

Teradata Warehouse tracks millions of U.S. Air Force aircraft parts around the world – critical for insight into each part’s history, availability and viability

The Customer

The mission of the U.S. Air Force is straightforward yet profound: to defend the United States and protect its interests through aerospace power.

Ensuring that the strength of that power remains at full throttle is the Air Force Materiel Command (AFMC), based at Wright-Patterson Air Force Base, Ohio. A major task that AFMC is specifically responsible for is ensuring that maintenance on and parts for all U.S. Air Force aircraft are accounted for in terms of readiness, location and availability – a significant task, given that the Air Force has thousands of aircraft, and each aircraft has thousands of parts.

The U.S. Air Force mission – and AFMC’s role in supporting that mission – has always been imperative to the security of the United States. But the terrorist attacks on the United States on September 11, 2001 make AFMC’s role even more vital, particularly in Operations Enduring Freedom (defense of U.S. against terrorism abroad) and Noble Eagle (homeland defense against terrorism).

Business Objectives

The U.S. Air Force deploys thousands of aircraft at 82 major U.S. Air Force bases around the world. Its inventory includes over 42 types and hundreds of variants of aircraft, from the well-known F-15 Eagle (a tactical fighter), to Air Force One

(providing transport for the President of the United States), to many other search, rescue, combat, and observation aircraft, as well as ground support equipment, simulators, trainers, pods, electronic gear, and other components.

Not only is each individual aircraft identified by a unique tail number – each individual part of each aircraft also has a unique identifying number. These part identification numbers indicate when the part was built and which vendor built it. What’s more, every single act of maintenance on every part must be logged. Using these numbers, AFMC also tracks every part to know its viability, its maintenance history, and its location.

The logistics of tracking this vast supply of aircraft resources and their readiness can mean anything from identifying when a part in a particular aircraft’s landing gear needs to be replaced as routine maintenance, to knowing where to find critical parts to ready a fleet for deployment as quickly as possible.

Some of the questions that AFMC must be ready to answer include:

- > What parts are needed for aircraft to be and stay mission ready?
- > Where are parts needed and how quickly are they available?
- > What are top back order items?
- > Are prices set correctly for parts?

Focus on end-consumer analysis made possible with Teradata Warehouse

- > Tracking of aircraft used in Operations Noble Eagle and Enduring Freedom
- > Reporting on status of parts goes from monthly to daily
- > Data warehouse replaces manual tracking of parts
- > Data warehouse enables proactive approach to parts management, says Lt. General Charles Coolidge, Vice Commander, Air Force Materiel Command

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United States Air Force

Like any large organization, the U.S. Air Force wants to operate as efficiently as possible and get the greatest value for its investment in aircraft parts and supplies. For example, the Air Force not only wants to know precisely when parts should be maintained or replaced, but whether parts from a particular vendor are wearing better than from another vendor. Identifying patterns in how aircraft parts wear – for example, do landing gear parts wear out more quickly on aircraft that land in humid climates versus arid climates? – is also crucial to understanding the most efficient, economical and safe ways to purchase, maintain and replace aircraft parts.

The AFMC's particular challenge, however, is gathering information on literally millions of parts that are in constant flux – moving from one part of the world to another as part of aircraft. As the Air Force strove to meet this challenge, various databases (or data marts) were created throughout the organization to track each part's history, location, and current state of viability.

AFMC realized that consolidating this information in a single enterprise data warehouse would result in greater efficiency, save considerable time and revenue, and provide a single source of truth about the status of the Air Force's aircraft parts.

The Teradata Choice

In the summer of 2001, AFMC implemented its Air Force Enterprise Data Warehouse, gathering historical

The Teradata Warehouse	
> Hardware	8-node 5300/5255 production system with 4-node 5250 for development/test Teradata Database Version 2 Release 4
> Applications	Business Objects (query tool)
> Professional Services	Teradata Professional Consulting and Support Services for installation and continual upgrades
> Partner Products	Informatica ETL solution Database Replication Engine Suite of tools from Golden Gate Software

maintenance, reliability, and inventory data on U.S. Air Force aircraft parts for the first time in one data warehouse – a Teradata® Warehouse.

The initial implementation included approximately 600 million records. Now, about 6 million new records are added per day in near real time.

Planned upgrades in the near future include adding logistical forecast data, detailed supply transactions, and detailed engine data.

To accommodate these upgrades, the AFMC's Teradata Warehouse is scheduled to grow to a 12-node production data warehouse by the summer of 2003. Initially, 50 users (both civilian and military) used

the AFMC's Teradata Warehouse when it was installed. In just one year, that usage has grown 12-fold to 600 users.

Business Insights

The Teradata-powered AFMC data warehouse provides the following typical kinds of information to the U.S. Air Force:

Aircraft:

- > Age and operating time on all aircraft
- > Maintenance man hours by month for the past two years
- > Aircraft history for the entire spectrum of hours and data in the data warehouse, with a concentration on the past two years

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United States Air Force

Operation Noble Eagle:

- > Real-time tracking of fighter flying hours
- > Current status of all assigned aircraft

Operations Noble Eagle and Enduring Freedom:

- > Flying hours by tail number
- > Maintenance performed by tail number
- > Maintenance trends

“The most exciting part of our Teradata Warehouse is that we now have the pieces of the puzzle, in terms of the status of our aircraft parts, all in one place,” states USAF Major Paul Williams. Major Williams was instrumental in developing the long-term vision that led to the AFMC implementing its Teradata Warehouse. “We were able to pull together the data we needed before, but not as efficiently as we needed. Gathering real time data was also not possible before we implemented our Teradata Warehouse.”

Monthly reports previously provided “dated” information on parts’ status; with its Teradata Warehouse, the Air Force now has daily reports that assess fleet status. What’s more, these reports can be updated within an hour when necessary.

Additionally, the organization uses its Teradata Warehouse to track inventory and availability of parts (both in use and spares). Before, much of this tracking was done manually through paperwork. Now, parts are all tracked via the Teradata Warehouse.

“In our new Teradata enterprise data warehouse world, we are able to operate proactively, because our warehouse empowers us to know when a part is going to fail, based on data gathered about that type of part....we can move parts ahead of time to fulfill a need, not wait until a requisition comes due. And that means we can fulfill our missions when and where we need to.”

– Lt. General Coolidge, AFMC Vice Commander, United States Air Force

“The nicest surprise from our Teradata Warehouse,” Major Williams says, “is the cross-functional analysis which it allows. For example, if a maintenance crew says a particular aircraft is non-mission capable due to an issue with a part, we can now quickly track the location and availability of the spare part needed to make that aircraft operational. Before, we might have to log on to between two and four systems to find the answers, which required a great deal of overhead, both financially and in terms of time. Our Teradata Warehouse is a much more efficient one-stop shop for the answers we need.”

This efficiency, says Major Williams, “empowers us to ask questions that we couldn’t begin to ask before, to think outside of the box. This gives us the foundation to think and operate truly

as an enterprise, to be proactive in how we use and maintain our aircraft, rather than reactive.”

For example, using its Teradata Warehouse, AFMC was able to put data behind the long-held understanding that flight line crew chiefs already knew – that steepness of approach affected the wear and tear of landing gear. With this real factual evidence, the Air Force is able to replace landing gear on aircraft used in these conditions before there’s a safety issue. Now, the Air Force can increasingly understand why parts wear out and replace them proactively.

Proactive is a concept that comes up frequently when senior-level Air Force decision makers discuss the impact that the service’s Teradata Warehouse has on the Air Force.

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For example, that proactive approach, says Lt. General Coolidge, AFMC Vice Commander, is a dramatic and important shift from the reactive approach the Air Force had to take prior to implementing its warehouse – fixing or replacing parts as they wore out.

“In our new Teradata enterprise data warehouse world, we are able to operate proactively, because our warehouse empowers us to know when a part is going to fail, based on data gathered about that type of part,” explains Lt. General Coolidge. “This means we never have to have equipment downtime unless it’s scheduled, for example, for maintenance. Thanks to this proactive approach, equipment is always available when and where we need it – we can move parts ahead of time to fulfill a need, not wait until a requisition comes due. And that means we can fulfill our missions when and where we need to.”

Another benefit of the Air Force Enterprise Data Warehouse is that it “creates the ability of people to function in new roles,” says Ken Percell, AFMC Chief Technology Officer. “Our logistics and supply managers have become knowledge workers thanks to our warehouse, meaning that

instead of reacting to scarcity of parts, they can use the power of the data warehouse to prevent scarcity, using the warehouse to do predictive work in terms of the logistics of parts management.”

The knowledge worker approach, adds Virginia Williamson, Air Force Deputy Program Executive Officer for Command, Control, and Combat Support “enables real decision making instead of number crunching. We can now do analysis to see what impact decisions can have. For example, we can look at the impact of a certain type of part being needed in two places, and play out various scenarios for how to manage that situation. And we can do this analysis very quickly. This makes us proactive in terms of preparing for future, similar contingencies.”

Why Teradata?

Before selecting Teradata as its data warehouse solution, the Air Force sent several commanding officers to visit Wal-Mart headquarters to review that organization’s Teradata Warehouse solution. Since Wal-Mart tracks thousands of items at hundreds of locations, it made sense for the Air Force to take a look at how Wal-Mart uses its Teradata solution.

The Air Force was impressed by what it saw at Wal-Mart, particularly the speed of access to information.

After this visit, Air Force Materiel Command did a pilot study using three years of aircraft data on a Teradata Warehouse that had been used for Y2K testing at an Air Force base.

The Air Force was impressed with how quickly the Teradata test system could process large amounts of data, while providing a detail view of that data.

“We knew that our data warehouse would have to be large and would grow quickly,” says Mike Riley, Air Force Enterprise Data Warehouse Chief Architect. “We wanted a data warehouse that could grow incrementally without our having to rebuild the data warehouse time and again – and this is one of the strong advantages Teradata brings to the table. Not only does Teradata technology enable very fast storage and retrieval; it also empowers incremental growth.”

Teradata’s expertise and professionalism were also compelling factors in the U.S. Air Force’s choice to select Teradata for tracking and analyzing its millions of aircraft parts around the world.

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