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Space Industry Workload Forecast Tool (IWFT)

Executive summary

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ABSTRACT:

This document presents the executive summary of the project for the specification of a tool and associated processes for the forecast of workload in the various industry segments comprising the European space industry.

The work described in this report was done under ESA Contract. Responsibility for the contents resides in the author or organisation that prepared it

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1 Introduction

1.1 Scope of document

This document summarizes the outcome of and the work done in ESA study "Specification and concept for space industry potential market and workload forecast tool" under ESA Contract N° 20854/07/F/VS.

The study was performed by BERTIN TECHNOLOGIES, prime contractor, with the assistance of EUROCONSULT, sub-contractor.

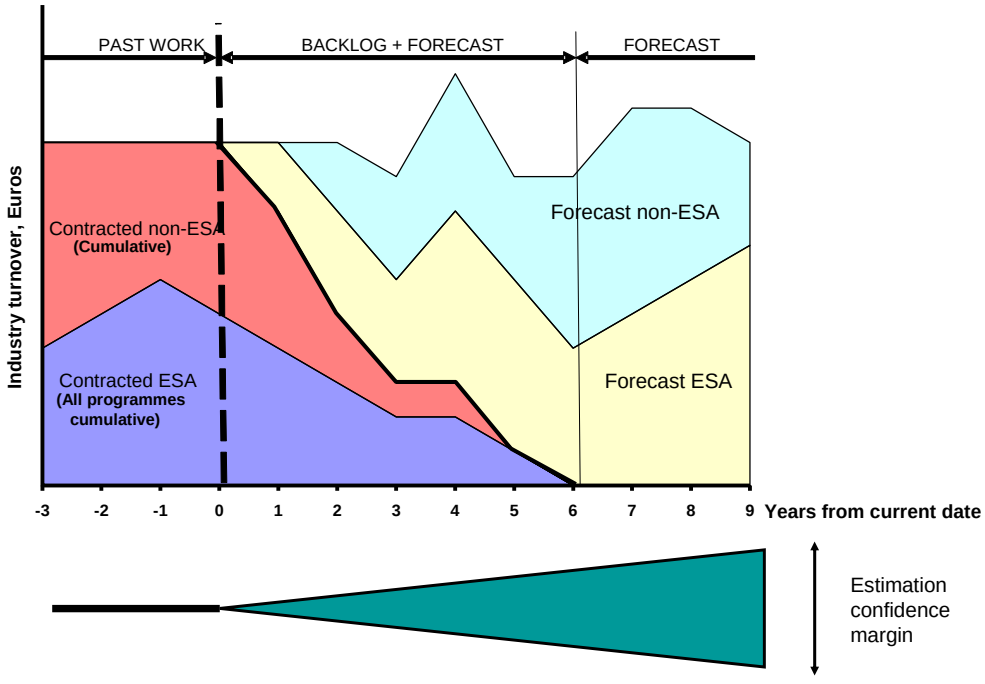
1.2 Context and objectives

The fundamental need for such a prediction tool is rooted in the ESA mandate of the ESA Convention for "… *keeping under review the industrial potential and industrial structure in relation to Agency's activities* …"

The space industry potential market and workload forecast tool (now denoted IWFT) aims at establishing workload predictions in the various industry activity domains comprising the European upstream space industry (launchers, orbital systems and ground systems). The tool will aggregate per domain all market perspectives at any given time with a +n year horizon (n is typically 10 years), including ESA missions and other institutional missions, as well as commercial satellites and direct export of space equipment and services, as illustrated in the following figure.

Figure 1: Illustration of envisaged IWFT output

(industry turnover can refer to a sector, to a product, …etc)



Such information will be used by different instances in ESA, from activity and financial planners to industrial policy makers. These users will build market scenarios and simulations in order to compare the impact on the industry workload of different financial, programmatic or strategic decisions.

2 Overview of study phasing and deliveries

The contract and subsequent change notices organised the work in two main phases with the following tasks and deliveries.

2.1 Phase 1 – Concept definition

Tasks

- Survey and characterisation of space markets data sources
- Investigation of adequate methodologies for the prediction of space industry workloads
- Investigation and selection of adequate taxonomies for the description of space markets and space industry activities
- Identification and characterisation of adequate workload cost modelling approaches
- Application of the recommended methodology to two case studies of industry workload prediction (space batteries and non-microwave space flight electronics)
- Definition of a recommended tool concept

Output

The output of Phase 1 was comprised of:

- A document “Space industry workload forecast tool – Concept definition” – Bertin Technologies document 05055-200-DV002-E.
- A Concept Design Review and supporting documentation

2.2 Phase 2 – Detailed specification

Tasks

- Clarification of pending methodology issues
- Detailed specification of tool requirements and acceptance criteria
- Optimisation of the tool taxonomies in the context of other ESA initiatives (Industry Surveys, ESA Product Tree, ESA technology Tree)
- Roadmap of the tool development steps
- Assessment of tool development cost and benefits
- Production of a design/specification document detailed enough to initiate tool development

Output

The output of Phase 2 was comprised of:

- A document “Space industry workload forecast tool – Final report” – Bertin Technologies document Ref. 05055-300-DV002-F,
- The Final Design Review and supporting documentation

3 Outcome and conclusion

3.1 IWFT is the answer to a diversity of planning needs within ESA

A number of space actors routinely call on plans, models and simulations of the European space industry activities to support their decision making, typically: ESA long term and strategic planners, ESA technology planners, ESA program managers, ESA industrial policy makers, as well as industry planners and investors and National Delegations.

Forecasting the future workload in industry, based for instance on different possible scenarios for conducting ESA (or other institutional) programs, is expected to be highly beneficial to:

- Support ESA in the financial planning of program activities, in the new context of the financial reform (accrual accounting of ESA spending). Simulating future workload scenarios may help investigate the financial impact of program delays or the program impact of changing payment profiles (decoupling of payment profiles from program activity).
- Tune ESA plans for better use of the industrial resources (program/project scheduling)
- Support industry in deciding over business models and strategies
- Identify priorities in technology investment
- Evaluate the impact on industry of various possible scenarios for approaching ESA missions and procurement
- Support geo-return prediction

3.2 IWFT appears technically feasible as well as affordable

Sufficient data can be collected to make order-of-magnitude estimations of industrial turnover in space activity domains at the required granularity level. The two case studies addressing space batteries on the one hand and space non-microwave electronics on the other hand, have shown that the currently existing and proven sources and mechanisms for data collection allow anticipating future procurement in the European industry and the derivation/validation of models for estimating the resulting turnover. In this context, the continued operation (and improvement) of the ESA Industry Outlook and Industry Survey processes remains a pre-requisite.

The predictive[1] costs shown in Figure 2 for deploying an IWFT facility are to be compared to the alternative approach of making industry workload predictions through dedicated ad hoc studies. With this concept, each individual ESA user of workload predictions, when confronted to a specific need, would have to perform (or, more likely, to procure from specialized space market/industry analysts) an ad hoc study. Such an alternative approach could quickly add up to several man-years of effort (for instance assuming 2 to 3 regular users, some of them interested in the complete industry spectrum).

3.3 The benefits and performance of the tool are expected to increase over time

An initial period will be needed to “learn by doing”, as well as to gain the confidence of data providers, whose readiness to provide relevant data will increase when they will appreciate that the tool is useful and that there is not undue diffusion of confidential or sensitive information from IWFT.

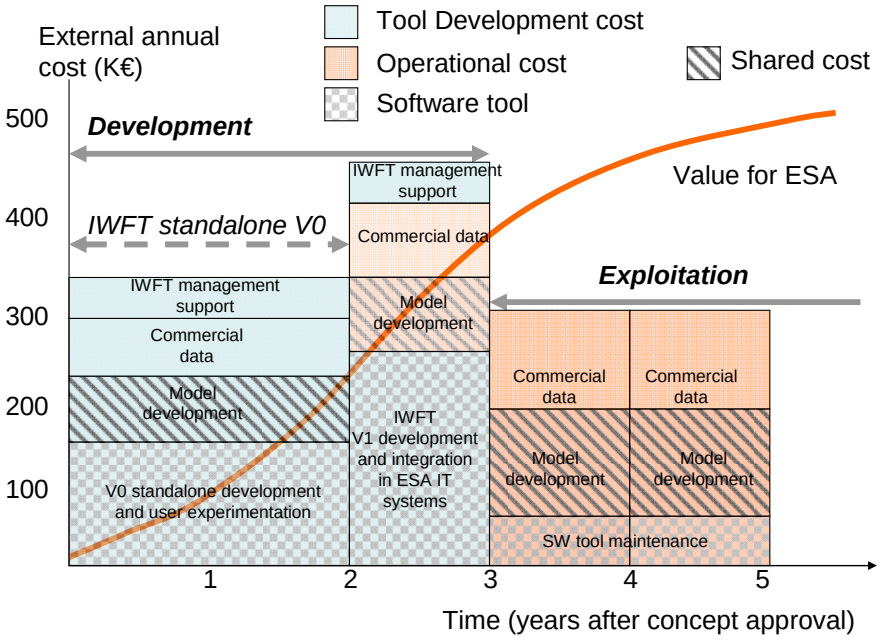
[1] The costs given here remain indicative at this stage, as the IWFT system is not stabilised yet.

Some time will also be needed to implement ESA-internal processes to recover fine-grained ESA contract and ESA budgets information on the one hand, and to exploit this data for building cost models of space activities on the other hand.

Such processes have the potential to considerably enhance the predictive capacities of the IWFT on the mid- to long-term, by increasing their accuracy.

The cost/value profile of the IWFT can then be seen as illustrated in 2. The value provided by the tool should keep increasing, as the tool databases are populated with more detailed and accurate data, and as the models used are improved, based on more space mission data and on confronting them to actual market data.

Figure 2: Illustration of IWFT investment and return



3.4 This study provides all the input needed to start implementing the IWFT

This study has strived to systematically address all the issues relevant to industry workload forecasting which can be raised today, thus defining the requirements that the IWFT will have to meet. Although not all solutions to the requirements have been specified in detail today, this work provides the descriptions sufficient to:

- Set up the processes needed for collecting the base information
- Set up the processes needed for coming up with appropriate costing models
- Develop an operational prototype tool in order to test with real users the full IWFT concept in its ESA environment
- Find appropriate solutions to the still pending requirements

3.5 The recommended next step is to develop and test a standalone tool prototype

Exploiting the existing sources and mechanisms (essentially, here, the Industry Outlook/Industry Surveys data, as well as the Euroconsult satellite market forecasts), it is possible to start operating a prototype tool within 9 to 12 months of development effort at a provisional cost between 200 and 300 k€ (for the software part only, that is, not including commercial data provision and the development of models).

The prototype tool would make it possible for a few selected ESA users to produce forecast reports as envisaged in the SOW in order to test the IWFT concept in a real and full scale environment. It would also provide valuable user feedback for optimizing the tool functionalities and interfaces, allowing a fast lane spiral-type development of the final tool in which incremental improvement of the tool would take place in parallel with pilot testing.