

## Next Generation Large Air Tanker Services; United States Department Agriculture-Forest Service - September 2012.

### Introduction

In the United States of America (USA) and Canada large airtankers (LAT/s) are a small part of wildfire response efforts; but they play a key role in the effectiveness of initial attack.

LATs are used to deliver fire retardant to remote wildfires to help reduce fire intensity and rates of spread until ground resources can attend to the fire.

The LAT fleet, managed by the United States Department of Agriculture-Forest Service (USDA-FS) has flown an average of 4,500 flight hours, dropping almost 75 million litres of retardant annually over the last ten years.

Similar to the Australian bushfire environment the changing fire seasons and the increased pressure from expanding populated areas are placing a higher demand on rapid initial attack and the effective use of aircraft.

Despite the increased fire activity the LAT fleet has been reduced as a result of ongoing airworthiness issues.

The number of LATs available has decreased from 43 in 2000 to 11 LATs in 2012, which has been attributed to the impact of numerous in-flight structural failures.

The accidents resulting from structural damage and failures have forced the implementation a strategic process to develop and provide a sustainable, safe and reliable LAT fleet for the future.

Additionally as a result of specific fatal LAT crashes in 2002; again attributed to in-flight structural failures, the USDA-FS were tasked by the Federal Aviation Administration USA (FAA) with providing assurance for the airworthiness of LATs.

The USDA-FS required all LAT providers to develop and implement a comprehensive maintenance and inspection program to be approved by the FAA, effecting the Lockheed SP-H2 ,P-2V and P-3 Orion aircraft.

In 2011, the USDA-FS terminated the contract with the contractor operating P-3 aircraft for failure to implement a continued airworthiness program, and those aircraft are not currently available.



Plate 1 Tanker 23, N923AU 1964 Lockheed P-3A Aero Star Aero Union Corp CA.

Unfortunately the current fleet of LATs is old, with an airframe average age of more than 50 years, and ten of the remaining eleven P-2V and Sp-H2 airtankers face retirement by 2021.

With the age and rising cost of maintaining LATs rapidly increasing and more importantly so are the risks associated with using them.



Plate 2 Tanker 48, N4692A 1961 Lockheed SP-2H. Minden Air Corp NV.

The USDA-FS currently has a limited surge capacity available, when circumstances allow, using call-when-needed helicopters and very large airtankers (VLAT/s), Modular Airborne Fire Fighting Systems (MAFFS) on C130H/J Hercules aircraft and international assistance.

The USDA-FS has recognised that relying on a diminishing and aging LAT fleet and other aircraft for a surge capacity on an ad-hoc basis is not a sustainable solution.



Plate 3 Conair CV-580 airtanker utilised often as a surge resource.

As a result the USDA-FS has developed and implemented a strategy that will maintain mission safety and effectiveness and has decided that the LAT fleet must be replaced with newer, faster, more cost-effective and safer aircraft.

### Requirement

The phases of flight in airtanker mission profiles are considered to be approximately four times more demanding than the designed use for a commercial transport aircraft.

The USDA-FS has determined that the next-generation LATs should be capable of fulfilling the airtanker mission phases of flight were they encounter heavy load manoeuvring impacts.

Currently there are only two aircraft have been purpose built in firefighting mission profiles; the scooping Bombardier CL-215/415 and the Air Tractor AT 802 single engine airtanker (SEAT).



Plate 4 Water drop from Bombardier CL-415 scooper.

There has been no larger aircraft built specifically for the purposes of firefighting.

However there are a large number of aircraft that were designed for missions and flight phases that are similar to the heavy load manoeuvring impacts of the airtanker mission profile, the C-130 Hercules.



Plate 5 A C-130 Hercules and MAFFS G-II commence a water drop evacuation during training.

There are also several modern commercial passenger transport aircraft that with appropriate design, reengineering can be utilised for the firefighting mission profile.

These aircraft would require additional inspection and maintenance programs to safely function as airtankers.

### Criteria

The requirements for the next generation LATs include but are not limited to:

- the use of turbine powered aircraft because of the greater reliability, less maintenance and increased fuel economy;
- a cruise speed at or greater than 300 knots.
- a minimum capacity should be at least 7500 litres gallons of retardant, with 11,300 litres strongly preferred;
- comply with USDA-FS contract Structural Integrity Program (Continued Airworthiness Program) requirements to assure airworthiness;
- be certificated by the FAA in the standard or restricted category;
- be supported by the original equipment manufacturer (OEM);
- have an FAA-approved maintenance and inspection program designed for an airtanker;
- have FAA approval of all modifications and alterations to the aircraft which change the configuration to the firefighting role; and
- fulfil the requirements of the Interagency Airtanker Board (IAB) which inspects delivery systems installed on proposed fire bombing aircraft.

Based on the fulfilling the minimum requirements listed above the USDA-FS determined the most suitable option for next generation airtankers would be passenger transport category aircraft, similar to the British Aerospace 146 200 (BAe 146 200), Bombardier Dash 8 or Q-Series (Q400) or similar aircraft.



Plate 6 Tanker 73 Q400 AT airtanker, Securite Civile Marseilles France 2007.

Currently, only two next generation LATs the BAe 146 200 and Q400 have been approved for the airtanker mission profiles.

Two multi-role Q400 airtankers operate in France. The Q400 is capable of operating as an airtanker, hauling cargo or passengers. The aircraft has a speed of 330 knots and carries 9800 litres of retardant and meets the IAB delivery system requirements.

### Solution

Subsequent to an Invitation To Tender the USDA-FS announced they had awarded new exclusive use contracts for seven additional air tankers comprising of BAe 146 200s and McDonnell Douglas MD-87s (MD-87).

As a result four companies will provide three next generation airtankers in 2012 and four in 2013:

- **Neptune Aviation Services, Inc.** will provide two BAe-146 200s in 2012;
- **Minden Air Corporation** will provide one BAe-146 200 in 2012 and 1 BAe-146 200 in 2013;
- **Aero Air, LLC** will provide two MD-87s in 2013; and
- **Aero Flite, Inc.** will provide one BAe Avro RJ/85 in 2013.

The BAe 146 is a regional airliner formerly manufactured in the United Kingdom by British Aerospace, in the early 1980s.

The manufacturing of an improved version known as the Avro RJ occurred in 1992.

The BAe 146/Avro RJ is a high-wing cantilever monoplane with a T-tail; it has four turbofan

engines mounted on pylons underneath the wings and has retractable tricycle landing gear.

The BAe 146 aircraft have a speed of 360 knots and comes in -100, -200 and -300 models.

The AVRO RJ/85 is a variant of the BAe-146 with more efficient jet engines, greater efficiency (15% less fuel-burn, 17% increased range), quieter performance and 20% lower maintenance costs.

The equivalent Avro RJ versions are designated RJ/70, RJ/85, and RJ/100. The RJ/85 aircraft have a speed of up to 390 knots.

The MD-87 is a variant of the McDonnell Douglas MD-80, a twin-engine jet, and as an airliner carried 114 to 139 passengers. It was produced from 1987 to 1992 and cruises at about 420 knots.

The BAe 146 is designed to operate in difficult conditions such as steep terrain, short runways, slow flight, and remote airports which make it ideally suited to operate as an airtanker.

Currently only one BAe 146 variant has passed the required retardant drop tests to perform as an airtanker; and has met agency and FAA airworthiness and safety requirements.

As part of the solution the current remaining P-2V LATs will be eventually transitioned out of service as more approved next generation LATs become available.

### Tronos/Neptune, BAe-146

The Tronos/Neptune design is an internal tank which uses gravity aided by positive air pressure in the cabin of the aircraft to help push the retardant out of four nozzles located in the underbelly of the aircraft.



Plate 7 Tanker 40 N146FF BAe146 200A (Built 1986) Neptune Services Missoula Airport August 2012.

The internal tank has a retardant volume capacity of 11,300 litres which can provide regulated flows and specified volume drops. It is the only new generation LAT presently working, however it is still under interim approval from the IAB.

### Minden Air Corporation, BAe-146

The Minden design is an internal GPS interactive, 11,700 litre, constant flow gravity tank which has a set of longitudinal doors fitted to the underbelly of the aircraft.



Plate 8 Tanker 46 BAe146 200A N446MA (Built 1988) Minden Airport, September 2012.

The system has the ability to provide regulated flows and specified volume drops.

Flight testing and water dropping tests were conducted successfully in mid September 2012.

### Aero Air LLC, MD-87

The MD-87 airtanker has an internal tank which is fitted with longitude parallel door/s which is located at the bottom of aircraft and relies on gravity to maintain the constant flow process.

The delivery system has a reported retardant volume of 15,000 litres and is capable of providing selective coverage levels and a full evacuation in four seconds.

This aircraft has not gone through the required testing, evaluation and flight phases for the airtanker mission profile.



Plate 9 Tanker 101 N293EA MD-87 (Built 1991) formerly EC-FFA Iberia Airlines.

### Aero Flite Inc, Avro RJ85

Unlike the other new generation airtankers, the BAe 146 & MD-87, the RJ/85 is fitted with an external "saddle tank" which is a similar design and configuration to the Q400 external tank, see Plate 5.

The external tank has is a constant flow gravity feed system with a retardant capacity of 12,500 litres, which is capable of variable coverage levels and multiple drop provisions and has a drop speed of 120 knots.



Plate 10 BAe Avro RJ85A N839AC (Built 1995) Aero Flite AZ.

The RJ/85 airtanker has a cruise speed at 18,000 feet of 390 knots fully loaded and a cruise speed at 12,500 feet 355 knots fully loaded.

The external tank of the RJ/85 minimises any airframe and operational flight issues associated with pressurised and non pressurised flight during airtanker operations.

### References

Large Airtanker Modernization Strategy U.S. Forest Service January, 2012.

### Further Information

- Hayden Biggs, State Aircraft Unit, Victoria