

Chapter 5
FIRE PROTECTION SYSTEM

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DESCRIPTION

▶ Introduction

1. This chapter contains a description of the fire protection system and gives details of servicing operations. For details of the fire extinguishers refer to AP 107E series. Pre Mod. 2455; five methyl-bromide fire extinguishing systems are provided, they protect the engine compartments, fuel tank bays, wing leading edges, bomb bay stores and AAPP Post Mod. 2455; the port fuselage tanks, leading edge and wing tanks system become a single system, with this arrangement being repeated for the star-

board areas. Six hand-operated (BCF) type fire extinguishers are provided; five for use in the pressure cabin and one for external use, the latter being located in the emergency equipment stowage in the fuselage nose section. The provision of pressurised joints at certain stages of the fuel system and suitably located drains and vents in the engine bays also minimise the risk of fire.

2. Inertia switches, Mk.1 on the lower forward face of the rear pressure bulkhead are ◀

provided to break the circuits to the generators, isolate the batteries to prevent the outbreak of fire in crash conditions, and also to discharge the containers automatically when deceleration exceeds 3G. Details of these installations are given in Sect.5, Chap.1.

OLYMPUS ENGINES SYSTEM

General

3. To ensure adequate protection against fire risk, each engine compartment

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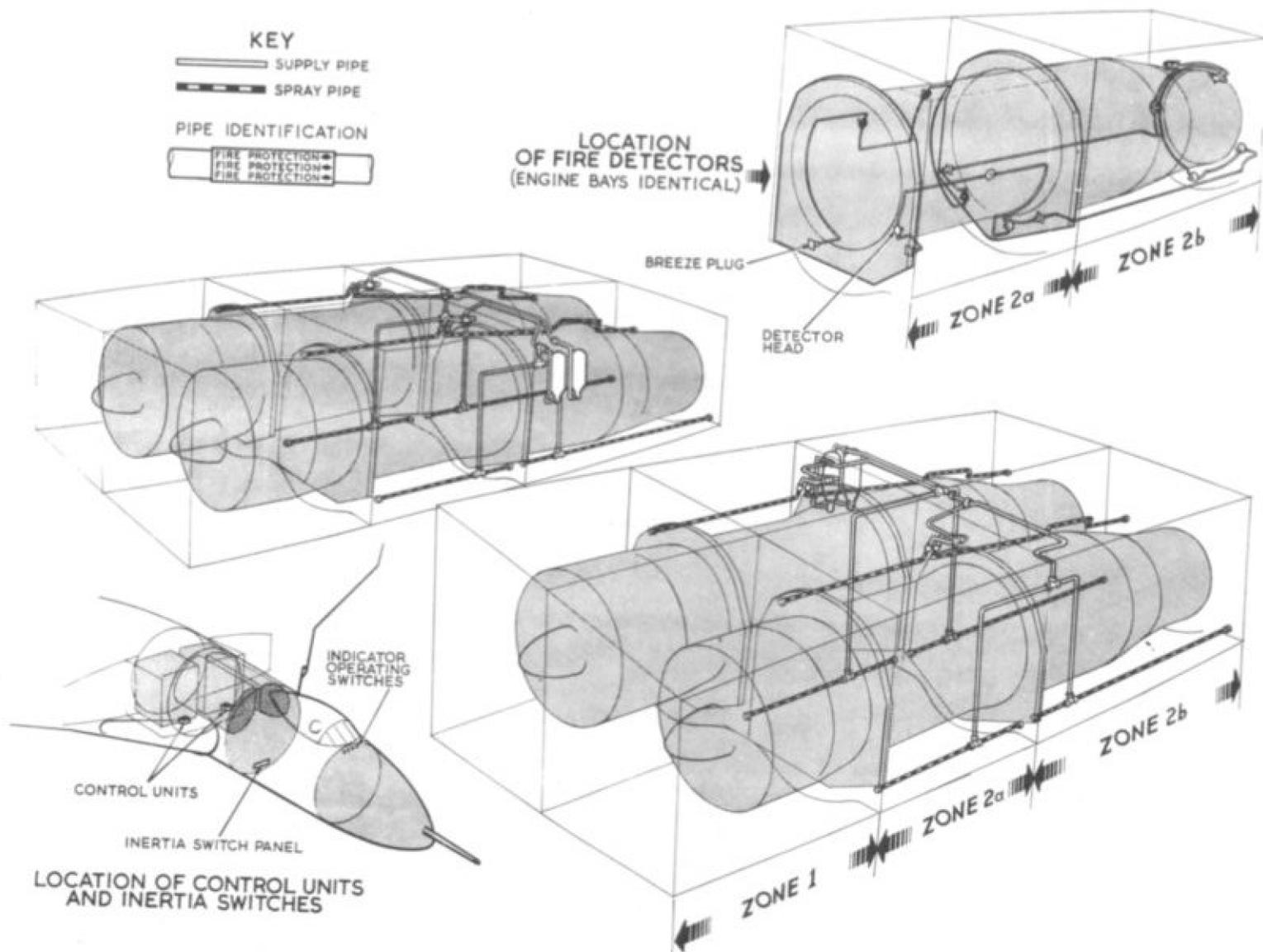


Fig 1 Fire protection system - engines
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is divided into zones, by bulkheads integral with the engine which seal on to the aircraft structure, the compartments thus formed being lined with 28 s.w.g. titanium sheet. The forward zone, designated Zone 1, is not covered by the extinguishing system spray pipes. The rear zone is sub-divided by an intermediate bulkhead immediately forward of the combustion chambers, the two positions being known as Zones 2A and 2B respectively. Refrasil blankets are fitted to each side of the centre engine rib in Zone 2B, these heat insulators protect the rib from the high temperature which is produced at this point.

4. Drainage from the engine fuel system, dump valve, combustion chambers and turbine annulus is piped to collector tanks self-emptying in flight through outlets in the rear engine doors.

5. Automatic warning of fire is given by a thermo-electric resetting fire detector system consisting of two control units Ref. No. 5CZ/6282265 or 5CZ/6282266, mounted port and starboard in the nose-wheel bay, a set of detectors Ref. No. 5CZ/4335581 in engine zones 2A and 2B and combined warning indicator/operating switches, one to each engine on the pilots' cockpit warning.

6. The indicator/operating switches are painted red and numbered 1, 2, 3 and 4 - relative to the engine system with which they are associated. An automatic warning only is given and normally the extinguishant is released by manual operation of the indicator/operating switch. In crash conditions, where the deceleration exceeds the given value of 'g' (set on the inertia switches) the extinguishers are discharged automatically.

System installation

7. Two Graviner fire extinguishers (12 lb

capacity) using methyl-bromide as the extinguishant, are installed on each side of the bomb bay. From the forward extinguisher, light-alloy piping leads to the inboard engine compartment and from the rear extinguisher to the outboard engine compartment. These pipes feed fore-and-aft spray-pipes which pass along the inboard lower and outboard upper sides of engine zones 2A and 2B. The extinguishant is sprayed into these zones through small holes positioned in two rows along the length of the spray-pipes.

Method of operation

8. This system of fire detection works on the thermo-electric principle of voltage generation when heat is applied to the junction of two dissimilar metals which form the thermo-couple. Each of the detector heads consists of two thermo-couples in series and of opposite polarity, one of which is shrouded from flame and rapid temperature changes, whilst the other, being exposed is rapidly affected by temperature change. When the combined temperature of the exposed thermo-couples exceeds that of the shrouded couples by 185 deg C., sufficient electrical output is generated (7.5 millivolts) to illuminate the corresponding cockpit warning indicator. It is then necessary to depress the warning indicator/switch to fire the electrically operated fuses which discharge the extinguishers.

9. When a cockpit indicator is depressed, an explosive charge in the extinguisher is ignited, electrically, to rupture the container diaphragm and create an outlet through which liquid methyl-bromide can flow into the pipe line system.

FUEL TANKS SYSTEM

General

10. A methyl-bromide system protects the

fuselage and wing fuel tanks, the extinguishers being automatically discharged by the firewire detectors or the inertia switches. An indicator lamp, positioned alongside the bomb bay warning lamp on the second pilot's instrument panel, lights when any fuel tank extinguishers have operated. It should be noted that when the inertia switches operate both heads of the dual-headed wing tanks extinguishers are fired to supply extinguishant to the inboard and outboard bank of tanks simultaneously; the extinguishers for fuselage tanks and wing leading edge also operate.

System installation - fuselage tanks

11. The air space around the front (No.1) tanks is covered by two 12 lb fire extinguishers. The extinguishers, mounted in brackets secured to the aft face of the rear pressure bulkhead, supply three horizontal spray pipes clipped together with firewire elements, along the length of the tanks and one vertical spray pipe at the front face of the tanks.

12. Air space around the rear (No.2) tanks in the nose-wheel bay is covered by two 12 lb extinguishers, mounted in brackets on the bulkhead between the forward and rear tanks, which feed three horizontal spray-pipes passing rearwards along the length of the tanks and one vertical spray pipe at the forward face of the tanks. Firewire elements run adjacent to the pipe lines.

System installation - wing tanks

13. The five wing tanks on each side of the aircraft are divided into two bays by a double skinned rib, from the front to the rear spar, between the three inboard tanks and the two outboard tanks. The inner tanks are contained on their inboard face by the undercarriage outboard rib, and on their front and rear faces by the front and rear spars respectively. The outer tanks

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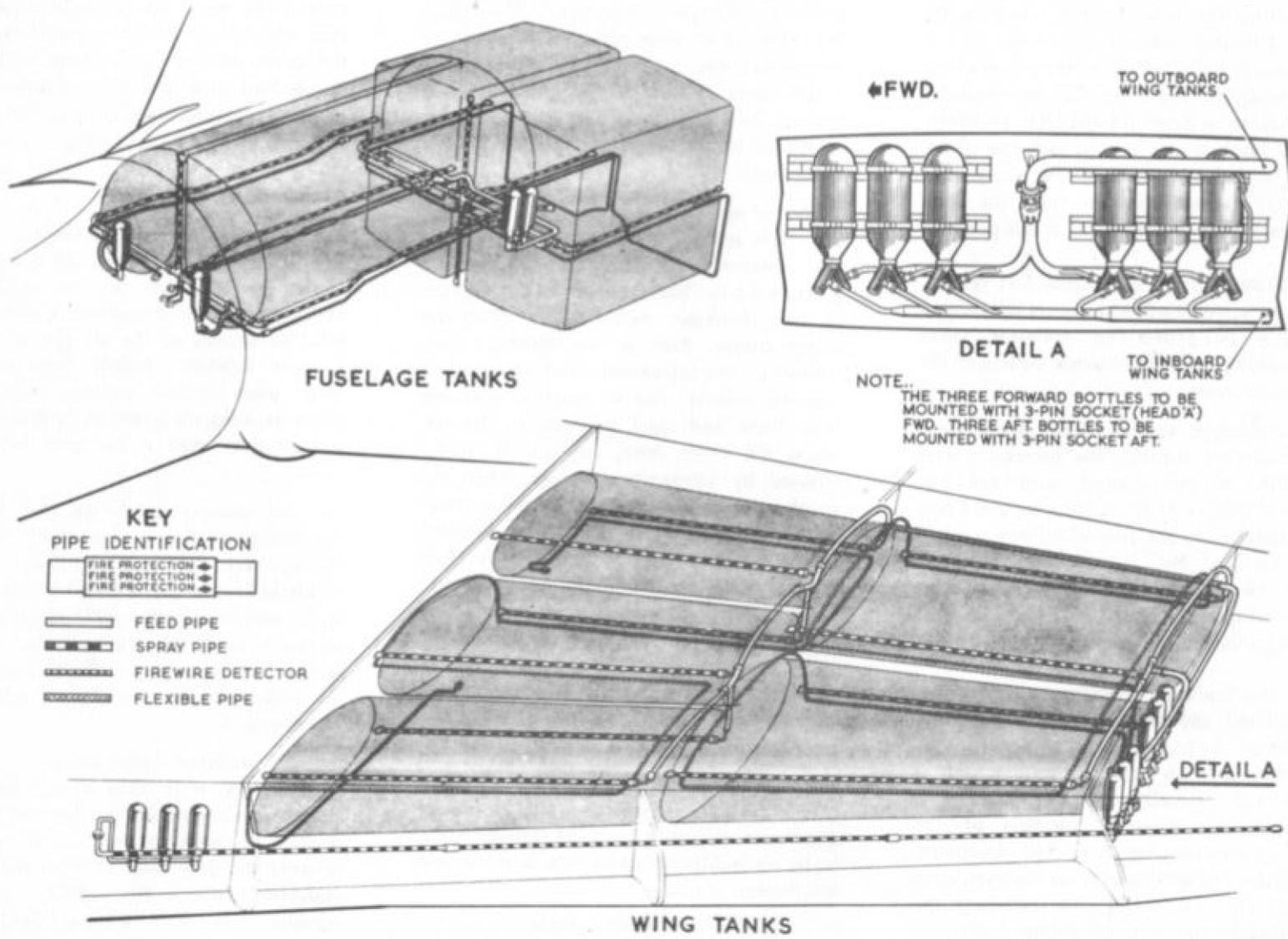


Fig. 2 Fire protection system—fuel tanks
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▶ are bounded by the outboard hinge rib and by the front and rear spars.

14. Six dual-headed methyl-bromide extinguishers are mounted in brackets on the transport rib. Pre Mod.2455; the methyl-bromide flow is automatically directed to either the inner or outer tank bays by operation of the relevant firewire detection system. Post Mod. 2455; the firewire detection system is made inoperative and one head of each extinguisher is disconnected. The wing tank extinguishers can then be operated by push-switches situated on panel 1P and the extinguishant is discharged to the inner tank area only. It should be noted that the firing of any one head discharges the whole contents of the container. Outlet pipes from the extinguishers pass along the transport rib and rear spar to connect to a further pipe, disposed centrally between the tank groups, which supplies spray-pipes on the forward and rear face of the tanks. Firewire elements are located adjacent to the pipe lines.

LEADING EDGE SYSTEM

General

15. Three 12 lb methyl-bromide extinguishers are provided in the bays forward of the main-wheel units to feed a spray pipe fitted along the leading edge of the wing, inside the anti-icing ducting to prevent a fire due to a strike ahead.

FIRE EXTINGUISHERS

21. The fire extinguishers, charged to a pressure of 250 psi, are painted peacock blue for identification purposes.

Pre Mod.2455; the extinguishers are operated automatically from the firewire detectors around the wing fuel tanks. Post Mod 2455; they are operated by the push-switches mentioned in para 14.

BOMB BAY SYSTEM

General

16. A methyl-bromide system is provided for protection of fuel tanks and special stores carried in the bomb bay. The system is operated automatically by firewire detectors or by the inertia switches; an indicator on the 2nd pilot's panel lights up when the extinguishers have been discharged.

Installation

17. Four Mk.13A methyl-bromide bottles are grouped each side of the bomb bay to the rear of bomb arch 64.592A, the outlet pipes from the bottles of each group are connected to a gallery pipe. The gallery pipes direct the methyl-bromide to stainless steel spray-pipes, which run along the port and starboard sides of the bomb bay, and have two rows of small diameter holes to distribute the extinguishant throughout the length of the bay.

SERVICING

22. No servicing is possible to the extinguishers except to determine that they have not been inadvertently discharged. The junction boxes of the extinguishers have a bottom cap-nut fitted with a mechanical discharge indicator

AAPP SYSTEM

General

18. A 10 lb methyl-bromide extinguisher, mounted externally on the front end panel of the power plant casing, is controlled by a button on the AAPP control panel in the crew's compartment. In the event of a fire in the power plant compartment, a series of detector heads mounted around the inside of the casing energize a warning light contained within the push button which, when depressed, will discharge the extinguisher into the power plant through a nozzle mounted on the interior of the front panel, and automatically close the LP cock.

EMERGENCY EQUIPMENT

19. Hand-operated (BCF) type extinguishers are mounted at convenient positions in the crew's compartment and in the emergency equipment stowage in the nose. Their location, together with other details, is given in Table 1.

20. Asbestos gloves and crash axes are provided for use in an emergency, details of this equipment being given in Sect.1, Chap.3.

WARNING . . .

Methyl-bromide fumes are toxic and must not be inhaled.

pin, which will protrude by about 1/8 in from the cap to give positive indication of discharge. Because of the difficulty of checking the bomb bay extinguishers when the bomb bay tanks are fitted, two indicator fuzes, Type A984 have

► been introduced by Mod.2009. The fuzes are located on a mounting bracket on the rear face, port side of the front spar in the bomb bay. The glass front of the fuzes become coloured red when the fuze has blown and an immediate check must be undertaken to determine if the related extinguishers have been operated.

23. In addition, the contents of the extinguishers should be periodically checked by weighing to ensure that no loss has occurred. The fully-charged weights are given in Table 1 and are also stamped on the head of the container. If the weight is outside the tolerance quoted in Table 1, the container is to be removed and replaced with a serviceable item.

System pipes

24. To ensure efficient delivery of extinguishant in the area protected by the system, feed pipes and connections must be leak free at all times. A leak test must be carried out when the system has been disturbed and this condition is in doubt, or at times given in AP 101B-1902-4. With the extinguisher bottles

disconnected and the feed pipe blanked off at the first spray pipe connection, pressure test the pipes and connections at 250 psi – there should be no leakage over a period of 30 minutes. When the test is complete, shut-off the air supply and re-connect the spray pipe system, this can then be checked, to ensure that no blockage exists, by blowing through at 250 psi. Finally, disconnect the air supply and restore the system to normal bearing in mind that these last made connections are not tested and must, therefore, be made with great care.

FIREWIRE DETECTOR SYSTEM

25. For the servicing of the electrical circuits and description of components refer to Sect.5, Chap.1 of this publication, and the AP 107E series.

INERTIA SWITCHES

26. At periodic intervals the switches are to be examined for the presence of moisture or damage. The inside of the switch can be observed

through the transparent case. Should moisture be present the switch must be replaced by a serviceable one.

27. To reset an inertia switch proceed as follows:-

- (1) Remove the four screws from the terminal-block cover and remove the cover. This will reveal the resetting plunger.
- (2) Press on the resetting plunger until the contact bow springs back into the unoperated position.
- (3) Refit the terminal-block cover.

HAND-OPERATED EXTINGUISHERS

28. At the periods stipulated in the Servicing Schedule the hand-operated extinguishers are to be weighed to ensure that no loss of charge has occurred. The reading obtained should be checked against the fully charged weight and logged against the last recorded weight on the tab provided. ◀

TABLE 1
Fire extinguisher details

Location	Qty.	Type	Ref.No.	Empty Weight	Full Weight (with cartridge) unit	Charge Pressure
ENGINE SYSTEM						
Each side of bomb bay (2 per side)	) 4)	Graviner Mk.13A (methyl-bromide)	27N/99	6 lb. ¾ oz. ± 3 oz.	18 lb. 4½ oz. ± 4 oz.	250
FUEL TANK SYSTEM						
No.1 fuselage tanks - rear pressure bulkhead	) 2)	plus One 2-pin cartridge	◀ Pre Mod. 1346 12K/1306 Post Mod. 1346 12K/1316			
No.2 fuselage tanks - tank bulkhead	) 2)	A716 per extinguisher	Mk.3 ▶			
Main plane tanks - Outer elevon hinge rib 6 per side	12	Graviner Mk.14A dual head (methyl-bromide) plus One 2-pin cartridge A716 One 3-pin cartridge A717 per extinguisher	27N/102 ◀ Pre Mod. 1346 12K/1306 Post Mod. 1346 12K/1316 Pre Mod. 1346 12K/1307 Post Mod. 1346 12K/1317	7 lb. 4 oz. ± 3 oz.	19 lb. 10½ oz. ± 4 oz.	250 Mk.3 Mk.3 ▶
LEADING EDGE SYSTEM						
Forward of main-wheel bays (3 per side)	6	Graviner Mk.13A (methyl-bromide) plus One 2-pin cartridge A716	27N/99 ◀ Pre Mod. 1346 12K/1306 Post Mod. 1346 12K/1316	6 lb. ¾ oz. ± 3 oz.	18 lb. 4½ oz. ± 4 oz.	250 Mk.3 ▶
A.A.P.P. Attached to unit	1	Graviner Mk.4 AX (methyl-bromide) plus One 2-pin cartridge A716	27N/152 or 27N/100	3 lb- 13¼ oz. ± 3 oz.	10 lb. 1 oz. ± 4 oz.	200
BOMB BAY SYSTEM						
Bomb bay wall, port and starboard (4 per side)	8	Graviner Mk.13A (methyl-bromide)	27N/99	6 lb. ¾ oz. ± 3 oz.	18 lb. 4½ oz. ± 4 oz.	250

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TABLE 1 - Fire extinguisher details - continued

Location	Qty.	Type	Ref.No.	Empty Weight	Full Weight (with cartridge) unit	Charge Pressure
HAND-OPERATED EXTINGUISHERS INTERNAL						
Behind each pilot's seat	2)					
Below pilot's floor (secured to floor support)	1)	Graviner				
Crew's seat - port side	)	Type 34H	27N/299	2lb.-14 ozs. ± 4 ozs.	5lb.-7 ozs. ± 4 ozs.	45
Crew's seat - starboard side	1)	(B.C.F.)				
	1)					
EXTERNAL						
Fuselage nose stowage	1	Graviner				
)	Type 34H	27N/299	2lb.-14 ozs. ± 4 ozs.	5lb.-7 ozs. ± 4 ozs.	45
)	(B.C.F.)				

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