

THE SIGNIFICANT BENEFITS OF INTRODUCING AERIAL REFUELLING INTO COMMERCIAL AVIATION

Range International Ltd: authors Wood, Hollingworth & Maunder

Introduction

For International Airlines the rising price of fuel has become a significant extra cost.

American Airlines and British Airways have annual fuel bills of about \$3 Billion each.

Aerial Refueling as described in Ref1 could reduce fuel consumption on long haul flights by as much as 45% and also allow other significant benefits in terms of increased airframe life.

Aerial Refueling has developed and matured within Military Aviation over the last 60 years. The first patent concerning aerial refueling was granted in 1921.

It is a parallel technology that has remained within the military sphere because commercial aircraft manufacturers have been able to develop faster and longer range aircraft to meet airline needs.

Range International believes that there are now four drivers for introducing this technology into commercial aviation:

Firstly, the pace of technical improvement and efficiency savings from new aircraft types has slowed down and none can compete with the step-change increase in efficiency delivered by aerial refueling.

Secondly, aviation fuel will continue to rise in price in real terms and become a larger percentage cost for airlines, reducing margins. The fuel savings made through aerial refueling are so significant that margins will be greatly increased.

Thirdly, geo political changes (specifically, the denial of access to airspace by Russia) remains a significant threat to the commercial arena.

Finally, significant increases in airframe life (measured in pressurization cycles) will be made when journeys currently requiring two legs are made in one through the use of aerial refueling.

Ref 1. "Operations and aircraft design towards greener civil aviation using air to air refueling", The Aeronautical Journal (RAeS) November 2006 by Dr R K Nangia.

The MRTT

Modern Aerial Refueling uses Multi Role Tanker Transport Aircraft (MRTTs). An MRTT is a current commercial type whose payload is passengers or freight and additional fuel that can be transferred to a receiver aircraft.

An MRTT transfers fuel via a telescopic boom and receives it via a standard coupling. Receiver aircraft have just the coupling and a slightly modified fuel system. The boom/coupling system has been developed and well-tested over decades of safe military use.

Current aircraft already developed as MRTTs include the Boeing 767 and Airbus A330.

Both are competing for a large USAF contract (KC X) to replace its ageing tanker transport fleet. The result will be announced shortly.

Both are flying today as MRTTs for the military market and both remain popular commercial models with about 700 of each in commercial use.

Concept of operation

The concept is simple; one MRTT departs on a short-range commercial flight with a payload and additional fuel for transfer. This short-range flight is required in its own right; the offload of additional fuel is an added source of revenue for the operators.

Once airborne it arranges a rendezvous with a second, long-haul, MRTT that has a full payload but is restricted by the fuel required for the length of its flight.

The second “receiver” aircraft flies slightly behind and below the first “tanker” aircraft. A boom operator on the tanker aircraft lowers a fly-by-wire refueling probe that connects with a coupling on the transport aircraft. Fuel is transferred at about 3000 kg per minute, and the transfer will take no longer than 10 minutes.

Once transfer is complete the respective aircraft separate to complete their missions.

A ten minute transfer of fuel would extend the range of a Boeing 747 by three hours or 1500nm and a Boeing 767 by 5 hours and 2500nm.

Is it Safe?

The system is very safe and is used by the USAF as a means to deploy troops and cargo all over the world.

More significantly, the system is so safe that Air Force One (a modified Boeing 747) routinely uses aerial refueling for mission extension, security and convenience when carrying the President and other Government staff.

Commercial Benefits

Airlines operating long range flights always have to make compromises between payload, range and the need for “technical stops” to take on more fuel. Long haul flights are limited by the *combined* weight of payload and fuel that can be loaded onto the aircraft and lifted safely from the departure airport.

This is particularly the case for air cargo carriers. 44% of all international freight is carried on cargo only flights.

On longer routes freight that could have been carried in the cargo hold of a passenger aircraft is often left behind because the spare capacity is required for fuel (Singapore New York for example).

Some successful air cargo routes from Asia to North America also suffer from significant imbalances in freight flows which reduces the potential margin.

According to data from the Economist magazine, the three busiest airports in the world for total cargo movements are:

1. Memphis Int. 3.69 million tonnes.
2. Hong Kong Int. 3.61 million Tonnes.
3. Anchorage Int. 2.80 million tones.

Anchorage is an anomaly, it is not a population, consumer or production center and yet it is the world’s third busiest cargo airport. Why?

It occupies this position because geographically it sits neatly half way between Asia and North America and is a convenient point for cargo aircraft to land and refuel.

The 2.8 million tones of freight that arrives and departs Anchorage annually represent Billions of Dollars in wasted time, fuel and crew costs.

If all cargo carriers used MRTTs they could avoid this waste in the following way:

Aircraft returning to Asia typically have lower cargo loads and this spare weight capacity could be used to carry extra fuel. The returning aircraft would rendezvous with fully loaded aircraft traveling from Asia, off load spare fuel, and thus preclude the need for the East bound aircraft to stop and refuel.

Precluding the need for a refueling stop also means that the whole journey is carried out using one pressurization of the aircraft rather than two - significantly extending the life of the airframe and reducing the cost of maintenance per mile.

Cargo Conversion Programs

Since most pure cargo aircraft result from modification programs of used passenger models the additional process to produce an MRTT is very straightforward.

There are manufacturer approved MRTT programs for the A330, A310, B747 (200), B767 and DC 10.

Geo Political Threats

In 2007 a dispute between Russia and Germany resulted in Lufthansa Cargo Aircraft being denied access to Russian Airspace. The dispute was settled but the threat remains.

The flight time between Europe and Asia has been reduced by about two hours because of access to airspace over Russia and China. The removal of such access is a powerful economic weapon.

Russian concerns over an American missile defense program due to be installed in Eastern Europe may see this sanction repeated.

Why now?

The rising cost of fuel coupled with the explosion in manufacturing and other business from Asia makes this the time to bring aerial refueling into the commercial arena.

In the past, aerial refueling has often been seen as a purely military activity. However, like the widespread adoption of military GPS for commercial and civil navigation, the technology is proven, available and offers huge cost savings at a time when fuel prices are ever increasing.

Conclusion

There are significant financial and green benefits.

It is a safe procedure, tested for decades and used by the President of the USA.

The technology and know how is already proven and available.