Gateway News
American Institute of Aeronautics and Astronautics, St. Louis Section
January 1996

Chairman's Corner

Changes in the Aircraft Industry: Implications for Engineering Education

by: Fred Stahl, Chairman, Saint Louis Section, AIAA

These are revolutionary times in the aviation and space industry. Design and manufacture of aircraft and missiles is increasingly competitive as product markets shrink. These Darwinian pressures are forcing changes in the developmental processes we use to define and build aerospace products.

At McDonnell Douglas, perhaps the most noticeable change has been "integrated product and process development" (IPPD). Key to integrated product and process development is concurrent engineering where manufacturing specialists are integrated within product teams during the development phase. This approach to engineering and manufacturing development is already reaping significant payoffs for the new F/A-18E/F fabrication and assembly.

Principles of integrated product and process development are being applied even in the conceptual and demonstration stage. Manufacturing specialists are, for example, having strong influence on such programs as the Joint Advanced Strike Technology (JAST) and Joint Direct Attack Munition (JDAM).

Perhaps less well known are the manufacturing planning and evaluation tools being applied upstream. Variation simulation and analysis (VSA), a digital simulation, assesses tolerances and fabrication in terms of the manufacturability of assemblies. The "integrated product definition data sheet" provides a powerful ways to look at manufacturing and supportability issues early in the design process. Design for assembly (DFA) reduces parts count, complexity and assembly time while simplifying support functions.

Digital technology, faster computers and improved graphical software will amplify the benefits of early manufacturability assessments. Computer visualization, simulation and three-dimensional design tools make digital fit checks and virtual manufacturing effective.

Integrated product and process development practices are becoming more widely institutionalized in our industry as training becomes more common. Less widely recognized are the dimensions of the revolution in manufacturing itself—mainly because it lags the popular acceptance of integrated product and process development.

The automobile industry is leading fundamental changes in manufacturing; as a consequence of Japanese market penetration. MIT popularized Japanese methods in the book "The Machine that Changed the World" and nicknamed their methods "lean production."

Under various names, such as "world-class manufacturing," the practices of lean production are being adopted in other U.S. industrial segments.

The American aircraft industry, known for leading edge technology, lags automotive and other industrial sectors in adopting these lean manufacturing practices.

Consequently, the aircraft revolution in manufacture will be the next big change incorporating integrated product and process development.

MIT is leading an Air Force initiated consortium to guide the adoption of lean production in production of military aircraft. Leaders of many companies in this "Lean Aircraft Initiative" are convinced of its validity. Culture and practices are changing from the board room to the factory floor. There is no question that our industry will see a "lean revolution" in manufacturing.

Observers of these changes, in aircraft and other industries predict this revolution in design and manufacturing will have far-reaching effects. Global strategic competition will shift from the Cold War paradigms to the factory floor arena. The capability to produce high quality products, quickly, and inexpensively, will be a crucial market discriminator.

continued on page 2

Use of Ozone Depleters Eliminated at McDonnell Douglas Aerospace (MDA)

Larry Sanders, MDA Environmental Assurance
Mark Bass, St. Louis Section
Public Policy Committee

MDA has eliminated the use of forty-five ozone depleting substances (ODS) in its manufacturing operations in St. Louis to do its part in protecting the stratospheric ozone layer. This layer which shields humans, animals and plants from ultraviolet radiation, is susceptible to certain chemicals containing chlorine and bromine.

In 1993 MDA's Environmental Assurance Division began the process of identifying ODS used in manufacturing aircraft and missiles in its St. Louis and St. Charles facilities. Following systematic evaluation of material requirements and extensive testing and manufacturing shop trials, MDA was able to find replacements for all of its Ozone Depleting Substances.

Teamwork

One of the primary features of the ODS elimination project was use of natural work groups composed of members from Manufacturing, Engineering, Occupational Safety and Environmental Health. The four major substance groups and the major tasks were:

- **Handwipe Solvent** - Replace methyl chloroform solvent. In 1992, MDA-St. Louis used over 280,000 pounds of this ODS in approximately 160 locations within the plant.
- **Release Agent & Bonding** - Find replacements for mold release agents, corrosion preventives, and adhesive bonding solvents as required by some 300 processes.
- **Electrical/Optical Cleaning** - Get rid of ODS used in cleaning fiber optic components and printed circuit boards.
- **Non-Destructive Testing** - Find replacements for the ODS used in testing structural parts, fuel systems and electrical components.

Each natural work group used the Quality Function Deployment "house of quality" tool to assure ODS replacements reflected customer needs and desires. In most cases the customer was the shop floor worker. Performance, safety, odor and cost topped the lists of most customers. Odor was a major concern because most of the ODS were tied to manual operations such as hand cleaning of parts.

Tests & Trials

Based on the derived requirements, almost 100 test matrices were established , with tests ranging from subjective odor tests to Fourier Transform Infrared examination of residual contamination following cleaning with a replacement cleaner. Materials that fared best were then considered by the natural work groups for shop trials on the manufacturing floor. Approximately 150 separate trials were conducted after on site training of the workers on the safe and proper use of these new chemicals.

Paperwork

Changing the numerous document references to ODS, such as drawings, specifications, manufacturing work instructions, to specify non-ODS replacements was a shared task. MDA's aircraft and missile programs revised program specific items, such as engineering drawings, and Environmental Assurance changed documents common to the programs such as material and process specifications.

Revision of some 300 process specification continues, with a completion goal of the end of March 1996.

Summary

The ODS Project took a bit over two years and resulted in the largest number of material changes for environmental reasons in MDA history. Team members were especially proud that implementation of the ODS replacements was accomplished safely and without negative impact to manufacturing operations. This type of project will continue as MDA searches for more environmentally friendly materials and processes.

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continued from page 2

Traditional factories will go out of business. "Lean factories" will survive, and lean industrial sectors will thrive.

The implications for engineering and manufacturing specialties seem to be far-reaching. The wall dividing the factory and engineering is disappearing. Design is the first step in product development. Manufacturing people are now on the design teams; likewise, designers are on production teams.

Technical education at the university level is adjusting to equip the graduates for these new realities. Educators are bringing manufacturing processes into the engineering curriculum and introducing manufacturing specialization tracks. The need for more industrial experience is being emphasized in the education of all engineering students. Some schools are even applying the principles of lean production and integrated product teams to the educational process itself.

Call for Nominations

Young Professional Awards recognize outstanding technical accomplishments of young engineers and scientists in the aerospace field. The Awards committee requests nomination of young professional candidates for 1995. Award criteria are:

- Candidates shall be 32 years old at time of award or 34 years old if in prior military service.
- Made a technical contribution to their employer's products or goals in the aerospace field during 1995.
- Nominee shall have displayed greater than normal merit in the performance of their total duties.
- Need not be an AIAA member, but should be eligible for AIAA membership. All other considerations being equal, AIAA members will receive priority for the award.

Nomination packages and more information may be obtained from

Owen Carson – McDonnell Douglas Aerospace
(314) 234-2048

Member Opportunities

- Feb 96 Engineer's week at St. Louis Science Center. Looking for AIAA Volunteers to work information table.
  Call Dave Morgan (314) 234-1919
- International Plastic Modelers Society Meet 1st Tuesday of each month. Thornhill Branch St. Louis County Library 7:00 p.m.
  Call Paul Hanson (314) 256-3077
- MDA Radio Control Model Airplane Club
  Call George Appel (314) 233-1022
- EAA (Experimental Aircraft Association) Chapter 32 meets 4th Sunday of each month 6:00 p.m.
  Call (314) 286-9932
- Newsletter Articles Wanted
  Call Dave Morgan (314) 234-1919

Honors and Awards

by Rudy Yurkovich
St. Louis Sections Honors and Awards Chairman

Each year the St. Louis Section presents a series of awards for outstanding contributions in the aerospace industry. The history of these awards spans several decades and has included a wide spectrum of individuals including corporate leaders, researchers, congressmen, engineers, and journalists. The significance and prestige of these awards is further enhanced because the St. Louis Section is one of the few sections in the Institute that has such a broad heritage of giving these types of awards on an annual basis.

We now need your recommendations of worthy individuals for these awards. Nominations are being accepted for the following awards which will be presented at the May 1996 Honors and Awards Dinner. The awards are as follows:

Technical Contribution: *In recognition of outstanding contribution to the advancement of the aerospace sciences in a technical discipline by a section member.*

Technical Management: *In recognition of outstanding accomplishment in technical management by a Section member.*

Section Service: *In recognition of outstanding contribution to the Section's activities by a member..*

Civic Award: *In recognition of outstanding contribution to the progress of aerospace activities in the St. Louis area (member or non-member).*

Lindbergh Award: *In recognition of a distinguished contribution in applying aerospace technology to improving the quality of human life (member or non-member).*

If you are associated with individuals whose achievements merit their candidacy for one of these awards, please submit an award on their behalf. Review of nominations by the Awards Committee will commence in early February. Please contact Rudy Yurkovich, St., Louis Section Honors and Awards Chairman, for additional information and nomination forms. Rudy can be reached at (314) 233-2563.

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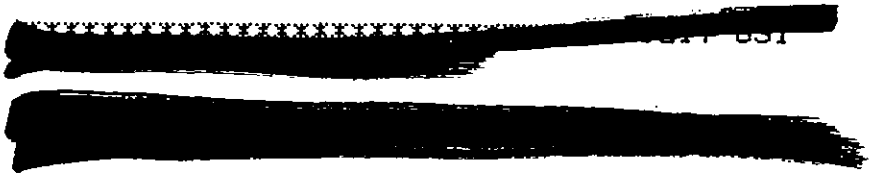
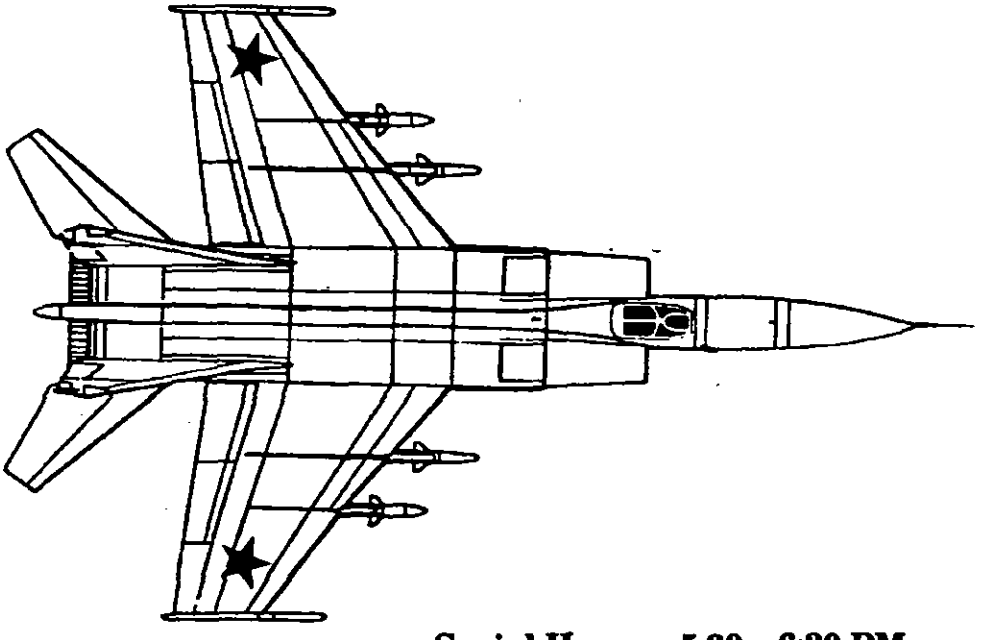


MIG Pilot

Victor Belenko



Thursday, 15 Feb.1996
Henry VIII Hotel

Social Hour	**5:30 – 6:30 PM**
Dinner	**6:30 – 7:30 PM**
Program	**7:30 – 9:00 PM**