F-35 Joint Strike Fighter and Unique Identification (UID)

he Department of Defense's (DoD's) largest military contract is making good progress toward critical design review (CDR1). Part of this progress includes an innovative approach to total system performance and integration responsibility (TSPIR) and what is loosely referred to as contractor arms-around support. You are probably wondering what all this has to do with the unique identifier (UID). The Lockheed Martin-led Joint Strike Fighter (JSF) team of LM Aeronautics, Northrop Grumman and BAE SYS-TEMS bid the ISF development program—system development & demonstration (SDD)—based upon the need for a technology advance in identification methods to affordably capture the part data we would need to execute our TSPIR duties.

This marked the beginning of our "automated identification" (Auto-ID) project on the JSF program. Our vision is to capture part traceability data on

and off aircraft as easily as grocery stores register their items in and out of stock, and to maintain these data with their associated inventory valuation and product support elements. The message is clear: the Auto-ID approach has to be simple in design, easy to use, and affordable. It is encouraging to realize that our JSF vision for Auto-ID is similar in many ways to the DoD's UID vision. This indicates that independent organizations have recognized a common need and come to a common conclusion—automated part marking must be done to reap downstream data usage benefits.

Find a Champion and an Industry Standard

The relatively small LM JSF proposal team had only a few choices when it came to naming a champion for this new Auto-ID approach. As configuration manager, I took on the task of de facto Auto-ID champion since I was the first

Mitch Kaarlela



Key players at the Auto-ID Phase II demo (left to right): Mitch Kaarlela, senior manager, JSF configuration management (Lockheed Martin); Julia Lujan, Auto-ID project, JSF configuration management (Lockheed Martin); Tim Trayers, JSF Program Office, systems engineering; and Ron McNeal, JSF Program Office, systems engineering. Photograph courtesy Lockheed Martin

person to recognize the need and propose a solution. Not long after we started the Auto-ID activity, our JSF supply chain management folks recognized the long-term benefits of Auto-ID in part tracking and spares management, and they voiced unanimous support of our objective. This kind of large-scale cultural initiative requires more than just a kickoff meeting: it takes a champion with a completion-oriented personality to guide the endeavor through, otherwise the initiative will collapse in the heat of program implementation.

My first objective was to find the people interested in or concerned about JSF's plans for automated part marking and start building a team. I found that configuration management, supply chain management, information technology, production operations, and materials/processes showed the most interest. This group formed the nucleus

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of what continues to be a regular, biweekly JSF Auto-ID/barcoding meeting. We also experienced a little luck in that a sister facility in Marietta, Ga., had recently transitioned to a mostly wireless barcode system and eagerly shared with us many lessons learned.

We decided that a fast way to get oriented on automated marking technology would be to ask industry associations and seek out U.S. industry best practices. Rule of thumb: Do not plow new ground if your industry association already has an affordable solution. For us in aerospace, that meant talking initially with the Air Transport Association and the Aerospace Industries Association. We also did an informal telephone poll of some other U.S. industry counterparts. The outcome of this benchmarking follows:

• In terms of the physical marking medium, one-dimensional (1D) Code 39-compliant barcode name-plates/labels was the most widely used and affordable solution.

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JSF Auto-ID Technical Demonstration Approach

	Phase I 1D Barcode Scan (label only) Compatible with	Phase II 1D Barcode Scan (real part)	Computer, Radar Altimeter CAG 81755
		Internal Database Representative of PDM	PNR 2RKE12345-0001
	Phase III 1D Barcode Scan (Prod Line)	Phase IV PDM Vaulted Official Data	ing block as show our aj technical ma
	SFM Captures Mfg Data	1D Barcode Scan (Field Remove & Replace)	I. Show wi work see the exp helped.
	Across Internal VES Network PDM Vaults Data	ALIS As Maintained Data PDM Vaults Data	II. Demons part scar network III. Add to P ing with

- In terms of the marking format technologies (typically referred to as automation "syntax" and "semantics"), the U.S. aerospace industry uses ATA Spec 2000 and its successor ISO-TS-21849 as the common standard of choice.
- There was no clear industry definition of what the minimum amount of information to be marked on parts should be. To resolve this, we sought out the most recent DoD large-scale aircraft program, the C-17, for help, and we adopted most of their model for our JSF use.

Armed with these data, I was convinced that the JSF program could implement an affordable automated identification solution. It would not be tremendously high tech, but it would fully sustain our production and support objectives.

Make Good Plans and Reduce Risk

To address the cultural change in marking our parts, it seemed wise to start with a JSF barcoding vision. This vision was captured originally in a simple flow diagram outlining how

we expected barcoding to be used in our manufacturing and assembly process. The diagram was expanded in fidelity and eventually grew into a JSF barcoding concept of operations (ConOps). In hindsight, I would recommend that a ConOps be written immediately and distributed to all the interested parties.

We next reviewed the whole Auto-ID task for JSF development and sliced it up into four major technical maturation phases. Each phase was oriented around a key build-

ing block aspect of integrating Auto-ID such that we could show our approach was manageable and low risk. The technical maturation phases are summarized as follows:

- I. Show wireless compatibility within a complicated net work security firewall system. This is an area where the experience from our Marietta, Ga., site really helped.
- II. Demonstrate actual data capture from 1D barcode part scan through a security firewall into a computer network and vault into a representative database.
- III. Add to Phase II the connectivity and integration, starting with our shop floor manager (SFM) system and

ending in our product data manager (PDM) database.

IV. Add to Phase III the capture and integration of the field user remove & replace/service/maintenance/overhaul data ("as-maintained") from our field logistics support database, Autonomic Logistics Information System (ALIS).

We have presently completed the first two of these demonstrations, on our way to a low-risk approach (bottom chart, preceding page).

Consider Your Culture

When implementing a new marking approach, consider the "culture" of the design and manufacturing workforce at your facility. I found that marking parts is one of a few fundamental tasks about which nearly all the ISF team members consider themselves experts. Moving self-declared experts to a new way of part marking can be a challenge, so do not underestimate the time and energy required of your champion. Another cultural issue to consider is the computer toolset that you will employ to achieve automation in part marking and associated data capture. Some

product data manager (PDM) tools are more robust than others. Look for capabilities in allowing new fields, field length changes, key field sorting, and ad hoc reporting. So query your information technology (IT) people and see if your tool is nearing its capacity in terms of functionality, integration, or storage. On JSF, we are finding that some legacy computer tools are giving us arbitrary boundaries on things like field lengths in our databases.

Pick Your Approach, Communicate, and Act

Once we synthesized all the available input, JSF concluded that our approach to automated part marking and data capture was affordable and practical. The biggest challenge we faced was how then to communicate this vision to a team of thousands spread out geographically over eight time zones and to get everyone marching in the same direction. For JSF, this meant spreading the word through our biweekly barcoding meetings and getting the Auto-ID ConOps out to the team. Next we prepared a barcoding frequently asked questions (FAQ) sheet for our JSF integrated product teams (IPTs) and shared the FAQ with every IPT staff meeting we could find. As the new approach starts to take hold and personnel begin to realize its full implications, we are starting to hold regular IPT Auto-ID barcode question and answer sessions.



Don't Forget Your Suppliers

For suppliers, Auto-ID has meant two steps. First, we put the basic automated part-marking requirements in our standard supplier purchase order (P.O.) template so that all P.O.s include it. Second, we convene special JSF supplier configuration management conferences where we share the new part-marking approach plans and address supplier questions. We have also laid the groundwork with our suppliers for the understanding that the best-value affordable approach would invariably be two-phased: Auto-ID for JSF development and an improved approach (we now know as UID) for JSF low-rate initial production (LRIP). So we advised our JSF suppliers to be cognizant of this long-range plan and not to make any capital or facilities decisions in the next few years that would unnecessarily lock them into a single-phase approach. JSF is not completely finished, but we have made tremendous progress in moving a large program toward a new cultural approach.

Monitor Progress and Communicate Some More

We are continuing to monitor our

progress toward Auto-ID implementation in our development program. We have found this to be a never-ending cycle of IPT recognition, angst, questions, practical implementation discussion, more questions, and then acceptance. We have found a few "outliers" in our monitoring, but mostly we see our team and suppliers trying their best to achieve the new part-marking approach. We are also formulating a backup plan for those instances we hope rare—where our parts are received without proper markings so that we can get the parts marked correctly and feed our manufacturing/assembly operations. We also believe that the dynamics of our program are such that we will continue to spread the message of Auto-ID for JSF development to the new folks we regularly have coming on board the program.

Stay In Touch with the Changing Business Landscape

So how does all of this fit in with the UID initiative? That answer is coming in a minute. First, you must realize that it really does benefit a company to stay in touch with what is going on in our industry for new initiatives. JSF is staying closely informed with the Aerospace Industries Association (AIA), the Government Electronics and Information Technology Association (GEIA), and the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD/AT&L) for part marking. This involvement is how, back in early 2001, we first learned of the new movement, which culminated in a July 29, 2003, policy memorandum that directed what is now called UID. We believe that our JSF one-dimensional Auto-ID part-marking approach is approximately 75 percent common with the new two-dimensional UID part-marking initiative. Once UID is made a part of the JSF contract, we will start work on the technical and cost areas that comprise the approximately 25 percent area of difference between Auto-ID and UID. We believe that our twostep plan of Auto-ID for development (SDD) and UID for low-rate initial production (LRIP) and beyond assists in JSF's being affordable in the long term. We will continue to advise our supplier base of the two-step plan we are on and the latest insights for achieving that plan. We also plan to continue our risk-reduction demonstrations well into the next few years.

To conceptually move to UID for LRIP, we plan to adopt an approach focused on the parts that we were going to serial number track anyway. We call these configuration items/computer software configuration items (CIs/CSCIs). Our target is to have approximately 750 CIs/CSCIs on JSF, and they, therefore, would be the initial items to get a UID mark. Expansion of this quantity may be viable in the future depending on the lessons we learn in early LRIP from our contractor arms-around support activities. As it is implemented, UID is expected to contribute significantly toward total asset visibility in a spiral development process via our evolutionary acquisition system. JSF is aware of upcoming technology advances in package marking and potentially in part marking—one example is radio frequency identification (RFID) tags. We understand and support the desire for continued technology improvement. We have questions regarding some of the new technologies. What, for example is the potential impact of adding many new low-power active RF emitters or passive RF reflectors to the JSF aircraft in terms of stealth requirements; potential weight increase for the RFID tags (including the lithium batteries); environmental disposal methods for lithium-based items since lithium is considered "hazardous"; and shelf-life change of the batteries? We plan to stay in touch with these new technologies as the implementation aspects are fully defined and challenges resolved for optimum benefit.

Keep The Rest of Your Company Informed

Because of the promising potential of the JSF Auto-ID work and the new DoD UID policy, Lockheed Martin Aeronautics is actively pursuing opportunities within our business unit to further spread these part-marking technologies. This effort includes a review of our legacy aircraft programs and supporting product lines. We continue to be involved in the DoD UID working group and industry association dialog that supports a technical implementation and that complements our best business practices.

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NIMA Changes Name to National Geospatial-Intelligence Agency

DEPARTMENT OF DEFENSE NEWS RELEASE Nov. 24, 2003

oday, the National Imagery and Mapping Agency was officially renamed the National Geospatial-Intelligence Agency.

The fiscal 2004 Defense Authorization Act authorized this change. The new name is the latest step in the agency's ongoing transformation efforts to ensure the nation's warfighters and senior policymakers receive the best geospatial intelligence possible in support of national security.

"In 1996, the National Imagery and Mapping Agency (NIMA) was chartered to bring together a variety of imagery and geospatial analysis disciplines into a totally new discipline—geospatial intelligence, or GEOINT," said the National Geospatial-Intelligence Agency (NGA) Director retired Air Force Lt. Gen. James R. Clapper Jr. "Geospatial intelligence is what we do, and our agency's name now properly reflects that reality."

The agency is both a combat support as well as national intelligence agency whose mission is to provide timely, relevant and accurate geospatial intelligence, or GEOINT, in support of our national security. GEOINT is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. Headquartered in Bethesda, Md., National Geospatial-Intelligence Agency has major facilities in the Washington, D.C., Northern Virginia, and St. Louis, Mo., areas with support teams worldwide.

For more information, contact the NGA Office of Corporate Relations, Public Affairs at (301) 227-2057.