

## Continental Airlines, Electronic Document Management

The EDMS 2000 system provides Continental Airlines with a state-of-the-art environment to support electronic airline information from multiple sources. EDMS 2000 converts ATA-2200 SGML so that it can be authored, managed, and displayed using available XML tools. OEM airline maintenance manual SGML source is imported into the system, converted to XML, broken down into the appropriate lower levels, and stored within a Documentum docbase. Authors are able to modify the source to implement Continental changes. Manuals are published to the file system, and released to the field for online viewing by authorized maintenance personnel.

EDMS 2000 provides Continental a competitive advantage in two major areas. The first is the ability to provide technical manuals through an electronic library, reducing distribution costs and increasing accuracy and efficiency. Secondly, the manuals are full text search capable and provide hyper-links across several types of manuals. This increases the productivity of Continental technicians.

The EDMS 2000 system has the potential for organized, versioned, linked and managed information across all Continental maintenance and engineering organizations. This will allow Continental to maximize quality and ROI through reuse of data.

### EDMS 2000 Importing, Authoring and Distribution Process

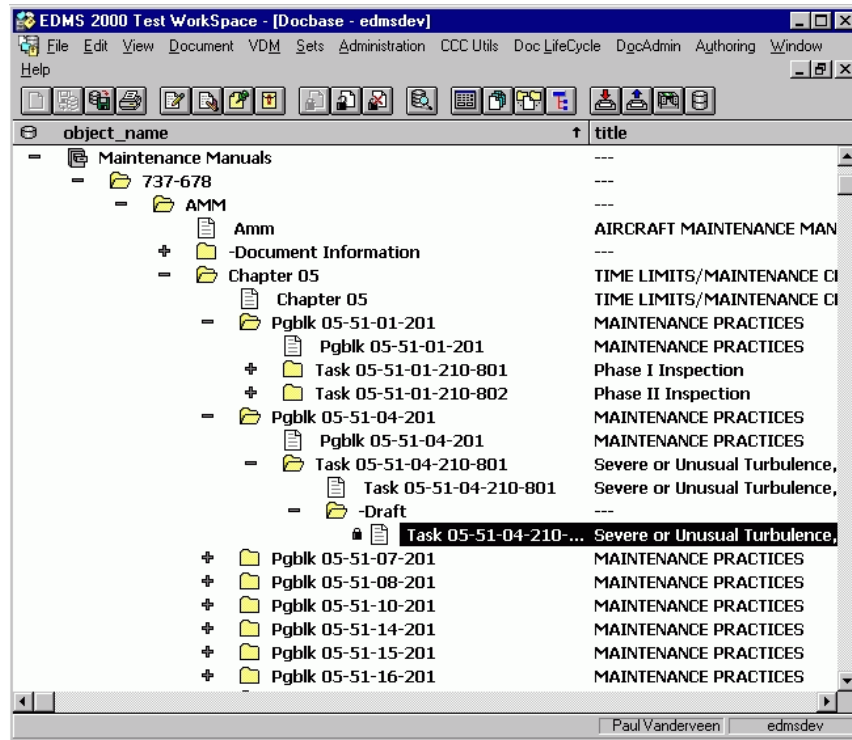
InfoTrust (formally CCC) designed the overall architecture for this system, including the detailed docbase (document repository) architecture. InfoTrust developed EDMS2000 to reuse data at very low levels of granularity. The concept uses an ATA anchor fragment for storage, an editable fragment for an author to work in, and a publishable fragment for the mechanic to view.

EDMS 2000 disproves the myth that an ATA-2200 document cannot be rendered as XML. The solution addresses any issues with character entities, inclusions, and exclusions in the ATA DTD by utilizing the increased functionality of processing instructions in XML, and by creating required standard character equivalents. Using these methods InfoTrust has successfully converted several ATA-2200 document types to XML and has taken the opportunity to enhance the ATA equivalent XML DTDs to make them more "airline-author" friendly.

Documentum's document management server was chosen for the EDMS 2000 project. Documentum allows for many more objects to be stored in the document management system by allowing multiple docbases to talk within a federation of docbases. To limit the number of objects in any one docbase, each docbase in the federation will contain the manuals for a fleet type. This increases the reuse of data by storing the data at a very fine level of granularity.

## Importing Manuals

During the import process SGML data is automatically converted into XML and burst into fragments. In many cases the application stores fragments in the document database (docbase) down to the ATA-2200 defined anchor level, shown in the illustration below.



One manual can be made up of between 30,000 and 75,000 XML and graphics fragments - each stored as a Documentum object. Any of these objects needs to be individually updated when the aircraft manufacturer releases a change to the manual. The airline may also make changes to these fragments that will override the manufacturer's data on the next publishing cycle. Internal and external links between manuals also need to be managed. Continental may need to add new text and graphics as part of their own changes.

Versioning is used to manage content changes; published versions are kept separate from draft versions currently being revised. The system provides complete traceability so Continental can determine what parts of the manual were active on a particular date or time, and why changes were made (change comments).

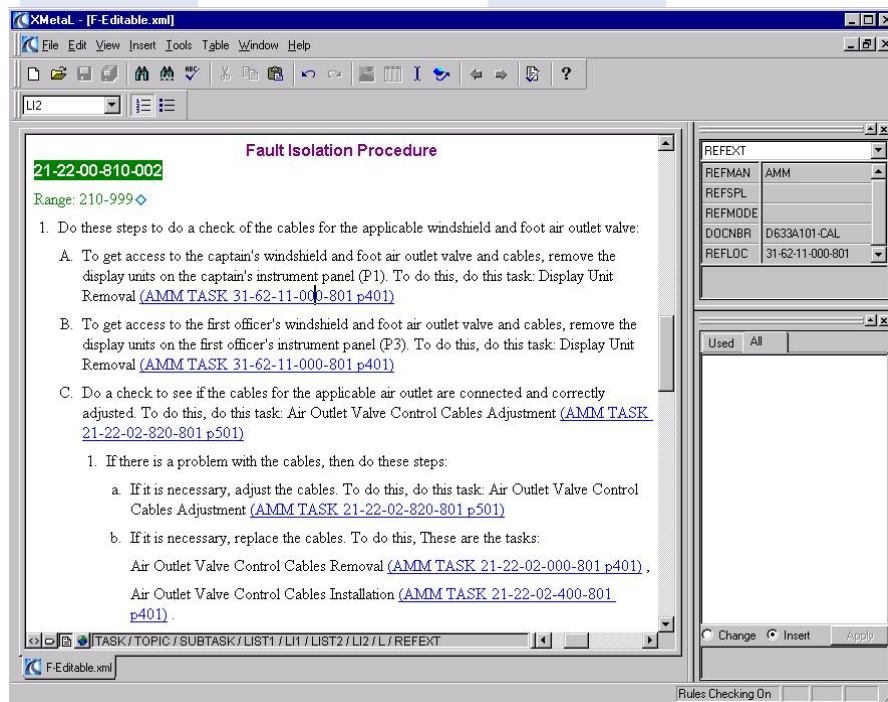
To support quality assurance, authors have the ability to preview the final manual as it would appear to the technicians prior to releasing it for publication to the web site. The time it takes for authors to revise manual content can be drastically reduced. Temporary Revisions can be implemented real-time. Hyper-links between manuals are verified and managed to ensure accuracy.

## CASE STUDY

### The Authoring Environment

A key aspect of the EDMS 2000 system is the change control processing that occurs during the import process when a revision of a manual is imported over an existing version in the docbase. EDMS 2000 ensures that when any manual fragments are changed, every change is merged with the manufacturer's revisions and compared for changes done by the airline. A list of "conflicts" is published so that the authors can make the adjustments to allow the airline data to reflect new changes from the manufacturer.

A requirement of EDMS 2000 was the development of a leading edge authoring environment utilizing Documentum and XMetaL. This environment improves the process of creating and modifying maintenance manual content by using a centralized content repository. The authoring environment supports version control, access control, and scheduled publishing and release of manuals to the field through an online intranet browser. The figure below shows a view of a manual in the authoring environment.



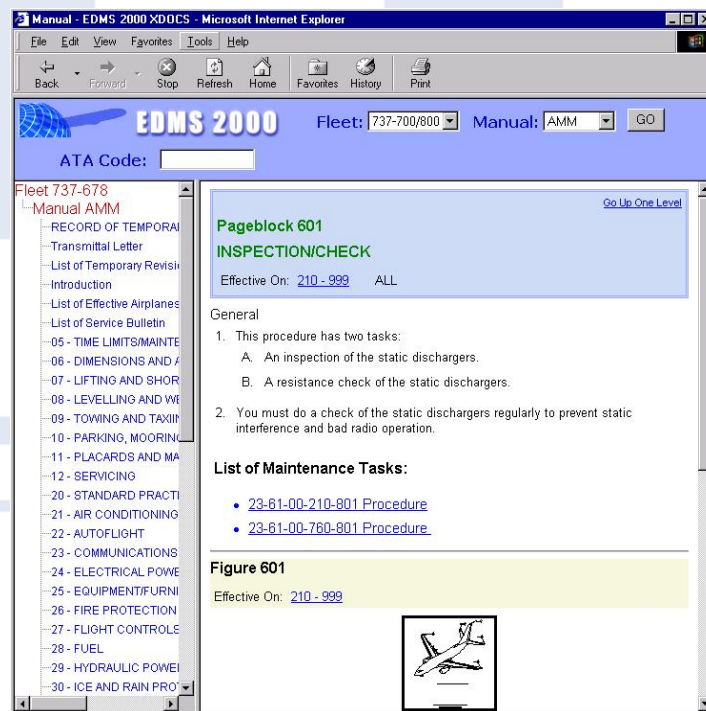
### Browser Support for Maintenance Manuals

Continental authors control when new versions of manuals are published and released to their end users. During a publish, manual fragments are extracted from the docbase and built into a publishable rendition using Omnimark. There are internal references in an aircraft manual that are resolved using the SGML, and there are also external references that are linked by ATA code.

After the publish, the data is stored as XML on the file system. The XML data can be displayed directly in Microsoft's Internet Explorer. The XML is converted to HTML on the browser using IE's built in Extensible Stylesheet Language Translator (XSLT) processor. The resulting HTML is rendered using a Cascading Style Sheet (CSS). By using a

## CASE STUDY

stylesheet, the presentation of the same data set may also be altered by applying different parameters to the stylesheet, allowing reuse of intelligent XML data to different audiences. An external plug-in or ActiveX control is used to view the ATA CGM and TIFF graphics in the browser. IE5 can automatically download and install everything needed to view and print graphics on the client from the intranet without requiring a separate installation on every client browser. Since XML is totally web delivered, it makes for easy integration with other online documents, dynamic updates, simplified replication and ease of portability. Content that is released through EDMS2000 can be viewed and used by all authorized Continental technicians. The illustration below shows a view of the browser. XML carries intelligence along with the familiar ATA-100 presentation of data to the engineer or mechanic who eventually sees the manual. This embedded intelligence allows for effectivity filtering, part number lookup, database interaction, and even the exchange of information for electronic signoffs or other tracking purposes.



### Key Features:

- Support for large, complex ATA-2200 compliant manuals
- Data reuse and automatic restructuring based on audience needs
- Link management capability between ATA-2200 manuals
- Incorporation of off-the-shelf software
- Web-based delivery to end users
- Documentum Repository for content storage and security