EUSO INSTRUMENT PHASE A

COLLABORATION MEETING

TABLE OF CONTENT

STATUS OF ESA PHASE A STUDY PREPARATION ACTIVITIES

- ESA ITT preparation activities were proceeding according to nominal schedule
  - 3 Pre-TEB meetings held on 13 July, 23 and 27 August 2001
  - SOW/SRD documentation and other ITT documents (cover letter, tender conditions and draft contract) finalised
- Unfortunately, due to some delay in the internal procedure, the ITT issue (planned mid September 2001) has not yet taken place
- Assuming that the Phase A ITT is released by mid October 2001, the Industry Proposals will be available in mid December 2001, thus leading to an overall delay of one month

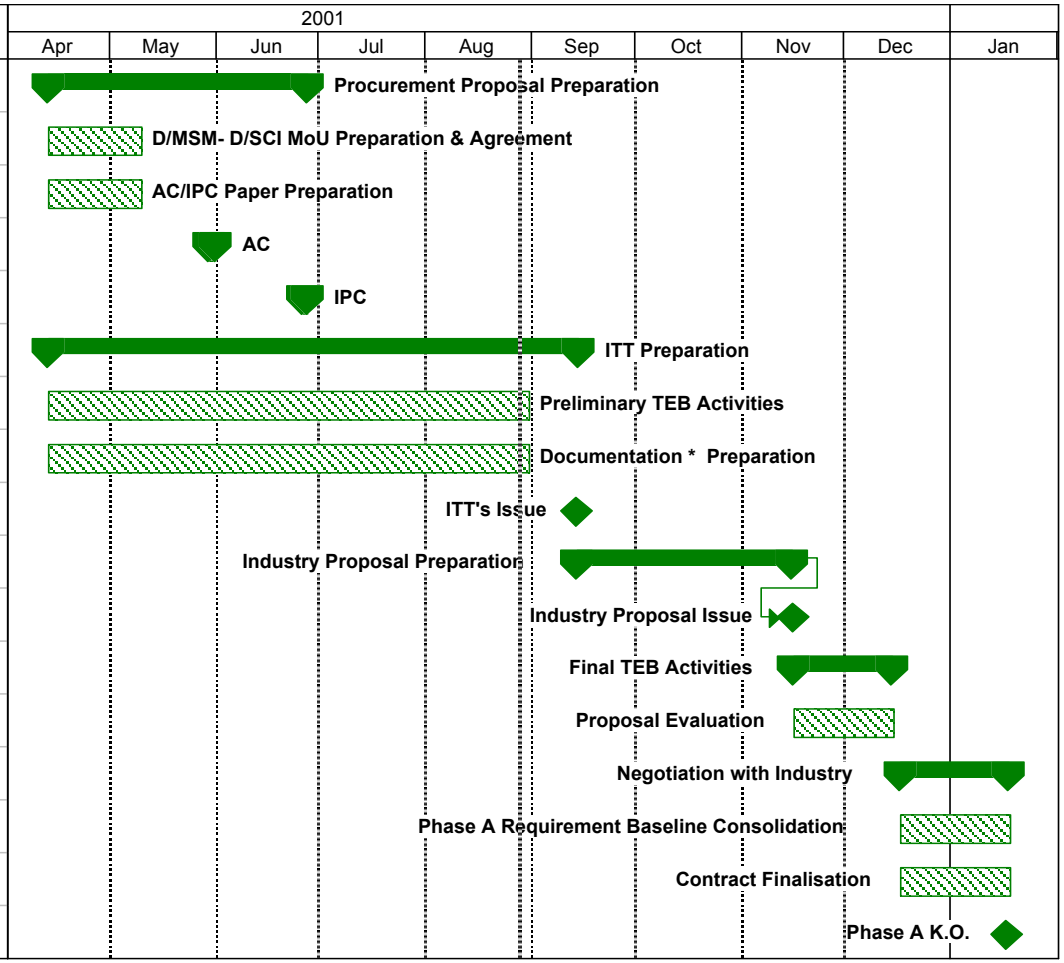
STATUS OF ESA PHASE A STUDY PREPARATION ACTIVITIES (Cont'd)

- Following the evaluation of relevant industrial proposals and the successfully negotiation with the selected Contractor, the Phase A should start by mid February 2002

- The details of the "nominal" ESA Phase A Study Preparation Activities are shown in a schedule form in the next page

STATUS OF ESA PHASE A STUDY PREPARATION ACTIVITIES (Cont'd)

ID	Task Name	Start	Finish
1	Procurement Proposal Preparation	Fri 13/04/01	Wed 27/06/01
2	**D/MSM- D/SCI MoU Preparation & Agreeme**	**Fri 13/04/01**	**Wed 09/05/01**
3	AC/IPC Paper Preparation	Fri 13/04/01	Wed 09/05/01
4	AC	Wed 30/05/01	Thu 31/05/01
5	IPC	Tue 26/06/01	Wed 27/06/01
6	**ITT Preparation**	**Fri 13/04/01**	**Fri 14/09/01**
7	Preliminary TEB Activities	Fri 13/04/01	Thu 30/08/01
8	Documentation * Preparation	Fri 13/04/01	Thu 30/08/01
9	ITT's Issue	Fri 14/09/01	Fri 14/09/01
10	Industry Proposal Preparation	Fri 14/09/01	Thu 15/11/01
11	Industry Proposal Issue	Fri 16/11/01	Fri 16/11/01
12	**Final TEB Activities**	**Fri 16/11/01**	**Fri 14/12/01**
13	Proposal Evaluation	Fri 16/11/01	Fri 14/12/01
14	**Negotiation with Industry**	**Mon 17/12/01**	**Thu 17/01/02**
15	Phase A Requirement Baseline Consoli	Mon 17/12/01	Thu 17/01/02
16	Contract Finalisation	Mon 17/12/01	Thu 17/01/02
17	Phase A K.O.	Thu 17/01/02	Thu 17/01/02



* Cover letter / SOW & SRD/ Tender Condition/ Draft Contract

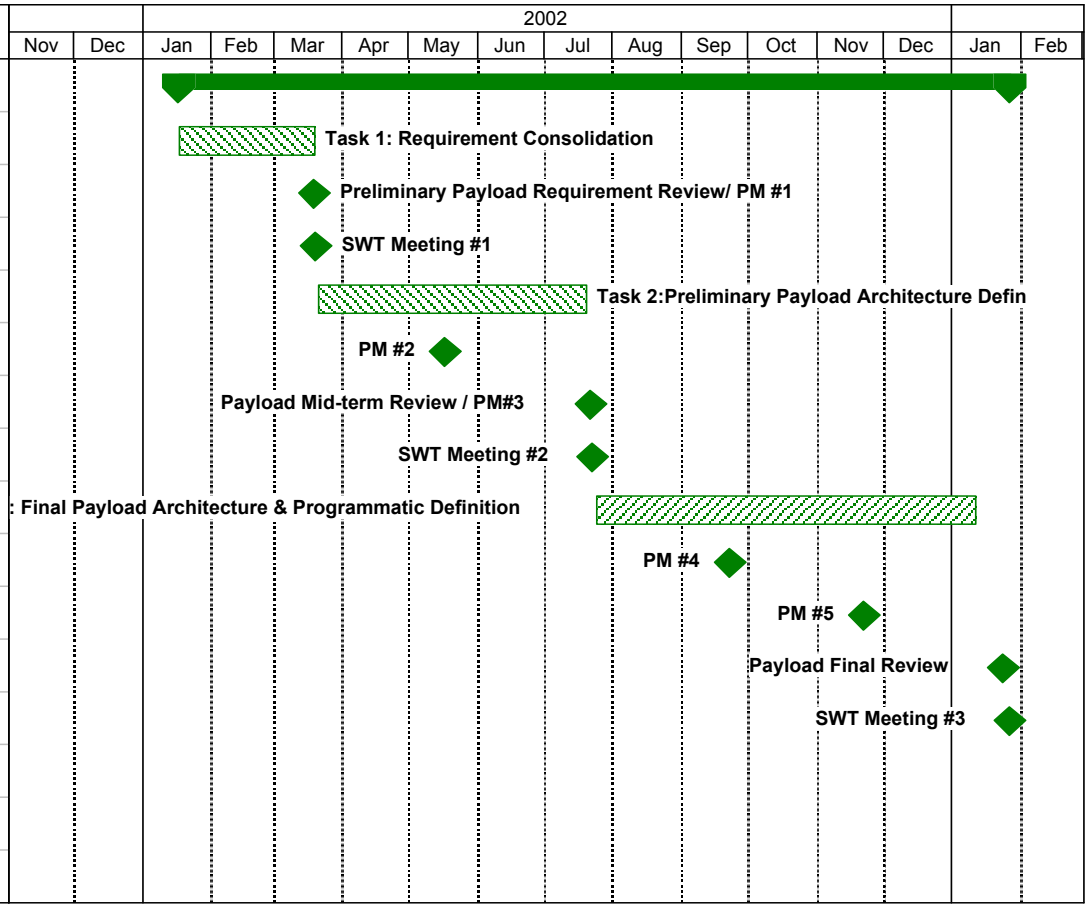
OBJECTIVES AND ACTIVITIES OF ESA PHASE A STUDY

- The ESA Phase A Study will confirm the feasibility and viability of the currently proposed EUSO Payload design (ESA/MSM-GU/2000.462/AP/RDA, December 2000) by focusing on:
  - Instrument architecture optimisation
  - Payload accommodation at CEPF and allocation of relevant resources (mass, volume, power, data) to be shared with other payloads
  - Consolidation of the Operational Modes and corresponding on-orbit resources
  - Payload system level design (mechanical, thermal, electrical, radiation and contamination) and interfaces
  - Payload launch, transportation and robotic handling for delivery to CEPF
  - Flight segment AIV Model Philosophy & AIT approach
  - End-to-end Flight Operations and Ground Segment

- The ESA Phase A Study logic is presented in the next page in the form of activity plan (NOTE: the one month delay has not yet been implemented into this plan)

OBJECTIVES AND ACTIVITIES OF ESA PHASE A STUDY (Cont'd)

ID	Task Name	Start	Finish
1	**Phase A (duration 12 months)**	**Thu 17/01/02**	**Mon 27/01/03**
2	Task 1: Requirement Consolidation	Thu 17/01/02	Mon 18/03/02
3	Preliminary Payload Requirement Review/ PM #1	Tue 19/03/02	Tue 19/03/02
4	SWT Meeting #1	Wed 20/03/02	Wed 20/03/02
5	Task 2:Preliminary Payload Architecture Definition	Thu 21/03/02	Fri 19/07/02
6	PM #2	Fri 17/05/02	Fri 17/05/02
7	Payload Mid-term Review / PM#3	Mon 22/07/02	Mon 22/07/02
8	SWT Meeting #2	Tue 23/07/02	Tue 23/07/02
9	Task 3: Final Payload Architecture & Programmatic Defini	Wed 24/07/02	Fri 10/01/03
10	PM #4	Mon 23/09/02	Mon 23/09/02
11	PM #5	Fri 22/11/02	Fri 22/11/02
12	Payload Final Review	Fri 24/01/03	Fri 24/01/03
13	SWT Meeting #3	Mon 27/01/03	Mon 27/01/03



OBJECTIVES AND ACTIVITIES OF ESA PHASE A STUDY (Cont'd)

- **Task 1: Requirement Consolidation**

  It will cover the understanding of external requirements and application to the lower level elements (e. g. instrument) with regard to:

  - The Instrument Architecture & Interfaces requirements
    ⇒ Iterations on Instrument Definition Document (IDD) required between Payload contractor and Instrument responsible
  - The facilities and resources available at the Columbus External Payload Facility (CEPF) with due regard to the technical and programmatic limitations
  - The geometrical fields of view and thermal (view factors) environment of the CEPF
  - The transportation environment of the various carriers proposed for this programme
  - The capabilities and limitations of the robotics servicing infrastructure
  - The end-to-end Flight Operations and Ground System Architecture

OBJECTIVES AND ACTIVITIES OF ESA PHASE A STUDY (Cont'd)

- **Task 2: Preliminary Payload Architecture Definition**

  Within the constraints imposed by the chosen platform and carrier and the knowledge from Task 1, the following activities will be performed:

  - System Configuration Trade-Off
  - System Design and Analysis
  - Mission Analysis
  - Environmental Analysis
  - Definition of Payload Development and Verification Approach
  - Definition of Payload Integration Approach

OBJECTIVES AND ACTIVITIES OF ESA PHASE A STUDY (Cont'd)

- **Task 3: Final Payload Architecture and Programmatic Definition**

  As a result of the first two tasks, options for the architecture and the operational approach of the Payload will have been identified. A preferred option will then emerge leading to:

  - Payload and Instrument Design Update
  - Drafting of Interface Documentation
  - AIV and Management Approach Consolidation
  - Programmatic Evaluation

SINERGY BETWEEN PAYLOAD AND INSTRUMENT PHASE A STUDIES

- Based on the knowledge in so far acquired regarding the Instrument baseline architecture and Phase A work scope, a significant overlap exists between the Instrument and the Payload Phase A Studies

- Therefore, in order to arrive at an optimised (hence feasible) EUSO configuration (at Payload level) it is mandatory that Payload and Instrument teams strictly and efficiently interact

- The following approach is proposed:
  - Payload and Instrument co-ordination of system design and interface tasks (**Mandatory**)
  - Payload and Instrument co-ordination of Flight Operation and Ground Segment tasks (**Optional**)
  - Focal point for co-ordination: ESA Study Manager (supported by Industrial Contractor – once selected – and ESA Study Scientist) and Instrument Manager
  - First basis for this co-ordination to be (hopefully) agreed during this meeting

EUSO MASS LIMIT

- The mass limitation of the CEPF structures is 1000 Kg (as it is known since the beginning of the Pre-Phase A Study)

- This was stated in the Final Report of the Pre-Phase A Accommodation Study (ESA/MSM-GU/2000.462/AP/RDA, December 2000):
  Quote *"Due to the original requirement for ExPA interoperability, the CEPF structures are designed to support a total of 1000 Kg in orbit. This mass includes payload hardware plus the FRAM/Adapter"* Unquote

- The objective of mass minimisation was also clearly defined in the same report:
  Quote *"The mass of EUSO, using presently available information and a conservative approach, is estimated at 1745 Kg… It is expected that improved definition will reduce this figure to below 1000 Kg. Should no alleviation of the absolute mass loading limitation for CEPF be obtained, an alternative configuration, not making use of the UCP as carrier, may reduce this mass further to perhaps 850 Kg"* Unquote

EUSO MASS LIMIT (Cont'd)

- Further clarification of the mass limitation and contacts with the COLUMBUS team have led to the following:
  - The requirement "$M_{\text{ExPA Payload (incl. adapter and active FRAM)}} \leq 290$ Kg" derives from NASA/ISS requirements:
    - COLUMBUS Dynamic Requirements f ≥1 Hz
    - COLUMBUS Static Load Requirements based on 0.2 g input acceleration in X, Y and Z
  - With 290 Kg mass per CEPF position no margin for CEPF structure design during tilting operations (contingency) is available
  - <u>Modifications on COLUMBUS module and EPF structure are no longer possible (Columbus CDR completed and EPF structure qualification achieved and FM h/w built)</u>

MASS LIMITATION ISSUE (Cont'd)

- ESA is currently specifying (in the scope of the Phase A Study) that the EUSO Payload maximum allowable mass shall be determined considering: the maximum mass carrying capability of the CEPF, the maximum robotic handling mass capability and the fact that EUSO payload will be operative together with an additional (standard ExPA) Payload (e. g. Lobster)

- It's ESA intention to review the feasibility of EUSO accommodation at CEPF, at the end of the Phase A Task 2 in the context of the Mid-Term Review

- Alternative accommodations, already under consideration: S3 Truss Site (NASA) and JEM-EF (NASDA), if needed shall be further elaborated and consolidated

- It is mandatory that EUSO Instrument mass shall also be reduced in order that the overall payload mass interface requirement is respected