Executive Roundtable:

Advanced Manufacturing Challenges

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Leaders from throughout civil aviation met May 7 for the first Aviation Week Executive Roundtable: Advanced Manufacturing. Record demand for air transport and air cargo aircraft has created huge opportunity, accompanied by shared issues across the industry.

Hosted by Aviation Week's Editor-in-Chief Tony Velocci, the roundtable focused on those issues the original equipment manufacturers and supply chain members have in common: meeting demand in a quality manner, assuring skills and capabilities, and synchronizing the low-volume environment into an efficient operation. The roundtable was hosted by Realization, whose reputation was built on theory of constraints, synchronization of operations and assuring effectiveness in a highly efficient environment.

Aviation Week convened its first Executive Roundtable in November 2004 as a means for aerospace and defense leaders to come together in a non-competitive environment to discuss issues and challenges impeding program, business and government performance. In the past nine years, more than 40 roundtables have been convened to define actions designed to support a healthy A&D enterprise. The roundtable participants divide into small groups to identify challenges, discuss possible solutions and then provide an overview to the group. Attendees then select areas seen as priorities.

Individuals attending the May 7 roundtable in Charlotte represented ALCOA, ATK, C&M Machine, Central South Carolina Alliance, Curtiss-Wright, Dept. of Energy Advanced Manufacturing Office, DOE Oak Ridge National Laboratory, Embraer, GE Aviation, Goodrich Aerostructures, Honda Aircraft, ICF International, IBM, Kuehne & Nagel, LORD Corp., 3M, North Carolina Dept of Commerce, North Carolina Aerospace Alliance, Realization, Rockwell Collins, Rolls-Royce, SS White Technologies, Stellar Microelectronics/Flextronics, and the U.S. Commerce Dept.

The top issues identified by the discussion groups were:

- **System integration/supply chain synchronization needs to improve across the industry.**
- **Regulatory/legislative progress in support of civil/commercial aviation may be slowed due to focus on declines for the defense and NASA-related industry sectors.**
- **Perceptions of manufacturing careers are based on a 30-year-old model rather than the current state of advanced technology and complexity.**
- **Risk associated with smaller vendors expanding capacity – invest too early and they lose money; invest too late and bottlenecks result.**

Participants chose the following actions as lead priorities for the future:

- **Stabilize the design and manufacturing baseline as early as possible; this is more difficult for smaller companies to forcer and must be demanded by larger suppliers of their customers.**
- **Develop a two-step approach to develop a proposal to the Aerospace Industries Association Supplier Management Council working group to champion research on business/policy/process innovation that improves efficiency across the value chain.**
- **Identify capital limitations within the lower tiers of the supply chain to target for assistance/support.**
- **Identify high-risk component/raw materials, analyze demand across all industry sectors and make available to industry leaders for use in materiel/sourcing strategies.**
- **Share best practices on organizational effectiveness/efficiency to model system thinking applied to productivity (the People factor).**
- **Develop consistent messaging about the economic impact and manufacturing challenges available in this sector as opportunities.**

Details of each small group's discussions follow.

Table 1

The low volume/high complexity nature of the aerospace manufacturing environment creates unique challenges. What are the core issues of successfully transitioning design into stable manufacturing? What are the best methods to achieve stable production in a low volume environment? What are the best metrics to assess/analyze/improve this stage of the lifecycle?

- Communication between all members of the teams needs to be improved, particularly as it relates to change. It is not structured or executed consistently.
- New technologies have enabled significant improvements in fuel, weight, etc. However, the implications and requirements imposed on manufacturing as a result are not fully considered or detailed as part of the changes.
- OEMs own the intellectual property and there is some resistance to communicating design phase issues in the current environment.
- Members of the supply chain must force back on OEMs to establish and stabilize baseline early.
- As new designs develop or are spiraled into existing aircraft, important to get people in the room to evaluate lessons learned and prevention of historical

errors; it would be interesting to have a compendium of key lessons learned on major aircraft that would establish fundamentals. AIA Supplier Management Council a good source for this type of think-tank analysis.

Table 2

The Engineering function also operates in unique ways in a low-volume environment. In addition, skills used in fabrication/production/manufacture have shifted to a higher level of complexity and skill. How do we assure we fully capitalize upon the knowledge and skills that converge in production? What are the key best practices in applying engineering effort to the production cycle? What are the organizational and process issues emerging from the highly automated, high-skill production environment?

- There is concern about the technical face of the future; that little outreach to high school level students is under way to convey a more accurate picture of today's manufacturing floor.
- Lessons learned are a matter of generations now, as the development/build of an aircraft takes much longer than in the past.
- Technology insertion has changed – in the past electronics were driven by defense applications; now consumer electronics is a base drive and forces obsolescence.
- Suppliers believe it would be of value for OEMS to specify at a higher level in the electronics field and allow suppliers to determine bets methods for assuring long-life availability and improvement cycles.
- Fraud and cyber theft are realities of a global industry and must e addressed.
- Integrated product teams need to evolve as the industry shifts to systems development at lower levels of the supply chain.
- Industry needs to identify standards for basic things to eliminate time, waste, and cost; however, no recommendations were made as to what possible standardization targets might be.
- Industry needs to adopt standard system for documentation within engineering and manufacturing to minimize miscommunication and improve time, cost, performance.
- Our labor force is more skilled; brighter people are taking on more responsibilities. We must alter how we operate – they don't want JUST a work package and prefer receiving a plan and allowing the team to determine how.

Table 3

The past decade of change, coupled with record demand, makes accurate assessment of the supply chain and integration up/down the value chain critical. What are the gaps remaining in understanding and assuring response to demand signals and appropriate SKU/inventory levels? What are the best metrics for evaluating supplier speed/surge capability? What are the best measures of supplier skill in terms of complexity and technology/tools? What components/parts are of most concern in terms of shortages?

- The earlier we lock in design, the better we do in terms of managing inventory and materials. Fasteners a good example of this; the final design differed from the early on design.
- Dual supply chains important, not just in vendors but in using different materials entirely so you can move between, hedging risk and cost exposure as related to surges within other industry sectors. However, must eliminate completely compounded hedging.
- Some concern emerging about the status of the supply chain infrastructure – roads, rail, and airports to provide access in/out.
- Need to identify organic and metallic supply shortages.
- Geopolitical issues continue to impact inventory and supplier sources. For instance, Turkey has significant activity but difficult currently to access.
- Rare earth minerals are problematic due to emerging/surging economies worldwide. The U.S. has rare earth minerals and materials but EPA/regulatory compliance essential; the result is that U.S. sometimes must give up access to other countries that have no such limits, resulting in monopolies.
- Industry needs to increase relationships with universities to develop new materials and their applications.
- Efficient, effective supply chain management of the future will involve centralized or enterprise-wide buying of some core materials/components.
- Unclear forecasts have negatively impacted the supply chain, affecting ability to invest in capacity and some inventory-build.
- What would a lean industry look like?
- Shift in after-market support is pinching second- and third-tier suppliers in recovery of margin.
- Skills/talent will require alignment between high schools/vocational schools/universities with companies, based upon accurate forecast of skills required. It's clear that educational institutions have not received clear messaging bout skills required for the 21st century factory.

Tables 4 and 5

Additional factors to consider, to assure manufacturing performance, include identifying gaps that impede full optimization at full-scale production, industry-wide concerns, and assuring the workforce needed in the next decade. These two groups were asked to itemize.

- On the people front, people are available and the industry is offering competitive positions. The challenge in the near future is to assure we are not stealing from one another and replacing with new, younger workers (currently the issue is churn from one industry to another, retraining/developing people; the future issue is assuring that young people believe manufacturing offers a long-term career).
- The industry must streamline and cut waste around documentation.
- Communication across the industry needs to be more standardized and thus simplified.

- Raw material lead times need to be shortened.
- Systems integration and adapting to complexity continue to be major hurdles.
- Companies need to strategically plan in-sourcing/outsourcing.
- Capital investment strategies and the timing of investment across the supply chain must be improved.
- Materials that could cause constraints: disruptive commodities, ceramics, carbon fibers and resins, fasteners, metals, raw materials, capacitors, and sub-components used by adjacent industries.
    - We need to understand the footprint aerospace has in overall demand for key materials/items.
- The inherent operation of high performance work teams – trust, empowerment, decision-making at appropriate levels, etc. – is extremely important to performance. Industry in general has lost its way to this effort since its heyday in early 1990s.