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Space Project Management

Cost & Schedule Management

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Foreword

This standard is one of the series of ECSS Standards intended to be applied together for the management, engineering and product assurance in space projects and applications. ECSS is a cooperative effort of the European Space Agency, National Space Agencies and European industry associations for the purpose of developing and maintaining common standards.

Requirements in this standard are defined in terms of what must be accomplished, rather than in terms of how to organise and perform the necessary work. This allows existing organisational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

The formulation of this standard takes into account the existing ISO 9000 family of documents.

This standard has been prepared by the ECSS Management Standards Working Group, reviewed by the ECSS Technical Panel and approved by the ECSS Steering Board.

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Introduction

Cost and Schedule management is defined as a collective system of organised processes and actions in support of project management. Its objective is to establish the optimum use of human resources, facilities, materials and funds, in order to achieve the successful completion of the space project within its established goals:

- cost targets,
- timely completion,
- technical performance.

To this end, costs and tasks shall be planned and actively controlled, care being taken to identify those critical situations that could lead to an adverse impact on the project cost and schedule and recovery actions being proposed.

Cost and Schedule management should not be confused with accounting activities.

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Scope

The present document, 'Cost and Schedule Management', is part of a collection of ECSS standards belonging to the management branch.

The requirements specified herein apply to, and affect the customer and supplier at all levels, when the capability to design and supply conforming product needs to be demonstrated. These requirements, as tailored in related Project Requirements Document, are applicable to any actor of a space project.

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References

2.1 Normative References

This ECSS standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these apply to this ECSS standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

This ECSS standard belongs to the Space Project Management series called up by the 'Policy and Principles' standard ECSS–M–00. The standards listed below shall be considered in association with this document.

ECSS–M–10 Project Breakdown Structures.

ECSS–M–20 Project Organisation.

ECSS–M–30 Project Phasing and Planning.

ECSS–M–40 Configuration Management.

ECSS–M–50 Information/Documentation Management.

ECSS–M–70 Integrated Logistic Support.

The applicable revision index shall be that valid at the time the Project Requirements Documents are created.

2.2 Informative References

RG Aéro 00040	General Recommendation for the Project Management Specification.
CNES IM–60–00	Gestion des Coûts et des Délais.
MR–P/01	Management Requirements on Industrial Contracts. (supersedes ESA PC/941904/TD/510)
DOD Instruction 5000.2	(to be replaced by BS 6079 when published, annex D, part 3)

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Definitions and Abbreviations

3.1 Definitions

For the purposes of this standard, the definitions given in ECSS–P–001 Issue 1 apply. In particular, it should be noted that the following terms have a specific definition for use in ECSS standards.

Business Agreement

Configuration

Configuration Baseline

Contract

Contractor

Contractual milestone

Cost ⇔ Price

Customer

Data (IEC 50:1991)

Evolution

Gantt chart

Information

Life cycle cost

Milestone

Network

Non recurrent cost

Phase (Project Phase)

Process

Project

Project Requirements Document

Purchaser

Recurrent cost

Resource

Space Project

Space System

Supplier

System

Task

Work Breakdown Structure (WBS)

Work Package (WP)

The following terms and definitions are specific to this standard and shall be applied.

"Cost breakdown structure: The structure which classifies agreed resources, cost categories and types."

"Cost reimbursement: Cost reimbursement is a generic typology of contracts in which the effected payments are depending upon provision of cost incurred."

"Current economic conditions: The conditions prevalent when the service is provided."

"Direct Manpower Cost: This is the manpower cost to be allotted to the project directly at the agreed rates."

"Estimate At Completion: The sum of the cumulative costs incurred at the cut-off date plus the respective Estimate To Completion will form the Estimate At Completion."

"Estimate To Completion
On the basis of the cumulative costs incurred and the entered commitments, the evaluation of the authorised work remaining to complete including the approved contract changes will form the Estimate To Completion."

"Fixed price: It is a typology of contracts in which payments are predefined in payment plans and are effected upon achievement of the relevant contractual milestone."

"Internal means of production
These are specialised technical means which represent, for example, computer facilities, integration hall etc. for which standard unit charging rates have been established. The work unit employed shall be clearly defined."

"Non production expenses
All the expenses including costs for distribution, general administration, and financing costs including applicable overheads for the whole company/subcontracts and which are chargeable according to a rate."

"Parametric Estimate: Cost estimate based on quantifiable parameters, such as mass, power, development status, maturity of technology, etc."

"Reference economic conditions
The conditions prevalent when the decision to commit to the project is taken. For a contract, they are the economic conditions at the time the contract prices are drawn up."

"Sub-contracts: In the customer-supplier chain, a contract between a contractor and their subordinate contractors, to obtain materiel in this manner."

"Supplies and other direct costs
These are, either parts to be incorporated, with or without transformation, into the final product, or sub-contracts or services relating to study or manufacturing."

3.2 Abbreviations

The following abbreviations are defined and used within this standard.

Abbreviation	Meaning
EAC:	Estimate At Completion
MPP:	Milestone Payment Plan
WBS:	Work Breakdown Structure
WP:	Work Package

In this ECSS standard, in order to facilitate reading and traceability, the requirements are listed according to numbered topics. Each numbered requirement is composed of a general wording (bold text), and often by an explanatory text attached to the general requirement and an expected output (text in italics).

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Principles for Cost Management

4.1 Cost Estimation and Planning

4.1.1 General Principles

All the required cost/price estimates, analysis, processing and reporting shall be based on the following project breakdown structures:

- Work Breakdown Structure
- Cost Breakdown Structure

specifying costs associated to each Work Package, broken down by the cost categories of the Cost Breakdown Structure.

Cost estimates and reporting shall be based on defined Economic Conditions, as the ones prevailing at the time the estimates/reporting is performed or the ones specified by the purchaser.

Reference economic conditions are those prevalent when the decision to commit to the project is taken. For a contract, they are the economic conditions specified in it. Current economic conditions are the conditions prevalent when the service is provided.

Price variation formulas, if applicable to the contract type, will be established per each contractor making data for planned/actual/forecast costs comparable along the project lifetime by linking current economic conditions with reference economic conditions. They are submitted to the purchaser for approval. Those formulas are called escalation formulas.

Escalation amount is not considered as cost category, but specific item of the contract.

4.1.2 Cost Breakdown Structure

The total cost planned per each Work Package shall be broken down depending from its nature (labour, non labour, subcontracted work) and its destination (Drafting, Product Assurance, Manufacturing etc. depending upon the contractor internal structure). This leads to the Cost Breakdown Structure (see figure 1).

The division of costs between direct and indirect cost categories shall be declared by the contractor to the purchaser if required.

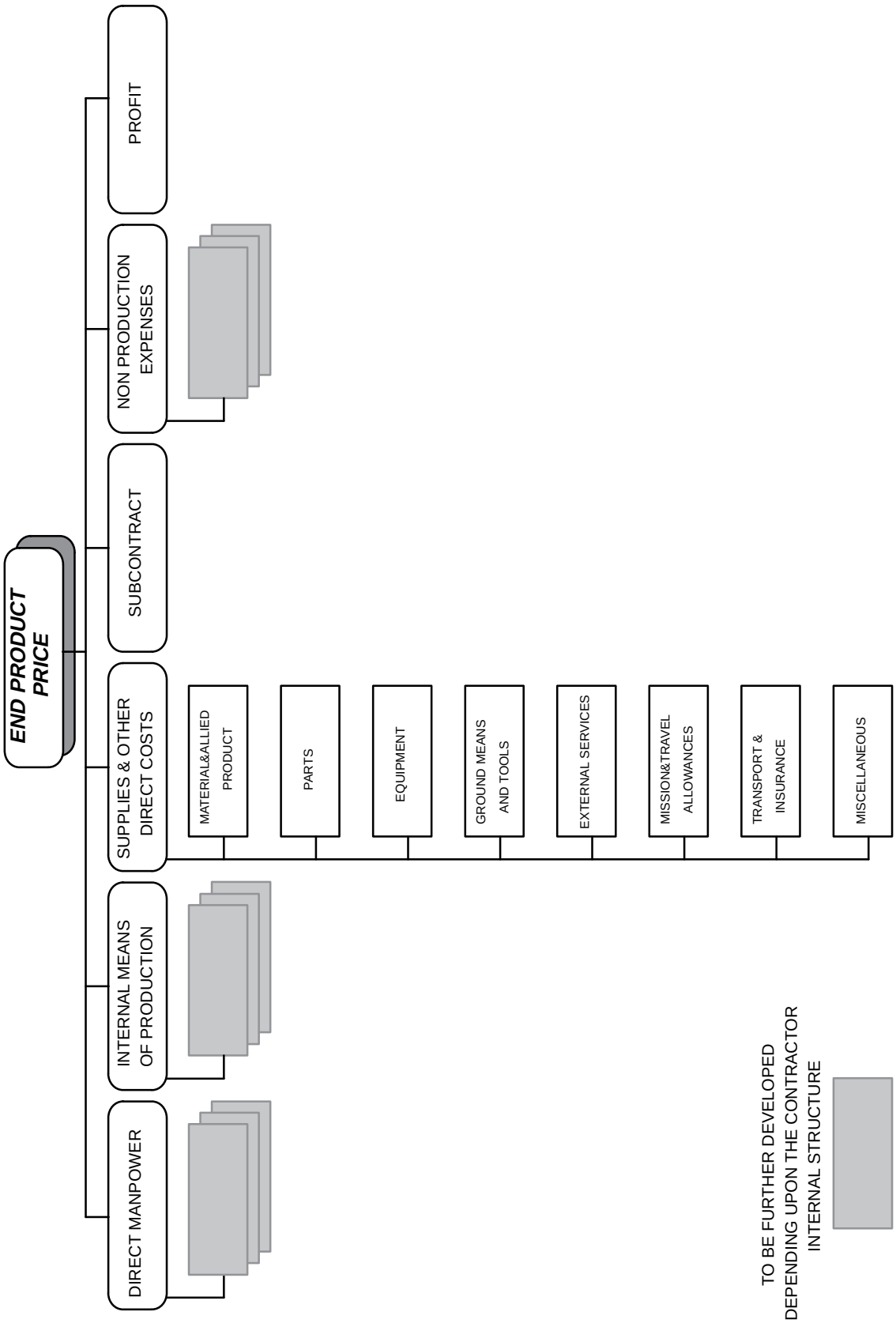

Figure 1: Cost Breakdown Structure

The following main categories apply:

- **Direct Manpower Cost**

  This is the manpower cost to be allotted to the project directly at the agreed rates. The work unit used is one man hour, specific hourly rate are applied. These time quantities are expressed either by the manpower categories used or by the internal cost accounts employed, in accordance with the company's usual accounting principles and methods.

- **Internal means of production**

  These are specialised technical means which represent, for example, computer facilities, integration hall etc. for which standard unit charging rates have been established. The work unit employed shall be clearly defined.

- **Supplies and other direct costs**

  These are, either parts to be incorporated, with or without transformation, into the system, or sub-contracts or services relating to study or manufacturing work.

  - **Materials and allied products**
    Raw or semi-worked supplies which will be subject to transformation and assembly operations.
  - **Parts**
    These are the smallest items used in a piece of equipment and are reckoned to be indivisible. They can be standard or specific to space projects (e.g. High reliability EEE components).

    In general, parts are provided by the contractor, or through a procurement agent.
  - **Equipment**
    Worked items such as sets, devices and modules that perform a complete function, usually designed by a specialised contractor for the benefit of one or several purchasers, to be directly incorporated without transformation into a larger set with or without adaptation.
  - **External services**
    Services to be rendered by a third party, such as hire of facilities, computer services, manpower services, surface treatments ....
  - **Ground means and tools**
    Facilities, apparatuses, machines, instruments, consoles, test racks, containers, gauges, vehicles which are not part of the contractor's usual means of production and which shall be bought in order to develop, test, store and/or transport the system. Costs which correspond to rental or acquisition.
  - **Missions and travel allowances**
    Transport and accommodation costs for direct personnel who need to travel for work requirements outside the geographical zone near the place of production.
  - **Transport and insurance**
    Transport and insurance costs of the deliverable items or part thereof.
  - **Miscellaneous**
    All the other items of direct costs, not covered by the headings above, in so far as they enter into works production costs (e.g. translation, document reproduction ...).

- **Non production expenses**

  All the expenses including costs for distribution, general administration, and financing costs including applicable overheads for the whole company/subcontracts and which are chargeable according to a rate.

- **Sub-contracts**

  Costs deriving from sub-contracts between purchaser and contractors established with a view to undertaking work with its own end and which is sufficiently important and specific to require the drawing up of particular technical specifications. It excludes those elements which fall under a definition contained under 'supplies and other direct costs'.

- **Profit margin**

  The profit margin, is the difference between the system cost and the selling price, and can include penalties or incentives.

4.1.3 Financial Audits

Cost categories associated with direct manpower costs, internal means of production and non production expenses will receive specified rates during financial audits to be performed between the first level purchaser and the concerned contractor, independent from the contractor price type. These rates being the basis of costs estimates and reporting, they shall be valid at the defined economic conditions.

In case of cost reimbursement contract the first level purchaser shall have the right to verify the correctness of the reported cost data with respect to the internal company accounts of the contractor.

4.1.4 Cost Expenditure Profile

The project cost broken down per Work Package/Cost Categories shall be time phased in accordance with the associated Work Package planning, originating a Work Package Manpower and Cost Plan.

For reporting purposes, the Work Package Manpower and Cost Plan can be summarised at a level to be agreed between the actors, as the actual level of control. The selected Work Packages are then called Control Work Packages.

In establishing the Work Package Manpower and Cost Plan, non labour costs shall be entered when committed.

Commitments are defined as the value of purchase orders placed minus the value of booked invoices for purchase orders.

On the contrary, the time apportionment of non labour costs in accordance with the real expenditures to be made generates the expenditures profile.

Cost and expenditure profiles shall be built on the same economic condition reference.

4.1.5 Sensitivity of Estimation

The cost estimate of space projects may be defined using different methodologies, depending from the maturity of the design and similarity to other space projects.

Any methodology of estimate should be a proven method prior to its utilisation on the project.

It is recommended that in the early project phases parametric estimates for the total project duration will be developed and presented at each major project review, and in support of trade off's.

The parametric estimate shall be based on dedicated methodologies for hardware and software and shall be calibrated and proved in their key factors with respect to the contractor peculiarities.

Parametric estimate are based on the fact that significant parameters concerning a project (technical parameters, development and production context) have an impact on the cost of the project.

Parametric estimates will be developed on the basis of cost data-banks for Work Packages or groups of them, and considering key parameters like engineering budgets, development status, schedule etc.

As the details of design and development programme will progress, parametric estimates will be refined, accompanied and subsequently substituted by detailed cost estimates per task or group of tasks of the Work Package.

Lessons learned from other projects shall be constantly considered. See also ECSS–M–20, clause 5.

The projected cost estimate shall take into account the risks associated with the defined work scope, in terms of technical performances of the project components, development and commercial risks.

This analysis will eventually lead to definition of a reasonable risk margin to be considered as part of the projected life-cycle cost; this risk margin shall be continuously monitored during the project development, being progressively reduced by the increased technical confidence.

4.1.6 Design to Cost

The Design to Cost method is especially aimed at controlling series production and operational costs for products to be developed from the early definition phases.

This method involves the following, for all the products to which it applies:

- establishment of recurring cost targets as from the start of the engineering process,
- identification and selection of technical solution alternatives, which achieve both cost targets and development requirements (quality, performance and delivery dates),
- management of recurrent costs throughout the definition phase, under consideration of performances, quality and delivery date parameters.

Design To Cost approach establishes a cost requirement, as one among the many other performance parameters of the project/system.

4.1.7 Geographical Distribution

Geographical distribution describes the cost sharing among the industries of participating countries.

Geographical distribution is deduced from the Contract Structure.

In some cases, a dedicated geographical distribution can be imposed as a requirement, together with specific application rules.

4.2 Cost Control

The set of technical, schedule and financial data on which the purchaser and the contractor have reached an agreement constitutes the Contractual Baseline. It corresponds to the notified contract. The associated financial data include the cost baseline for the project at the defined economic conditions.

The cost baseline shall serve as a basis for actively exercising manpower and cost monitoring, controlling and reporting, and for assessing any change to the Contractual Baseline.

Cost control shall be actively performed, without limiting it to accountancy and reporting only. It will include control of open commitments.

Responsibility of keeping the planned task results inside the specified cost (and time) constraints shall be allocated in a clear way. WP responsible shall plan and control his WP cost.

Deviations from the cost baseline shall be analysed identifying reasons and trends, reported and classified according to the classification of the risks, for necessary recovery actions as part of the overall risk management.

In the case where implementation of recovery actions requires a modification of the contractual baseline, the purchaser concurrence is needed.

4.2.1 Estimate at Completion and Estimate to Completion

On the basis of the cumulative costs incurred and the entered commitments, the estimated cost of the authorised work remaining to complete including the approved contract changes will form the Estimate To Completion.

The date at which the Estimate To Completion is evaluated constitutes the cut-off date.

The sum of the cumulative costs incurred at the cut-off date plus the respective Estimate To Completion will form the Estimate At Completion (EAC).

EAC shall be prepared at predefined intervals along the project duration and submitted by the contractor to the purchaser for concurrence.

As part of the EAC, the contractual changes submitted for approval and Potential Cost Items shall be identified (see 4.2.3).

4.2.2 Cost versus Progress Control – Performance Measurement

Upon establishment of the Contractual Baseline, the cost control task will not be performed in isolation from progress of activities.

Prerequisite for performance control is therefore the measurement and analysis of the cost/schedule/technical progress of the space project, i.e. to clearly indicate the amount of actual progress of the work on the space project, and properly relate cost, schedule and technical achievement to that work.

Formalised methods for performance measurement exist, e.g. Earned Value, Event Based Planning.

Earned Value is defined by the Budgeted Cost of the Work Performed. This (or Earned Value) is the sum of the budgets for completed Work Packages, and completed portions of open Work Packages, plus the portion of the budgets for tasks of level of effort and apportioned types (see ECSS–M–10) as relevant for the above. The Budgeted Cost of the Work Performed is evaluated with respect to other factors as the Actual Cost of Work Performed and the Budgeted Cost of Work Scheduled. The Actual Cost of Work Performed is the sum of the actual cost incurred for open Work Packages in accomplishing the work performed at a specified point. The Budgeted Cost of Work Scheduled is the sum of budgets for all the Work Packages, planning packages, etc., scheduled to be accomplished (including in-process Work Packages), plus the amount of level of effort and apportioned effort scheduled to be accomplished within a given time period.

Event Based Planning relies on establishing milestones, their significant tasks and the criteria by which completion of significant tasks are determined.

Through these methods, an effective evidence of cost/schedule deviations can be obtained and cost/schedule performance indexes can be evaluated. (For more details, refer to Informative References).

4.2.3 Potential Cost Items

During the duration of the space project, unforeseen technical or commercial modifications can require implementations.

Those modifications or items potentially leading to programmatic impacts such as cost and schedule shall be traced during the project evolution, becoming an essential element for the updating of the Estimate At Completion.

4.2.4 Inventory Control

Inventory Control function is to provide the necessary accountability to the first level purchaser of his own hardware and software items during the duration of the contract.

The inventory items shall be maintained, stored, refurbished and revalidated within the requirements of the contract; in particular the contract shall specify the lowest value of an item in inventory.

When no longer required and latest upon completion of the contract, all the items under inventory control are disposed as prescribed by the first level purchaser.

4.2.5 Change of Contractual Costs

Any change proposal affecting the cost baseline of the project shall be forwarded by the contractor to the purchaser for approval.

The change proposal shall be notified with accompanying documentation defining classification of the change, technical, schedule and cost impacts in accordance with the specified contractual regulations.

If approved by the purchaser, the cost change will constitute a modification to the cost baseline, resulting in a modified cost baseline, called current cost baseline, against which cost control / analysis / reporting shall be performed (for change control management, refer to ECSS–M–40).

4.3 Cost Reporting

The routine monitoring of project progress by the purchaser will be performed on the basis of schedule and cost information reported by the contractor.

Details of schedule and cost data are given for the Control Work Packages, to be agreed between the purchaser and the contractor prior to contract award (see ECSS–M–10).

The type of cost data to be reported is driven by the type of contract between purchaser and contractor.

Cost reimbursement type of contract requires essentially to report the incurred expenditures, while in fixed price environments reporting is limited to invoice of the specified price value in payment plans upon achievements of the payment event.

4.3.1 Cost Reimbursement

Cost reimbursement is a generic type of contracts in which the effected payments are depending upon provision of evidence of the costs incurred.

For all activities undertaken under a cost reimbursement contract incurred expenditures shall be periodically reported.

Data shall be reported splitting Direct Manpower Cost and Supplies and Other Direct costs per Control Work Package and comparing actual costs against the cost baseline and the current cost baseline.

The current cost baseline includes modifications induced by the agreed changes to the Contractual Baseline.

Reporting of expenditures shall be accompanied by an analysis of the deviations between the values specified in the current cost baseline and actuals for all the Control Work Packages having a cost deviation beyond the specified value (to be defined in the contract).

Cost summaries per contractor shall also be provided, including Financial Commitments, Fees, Incentives/Penalties (as applicable).

4.3.2 Fixed Price

It is a type of contracts in which payments are predefined in payment plans and are effected upon achievement of the relevant contractual milestone. It can coincide with one or several technical key-events chosen by agreement between the purchaser and the contractor before notification of the contract. It serves as an indication of the progress of work justifying the release of a payment.

For fixed price type of contract the following cost data will be kept current and reported periodically by the contractor to the purchaser:

- Milestone Payment Plan (MPP), defined according to the Contract Structure (see ECSS–M–10) and identifying payment events, associated value and contractual & planned dates.
- List of submitted change proposal and approval status.
- Fees, Incentives/Penalties as applicable.

Each MPP shall specify values in currency as defined by the contract.

At contract award, the MPP shall be agreed between the actors.

Approval of Payment Milestone achievement should be formally requested by the contractor and given by the purchaser.

For fixed price environment, EAC consist of an update of the Milestones Payment Plan.

4.3.3 Geographical Distribution Reporting

As part of the EAC or MPP update, the geographical distribution shall be reported, in terms of cumulative return status resulting from the reported actual costs and geographical distribution forecast at total contract level.

4.3.4 Invoicing and Payment Reporting

Invoicing status will be routinely reported by the contractor to the purchaser, specifying submitted invoices and payments received.

5

Requirements for Cost Management

5.1

The cost estimate shall be based on the Work Breakdown Structure.

AIM: Achieve accuracy and coherence of all the cost data.

EXPECTED OUTPUT: *Reliable and traceable cost estimate.*

5.2

A cost shall be associated to each Work Package broken down by the Cost Categories of the Cost Breakdown Structure.

AIM: Achieve accuracy and coherence of all the cost data.

EXPECTED OUTPUT: *Reliable and traceable cost estimates.*

5.3

The economic conditions per each cost estimate and reporting shall be specified .

AIM: Allow proper correlation between planned and actual costs.

EXPECTED OUTPUT: *Cost data based on specified economic conditions.*

5.4

Every escalation formula shall be defined by each contractor and agreed with his purchaser.

AIM: Allow proper correlation between planned and actual costs along the life cycle of the project.

EXPECTED OUTPUT: *Escalation formula.*

5.5

Cost categories shall receive rates agreed by the first level purchaser.

AIM: Ensure coherence of cost data.

EXPECTED OUTPUT: *Audited rates.*

5.6

The cost baseline of the project shall be time phased.

AIM: Establish an agreed costs/expenditures plan.

EXPECTED OUTPUT: *Work Package Manpower and Cost plan, Expenditure profile.*

5.7

Any parametric estimate shall be based on proven methods.

AIM: Ensure reliability of cost estimates.

EXPECTED OUTPUT: *Parametric data and parametric estimates.*

5.8

The contractor shall define the anticipated geographical distribution for his project prior to the project start according to the Contract Structure.

AIM: Allow visibility of the planned geographical distribution.

EXPECTED OUTPUT: *Geographical distribution table, Task allocation list per country.*

5.9

Any planned project change to the established baseline shall specify the impacts to the corresponding geographical distribution.

AIM: Establish proper geographical distribution trends and to keep geographical distribution status current.

EXPECTED OUTPUT: *Forecast Geographical distribution*

5.10

Manpower and Cost control/reporting shall be based on the current cost baseline.

AIM: Identify variations and trends with reference to the current cost baseline.

EXPECTED OUTPUT: *Cost report.*

5.11

Financial commitments shall be controlled.

AIM: Get proper visibility of cost incurred and trends.

EXPECTED OUTPUT: *Open commitments as part of cost report, EAC.*

5.12

Recovery actions requiring a modification of the Contractual Baseline shall be implemented upon approval of a contract change.

AIM: Maintenance of the Contractual Baseline.

EXPECTED OUTPUT: *Updated Contractual Baseline.*

5.13

Estimate At Completion shall be prepared at predefined intervals along the project duration.

AIM: Visibility on cost trends and reference for cost reporting and budgeting.

EXPECTED OUTPUT: *Estimate At Completion, current cost baseline.*

5.14

The contractor shall prepare and report a listing of Potential Cost Items.

AIM: Definition of potential recovery measures, active cost/schedule control.

EXPECTED OUTPUT: *Potential Cost Item list as part of progress reporting, EAC.*

5.15

The contractor shall identify, protect, mark, record, segregate and maintain all the items belonging to the first level purchaser.

AIM: Definition and conservation of the first level purchaser properties.

5.16

The contractor shall report the status of the inventoried items belonging to the first level purchaser.

AIM: Definition of the first level purchaser properties.

EXPECTED OUTPUT: *Inventory list.*

5.17

Cost reports shall identify Direct Manpower Cost, Supplies and Other Direct Costs per Control Work Package.

AIM: Visibility and control of incurred expenditures for cost reimbursement management.

EXPECTED OUTPUT: *Cost report.*

5.18

Cost summaries per contractor shall be reported.

AIM: Visibility and control of project cost status per contractor.

EXPECTED OUTPUT: *Cost report.*

5.19

Cost report shall show the current cost baseline and the cost baseline.

AIM: Evaluation of deviations from cost baseline and EAC.

EXPECTED OUTPUT: *Cost report.*

5.20

Milestone payment plans (MPP) shall specify measurable payment events, contractual & planned dates, payment values in currency.

AIM: Cost/payment management, evaluation of geographical distribution.

EXPECTED OUTPUT: *Milestone payment plan (MPP).*

5.21

MPP shall be established according to the contract structure.

AIM: Cost/payment management.

EXPECTED OUTPUT: *MPP per contractor.*

5.22

MPP shall be kept current and changes reported.

AIM: Definition of the current Contractual Baseline for fixed price contracts.

EXPECTED OUTPUT: *Updated MPP as part of EAC and change proposals.*

5.23

Invoicing and payments per contractor shall be reported.

AIM: Effective management of payments.

EXPECTED OUTPUT: *Invoicing/payments status list.*

5.24

The recurrent cost target shall be agreed between the purchaser and contractor, in accordance with the Technical Specification for the system, before starting the development phase.

AIM: Conduct the design in order to respect the recurrent cost target.

EXPECTED OUTPUT: *Recurrent cost target.*

NOTE To be applied if design to cost is required.

5.25

The contractor shall periodically report the expected recurrent cost of the system to the purchaser.

AIM: Control the effectiveness of the design to cost process.

EXPECTED OUTPUT: *Updated expected recurrent cost of the system.*

NOTE To be applied if design to cost is required.

6

Principles for Schedule Management

The work to be performed for every project shall be planned to a level of detail appropriate to the project phase for which the schedule planning is established.

Any planning drawn up shall be linked to the Work Breakdown Structure such that per each project phase all the major project milestones (including the contractual ones), the significant development/test campaigns, deliveries, start/end events of Work Packages can be identified.

After the contract award for the relevant project phase the work progress shall be actively monitored throughout the phase duration and periodically reported to the purchaser.

6.1 Schedule Creation

It is a task to be performed prior to the project phase start and normally as part of the proposal definition process, in conjunction with the identification of the project objectives and the associated development approach.

The schedule planning will be established following an iteration process internally at the supplier and between the supplier and the customer, until data are consolidated and mutually agreed.

The schedule planning shall be specific for each project phase, showing milestones and required inputs/outputs.

Activities shall be grouped in accordance with the project Work Breakdown Structure, in a way which renders possible identification of WP start and end dates at least at the agreed selected level.

Task duration and planning shall be established under constraint of available resources (manpower and facilities) unless specifically directed by the customer to consider unlimited resources.

A reasonable margin shall be accounted in evaluating the task duration, avoiding unnecessary schedule extension while reducing the overall schedule risk.

All the required planning data will be established by utilising computerised methodologies, creating logical time sequence of activities from which bar charts and related list of milestones can be derived.

Networks will be created using standardized methods.

Contents of schedule documents shall be structured to satisfy the information requirement for the schedule control system and the method of performance measurement to be adopted.

6.2 Schedule Control

The planning data established for the supplier's proposal once agreed with the customer will constitute the reference for actively planning, controlling and progress reporting.

This reference shall be the single source of data based on which manpower, resources and cost/expenditures are planned and controlled.

In case changes to the Contractual Baseline are proposed, schedule implications will be highlighted.

Upon agreement of a contractual change, the contractor shall update his schedule data and resubmit to the purchaser the appropriate planning documents.

Deviations from the reference planning shall be analysed identifying reasons and trends, reported and classified according to the classification of the risks, for necessary recovery actions as part of the overall risk management.

Each project actor shall implement throughout the project duration an active schedule control, anticipating backup solutions to potential problem rather than facing schedule delays once it has occurred.

6.3 Schedule Reporting

The schedule data part of the Contractual Baseline shall be maintained by each project actor via the schedule control task. They shall be periodically reported to the purchaser implementing the progress achieved at the specified reporting date.

Following items shall be reported as a minimum:

- activities started, recording actual start date
- activities completed, recording actual finish date
- correctness of schedule completion date for task in progress
- statement that sequence, relationships, constraints of planned activities are still valid

Above data shall be accompanied by synthetic description of assumptions and resulting effects.

Evolution of major project events selected as project milestones for schedule control purposes shall be reported in conjunction with above information.

In case an unforeseen event occurs at any time of the project duration that could significantly affect the achievement of the schedule objectives, the contractor shall formally notify the purchaser, independently from the nominal reporting cycle, within the agreed short time notice.

6.3.1 Schedule Review Meetings

The customer shall perform specific planning/schedule review meetings with the supplier in addition to any routine progress reviews whenever a schedule criticality is highlighted to require special attention.

6.4 Schedule Deviations

For any delay indicating the presence of a not previously reported problem an immediate evaluation of the causes shall be performed and recovery measure shall be developed and implemented.

In case the deviation will affect one or more events selected as project milestones for schedule/ performance control purposes, the customer approval shall be obtained prior to implementation.

7

Requirements for Schedule Management

7.1

Project schedule shall be linked to the Work Breakdown Structure, showing all major milestones (including contractual ones) and required input/outputs.

AIM: Establish and maintain a coherent management system.

The project schedule should show the Control Work Packages, planned and actual start and end times of the Control Work Packages, milestones, critical path.

EXPECTED OUTPUT: *Networks, Bar charts, Milestones list, critical path analysis, etc., as appropriate to the methodology applied.*

7.2

Task duration and planning shall be established under consideration of available resources.

AIM: Reconcile planning and available resources.

EXPECTED OUTPUT: *Realistic planning.*

7.3

Schedule margins management shall be implemented, and margins shall be shown.

AIM: Optimise margins inside the schedule.

EXPECTED OUTPUT: *Schedule showing available margins (duration and allocation).*

7.4

Contents of schedule documents shall be structured to satisfy the information requirement, support the schedule control system and the performance measurement.

AIM: Coherency of planning.

EXPECTED OUTPUT: *Scheduling documentation, performances matrix.*

7.5

Schedule planning and control shall be established in relation to the planning part of the Contractual Baseline.

AIM: Coherency of data.

EXPECTED OUTPUT: *Schedule documentation update, trend charts, progress report, based on Contractual Baseline.*

7.6

Pro-active schedule control shall be implemented.

AIM: Minimisation of schedule problem areas, definition of backup solutions.

EXPECTED OUTPUT: *Element of Progress report and critical path analysis.*

7.7

Schedule reporting shall include description of assumptions and resulting affects.

AIM: Get adequate and clear understanding of schedule progress.

EXPECTED OUTPUT: *Progress report, schedule documentation update.*

7.8

Unforeseen events which could significantly affect the achievement of schedule objectives shall be notified between the actors within the agreed short time notice.

AIM: Minimise impacts of unforeseen events.

EXPECTED OUTPUT: *Problem notification report.*

7.9

Modification of planning affecting contractual milestones shall be implemented upon approval of a contract change proposal.

AIM: Maintain a coherent project planning between the various actors.

EXPECTED OUTPUT: *Contract change proposal.*