

LOGISTIC AND ACQUISITION

^{1,2} TECHNICAL UNIVERSITY, FACULTY OF AERONAUTICS, DEPARTMENT OF AVIATION ENGINEERING, RAMPOVÁ 7, 041 21 KOŠICE, SLOVAKIA

ABSTRACT: Acquisition of the most modern technical systems and their logistical support requires innovative approaches to be adopted in design, manufacturing and providing logistical services for their operation. The article aims to be a contribution to the acquisitional approach termed as CALS, i.e. to a modern, computer-based logistics. Integrated logistical support provided through electronization of design and operational documentation linked with standardization and continuous upgrade is yielding surprising benefits.

KEYWORDS: Logistics Support, Production's Logistics, Continued Acquisition, Life-Cycle, Logistical management, Simulted engineering

INTRODUCTION

Long term aspect of life-cycle at complex and costly systems in aviation and defence industry is necessitating continuous and rapid solutions to economically demanding upgrades, modernization and innovation. All that requires knowledge of steady and more frequent and revolutionary facts from sciences and technology bound to growing need for computer technology, new information and testing technologies, etc.

Implementation of computer systems in logistics for modern trends in military and industrial branches is of vital importance, particularly for the purpose of obtaining higher quality (complex quality) from the aspect of system characteristics (readiness, performance, reliability, safety, viability for manufacturing, maintainability, availability, supportability, partial or overall modernization, recycling, etc....), both in view of the methods applied (concurrent engineering, limiting the variability of manufacturing and the like).

The CALS Initiative (Computer Aided Acquisition and Logistic Support)- was incepted in 1985 and starting with 1994 it has been meant as continuous acquisition and life cycle support as a means of integrated logistical support for complex technical systems [1].

THE CALS APPROACH AND PRODUCT ACQUISITION

Technologies based on CALS have been originally designed only for information support of logistics. Gradual development, mostly the increasing performance of information technologies caused CALS to transform into the means of informational support for research-manufacturing-operation and modern logistical support of complex technical systems (CTS) in all phases of the product life-cycle, starting with market research and ending with its liquidation. Interconnection of design of complex technical systems and their manufacturing through information technologies, i.e. Computer Aided Design (CAD), Computer Aided Manufacturing (CAM) is

affected by rapid changes in modernization, facts that require comprehensive revision of the manufacturing processes and activities related to both acquisition and support of logistics.

The fundamental thing in managing CTS is management of logistics in terms of acquisition disciplines, directed in all the phases of the acquisition life-cycle. The complex effort is covered by the notion of integrated logistical support (ILS) and is continuously defining, projecting, upgrading and ensuring a comprehensive readiness support of the CTS throughout its entire life-cycle [2].

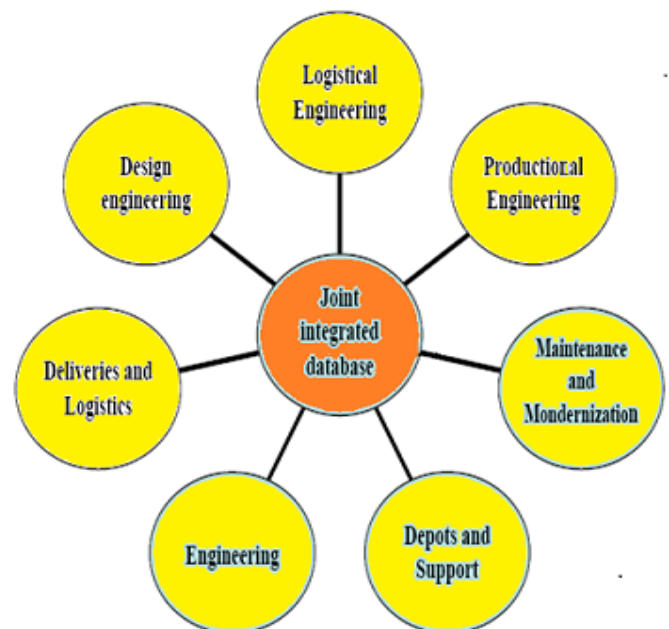


Fig. 1. Acquisition approach of the CALS

CALS is aimed to bring revolutionary changes in the fields of collecting, archiving and transfer of digital data as well as unification of information and testing technologies. Computer aided design and manufacturing enables replacement of drawing and copies by data modelling the new product to be manufactured taking the form of an integrated

database, which makes it possible to design and plan both manufacturing and logistical support in real time, involving production teams, further contractors and sub-contractors. There is thus an integrated Product Team - the IPT. Such approach is termed as Concurrent Engineering - CE, see illustration in Fig.1.

In practice, CALS involves organization of a joint information area supported by automated systems designed to ensure efficient solution of engineering problems and planning of company resources, as well as planning of manufacturing, remote approach to information and on-line solutions of supplier-and-customer relations, prognoses development and tasks of prediction. The joint integrated database features uniform and standard rules of generating, downloading, upgrading, searching and transferring information.

Administration of the joint data base is ensured by a system called PLM (Product Lifecycle Management), either serving as a comprehensive file of computerized systems such as CAE/CAD/CAM/PMD and ERP/CRM/SCM for development, design and integrated logistic support of CTS, or as an information system for a company facilitating interaction with other manufacturers.

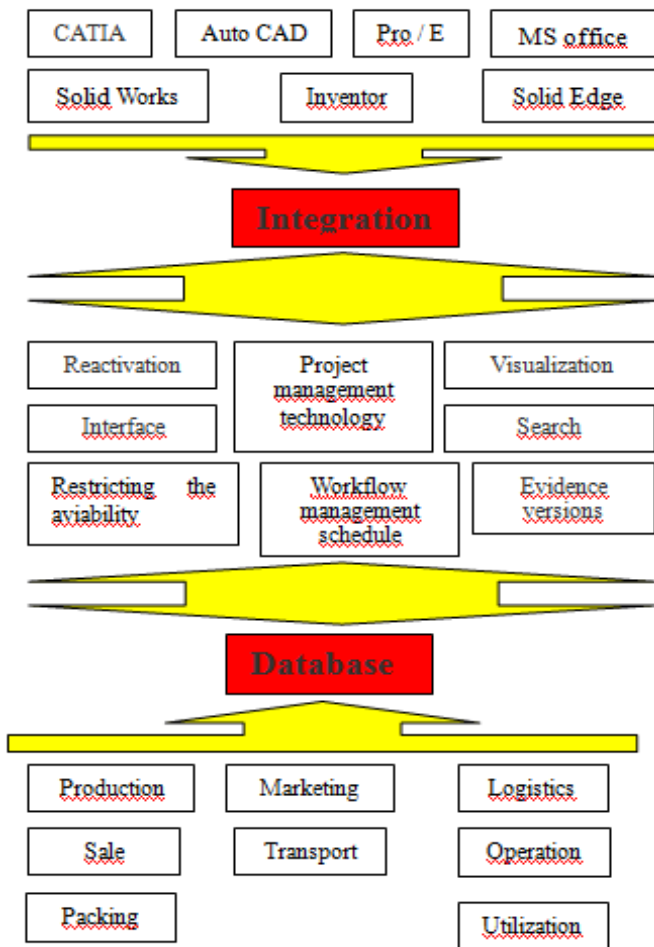


Fig. 2. System Smart Team

Currently from the PDM systems is the most famous ENOVIA and Smart Team (Dessault System), Teamcenter (Unigraphics Solutions), Winchill (PTC), my SAP PLM (SAP), Baan PDM (PDM), and Russian system Pilot: PLM (ASCON), PMD Step Suite (MO "Applied logistics), Party Plus (Pilot Software).

Dessault Systems Company a program based on ENOVIA PDM (Product Manager) integration modules CAD/CAM/CAE designed to simulate a product data management, processes and resources at different stages of life cycle – from conceptual design to disposal. The Smart Team is based on Interbase or Oracle with different visualizer – Fig. 2

PLM as a system – illustrated in Fig.3 forms fundamentals of integrating the information area of industrial products and on the basis CALS, it enables interaction of a wide spectrum of manufacturers utilizing computerized systems.

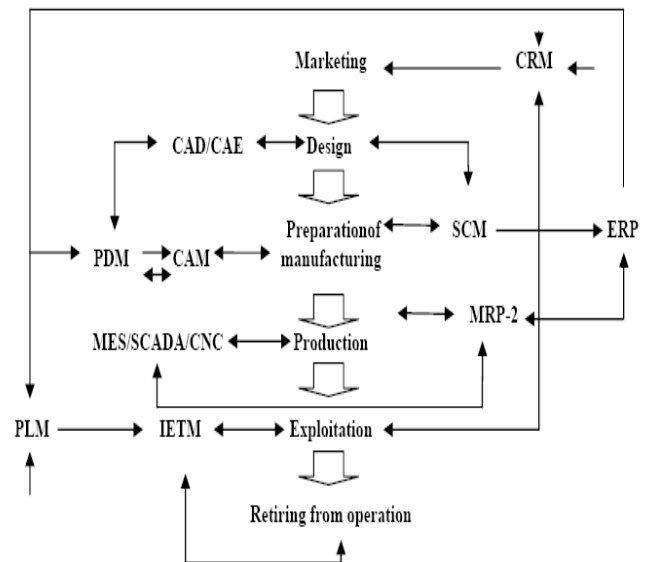


Fig. 3. Life cycle of industrial manufacturing and the computerized systems applied

Legend:

PLM – life-cycle management, PDM – management of system data, CAD –design, CAE – engineering, CAM – technology and manufacturing, CRM – customer data management , SCADA – dispatching management, MES – managing performances, SCM – managing the supply chain, ERP – company planning and management, CNC – computer based control of the machinery, MRP-2 – planning of production resources, ITEM – interactive electronic manuals.

The market success of the CTS without the CALS technology would be in these days a mission impossible. Standardized data formats of network servers enable rapid propagation of modern designs avoiding „reinventing the wheel“. Such a modern approach to design and manufacturing of high-tech products consists of:

- applying computer and modern information technology in all phases of the product life-cycle,
- applying a unified methodology to process controlling,
- cooperating with the participants (manufacturers, contractors, operators ...) in compliance with the requirements set out by international standards regulating such interactions (electronic data exchange).

Implementation of the CALS should be integrated into the Contracts on delivery of CTS concluded between the manufacturer, contractor and the customer. Higher level of information integration is known as the „Joint CALS Program and the „ Joint Engineering Data Management of Information Control Systems – JED-MICS“. Both are considered as revolutionary programs identifying a range of functional requirements for the logistical processes of the CTS, such as:

- Logistical support analysis / LSA /,
- Logistical support analysis recording / LSAR /, etc....,

or supporting the spare parts supply for the equipment repair processes.

LOGISTICAL SUPPORT TO MANUFACTURING AND OPERATION

The introduction of CALS for manufacturing and logistics was of key importance owing to its single and integrated databases equally suitable for the supplier, designer, technical manuals, trainers and logistic specialists as well. Existence of different databases designed and maintained on the part of the supplier and customer raises the need for standardization and cooperation. Then both parts of the logistics, acquisition and maintenance are fused into a single, integrated logistics, which starts before research and ends at retiring the item from operation. Most of the life-cycle phases, starting with choosing the suppliers of raw materials and components ending with selling the product require logistical support, i.e. controlling the supplier chain to increase the value added to the product, to decrease material demand and cut short the time of waiting for the product made ready. The more frequently used approach „ Make or Buy “, particularly at limited manufacturing capacities, or advantages in completion of standard parts. Most of the firms are developing specialized software and hardware for example - commerce and, either they are providing or using a joint information area, to provide services, ensure operation for building, manufacturing or delivery the products on order [4]. Design and manufacturing of CTS directly on order with re-defined parameters and specifications, when using CALS technology, enables minimizing time on cost per order. Coordination of the activities of all the partner companies making use of the internet and e-commerce, /electronic data Exchange/ known as the

system of data administration /CPC/ integrated information area enables repeated use of identical project documentation in joint projects, an approach that substantially reduces the time of developing a new product, reduces the costs of the entire design and the cycle of manufacturing as well as simplifying functioning of the systems (Fig. 4).

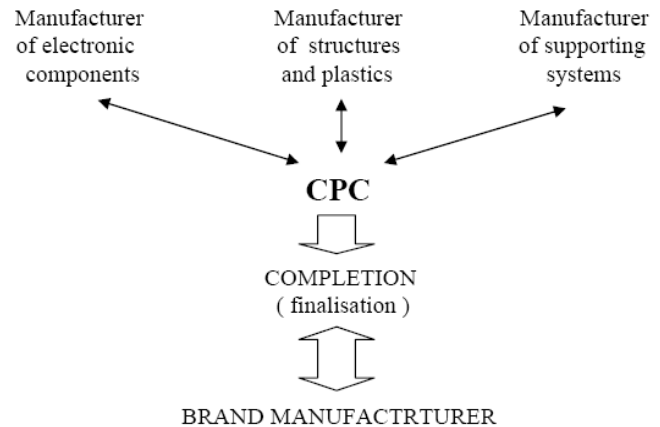


Fig. 4. Virtual company and interaction with subcontractors

MODERN LOGISTIC SYSTEM based on the CALS vision will be a system continuously upgraded and standardized. The standards must be applied in all the participating companies involved in the research, development and manufacturing of the CTS, on the basis of internationally accepted documents for the integrated logistical support. The synergic effect of implementing the CALS is remarkable and some of the sources declare:

- 30 - 40% acceleration in implementation of research and development,
- Up to 30% cuts in cost of purchasing new CTS,
- Up to 20% cuts in the time of purchasing and delivering spare parts,
- As much as the 9th multiple of reducing time needed for adaptation of projects [1],[5].

In view of the manufacturing, substantial in-crease in the quality of products, as much as 50% reduction of the time for development and preparation of manufacturing, increase in productivity by 75%, savings in inventory management by 60%, increasing return of investments by 70% and as high as 50% reduction in the services and stocks.

On introducing CALS, the savings presented can be even higher thanks to its function of maintenance and sub-function of testing, measurement and diagnostics (TDM – Test Measurement Diagnostic), which enable transition from the time-bound maintenance to maintenance by status quo. Furthermore, CALS is providing accelerated research and development of ZTS reducing the periods of 6 up 10 years down to 4 and rapid implementation of top-level technology into manufacturing processes. Researches centres of CALS

technology – „Applied logistics,, are in economically developed countries (USA, France, Germany, Russia, UK) are intensively dealing with research and implementation of software solutions for high-tech products and their information support. Provision of logistical services for the implementation of solutions is conditioned by the joint approach of the participating companies at creating integrated information products and modern technology-based approaches.

INTEGRATED LOGISTICAL SUPPORT (ILP) is ensured by a set of Technologies focused on improving operational and technical features of products as well as on cutting life-cycle costs. For example, „Tupolev“ by developing its operational documentation Tu – 204/214 to the international standard known as the ASD S 1000 D is managing its post-sale service and increasing its product competitiveness. Key component of this technology for monitoring technical status is in creating and maintaining electronic form for aircraft, automated data processing, using RFID components, etc. ..., what in their long run provides excellent reliability of aircraft manufactured and passenger safety. The first Russian aircraft designed by means of the CALS technology, including the digital analysis of logistical support (ALP) is the one known as the SSJ – 100, an aircraft entirely designed in digital environment, making extensive use of the CAD and PDM technologies.

CONCLUSIONS

Systems-based approach in developing integrated information systems in support of high-tech products and CTS throughout their entire life-cycle makes it necessary to adopt continuous improvements of concepts, in-depth study and development of CALS technologies. Knowledge of top-level products and procedures of the CALS enables high-speed

configuration of the CTS, integrated logistical support and its analysis in all phases of the product life-cycle, re-engineering of company processes in research, manufacturing and operation of high-tech products. The system of PDM data administration plays a decisive role in an integrated information environment and provides retrieves rationally structured data for product design, technology, manufacturing and operation as well as operation of realization of modern logistical support for complex technical systems. A new standard ASD S 3000 L is being prepared today with participation of world leaders in research of technologies. Certain modules for logistics and safety mostly in aviation technology are object of development conducted by the AVIS, a well established Slovak company.

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