Taming the Complexities of a Manufacturer's Content Ecosystem

How Airlines and OEMs Can Control Costs and Speed the Delivery of High-quality Information
Table of contents

Abstract ................................................................................................................................. 3
A New Generation of Aircraft ............................................................... 4
New Aircraft, New Information Requirements ...................................... 5
Information Handling in a Digital Era ..................................................... 6
The Case for Reusable Content Components ........................................ 6
Using Content Components in the Aerospace Industry ......................... 6
Challenges of a Manufacturer’s Content Ecosystem ................................. 8
Data specs and Mergers ......................................................................................... 10
Options for Operating in a Manufacturer’s Content Ecosystem ............... 10
An Emerging Approach ....................................................................................... 12
Conclusion: Planning Ahead, Getting Ahead ............................................ 14
Appendix A: Comparison of ATA iSpec 2200 and S1000D ....................... 15
Taming the Complexities of a Manufacturer's Content Ecosystem

Abstract
Led by Boeing’s 787 Dreamliner and the Airbus A350, the introduction of new-generation aircraft requires airlines to create, manage, and deliver technical information using the S1000D information exchange standard.

Meeting S1000D requirements while simultaneously supporting the existing ATA iSpec 2200 creates a number of challenges for airlines as they transition from older fleets to new-generation aircraft.

This white paper discusses the origin of S1000D, challenges of maintaining multiple content platforms, and options airlines have to manage multiple specifications in their overall content ecosystem.

This white paper also identifies an emerging approach that can help airlines meet the demands for aging aircraft based on ATA iSpec 2200 and new-generation aircraft that require S1000D while speeding the delivery of high-quality technical information and controlling overall costs.
A New Generation of Aircraft

Continued growth in passenger air traffic, rising fuel costs, and new technology available to consumers and aircraft manufacturers alike are ushering in a new era for the aerospace and aviation industry. An increase in worldwide demand for air travel has propelled estimates for passenger airliners from 15,500 today to more than 32,500 by 2031\(^1\). Led by the Boeing 787 Dreamliner and the A350 fleet from Airbus, the new aircraft that manufacturers are building to meet this demand are a radical departure from aircraft of the past. As the price for jet fuel continues to rise (up 40% from $79 a barrel to $127 in 2012 alone)\(^2\), manufacturers have been forced to tap into lighter carbon fiber, titanium, and aluminum-alloy materials, which are estimated to bring fuel costs down by as much as 20-25\%\(^3\).

While fuel costs drive manufacturers to innovate to control costs, manufacturers also are reinventing cabins to help airlines deliver an entirely new passenger experience with windows that are up to 30\% larger, larger overhead bins, flat seats, connectors for mobile devices such as iPods\(^\text{®}\) and tablets, and more.

Perhaps most revolutionary is the new communications technology that is a hallmark of new-generation, “e-enabled” aircraft. Boeing’s 787 Dreamliner “combines the power of integrated information and communications systems to drive operational efficiency, enhance revenue, and streamline airplane maintenance.”\(^4\)

“...The e-Enabling equipment on the 787 will be highly integrated with the onboard maintenance, data-load, and crew information systems, offering airlines opportunities to reduce maintenance costs. Airlines have the option to include a wireless network for maintenance access, enabling airline back-office teams to remotely deploy software, parts, data, charts, and manuals to airplanes with minimal hands-on mechanic involvement.”

---

\(^1\) “Airbus Global Market Forecast 2012-2013,” www.airbus.com
\(^2\) “Financial Forecast, September 2012,” www.iata.org
\(^4\) “E-Enabled Capabilities of the 787 Dreamliner,” www.boeing.com
\(^5\) Aero Quarterly, January 2009, Boeing
The Airbus A350 fleet delivers similar technological advances. The introduction of e-enabled aircraft means that pilots and flight crews no longer have to wait until they are on the ground to address issues. They, and their counterparts on the ground, have real-time, in-flight access to information about the aircraft to immediately diagnose issues. The impact of real-time feedback from the aircraft translates into increased safety, faster turns on the ground, and overall cost savings.

New Aircraft, New Information Requirements

Just as the materials and technology that have gone into new-generation aircraft and their designs are changing, so, too, is the way information about them is created, managed, and delivered – from the fuselage, engines, avionics and other on-board systems to every cabin component.

For the past decade, manufacturers and airlines have based their maintenance and engineering information on ATA iSpec 2200. This specification was developed by the Air Transport Association (ATA) as a global aviation industry standard for the content, structure, and electronic exchange of aircraft engineering and maintenance information. The specification was introduced largely to address the massive volumes of paper required to produce multiple manuals and publications that accompany every aircraft. ATA iSpec 2200 reduced dependence on paper by providing a common way to enable the electronic use of maintenance and engineering information in the aerospace industry.

ATA iSpec 2200 moved maintenance and engineering documentation from paper to electronic format and has been the dominant specification used in the aerospace industry for the past decade. During this time the Internet came into its own, only to be overcome by the more recent explosion of mobile devices that are leading the transition from the PC era to a post-PC era.

BENEFITS OF THE eENABLED FEATURES OF THE 787

- Eliminates time-consuming and awkward physical software data loading via wireless data distribution and media-less software loading.
- Provides flight operations and maintenance personnel with data in digital formats to streamline the updating process, reduce errors, and eliminate the costs associated with shipping, handling, revising, and maintaining paper documents.
- Ensures compliance with new U.S. Federal Aviation Administration security requirements within heavily networked airplane environments.
- Enables near real-time data transactions both on- and off-board the airplane and provides the ability to access much of this data during flight to enable airlines to make timelier, informed maintenance and other operational decisions.
- Allows airlines to easily customize many aspects of their airplanes to fit their specific operations.

---

6 Airlines for America, www.airlines.org
Information Handling In a Digital Era – The Case for Reusable Content Components

Easy, instant access to information has changed the way organizations create, manage, and deliver information. People expect to find information where they want it — in print/PDF, on websites, on smartphones and tablets — when they want it. Today, no industry can afford to delay the quick delivery of reliable information in all the ways consumers of the information expect.

In response, industries for which information is a critical part of their business have revolutionized the way they create, manage, and distribute information. Rather than emphasize the production of a final publication (such as repair or overhaul manuals) — which is time-consuming, locks information into a single publication, and makes it difficult to reuse information — these organizations have adopted structured, or media- and format-independent, XML.

XML is based on the creation of small, reusable content components. Each component has related metadata, or information about it that can be used to determine its relevance for a publication. Metadata also makes it easy to search for and quickly find information. And because XML content components are not associated with a format or publication type, they can be assembled automatically, on demand, for multiple publications and formats – PDF, Web, or mobile.

Using Content Components in the Aerospace Industry

Recognizing the need to manage the voluminous amounts of technical information about aircraft in a more nimble way, in 2004 the ATA e-Business Strategic Planning Team tasked a group of its members representing manufacturers and airlines to evaluate the potential of using S1000D — a component-based information exchange standard developed by the AeroSpace and Defence Industries Association of Europe (ASD) and the Aerospace Industries Association of America (AIA) — in commercial aviation.

WHAT IS S1000D?

S1000D is an international specification for technical publications, utilizing a Common Source Database. It was originally introduced to the European community by the Association Europeenne de Constructeurs de Materiel Aerospacial, representing the aerospace industry.

DID YOU KNOW?

The purpose of the ATA e-Business Program’s Civil Aviation Working Group (CAWG) is to develop the necessary modifications to enable S1000D to be the worldwide accepted future Technical Data exchange standard for the Civil Aviation industry.
The basic principles of S1000D are:

- Information produced in accordance with the standard is in a modular form called a "data module"
- A data module is the smallest, self-contained information unit within a technical publication
- A data module must have sense and meaning when viewed without any supporting data other than graphics
- All data modules are stored and retrieved in a Common Source Data Base (CSDB)
- Using a CSDB allows for output in either a page-oriented or Interactive Electronic Technical Publication (IETP) that is consistent regardless of the IT platform used
- Individual data modules can be used many times in output

The benefits of using a modular approach are multi-fold and include:

**Information consistency**
Many different output forms can be generated from a single data source

**Cost savings**
Achieved by reusing a single data module rather than recreating information each time it is required and by lowering the cost to maintain technical information

**Customized content**
Allows sub-sets of information to be generated to meet specific user needs

**Information transfer**
Facilitates transfer of information and electronic output between disparate IT systems

**Collaboration**
Provides a single standard to support communications and data exchange among all participants in a given project

**Backward compatibility**
The S1000D data module concept can be applied to legacy data

---

**BOEING AND AIRBUS USE S1000D**

Boeing and Airbus identified S1000D as the information exchange standard for their new-generation aircraft, which requires airlines to be able to create, manage, and deliver technical information in S1000D.

---

7 www.s1000d.net
8 Ibid
In contrast to the reusable, data module approach of S1000D, ATA iSpec 2200 is a document-based model with an emphasis on the output of legacy publications. As requirements for more flexible technical information management and distribution continue to increase, the limitations of ATA iSpec 2200 become apparent.

Manufacturers and airline representatives on the ATA task group recognized the limitations of iSpec 2200 and benefits offered by S1000D that address evolving information management requirements. As a result, they recommended further collaboration with the ASD/AIA to incorporate commercial aviation requirements into S1000D.

For the past several years, the ATA has worked closely with the ASD and AIA to make S1000D the new information exchange standard for civil aviation. Boeing and Airbus also identified S1000D as the information exchange standard for their new-generation aircraft, which requires airlines to be able to create, manage, and deliver technical information in S1000D. Today, S1000D issue 4.1 meets the needs of e-enabled aircraft.

Challenges of a Manufacturer’s Content Ecosystem

As of October 2012, more than 30 airlines had placed orders for over 900 Boeing 787 Dreamliners, and 30 Dreamliners have been delivered. Orders for the Airbus A350 fleet (including the A350-800, A350-900, and A350-1000) exceed 550, with delivery estimated to begin in 2014.

As airlines take delivery of new-generation aircraft, the environment for the technical information to operate and maintain both older and new-generation aircraft is changing. In addition to supporting ATA iSpec 2200, airlines must have staff, systems, and processes in place to accept and work with information in S1000D. Waiting until new-generation aircraft are delivered may be too late, because identifying a plan to support information requirements in both ATA iSpec 2200 and S1000D includes several challenges — none of which airlines can afford to let impede daily operations.

CHALLENGES

Identifying a plan to support information requirements in both ATA iSpec 2200 and S1000D includes several challenges — none of which airlines can afford to let impede daily operations.

9 http://active.boeing.com/commercial/orders/index.cfm
10 www.airbus.com/presscentre/corporate-information/orders-deliveries/
Challenges of a manufacturer’s content environment include: **CHALLENGE**

**#1 STAFF TRAINING AND EFFICIENCY**

Airlines’ technical operations staff must be able to author and edit content in both ATA iSpec 2200 and S1000D, which requires airlines to invest in training to equip their staff to author according to S1000D requirements. Having to author and edit in two specifications slows their ability to maintain and deliver technical information in a timely manner, which can result in fines and safety issues.

**CHALLENGE**

**#2 SYSTEMS COMPLEXITY**

In order to accommodate structured authoring of reusable data modules and a Common Source Data Base as required by S1000D, airlines may add new systems to their existing IT infrastructure. This increases IT costs and complexity of on-going IT requirements.

**CHALLENGE**

**#3 PROCESS OVERHEAD**

Two sets of standards require two distinct change management processes. Although airlines that acquire new-generation aircraft have to develop new processes to support S1000D, the on-going requirement to maintain two parallel processes adds to the cost and complexity of technical information management.

**CHALLENGE**

**#4 HUMAN FACTORS**

Just as technical operations writers must learn structured authoring to support S1000D data modules, mechanics may also face a learning curve to access technical information from an IETP based on S1000D delivery principles. An S1000D-based IETP offers a new user interface with more precise search and information access capabilities. Becoming proficient in both IETPs and switching between them can slow mechanics down. Mastering two IETPs also increases the risk of misusing them, and the result is an impact on productivity and a potential increase in the risk of fines.
Data Specifications and Mergers

Compounding the challenges of operating in a manufacturer’s environment is the trend of mergers and acquisitions. As the trend of mergers and acquisitions in the aerospace industry continues, the importance of addressing a manufacturer’s environment becomes critical. When airlines merge or are acquired, they must address the complexity of merging their technical information systems and processes. Requiring support for duplicate iSpec 2200 and S1000D systems further complicates integration issues and introduces too many risks.

Moreover, and not to be underestimated, merging two airlines’ systems and processes involves a decision on whose to use. Too much time can be lost and negotiation drawn out to identify a common path forward. As Jeff Smisek, CEO of the combined United/Continental observed recently about the merger of the two airlines and impact of human factors, “The thing that surprised me the most is people’s resistance to change, whether it’s changes in the product itself, changes to the processes and procedures, changes in the technology or changes in the way of doing business.”

When human factors are combined with the impact of redundant systems and staff — and the growing technical information requirements associated with e-enabled aircraft — it becomes clear that operating in a manufacturer’s environment requires new approaches and toolsets.

Options for Operating in a Manufacturer’s Content Ecosystem

Airlines that have purchased or intend to purchase new-generation aircraft have several options for meeting the business requirements and technical challenges of operating in a manufacturer’s content ecosystem.

““The thing that surprised me the most is people’s resistance to change, whether it’s changes in the product itself, changes to the processes and procedures, changes in the technology or changes in the way of doing business.”

Options include:

**OPTION #1 MAINTAINING MULTIPLE PLATFORMS**

By maintaining multiple platforms for ATA iSpec 2200 content and S1000D content, existing staff can keep working the way they currently work. However, this advantage is outweighed by several considerable disadvantages.

This approach:
- Requires airlines to hire new staff with expertise in S1000D, which results in redundant authoring staff and higher costs.
- Limits the opportunity for content reuse, which slows down the content creation and delivery process and results in more room for making errors.
- Impacts maintenance technicians, from requiring training on multiple platforms and higher training costs to productivity loss from switching between systems.
- Drives up both content conversion and IT costs.

**OPTION #2 MIGRATING TO S1000D IN A WHOLESALE FASHION**

In order to avoid the negative impact of maintaining multiple platforms, airlines that are transitioning their fleets to new-generation aircraft may consider migrating their technical information to S1000D in a wholesale fashion. While this option simplifies training, limits IT expenses and overhead in the long term, and streamlines processes, it is both expensive to implement and results in the loss of compatibility with both ATA iSpec 2200 and earlier versions of S1000D.

**OPTION #3 CONVERTING S1000D DATA TO ATA ISPEC 2200**

In cases where the ability to output information in either ATA iSpec 2200 or S1000D is required (which is a more common requirement for original equipment manufacturers than for airlines), organizations that make a wholesale switch to S1000D also may consider converting S1000D data to ATA iSpec 2200. However, this sacrifices many of the applicability and reusability benefits inherent to the S1000D specification and entails tremendous cost and risk. Moreover, it results in the loss of information on new-generation aircraft and results in regulatory issues.

**NEW APPROACH IS NEEDED**

What’s needed is a new approach that addresses overlapping requirements to maintain ATA iSpec 2200 content as airlines begin the long-term process of transitioning to new-generation aircraft and introduce S1000D content, while simplifying the tasks of authors and end users, controlling IT costs, and ensuring high-quality information—regardless of the information standard required.
What’s needed is a new approach that addresses overlapping requirements to maintain ATA iSpec 2200 content as airlines begin the long-term process of transitioning to new-generation aircraft and introduce S1000D content, while simplifying the tasks of authors and end users, controlling IT costs, and ensuring high-quality information — regardless of the information standard required.

An Emerging Approach to Managing a Manufacturer’s Content Ecosystem

An emerging approach to managing a manufacturer’s content ecosystem lets airlines meet these systems, user, and cost challenges head-on. This approach is based on a single content platform that:

- Handles multiple content types coming in and being published out
- Adopts a single, structured authoring approach to content creation
- Uses one (structured) data-centric content management system
- Automates transformation profiles to deliver either ATA iSpec 2200 or S1000D content on-demand

Provides flexibility in the delivery of content to a variety of destinations (PDF, Web portals, IETPs, tablets) with a standardized look and feel.
From the airline operator perspective, this approach provides:

- A single authoring tool and one authoring process
- A single content management system and one content management process
- Automated publication management
- One IETP for content delivery
- One set of policies and procedures

The benefits and advantages of this approach are considerable, including:

**Simplified training**
Authors reduce the time spent learning two methods for writing technical information. Instead, they focus on learning how to create reusable structured content components, which can be assembled as part of the publication and delivery process to meet ATA iSpec 2200 or S1000D requirements. Similarly, mechanics access one IETP that serves information in both specifications. They do not have to learn a traditional ATA iSpec 2200 process and a separate method for accessing S1000D data. As a result, both authors and mechanics reduce the amount of time learning tools so they can focus on information creation and use.

**Improved content usability & consistency**
By authoring information as structured content components — rather than recreating information for each instance in which it is required — airlines can reuse the components in multiple instances. Not only does this make the authoring process more productive, but by drawing on a single source (content repository), airlines also can improve the consistency of information.

**Lower IT costs**
Consolidating an ATA iSpec 2200 system and an S1000D system into one reduces overall IT costs and on-going maintenance. As airlines begin the long transition from older aircraft to new-generation models, they cannot afford to not take advantage of these cost savings.

**Lower publication management costs**
Just as the consolidation of two systems into one lowers IT costs, it also lowers the costs of on-going publication management. These costs are lowered by reducing the amount of effort required to manually produce every required publication and automating the publishing process to assemble multiple publications on demand.

**DRAWING ON A SINGLE SOURCE**
By authoring information as structured content components — rather than recreating information for each instance in which it is required — airlines can reuse the components in multiple instances. Not only does this make the authoring process more productive, but by drawing on a single source (content repository), airlines also can improve the consistency of information.
Improved business agility
By letting authors write content once and using a transformation process to output content to the required specification; by serving information to mechanics in one IETP rather than two; and by maintaining a single system for technical information, airlines can respond more quickly and effectively to the daily requirements for creating and using technical information and less time juggling low-value, back-end work with multiple tools and processes.

Most importantly, addressing requirements for multiple specifications in a single system can help airlines get information to the people who need it in the fastest, most cost-effective way possible, no matter what the specification is.

Conclusion: Planning Ahead, Getting Ahead
While the impact of being able to effectively manage ATA iSpec 2200 and S1000D specifications simultaneously may not yet be at the forefront of airlines’ priorities, the need to begin to address the challenges is real. New-generation aircraft are ushering in an entirely new way to fly, transforming both the passenger experience and airlines’ bottom lines.

By addressing evolving technical information requirements now, airlines not only will be able to manage their information for existing and new aircraft effectively; by developing a manufacturer’s content strategy, they will be better equipped to operate all of their aircraft efficiently so they can reap the benefits offered by new-generation aircraft and sharpen their competitive edge in a fiercely competitive industry.
## Comparison of ATA iSpec and S1000D

<table>
<thead>
<tr>
<th></th>
<th>iSpec 2200</th>
<th>$1000D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary purpose</strong></td>
<td>To enable the electronic use of technical information</td>
<td>To support next-generation aircraft</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Reduce dependence on paper</td>
<td>Increase the speed at which technical information is delivered</td>
</tr>
<tr>
<td></td>
<td>Enable easier exchange of technical information</td>
<td>Make it easier and faster to find specific information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Publish information faster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Achieve greater information consistency</td>
</tr>
<tr>
<td><strong>Key characteristics</strong></td>
<td>Requires SGML experts</td>
<td>Based on the creation and use of reusable data modules</td>
</tr>
<tr>
<td></td>
<td>Expensive to author</td>
<td>Uses a Common Source Database (CSDB)</td>
</tr>
<tr>
<td></td>
<td>Based on the production of monolithic documents; locks content to</td>
<td>Requires users knowledgeable in XML, which is more broadly used than</td>
</tr>
<tr>
<td></td>
<td>publication and limits content reuse</td>
<td>SGML</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generates multiple output formats</td>
</tr>
</tbody>
</table>
ABOUT FLATIRONS SOLUTIONS

Flatirons Solutions® provides solutions for content lifecycle management for large asset industries like aviation, defense, rail, and marine. For more than 20 years, it has helped manufacturers, operators, and military forces maintain and operate complex assets more effectively. Its software and service solutions help organizations to deliver the right information, at the right time, to the right people.

ABOUT CORENA SUITE

The CORENA Suite™ from Flatirons Solutions® is the leading solution for content lifecycle management developed specifically for organizations that rely on mission-critical data to design, manufacture, operate, or maintain complex assets over product and service lifecycles as well as across their business networks.

FLATIRONS SOLUTIONS REGIONAL HEADQUARTERS

AMERICAS  |  Flatirons Solutions, Inc.  |  Boulder, CO  |  +1 303 544 0514
EUROPE    |  Flatirons A/S  |  Birkerød, Denmark  |  +45 4594 9400
ASIA      |  Flatirons Solutions India Private Limited  |  Chennai, India  |  +91 44 6693 6949

© 2019 Flatirons Solutions, Inc. All Rights Reserved