Programmes in Progress

Status end-October 2002
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**Legend:**
- DEFINITION PHASE
- MAIN DEVELOPMENT PHASE
- LAUNCH/READY FOR LAUNCH
- ADDITIONAL LIFE POSSIBLE
- RETRIEVAL
- STORAGE

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**Project Timeline:**

- **Space Telescope:** Launched April 1990
- **Mars Express:** Launch January 2003
- **SMART-1:** Launch May 2003
- **Herschel/Planck:** Launch February 2007
- **GNSS-Vegasos:** Initial ops. start 2004
- **GalileoSat:** First launch 2005
- **ECOPP:** Launch April 2006
- **EDOP/PYEDAT/GOCE/MATIS/MACULUS:** Retrievable storage
- **METOP-1:** Launch 2nd half 2005
- **Columbus:** Launch October 2004
- **ATV:** Launch September 2004
- **NODE-2 A & 3:** Launch February 2004
- **Cupola:** Launch January 2005 (under review)
- **ERA:** Launch March 2005
- **DMS (P):** Launch May 2005
- **MELF-1:** Launch October 2005
- **HXOGP3:** Launch October 2005
- **EURERLIPS:** Launch January 2006
- **MFC:** Launch February 2006
- **Ariane-5 Develop:** Operational
- **Ariane-5 Plus:** First launch Nov. 2002
- **Vega:** First launch Dec. 2005
Integral

The Integral spacecraft was successfully launched from the Baikonur Cosmodrome in Kazakhstan on 17 October by a Proton launcher. Separation from the launcher and the initial automatic spacecraft operations, including pointing the spacecraft correctly with respect to the Sun and deploying the solar arrays, went according to plan. The subsequent early flight operations under the control of ESA’s Space Operations Centre (ESOC) in Darmstadt (D) have also been problem-free.

Integral is now in its final operating orbit and all spacecraft service-module functions are nominal. Payload activation is proceeding as planned for the four instruments on board: IBIS, SPI, JEM-X and OMC. The Mission Commissioning Results Review is scheduled to take place in December 2002.

The Integral ground segment, consisting of the Integral Science Operations Centre at ESTEC in Noordwijk (NL), the Mission Operations Centre at ESOC in Darmstadt (D) (using ESA and NASA ground stations), and the Integral Science Data Centre in Geneva (CH), is working well.

Further coverage of the launch campaign and in-orbit commissioning can be found elsewhere in this issue of the Bulletin.

Rosetta

The flight-model spacecraft successfully completed its environmental and functional test campaign in Europe and is now in Kourou, French Guiana, undergoing final launch preparations. All subsystems are working as expected, and the software for the spacecraft’s early in-orbit phase is being loaded and checked out.

Some anomalies have been detected in an engineering-model transponder and tests are underway to demonstrate that they do not apply to the flight model. The spacecraft qualification-model programme has been continuing in parallel at ESTEC to verify the software and on-board control procedures.

Several of the scientific payload’s detectors have been exchanged during the summer and there is now a fully optimised set of experiments on the flight spacecraft.

The Lander needed to be demounted from the Orbiter in Kourou to replace some faulty actuators, which attach the Lander to the mothercraft, but it has also now been re-integrated, in fully functional flight configuration, on the spacecraft.

The ground segment, including the Rosetta Science Operations Centre, has successfully passed the Ground Segment Readiness Review. The performance of some subsystems is still being optimised, but no launch-critical items have been identified. The New Norcia ground station in Western Australia is now operational and has already been used for tracking other spacecraft.
The preparation of the Ariane launch vehicle itself is going according to plan, with the new elements unique to the Rosetta mission currently completing qualification. The final mission-analysis review has been held.

In summary, all of the Rosetta mission elements are 'code green' for a launch on 13 January 2003.

**Artemis**

The Artemis satellite continues on its journey towards its planned operating position in geostationary Earth orbit. Driven by electric propulsion using the single functional ion thruster, it gains 15 to 16 km of altitude every day. With just 1500 km to go, it is expected to reach its final operational orbit by the end of January 2003.

With no ion thruster now operating on the south face of the satellite, it will be necessary to abandon orbit inclination control for the mission. Nevertheless, since the approximately 1.5 deg inclination at the beginning of the satellite’s on-station lifetime will grow by 0.8 deg/year or less, Artemis will still have an expected operational lifetime of the order of 10 years.

Services to users will begin soon after the satellite’s arrival on station, with a regular data-relay service for Envisat and Spot-4, operation by EGNOS of the navigation payload, and Eutelsat’s use of the land-mobile payload.

**Envisat**

The satellite operations have been very stable since mid-June, with just one planned interruption from 8 to 11 September to correct the inclination of the spacecraft’s orbit.

With the mission planning systems of the Flight Operations Segment (FOS) at ESOC (D) and the Payload Data Segment (PDS) at ESRIN (I) operating nominally, it has been possible to confirm the stable performances of the various instruments. Several updates to the ground and onboard instrument software have been implemented to correct for the few anomalies that have been encountered.

The PDS instrument processors have also been updated with the corrections identified by the Expert Support Laboratories during the calibration activities. Despite the problems encountered with the irregular throughput of the PDS, the Calibration/Validation teams received sufficient data to perform their calibration activities on time and the Calibration Review was held successfully on 9-13 September at ESTEC (NL).

Based on these results, the progressive phasing-in of the services to Principal Investigators (PIs), in particular for ASAR and MERIS image data products, was initiated in mid-September and is continuing through the last quarter of 2002. Over this period, priority will still be given to servicing the Calibration/Validation Teams, to provide them with the data products needed to prepare for the Validation Workshop planned for 9-13 December at ESRIN. The goal is still to achieve full operational readiness of the mission by end-2002.

The interim Kiruna-Svalbard dual-ground-station operation scenario will be introduced early in November. It will allow load-sharing between these two stations for global mission data recovery, for 10 orbits a day over Kiruna (S) and 4 to 5 orbits per day over Svalbard (N). The Svalbard data will be routed to ESRIN for processing. This interim scenario will allow mission operations to proceed whilst waiting for the Artemis data-relay satellite to become available in the first quarter of 2003.

**Meteosat Second Generation (MSG)**

As reported in detail in ESA Bulletin 111, the MSG-1 spacecraft was successfully launched on 28 August 2002, together with the European telecommunications satellite Atlantic Bird-1, by an Ariane-5 vehicle.

After lift-off, ownership of the MSG-1 spacecraft was transferred from ESA to Eumetsat as per the agreed contractual arrangements. On Eumetsat’s behalf, ESA’s Space Operations Centre (ESOC) in Darmstadt (D) was responsible for the launch and early orbit activities for the spacecraft, and successfully placed MSG-1 into its geostationary operational orbit at around 10 deg West above the equator. The handover of operations from ESOC to Eumetsat, which will run all of the spacecraft’s future geostationary operations, took place at the end of September. Eumetsat then began the spacecraft-commissioning exercise.

Based on these results, the progressive phasing-in of the services to Principal Investigators (PIs), in particular for ASAR and MERIS image data products, was initiated in mid-September and is continuing through the last quarter of 2002. Over this period, priority will still be given to servicing the Calibration/Validation Teams, to provide them with the data products needed to prepare for the Validation Workshop planned for 9-13 December at ESRIN. The goal is still to achieve full operational readiness of the mission by end-2002.

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Thereafter, real-time data-product delivery will be available for all of the day’s orbits.

The Envisat Commissioning Phase has been extended to the end of the year, and all efforts are now focusing on achieving a successful Operational Readiness Review in December.

**ADM-Aeolus**

The first few months of the industrial design phase contract (Phase-B) for this mission have concluded with the establishment by industry of the Satellite Design Specification and an Instrument Requirements Specification. These two documents will allow industry to produce equipment specifications to accompany a coherent set of Invitations to Tender (ITTs) to be issued early next year.

There has been significant progress in the development of the pulsed lasers needed. Both industry and the Executive are now convinced that a laser with adequate output power can be manufactured to meet the Aeolus programme’s schedule constraints. This laser will deliver a 7 sec burst of pulses every 28 sec.

To maximise the system performance margins, it has been agreed to increase the telescope diameter from 1.2 to 1.5 m, and to increase the platform’s capability accordingly, whilst still maintaining compatibility with the smaller and cheaper launchers likely to be available, such as Eurockot, Vega and Dnepr.

Development of the ground segment is also progressing according to plan and the definition activities for the Level-2 processing algorithms have begun.

**CryoSat**

The CryoSat project is now well into its main development phase (Phase-C/D), and the industrial partners are well advanced with manufacturing the satellite components. Some elements have already been delivered to Astrium GmbH, the satellite prime contractor.

The launch-preparation work with Eurockot has started, and a review of the CryoSat requirements for launch services was successfully completed in September.
Following the Announcement of Opportunity (AO), a first meeting of the Calibration and Validation group took place in September. One outcome of this meeting was the definition of a pre-launch validation campaign, which should take place early in 2003 in the Fram Strait, between Norway and Greenland.

**GOCE**

Following successful completion of the space-segment Preliminary Design Review (PDR) in April and the subsequent close-out of related action items, the system prime contractor Alenia Spazio has authorized industrial core-team members Astrium GmbH and Alcatel Space Industries to proceed with all main-development-phase (Phase-C/D) activities associated with the platform and gradiometer instruments.

Tribological tests have recently been performed to find a gradiometer proof-mass stop material or coating that reduces material transfer between the corner stops and the proof-mass to an acceptable level. This is a key factor in assessing the ability of the gradiometer accelerometer design to withstand the launch vibrations. Mechanical testing of an accelerometer sensor head equipped with the selected stop material/coating is planned at the end of November. An updated gradiometer calibration scenario has been worked out, supported by a dedicated simulation campaign, to consolidate the instrument’s in-flight calibration.

The Preliminary Design Review (PDR) for the second primary payload, the twelve-channel dual-frequency GPS receiver provided by Laben (I), began at the end of October, and the conclusions are expected towards the end of the year.

The make-up of the GOCE space-segment consortium is now almost complete. The last Invitation to Tender (ITT), addressing the selection of the independent software validation contractor, was issued at the beginning of July.

The micro-propulsion and solar-generator selection processes are also approaching a conclusion. The Tender Evaluation Board (TEB) for the micro-propulsion thruster assembly met in mid-July. Negotiations with the recommended field-emission electric-propulsion (FEEP) thruster supplier are in progress. The evaluation of the proposals submitted by potential solar-generator suppliers was also completed in July, and negotiations with the recommended supplier are in progress.

The predicted launch date for Cryosat is currently mid-February 2006.

**SMOS**

The CASA-EADS industrial proposal for the payload design phase (Phase-B) was received on 21 October and is currently under evaluation/negotiation. The timing should allow a seamless transition between the extended Phase-A (definition phase) and the Phase-B.

System-support studies with CNES and Alcatel are in preparation, but an assessment is needed first of whether the Proteus attitude and orbit control system requires a fourth gyroscope. If so, a major redirection of work might be needed.

The breadboarding activities within the framework of the MIRAS Demonstrator Pilot Projects (MDPP) 1 and 2 are about to be completed, with a full one-arm deployment test and an image-validation test with a set of 12 receivers.

Studies for the definition of the payload-data ground segment and the scientific algorithms for instrument calibration and image reconstruction are about to be kicked-off.

**MetOp**

The MetOp integration programme continues to make good progress. The first flight Payload Module was delivered from Astrium in Friedrichshafen (D) at the end of September for thermal-vacuum testing in the Large Space Simulator at ESTEC in Noordwijk (NL). The MetOp-1 Service Module is also progressing towards its thermal-vacuum testing, this time at the Intespace facilities in Toulouse (F), which should be completed at the end of the year.

The impact of the problem discovered with the IASI detectors has been assessed and already partially resolved via a work-around that will respect the critical schedule leading to launch-readiness of the first MetOp. This is, however, being achieved at the expense of the MetOp-3 integration programme, which will need to be restructured accordingly. Other concerns arising from the IASI Critical Design Review have been largely resolved. Good progress has also been made in understanding and implementing the measures needed to accommodate the IASI-specific constraints during the Assembly, Integration and Verification programme.

The ASCAT instrument’s switching front-end unit definitely needs modification to mitigate the impact of its radiation sensitivity. The details of this modification are still being discussed with industry. GOME-2 continues to make good progress, with the second flight instrument undergoing calibration at TPD Delft (NL). The first flight-model GRAS instrument has completed its acceptance testing and will be available for integration once the acceptance review is completed. Solutions for the antenna metallisation problems are still being examined, but this does not threaten the overall schedule.

**International Space Station**

Overall Assembly Sequence

One logistic flight was made to the ISS during the third quarter, with the launch from Baikonur on 25 September of Progress re-supply flight 9P. Investigations and recovery procedures to resolve the problems in the fuel-supply lines of the four Orbiters of the Shuttle fleet were completed and the next flight scheduled for early October.
Discussions are continuing regarding the so-called 'End State' configuration of the ISS, which has been put into question due to NASA's budgetary situation.

**Columbus Laboratory**

ESA/NASA bilateral qualification tests on the flight-model power and audio interfaces and command and control verification have shown these systems to be extremely robust. System functional qualification testing with the Electrical Test Model (ETM) is in progress and preparations for the major ESA/NASA bilateral hardware/software compatibility testing is underway.

The Columbus launch is on the Shuttle manifest for October 2004 and a Columbus Mission Manager has been appointed to ensure that all aspects of the flight and ground segments in Europe and the USA are actively monitored and managed.

**Columbus Launch Barter**

*Nodes-2 and -3*

Integration of the Node-2 flight unit is progressing well, and the Safety Review Phase III has been successfully completed. System Design Review 2 for Node-3 has also been completed successfully. Structure acceptance testing has been delayed until January 2003, but without impacting the planned delivery date.

*Crew Refrigerator/Freezer (RFR)*

Manufacture of the RFR qualification model is progressing, with the Qualification Review planned for March 2003.

*Cryogenic Freezer (CRYOS)*

The CRYOS System Requirements Review, due to start in late-October, is in preparation.

*Cupola*

Vibro-acoustic testing of the Structural Test Article (STA) has been successfully completed and it has subsequently been delivered to Johnson Space Center in Houston. Manufacture of the flight-unit dome is progressing and all shutter mechanisms are now available for integration. Flight-unit delivery is now expected to take place in July 2003.

**Automated Transfer Vehicle (ATV)**

Thermal-vacuum testing at ESTEC (NL) on the Structural-Thermal Model (STM) has been successfully completed, thereby concluding that model's test campaign. The Cargo Carrier has now been returned for refurbishment into a Crew Trainer and the spacecraft part of the STM is being shipped to Bremen (D). Tests on the avionics Electrical Test Model (ETM) have been completed and manufacture and integration of the first flight unit is progressing well, although the Stage-3 propulsion firing test has been further delayed to November 2002.

The first ATV launch is scheduled for September 2004 and an ATV Mission Manager has been appointed to ensure that all aspects of the flight and ground segments are actively monitored and managed.

**X-38/CRV and Applied Re-entry Technology (ART)**

Formal notification of the X-38's cancellation was received from NASA in August, and detailed consultations relating to the termination of the programme are to take place. Work on all European contributions to the X-38 vehicle will be completed within 2002.

**Ground-segment development and operations preparation**

The ATV Control Centre (ATV-CC) Preliminary Design Review (PDR) has been successfully completed and the main development phase (Phase-C/D) proposal has been delivered. Regarding the Columbus Control Centre's (COL-CC) development, subsystem requirements reviews have been successfully conducted for the major subsystems, and preparation of the COL-CC system PDR and the Phase-C/D proposal is ongoing. The ground segment for the ‘Odissea’ Taxi Flight to the ISS was set up and checked-out. Simulations and training of ground controllers are ongoing.

The PDR for the ATV Crew Trainer and ground...
simulator has been successfully completed and the design review for the ATV training mock-up has also been conducted satisfactorily. The Columbus Crew Trainer has been successfully integrated into the Mechanical Mock-Up and European Astronaut Centre (EAC) infrastructure and has been used to support the first ISS Advanced Crew Training session (reported in greater detail elsewhere in this ESA Bulletin).

In terms of ATV operations preparation, the System Operations Reference was released and an agreement to use the Artemis satellite in place of the Russian ground stations as the data relay for the attached and proximity phases was negotiated with the Artemis Project. Preparation of the Columbus operations has also taken a step forward with the definition of the core members of the Flight Control Teams (FCT) and the nomination of the lead Flight Directors for the Columbus launch (1E) mission.

Utilisation
Preparation
Following-on from the Heads of Agencies meeting in June, the International Partners have provided estimated up-load-mass and crew-time requirements resulting from their respective Research Plans 2004-2008. The integrated research requirements, which include the American, Canadian, Japanese and European needs, will serve as input to analyse path options for the ISS ‘End-State’.

43 of the 44 Microgravity Applications Promotion (MAP) projects originally planned are now in progress, with some approaching first-phase completion. They will be evaluated using a procedure based on 3-4 monthly batch evaluations by an expert panel.

Payloads and their integration
Following the agreement with NASA that two ESA External Payloads, SOLAR and EuTEF mounted on the ICC-Lite carrier, could fly on the 1E Columbus flight, assessment work to determine the technical implications continued in preparation for an ESA/NASA meeting in October.

Concerning the Atomic Clock Ensemble in Space (ACES), significant progress has been made in finalising the Phase-C/D contract. Phase-A for the RapidEye commercial Earth-observation instrument was in preparation. The Acceptance Test of the Neutral Buoyancy Model for Matroshka, the radiation-monitoring instrument for the Russian segment, was completed at the European Astronaut Centre (EAC) and the Critical Design Review (CDR) has started. Analytical payload integration for the Columbus pressurised facilities Biolab, FSL, EPM and EDR is in progress.

The European Drawer Rack (EDR) CDR data package was presented in September and is under review. Due to a major contract change, implemented to make Agency-furnished equipment compatible with Columbus interfaces and EDR design constraints, the delivery of the engineering model has shifted to early-March and the flight-model delivery to early-September 2003.

The contract for the European Transport Carrier (ETC) will start in mid-October 2002.

In-orbit commissioning of the Materials Science Glovebox (MSG), which was delivered to the ISS in June, is in progress. The first two US experiments using the MSG were run successfully and Acceptance Review 3, which will define the terms for transfer of ownership to NASA, is planned for end-October.

The flight unit (FU1) of the MELFI -80°C freezer has been at Kennedy Space Center since late-March. All interface tests with the ISS have been completed successfully and the launch of FU1 is planned for March 2003.

Subsystem-level testing of the Hexapod pointing system has been completed and mechanical integration of the flight unit is now in progress.

A number of experiments to be performed during the ‘Odissa’ Taxi Flight in October were delivered to the ISS on 25 September by the Progress logistics flight, whilst preparation of the remaining experiments to be launched
together with ESA astronaut Frank de Winne on the Soyuz vehicle continued.

Astronaut activities
Frank de Winne continued his training at Star City for the 'Odissea' Taxi Flight, following his earlier experiment training in Brussels, at ESTEC and in the USA. Christer Fuglesang continued his training at Johnson Space Center for his STS-116/12A.1 Shuttle mission scheduled for June 2003.

The first ISS Advanced Training session at the European astronaut Centre (EAC) for an international class of 10 astronauts took place from 26 August to 6 September. The participants, who included four ESA, four Japanese (NASDA) and two NASA astronauts, received a total of 32 classroom and hands-on lessons on the Columbus and ATV systems, as well as an introduction to the ESA ISS payloads.

Early deliveries
Data Management System for the Russian Service Module (DMS-R)
The DMS-R on-board the Russian Service Module continues to operate problem-free.

European Robotic Arm (ERA)
Functional qualification testing of the ERA flight model is continuing and a new baseline schedule has been agreed, resulting in a Flight Model Qualification Review in March/April 2003.

ISS Exploitation Programme
The Request for Quotation (RFQ) for the ATV Follow-on Production Contract was released to Industry and a proposal is expected in October. A major Contract Change Notice (CCN) to the Exploitation Contract for the implementation of the operations-preparation Initial Tasks is under negotiation with industry.

Microgravity
Preparation of ESA’s payloads for the Spacehab mission (STS-107) was completed by mid-2002, but the delayed launch is not now expected to take place until January 2003. All of ESA’s facilities for the Foton M-1 mission have been completed and accepted for flight, and the Foton capsule itself was transferred to Plesetsk for launch on 15 October. Preparations for the Maxus-5 sounding-rocket flight continued, with launch planned for March 2003. The first parabolic-flight campaigns with the overhauled Airbus 300 Zero-G aircraft were performed in September.

Development of payloads for the ISS continued. NASA announced a July 2004 launch for the European Modular Cultivation System (EMCS) botany facility, and the EXPOSE facility for exobiology, for which the CDR was successfully completed in August, will now be launched in October 2004 together with Columbus. Delivery to NASA of the HGD/PFD and PEMS physiology instruments was also completed. Development of the MARES (physiology) and PCDF (proteins) facilities for the European Drawer Rack (EDR) continued, and the MARES CDR started in July.

Microgravity Facilities for Columbus (MFC)
All the laboratory facilities that are to be carried in Columbus are on schedule for its October 2004 launch. The flight-model subsystems for the Fluid Science Laboratory have been manufactured and are now being tested. Integration of the system flight model with the secondary structure has begun. Integration of the Biolab’s flight hardware has been progressing well and will be completed in early-2003.

NASA's Human Research Facility (HRF-2), including the ESA Pulmonary Function System, has been shipped to Kennedy Space Center for launch, which is expected to take place early in 2003. The system CDR for the European Physiology Module (EPM) was successfully concluded in September, the engineering model completed its testing, and flight-model integration has started.

Ariane-5 Plus
The filling-model (MR) campaign for Ariane-5 Evolution and Ariane-5 Plus referred to in previous reports, and aimed at validating the upper-stage tank-filling procedures, was successfully completed at the end of July. This
important achievement, together with the significant progress made with the Launcher Qualification Review, allowed the holding on 8 August and 9 September of the Flight-Readiness Review for the V157 flight, the first launcher configuration combining the Ariane-5 Evolution and Ariane-5 Plus developments. With all major problems identified having been resolved, authorisation was given to start the launch campaign on 22 August. At the end of September, the lower composite with the Vehicle Equipment Bay was erected. The Launcher System Rehearsal is planned for the beginning of October and the V157 launch, carrying Hot Bird-7 for Eutelsat and Stentor for CNES, is presently scheduled for the end of November.

**Vega / P80**

The proposal from Industry for the Vega Small Launcher Development Programme was evaluated in June by the Tender Evaluation Board. Following a series of discussions between the Programme Team and Industry, a new proposal was issued in late July. Based on this new version, a Preliminary Authorisation to Proceed was released to the Industrial Consortium in order to start time-critical activities. Final contract negotiations have started in late September.

A successful Preliminary Design Review for the Vega Ground Segment was held during June and July, and a first proposal for the Ground Segment Technical Management Engineering and Test Contract was issued. Discussions with the Programme Team to agree and issue an improved version of this proposal are in progress.

The P80 development activities have concentrated on finalising the contract negotiations. Some schedule delays associated with long-lead-item procurement are being recovered by applying a modified development logic.