

using inputs from Study and Project Scientists.

5. Satellites in orbit

5.1 HST: Bob Fosbury

The Cycle 12 time allocation process took place in Baltimore in late March this year and resulted in the allocation of 3154 primary orbits from a total of 19674 requested. These were distributed over the five instruments currently available, with 53.7% going to ACS, 27.8% to STIS, 14.5% to NICMOS, 7.4% to WFPC2 and 2.2% to the FGS. PIs from ESA member states were awarded 16.8% of the accepted proposals and 10.2% of the accepted primary orbits. The Cycle 13 call for proposals will be issued in early October 2003.

The report of the HST-JWST Transition Panel, chaired by John Bahcall, was issued before schedule in mid-August. It recommended three options to NASA, the preferred one including two further servicing missions to the Observatory: SM4, carrying WFC3 and COS, around 2005 and a new SM5 around 2010 aimed towards maximising the scientific productivity of HST - but only after the proposed science was successful in an open peer-reviewed competition with other new space astrophysics proposals. Whichever of the three options is chosen, it will be necessary to fit a propulsion module to the spacecraft in order to allow a controlled re-entry at the end of its operational life.

All science instruments on HST are working well but there is a significant probability that a full complement of operating gyros may be lost before replacement becomes possible in SM4. Work is being carried out on software for a two-gyro operating mode.

On August 29, 2003, the GOODS ACS Team reached a major milestone by releasing the version v1.0 of the reduced ACS imaging data, acquired as part of the GOODS HST Treasury project (~400 orbits). The data release consists of the full stack mosaic of the 5 epochs of GOODS observations in each of four bands and in both fields of the survey, namely the CDF-S and the HDF-N.

This v1.0 release incorporates a number of significant improvements in the data reduction process over the previous release, including superior geometrical distortion corrections, a recalibration of the raw data made using improved reference files, corrections for the velocity aberration, etc. These features result in a superior astrometric solution, better rejection of cosmic rays and other blemishes and overall

increased sensitivity. Resampling of the data to a scale of 0.03 arcsec/pixel also allows a better sampling of the ACS PSF.

Of particular interest is the use of the ACS grism mode to obtain spectra of supernovae discovered using the split-epoch ACS observing strategy. This mode, with calibration and extraction software developed at the ST-ECF, provides probably the most sensitive optical spectroscopic capability for point sources available to astronomers at the moment. This is currently being exploited by a GO programme to follow up the GOODS discoveries. The aim is to confirm the SN Ia classification and provide the redshift for SN cosmology studies (Omega Lambda and equation of state of dark energy). A spectacular example is provided by SN2002fw which has a redshift of 1.3. An ACS grism spectrum was obtained in 15ks and is the spectrum of the highest z SN to date.

As part of the complementary ground-based observing programmes, ESO is currently releasing the optical spectroscopy of approximately 500 colour-selected sources in the CDF-S obtained with the red-optimised FORS2 instrument on the VLT.

5.2 Infrared Space Observatory (ISO) active archive phase: Alberto Salama

The ISO Data Centre Active Archive Phase activities continue to run smoothly. On July 24, a new version of the ISO Data Archive (IDA V.6) was released. This release was devoted to upgrading functionality associated with, and visibility of, the Highly Processed Data Products (HPDP) - data reduced systematically "by hand". Catalogues and atlases can now be easily ingested and queried. Projects focussed on reducing data from selected observing modes are underway. A campaign for soliciting reduced data from the community has started in parallel. Currently, IDA hosts 6 HPDP sets and a dozen more are expected in the next reporting period. The goal is to acquire HPDP for some 30% of the scientific contents of the ISO archive during the Active Archive Phase. A new interoperability mechanism, fully compliant with the Virtual Observatories standards is currently under test and will be released in October. It will be demonstrated at the next ADASS conference hosted by CDS, Strasbourg.

Work continues in the area of data quality assessment, which will culminate in the next major release of the IDA, planned for spring next year. This will consist in the upgrade from a small set of "technical" quality flags to a well-structured quality report and we work closely with the XMM-Newton archive team towards a harmonised approach. The IDA continues to be heavily used, with about 60 users downloading every month typically the equivalent of 10% of its scientific observations content.

Work on documentation continues well. The legacy version of the ISO Handbook is in press. The proceedings of the last two conferences organised by the ISO Data Centre have been issued (SP-511, Exploiting the ISO Data Archive; SP-481, Calibration Legacy conference).

ISO continues to have a significant presence in the refereed literature with more than 1000 articles drawing upon ISO data having appeared since late 1996. An ESA press release has been issued on the occasion. The publication rate continues to be good, with 86 papers having been published until August. ISO papers cover all areas of astronomy.

5.3 XMM-Newton: Fred Jansen

XMM-Newton operations continue to run smoothly. The autumn 2003 eclipse season went by without any problems. An effort is being made to model the satellite's radiation environment with the goal to achieve a higher fraction of successful observations, and slightly increase the amount of available science time.

The deadline for proposal submission for the XMM-Newton AO-3 programme was 30 April. A total of 692 valid proposals were received from 468 different Principal Investigators in 24 countries. These proposals requested a total of 98833 ksec of science time, some 10% more than was requested in AO-2. The evaluation process involved 70 scientists from 16 countries. The TAC was organized into 14 panels addressing 6 scientific areas, with each panel consisting of 5 members. In addition to merging individual panel results, resolving cases of duplication and addressing the overall scientific balance, the meeting of the Panel Chairs also reviewed and selected the "Large Programmes", for which there was a tenfold oversubscription. In all, 948 observations were selected for A0-3. Following approval of the recommended observing programme by the Director of Science, proposers were notified of the results in early July, thereby completing the process in record time. AO-4 is currently foreseen for release in September 2004.

The overall programme completion status is as follows:

Guaranteed time:	97.2 %
AO-1 programme:	93.8 %
AO-2 programme:	91.2 %
AO-3 programme:	0.5 %

Completion of all of the above observing programmes is expected by early 2005. Currently, over 2829 observation sequences have been executed and the data for 2721 of these has been shipped.

Version 2.0 of the XSA (XMM-Newton Science Archive) was released in early April 2003. This also contained –generated by the Survey Science Centre (SSC)– the first version of the XMM-Newton source catalogue, containing full details on some 30,000 new X-ray sources. Future updates of the XMM-Newton source catalogue are being studied.

The XMM-Newton users group met on 22/23 September 2003 at VILSPA. They discussed, amongst other topics, membership and modus operandi for the users group so as to remain effective in the future. The group was very happy both with the way the mission is being run and, specifically, with the AO-3 process.

A paper was published in Nature (12-June-2003) where the first direct measurement of a neutron star's magnetic field was reported. This measurement was enabled by the discovery of cyclotron resonant absorption dips in the X-ray spectrum of the source. A paper was published in Science, which reported the discovery of a X-ray emission from a shockwave caused by Geminga's motion through space. Some 365 papers have been published in the refereed literature, either directly or indirectly based on XMM-Newton observations.

5.4 Integral: Chris Winkler

The Board, overseeing ESA's Mission Performance Verification Review, concluded on 20 May that "the INTEGRAL spacecraft, instruments, and ground segment are all performing extremely well and [that] there are no major open issues." It also recommended that AO-2 should be released as planned and was convinced "that INTEGRAL would be able to carry out its foreseen 5-year mission (2 years nominal, 3 years extended) and that further extensions might be possible".

During the commissioning phase, it became obvious that the background due to cosmic particle radiation is at the high end, or even higher than, pre-launch estimates. Thus, the instrument teams were faced with a shortage of telemetry. They made major efforts to reduce their telemetry needs and there was an excellent co-operation to share the available telemetry between them. In parallel, a spacecraft software patch was prepared to increase the telemetry rate by 25%. The patch was successfully uploaded on 21 May 2003. The increase is sufficient for the instruments to operate as planned before launch and also provides a good margin for operation in future when the background is expected to increase as solar minimum approaches.

Overall, the operations of SPI (also see following), IBIS, OMC and JEM-X (one instrument) are nominal. The first in-orbit SPI annealing cycle was successfully executed from 5 – 18 February 5 2003. The goals of the annealing were achieved, namely, the cleaning of the detector system from contamination and the "repair" of radiation damage in the detector crystals. The former was confirmed by the much better performance of the cooling system and the recovered energy resolution at lower energies, the latter by the recovered energy resolution at higher energies (> 1 MeV). After annealing, all detectors had an energy resolution in excellent agreement with specified pre-launch values. The second SPI annealing cycle was executed between 18 – 30 July 2003. The annealing cycle itself was executed without problems. Analysis of post-annealing data showed, however, that the SPI energy resolution had not been fully recovered. The energy resolution at 2.754 MeV only improved from 4.7 keV to 4.3 keV rather than to the expected 4.0 keV. This indicates that the bake-out period of 36 hours (during which the detector temperature was kept at 100 degrees Celsius) was not long enough. It is planned that the next annealing cycle –foreseen for November 2003– will have a longer bake-out period.

On 6 August 2003, it was noted that the Front End Electronics (FEE) #57 of the SPI Anticoincidence System (ACS) was producing zero counts. Three recovery actions were taken twice on 8 August and once on 27 August but without success. However, due to the redundant concept of the ACS (each ACS element is viewed by two PMTs/FEEs), there is no loss of functionality.

Scheduling of observations by ISOC is proceeding very smoothly. The current scheduling efficiency of INTEGRAL is 93%, i.e. on average 93% of the time above the radiation belts is used for science observations, with the remaining time being spent on slews or spacecraft operational activities. This efficiency is better than was expected before launch. The entire operations chain from ISOC schedules, through telecommand generation and uplink by MOC, execution on board, routing of downlink data to Geneva to processing/distribution of data by ISDC generally works extremely well.

The deadline for submission of proposals for AO-2 open time observations was 15:00 CEST, 05 Sep 2003. A total of 142 proposals was received, requesting approximately 144 Msec of observing time (assuming that a typical ToO proposal would use 10% of the requested time). The total time requested represents an oversubscription factor of about 8, clearly showing the continued high interest of the scientific community in INTEGRAL. The table below gives a breakdown of number of proposals and time requested per proposal category. Note that the numbers on total requested observing times do include TOO proposals.

Category	No.	Time(10^6 s)
Compact objects	64	44.7
Extragalactic objects	39	46.9
Nucleosynthesis	21	43.9
Miscellaneous (incl. GRB)	18	8.9

A number of papers have already appeared in the refereed literature (ApJ, A&A). Major efforts have been invested into over 70 papers, that will appear in a special issue of A&A Letters, "First Science with INTEGRAL" to be published in November 2003. These papers describe the mission (flight and ground segment, instrument description, calibration, in-flight performance), as well as scientific results obtained during the first months of the mission. Given the complexity of the data analysis techniques required for the coded mask instruments, the low signal-to-noise ratios inherent in gamma-ray astronomy and the fact that the Crab Nebula "standard candle" could not be observed until 2003 February due to solar aspect viewing constraints, these papers convincingly demonstrate the potential of INTEGRAL to contribute significantly in understanding many of the outstanding issues in high-energy astronomy.

7. *Projects under development*

7.1 Herschel: Göran Pilbratt

The SPIRE Instrument Hardware Design Review (IHDR) took place as planned, with presentations in RAL on 9-10 Jul 2003. Due to schedule pressure, the SPIRE consortium had to "de-scope" their model philosophy. They will now deliver a less complete Cryogenic Qualification Model (CQM) instrument (e.g. one without the spectrometer), which will enable them to start earlier on their Flight Model (FM.) The updated philosophy places greater emphasis on subsystem verification and is seen as inevitably increasing the overall risk; however, the change is deemed necessary and the increased risk is considered acceptable. The corresponding PACS review has been delayed to November and the HIFI one to December 2003, on their requests.

All three instruments are under severe schedule pressure. During spring, ASI stopped funding the Italian institutes involved in Herschel as well as the development by IFSI (Frascati) of the Data Processing Units (DPU) common to all three instruments. After a long period of stalemate there is now hope of this issue being settled in the near future; however, schedule wise damage has already been done. The philosophy for the provision of the warm electronics for the bolometers on PACS and SPIRE (by CEA,

Saclay) has been updated in an attempt to recover schedule. A similar exercise is underway for the Canadian provision (by COMDEV under CSA funding) of the local oscillator source unit for HIFI.

The Quarterly Progress meeting with industry was held in Alcatel, Cannes, 15-18 Jul 2003, as planned. Instrument interfaces were the subject of many discussions. There are still open issues, and for some of these, important progress was achieved during the meeting itself. The main subject of discussion was the overall schedule and the need dates for the various instrument models. It is highly unlikely that the instrument consortia will be able to deliver at the *contractually* agreed dates. This is being addressed by the identification of industrial actual *need* dates, and by increasing the pressure on the instrument teams to deliver as early as possible. The Project Scientist is concerned that ever increasing schedule pressure will, in the end, lead to *insufficiently* tested and characterized instruments being delivered, thereby compromising efficient use of the limited in-orbit time.

The brazing of the Herschel telescope primary mirror took place at the end of June 2003. Brazing is the operation by which the mirror segments are connected together to form one single monolithic mirror. The operation appeared nominal; however, upon detailed ultrasonic inspection, it appeared that the filling factor of the brazing agent was below specification for the majority of the brazed joints such that the result was deemed unacceptable. Work to identify the cause of the problem is underway, and progress is being made. In the meantime additional telescope segments are being manufactured and the second primary mirror could be brazed in October 2003, allowing the telescope schedule to remain compatible with the overall project schedule.

The Science Team has agreed, in principle on a scheme for the time allocation of the various observing programmes, including the so-called “Key Projects”. Details will be presented at the meeting. It is becoming increasingly probable that the interactive analysis (IA) software – a PI provided tool for data reduction by the guest observers - will have different environments for each of the three instruments. This is against the ambition of ESA, but now appears unavoidable.

7.2 Planck: Jan Tauber

The hardware development of the reflectors is nominal, while the testing schedule is slightly slipping. The QM sub-reflector will be cryo-tested within a month, followed by a review of the testing methods. The H/P Project is addressing with JPL concerns that exist about the design and the lifetime of the 20 K sorption cooler.

Industrial development of the LFI instrument is advancing. However, ASI and Laben are proving very inflexible and block every tiny design change on financial grounds. For example, small modifications to the focal plane design needed after the removal of the 100 GHz channel are being blocked for no substantial reason. ASI has verbally agreed to resume funding the LFI institutes, but only if this is done through the industrial prime contractor, Laben. This arrangement remains to be formalised, but the PI is hopeful. The Baseline Design Review was completed. An accelerated development approach, which completely skips a system-level qualification model, was accepted as inevitable, though quite risky.

The development of the HFI instrument is largely nominal, although the schedule is slipping slightly, as a number of small technical problems are found along the way. By redeploying some activities to the UK and France and the corresponding funding to PPARC and CNES, the PI (Puget) has made good progress with respect to the provision of 100 GHz Polarisation Sensitive Bolometers. However, a small amount of money is still missing from NASA for packaging and testing activities at JPL. Unfortunately, the prospects for flying PSB at this critical frequency therefore remain low. The Hardware Design Review will take place in October.

Schedule remains a critical aspect of the spacecraft development. A new official schedule is expected from Project/Alcatel in the September timeframe. Development of the ground segment is progressing nominally.

7.3 COROT Project Status (23/9/03): Thien Lam-Trong and Annie Baglin

Following the CNES crisis occurred during the first half-year 2003, the Corot project is going on at full speed now. Due to this situation, the launch date has been postponed until June 2006 with six month margin.

The complete Corot System (mission, system & interface requirements, validation, ground architecture, operation concept) will be reviewed in November 2003.

The design of the instrument has been completed. Most of the equipment has been critically reviewed without any major problem. The instrument critical design review is planned at the end of the year and then, the manufacturing and integration of the instrument will start.

The satellite contract with Alcatel started last June. Since the platform is within the Proteus line of products, the design addresses mainly the interfaces and functions dedicated to the Corot mission. This design will be reviewed in February 2004.

The launcher contract is still under negotiation with Arianespace because of uncertainties concerning the planning for the transfer of the Soyuz launch to Kourou; the Rockot launcher remains available and is a serious backup solution.

The scientific preparation is on going with two meetings per year, in the different participating countries; the next one is in Berlin in December 2003.

The ground based preparatory observations are well advanced (100% done for the seismology programme, 50% for the exoplanet programme).

A Call for Letters of Intent for the Additional programmes (open to all members of the contributing countries) has been issued (deadline November 1st) to prepare an AO for observation proposals.

The COROT Data Centre has been set up (under the responsibility of the Scientific Committee) and will be reviewed in early 2004. CO-Is (~60) have been officially nominated by the Scientific Committee.

8. Projects in preparation

8.1 JWST: Peter Jakobsen

The JWST project successfully passed its Initial NASA Confirmation Review on July 30 and has now formally entered Phase B. The official launch date is August 2011. A 6.55 m primary mirror consisting of 18 hexagonal segments manufactured in beryllium has been decided for the telescope. Work throughout the project is currently focused on negotiating and finalizing the various formal mission and system requirements and associated documentation.

The MIRI instrument has passed its Preliminary Systems Requirements Review and is officially in Phase B. A JPL-supplied solid hydrogen cryostat has been decided for the MIRI cooler. The mechanical and optical layout of the spectrograph channel has been significantly simplified. Progress is also being made in resolving the remaining issues with the funding of the European Consortium, with Germany and Switzerland having reached an agreement, and Belgium possibly stepping in to cover the Italian shortfall.

Proposals have been received from both Astrium and Alcatel for the competitive NIRSpec Definition Study. Kick-off meetings are to take place in September. The Invitation-to-Tender for the NIRSpec Implementation Phase is on schedule for release in mid-November, with prime down-selection in early spring. Good progress is being made on defining the requirements and deliverables for the two NASA-supplied components, the detector and micro shutter arrays. Following NIRCam, NIRSpec has agreed to employ HgCdTe detectors, thereby allowing a common focal plane temperature to be set near 37 K. NASA will procure the NIRSpec detectors separately from the NIRCam procurement, to ESA's specifications. A significant simplification and fourfold reduction in size of the Micro Shutter Array has been achieved by changing the NIRSpec plate scale so that a single shutter can be used as the spectrograph slit for multi-object observations.

It is intended that a single ESA JWST Science Management Plan, covering both MIRI and NIRSpec, will be presented to the advisory structure in time for approval at the February SPC meeting. While the overall JWST Science Advisory Structure is in place and defined by the NASA AO, the European members of both the MIRI and NIRSpec Instrument Science Teams still need to be appointed. The final composition of the European MIRI Consortium and European members of the Science Team can only be confirmed once the consortium negotiations are completed. The external European members of the NIRSpec flight Science Team need to be solicited and selected in time for the start of the Implementation Phase in April.

8.2 GAIA: Michael Perryman

On the technological side, all major technology development activities identified during the earlier "concept and technology study" are now underway and expected to be completed at the end of 2004. This includes the CCD/focal plane assembly; the silicon-carbide mirror and structures; the payload data handling electronics; ground verification and calibration; phased array antenna; sunshield; and radial velocity spectrometer optimisation. According to this schedule, Gaia would be in a position to

enter Phase B2 (implementation phase) at the beginning of 2005, with a launch in mid-2010. Activities in ESTEC and in the scientific teams remain focused on this launch date. Technical highlights are the commencement of the prototype CCD manufacturing (June 2003) and the start of the prototype primary mirror manufacture (in SiC). Difficult areas remain: thermal and mechanical stability, CCD and focal plane, radiation environment, on-board data handling, and telemetry rate.

On the scientific side, the activities of the 16 or so working groups are proceeding well. A focus for many of these activities is the design of the prototype data analysis system for Gaia, now 2.5 years into development. Already this system is capable of "ingesting" rather detailed simulated satellite data, and running simplified algorithms representative of the required reduction system (object matching, instrument calibration, attitude solution, and source parameter determination). There are great challenges inherent in this complex system, however. The earlier target of having, by mid-2003, the completed reduction of simulated observations for 1 million stars observed over 5 years has not been met. This is largely due to limited availability of the dedicated processing power needed for such an intensive task, but it is also related to the inherent complexity of the system, the algorithms, and the interaction with the enormous database underlying this prototype. In parallel with the testing of the Phase 1 system, a workshop was held in April to prepare for the next phase of algorithm delivery and implementation into this prototype system. By early July, the Gaia community had delivered some 15 identified algorithms. An outline proposal for how this development activity should be followed by an AO for the Gaia data processing will be presented to the AWG at its 116th meeting. It follows precisely the lines described in the March report to the AWG.

All groups involved are convinced that early and intensive development efforts are necessary to put the required data processing system in place, and previous experience of large space missions underlines the importance of timely preparations, phased with the satellite development. Unfortunately, funding authorities are generally reluctant to start funding these tasks - even at the level of one or two postdoctoral positions - this far in time in advance of launch. Some further support in certain countries is needed, and support of the AWG here would be valuable.

A proposal for a SMEX funded US mission (Amex) has been submitted to NASA, with financial and scientific support from DLR. A first selection round in October 2003 will be followed by a final selection in October 2004, with a nominal launch in 2008-09.

8.3 Eddington: Fabio Favata

The industrial definition studies are proceeding well, with a mid-term review on September 23-25. Both contractors, Astrium and Alcatel, are converging to a similar design, which is fully compliant with the scientific requirements of the mission and fits within its programmatic and budgetary constraints. In particular, the payload fits well within the mass and power budget of the Herschel bus, and its development schedule is compatible with a 2008 launch. No problems have been identified which could delay the development of Eddington. The only relevant change with respect to the previous baseline is the addition of a capability to obtain colour information, which enhances the scientific return of Eddington.

In parallel with the industrial definition studies, the Eddington scientific community (structured in a number of working groups) is refining the operation concept, focussing in particular on the on-board data processing aspects to ensure that adequate resources (CPU, power, mass, telemetry…) are allocated to the payload. Indeed, because of its large field of view and frequent sampling, Eddington will accumulate very large data set, which need to be reduced to a manageable size prior to transmission. This in turn sets stringent requirements on the spacecraft onboard processing capabilities. Preliminary results show that these requirements can be met and that neither onboard processing nor telemetry bandwidth constitutes a problem.

The CCD pre-procurement activities with E2V are progressing, with the first chips in Eddington configuration (large format, frame transfer) due for delivery in late 2003. The chip manufacturer confirms the feasibility of the delivery schedule for a 2008 launch.

The deadline for the two Eddington Announcements of Opportunity - Science Team and payload Consortium - was on September 12. For the payload Consortium, one proposal was received from a consortium comprising 41 institutions in 11 countries; the proposal is led by Dr. M. Mas Hesse of INTA (Spain). For membership in the Eddington Science Team (EST), 14 proposals were received. The EST proposals were forwarded to the relevant AWG sub-committee appointed by the AWG chair.

The 2nd Eddington workshop, held in Palermo last April, attracted more than 150 participants. The proceedings are now in press, with over 450 pages. One of the key goals of the workshop was to select an optimal stellar field for the 3 years long planet-finding observation. Following the workshop, a number of teams (specially that from Padua University) produced detailed proposals, which resulted in the selection of a limited number of fields, both in the southern and the northern hemisphere. These fields will need to be characterized in full – and that entails dedicated ground-based observations - before a final selection can be made. The preferred field is located in the Lacerta constellation (between Cygnus and Cassiopeia) and was the subject of an ESA press release.

The attention of the media toward Eddington has been constantly high, and a number of articles and radio and TV broadcasts featuring Eddington have appeared over the summer, some of them triggered by the ESA press releases, some of them “spontaneous”.

8.4 ASTRO-F: Martin Kessler

ISAS have announced a launch delay from the previously planned February 2004 to a new target date of August 2005. The cause was a failure in the primary mirror mounting during cryogenic vibration testing. The SiC mirror is connected to the Al baseplate via super invar pads glued to the mirror. The actual coefficient of thermal expansion of super invar is much larger than that assumed in the design process. Thus, during the low temperature test, there was a large thermal stress, which caused the pads to come loose. There was also some damage to the support structure. A detailed recovery plan is being put into place and it is expected that this will be formally approved by ISAS management before the end of the year. The intention within ESA is to re-arrange, delay and/or hibernate activities so as to try to remain within the agreed cost envelope.

Activities regarding ESA's pointing reconstruction task will start in earnest in October with the start of industrial support. Discussions continue with ISAS regarding distribution of observing time to the ESA astronomical community. For the tracking support, the Kiruna upgrade will be completed according to the original schedule and then the equipment will be left dormant until launch preparations start at around L-4 months. In June, a radio frequency compatibility test (RFCT) was successfully carried out in ESOC with ISAS participation.

9. Future Mission Studies

9.1 IRSI-Darwin: Malcolm Fridlund

The Science Advisory Team TE-SAT has had their first two meetings in May and September of 2003. The work is currently focusing on a refinement of the scientific case, particularly in view of the collaboration with the NASA TPF Science Working Group. Broadly speaking, the work is progressing along two parallel routes. On the astronomical side, a strategy is being put in place for defining the minimum number of stars one needs to observe to obtain significant results for what concerns the physics of rocky bodies orbiting other stars and their evolution. The second investigation focuses more upon the types of observations that are required – e.g. wavelength range, resolution, sensitivities, frequency of repetition… - to properly characterise the exo-planets, their evolution and their ability to host life. The results will be documented in a Science Requirement Document (SRD), which will drive the technical implementation of Darwin. This activity will continue up to 2006.

The GENIE Study Science team has been appointed jointly by ESA and ESO. Its 4 ESA representatives are: G. White (Univ. of Kent), V. Coude du Foresto (Meudon,), J. Alves (Portugal), and T. Herbst, (Max-Planck, Heidelberg). Team members appointed by ESO are: R Waters, R. Neuhauser, D. Segransan and D. Mourard.

9.2 XEUS: Arvind Parmar

The Instrument Working Group held its 2nd meeting on 2003 June 19-20. The goal of the meeting was to examine the recommendations for additional instruments proposed at the Munich science meeting and see if these could be arranged into a focal plane layout which could be provided as an input to a System Study. The proposed focal plane configuration has an Advanced Pixel Sensor at the centre of a larger, more conventional CCD array, with the hard X-ray detector mounted under the CCDs Additionally, 4 small high-count rate diodes would be positioned around the outer edge of the conventional CCDs. All these instruments could be operated in parallel to provide a 15' diameter field of view. Alternatively, a small field of view (0.5' diameter) cryogenic detector could be placed in the focal plane for high spectral resolution studies. The IWG stated that baffling requires a more careful assessment and should be part of the forthcoming System Study.

9.3 ISS payloads (EUSO, Lobster, Rosita): Arvind Parmar & Jean Clavel

EUSO:
The instrument Phase-A report and supporting documentation, which were expected by the end of July, was delayed until the beginning of September due to the summer closure of the contractor responsible for the system aspects of the instrument design (Alenia). The document package is currently under review by SCI-A personnel, supported by D-TOS. This delay has the advantage of bringing the instrument and payload studies better into alignment and the final reviews for both studies are scheduled for October 30 and 31. This scheduling will allow the Science Study Team to witness both the industrial payload and instrument team consortium presentations before making their final recommendations.

LOBSTER/ISS:
The mid-term review of the Phase-A study was successfully held in Carlo Gavazzi Space as planned. No major problems have been identified and the open issues should be closed as part of normal work. As is usual with ISS payloads, safety is an important aspect and the payload team is working hard to ensure that the Lobster design meets all the necessary requirements. The Phase-A final review is provisionally scheduled for October 22nd

ROSITA:
As previously reported, the start of the Rosita phase-A study is on hold until the Lobster-ISS one finishes. This is due to manpower limitations from