

The Aeronautical Production System (APS)



No. 1 Aeronautical Information Documents Unit (No. 1 AIDU) of the RAF publishes aeronautical information in graphical, textual and digital format for use by UK military and allied forces. In conjunction with 1Spatial, the Unit has developed an Aeronautical Production System (APS). This system has been designed and built to enable No. 1 AIDU to maintain a single aeronautical database and produce both paper and digital products from it.

The Challenge

Prior to the development of the APS, charts were held as individual files. Each chart's files were maintained separately by a data maintenance team. Since numerous charts overlap one another, one change to the source data could impact many charts. Other paper and digital products were also affected in the same way. Updating the charts involved much duplication of effort and led to possible inconsistencies between the products. No. 1 AIDU wished to implement a system that could produce and maintain a variety of digital and paper products, including En-Route charts, using a single main data store; an Aeronautical Object Oriented Database (AOODB).

No. 1 AIDU is constrained to a 28 day Aeronautical Information Regulation and Control (AIRAC) production cycle. This constraint resulted in peaks and troughs in the work efficiency and prevented amendments being made to the products beyond the current cycle. They required a method for making amendments to the source data regardless of which cycle the amendment pertains to, effectively updating their information at time of receipt in advance of the need for publication.

No. 1 AIDU also wished to automate its chart production process. Although digital, this was originally a highly interactive task as, although the features and objects on each chart had been digitised, they contained no intelligence. If features have intelligence they can decide how to represent themselves depending on the type of chart and their interaction with other features on the chart.

The Solution

The foundation of the APS solution is the AOODB. The database schema of the AOODB is based upon the Digital Aeronautical Flight Information File (DAFIF) specification. DAFIF is the primary source of global aeronautical information and No.1 AIDU is responsible for maintaining a core area of the data with the remainder maintained by NGA (National Geospatial-Intelligence Agency), USA. The relational DAFIF specification has been implemented in 1Spatial's Gothic geo-processing environment. Implementing the specification in Gothic's object-oriented architecture has provided the opportunity to build intelligence into the data.

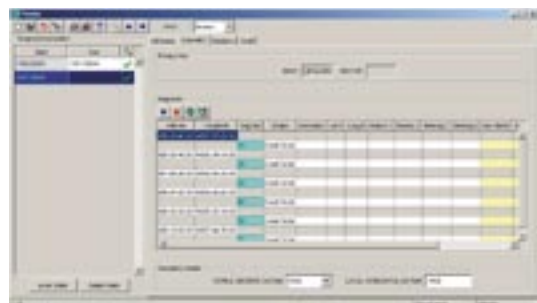
In order to amend the data a custom graphical user interface (GUI) and application was built, using 1Spatial's Java-based application development environment. The GUI has proved to be intuitive to use and extremely user friendly.

One of the first products to be generated from the APS is digital DAFIF data. Where necessary the AOODB DAFIF schema has been extended to allow for product specific attributes to be stored. In addition to this, geographical data (coastlines and international boundaries) are stored in the AOODB for use by all products. These additions will allow other Flight Information Publication (FLIP) products, initially En-Route charts, to be derived from the system.

ATS Route user interface



SUAS Geometry user interface



Benefits

Efficiency

The APS temporal functionality overcomes the production constraints placed on No. 1 AIDU by the 28-day AIRAC cycle. 1Spatial's solution allows amendments to the database at any time, regardless of the amendment's activation date. This allows air cartographers to make continual updates beyond the current cycle and in advance of the production date, which spreads the overall workload more evenly. Multiple changes can now also be committed to the database simultaneously. Previously this action would have taken hours, but can now be completed within a few minutes.

Excellent data quality

The DAFIF specification contains an extensive set of validation rules. The APS will be the first system to fully implement these rules. Data can be amended using a suite of purpose built user interfaces. As each amendment is committed it is validated against the rules. Invalid data will be rejected thereby ensuring excellent data quality.

Single continuous database

1Spatial's technology allows No. 1 AIDU to continuously model the whole world within a single geographical dataset. This allows aeronautical features to cross the International Date Line as well as North and South Poles.

Intelligent charts

Features with intelligence know how to display themselves when interacting with other features. For example, airspace boundaries use different styles of representation depending on whether or not they share a boundary segment with another feature. This intelligence is achieved through a combination of attribution and flexible topology.

New charts, using different geographical boundaries, can be quickly defined enabling No. 1 AIDU to react swiftly to changing worldwide events.

Better text handling

In appreciation of future phases and products beyond En-Route Charts, 1Spatial has developed an export interface that incorporates a third party desktop publishing system: Adobe™ FrameMaker™. This will allow the system flexibility in producing heavily textual products, for example En-Route Supplements in addition to graphical and digital products. FrameMaker™ also offers the potential to eliminate other elements of the current flowline in the future. This would offer additional cost-effectiveness benefits to the pre-press phase in the production of FLIPs.

Improved printing

1Spatial further developed the existing Gothic functionality to support the use of different inks printed products. This development supports the need for colour separated plotting, as well as allowing No. 1 AIDU to specify colours as spot or process colours.

Audit

Cartographic changes to the data can now be tracked according to username, action type and date. The APS also allows No. 1 AIDU to assign different levels of authority to each individual user. Any changes that have been made can be queried and reported quickly, creating an accurate audit trail and increasing safety and accountability.

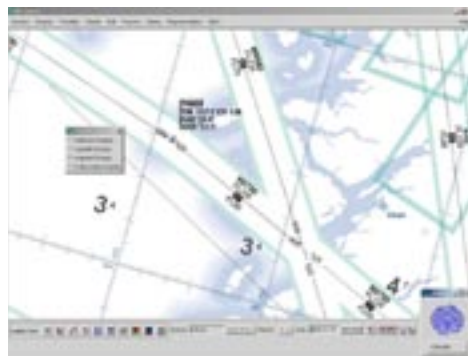
Conclusion

The APS has enabled No. 1 AIDU to improve data quality and consistency by maintaining all its data in a single database. This enhanced level of data quality is vital in creating user confidence and satisfaction as well as improving aircrew safety. Additional and improved chart editing, colour and text placement functionality allows the Unit to create products in multiple formats.

No. 1 AIDU has also achieved a greater level of efficiency. The creation of a single data source and the temporal functionality of the APS have minimised the duplication of effort as well as reducing inconsistencies. This has led to substantial time and cost savings. The increased levels of productivity have allowed the Unit to develop its product ranges over a number of platforms, as demanded by a dynamic customer base. Furthermore, aircraft flying from the UK are using onboard avionics systems with data populated from the APS.

**Wing Commander Gary Barber,
Officer Commanding No. 1 AIDU said:**

“No. 1 AIDU is delighted with the solution offered by 1Spatial, and looks forward to continuing its long-standing relationship. The Gothic APS is an exciting technological leap forward, and the increased utility and data integrity that the system provides will make a significant contribution to flight safety.”



En-Route Chart production



1Spatial

Head Office

Cavendish House
Cambridge Business Park
Cambridge
CB4 0WZ, UK

International Offices

Rue de Colonies 11
1000 Brussels
Belgium

1 Nore House,
Riverview Business Park
Mahon
Cork
Ireland

Olavsgt. 39b
NO-3612
Kongsberg
Norway

3 Wellgreen Lane
Stirling,
FK8 2BS
UK