

Modular Airborne Fire Fighting Systems - September 2012.

Introduction

A series of devastating wildfires occurred on United States Air Force (USAF) owned property and on private land in California during 1970 and 1971.

The wildfires destroyed hundreds of homes and completely overwhelmed the capacity of the large air tanker fleet and a need for an emergency backup system was required.

In response The US Government established the joint Modular Airborne Fire Fighting Systems (MAFFS) program between the USAF and the United States Department of Agriculture-Forest Service (USDA-FS).

The funding for initial design, development, production, and testing of a prototype system was provided by the USAF and was completed in 1973. Under the joint agreement the USDA-FS owns and maintains the equipment.

The MAFFS program now provides emergency surge support when additional large air tankers are needed to support the contracted air tankers.



Plate 1 C-130 and MAFFS G-I drop evacuation, Black Crater Fire 2008.

Background

The MAFFS Generation I (G-I) was a portable pressurised fire bombing system designed to fit inside a large cargo aircraft, primarily a Lockheed Martin C-130 Hercules.

Under accumulated pressure, the system has a capacity to discharge up to 11,350 litres (3,000 US-gals) of retardant or water through two external tubes mounted at the rear of the aircraft.

The MAFFS G-I became fully operational in 1974.

In 1982 a Royal Australian Air Force (RAAF) C-130 fitted with a MAFFS G-I was operated in Victoria for the fire season.

The C-130 was operated by the 36th Tactical Squadron, Richmond Air Force Base New South Wales.

During the season it was dispatched to four forest fires across the State delivering nine loads with a total of twelve drops.

Location	Fire No.	Date	Loads	Drops
Broadford	5	4/2/1982	1	2
Broadford	6	8/2/1982	5	5
Orbost	8	14/2/1982	2	2
Bright	4	14/2/1982	1	3

Table 1 List of locations, loads and drops for the RAAF C-130 and the MAFFS G-I Victoria 1982.



Plate 2 C-130 and MAFFS G-I drop evacuation Mt Disappointment 1982.

An improved version of the original system known as the MAFFS G-II was developed during 2007 by the USDA-FS and the Aero Union Corporation.

The new system has an increased capacity with the ability to carry up to 13,000 litres and discharges the retardant through a single tube on the side of the aircraft.

It was first used on a fire in July 2008, out of McClellan Tanker Base in California using a C-130-H Hercules.

MAFFS program

The MAFFS G-I & II are currently in use and installed on either Air National Guard or military Reserve C-130 aircraft which are operated on behalf of the USDA-FS.

Generally the program consists of eight C-130 aircraft that are MAFFS capable and the current 2012 fire season will mark the thirty-ninth year of MAFFS operations.

Variants

The MAFFS G-I have a series of five 1900 litre aluminium tanks, capable of carrying 11,350 litres, which are rolled onto the aircraft on connected, standard-size, cargo pallets.



Brian E. Christiansen USAF.

Plate 3 Image shows the five tanks of the MAFFS G-I Charlotte, North Carolina 2008.

The system is pressurised by ground-based compressors as a part of the loading process.

The system has two manifolds which use two articulated ejection tubes that extend rearward and downward, over the trailing edge of the opened cargo ramp of the aircraft.



Plate 4 C-130 Hercules and MAFFS G-I showing lowered discharge chutes.

All C-130 aircraft using the MAFFS G-I operate with the cargo ramp down.

A limited number of the original MAFFS G-I units were capable of incremental drops of 3800 litres or 7500 litres and capable of releasing a full load in less than 7 seconds. The load of retardant is limited to 10,000 litres because of the specific gravity weight for retardant.

At the maximum flow rate the drop produces a recorded coverage level of 4, the lesser coverage levels can be achieved by regulating pressure settings.

In the original MAFFS G-I configurations the retardant discharge chutes had to be deployed prior to flight in the operable position.

This dramatically increased drag, impaired aircraft handling characteristics restricting flight altitudes to below ten thousand feet and resulted in slower transit times.



Plate 5 C-130 Hercules fitted with a MAFFS G-I commences water drop during training operations.

MAFFS G-II

The MAFFS G-II has an increased capacity of up to 13,000 litres and now has a single large tank which replaces the original five tanks



Brian E. Christiansen USAF.

Plate 6 Image shows the single tank of the MAFFS G-II prior to loading into C-130J Hercules.

To improve performance it has two on-board air compressors to pressurise the system. The original MAFFS G-I has to be pressurized by a

compressor on the ground during the loading process.

The ability to pressurise the system airborne reduces turn-around time significantly on the ground and ensures repeatability and consistency with multiple drop requirements over a wildfire.



Plate 7 Internal fitment of MAFFS G-II inside C-130 Hercules, lower left of image shows dispensing manifold.

The retardant is now discharged through a special chute installed into the para-troop drop door on the side of the aircraft.



Plate 8 Shows the single dispensing chute and drop control valve.

Utilisation of the single discharge chute and side door avoids the use of the cargo ramp door and allows the aircraft to remain pressurized during flight operations and the drop evacuation process.

The MAFFS G-II provides the ability to be more effective on the fire by regulating flow rates and drop volumes dispensing only the required amount necessary and providing for multiple drops scenarios.

The discharge chute forcefully directs a stream of retardant to the rear of the aircraft; the velocity is equal to approximately 185 kilometres and hour.



Plate 9 A C-130 Hercules and MAFFS G-II commence a water drop evacuation during training.

The system has satisfied the formal requirements of the Inter-Agency Airtanker Board (US) and has the ability to achieve all coverage levels up to 8.



Plate 10 C-130H Hercules and MAFFS G-II delivers a load of retardant, September 2012.

The MAFFS G-II has the ability to split the load into eighths, quarters and halves, similar to a constant flow delivery system. A full load can be released in less than 7 seconds.



Plate 11 C-130H Hercules and MAFFS G-II delivers a load of retardant, September 2012.

A significant enhancement to the MAFFS G-II has been the installation of a separate onboard 600 litre tank; providing the ability to inject Class-A foam concentrate into a load of water.

Further Information

- Hayden Biggs, State Aircraft Unit, Victoria.