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From: Commanding Officer, Helicopter Anti-Submarine Squadron SIX
To: Commander, Naval Air U.S. Pacific Fleet
Subj: Search and Rescue equipment and procedures: recommendations
for improvement of
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EXTRACTED FROM THE ORIGINAL DRAFT DOCUMENT

6. Forward Firing Machine Gun

Past operations in Southeast Asia with SH-3A aircraft have indicated the desirability of a forward firing machine-gun. The present M-60 machine guns mount in the personnel door and cargo door and are designed so that neither affords a field of fire directly forward of the aircraft. Furthermore, during rescue operations, the forward port firing mount is often unattended while both crewmen are involved in operating the rescue hoist and aft mount.

Obviously, while effecting a rescue from a hover, the cockpit may be subjected to ground fire from forward and to port. The development of a fixed standard M-60 to be located on the outside of the aircraft and below the existing swivel mount was the desired goal.

Important requirements to be met were:

1. Developing an adequate fixed mount that would not interfere with flexible mount.
2. Maintaining adequate fire control over the weapon by the pilot and/or the co-pilot.
3. Loading and servicing the weapon in flight.
4. Retention of expended brass and links within the aircraft.

5. Minimizing effects to the aircraft caused by firing.

Positioning an M-60 in relation to the flexible mount indicated that the first requirement could be readily met. From available materials the mount pictured in [Encl.\(1\)](#) was constructed. Exact dimensions for materials used was not carefully considered as long as they were obviously adequate to meet anticipated forces.

The forward firing M-60 mount is divided into two separate assemblies. The rear half is so designed that it will accommodate either the M-60 or the M-60D mounting bracket. A lock pin engages lugs on these brackets and corresponding lugs on the gun, thus restricting canting and lateral motion of the weapon. The front half of the mount was initially designed to utilize existing bi-pod mounting bolts but later modified to facilitate quick removal of the gun.

The second requirement, that of controlling the firing of the weapon, was first attempted through the use of electrical solenoids. No units which provide a long enough throw or reliably to overcome the forces inherent in the weapons firing mechanism were available. A satisfactory means of control was developed through the use of a linear actuator (FSN-1680-858-6803-ABN). This unit provides sufficient power to reliably actuate the M-60 firing mechanism. Its primary drawbacks are that it operates more slowly and lacks the fail-safe ceasefire qualities of a solenoid. Electrical power drives the actuator to the fire position. A reversal of electrical polarity is necessary to drive the actuator to the ceasefire position. In the event of electrical power failure the actuator remains in its last position. Control of the actuator is achieved by an electrical relay through the weapons release button on each cyclic, either of which serve to operate weapon. Emergency stoppage of the weapon is readily

effected through release of the feed mechanism latch. Further positive electrical safing is provided by routing actuator power through the master armament switch of the aircraft.

The third requirement, effective feeding of ammunition to the weapon, was achieved through the use of a feed chute. This component is locked to the weapon through an existing system of latches and the plate from a standard 100 round magazine. The chute angles inward beneath the weapon and penetrates the armor plate. Ammunition is drawn from containers inside the aircraft and fed through the chute into the gun. No difficulties in feed with this arrangement have been encountered. Firing tests indicated the workability of the system with new or rebuilt guns. However, in older weapons due to the wear of certain components, it frequently misfired with belts containing more than twenty (20) rounds. During these tests the ability to service the weapon under flight conditions was proven by the rapid clearing of jams, etc.

Quick detachment of the weapon to facilitate replacement or in-flight servicing of the weapon was deemed a desirable feature. Redesign of the front mount ([Encl\(1\)](#)) to accomplish this consisted of fabricating a triangular shaped plate with a flange welded to its base. Two bolts through the flange secure the plate to the armored door slightly forward of the original mount and the plate is drilled to receive the muzzle break. This assures accurate alignment while allowing more rapid removal of the gun. Removal of the feed chute using the existing latches, breaking the electrical connection at a cannon plug, and removing the lock are the other simple steps for detaching the weapon.

The fourth requirement, to retain expended brass within the

aircraft, was felt necessary to safeguard the tail rotor in all flight attitudes. Jamming was experienced initially but by cutting away the forward side of the standard ejection chute this problem was eliminated.

The fifth requirement, minimizing effects to the aircraft caused by firing, was met by locating the weapon so that the muzzle was over the one-half (1/2) inch aluminum armor plate. [Encl.\(1\)](#) shows the effects of in-flight firing to the aircraft. Other than smoke smudges along the fuselage no undesirable effects could be determined. Muzzle blast noise in the cockpit is not of sufficient magnitude to be significant. The weapon is depressed five (5) degrees below the longitudinal axis of the aircraft. This causes the point of impact of the bullets to appear nearly level with the pilot's line of sight in an 80 to 100 knot attitude at a mean range of 700 feet. Point of impact was directly ahead of the aircraft and could easily and rapidly be controlled through normal displacement of aircraft controls. A high degree of accuracy was obtained on stationary surface targets during the test flights considering the lack of a gun-sight. A simple sighting system would improve accuracy in situations where hits are not readily apparent, such as in heavy foliage.

The M-60 machine gun provides considerably less firepower than the HH-53 mini-gun installation but it does offer a simple and effective forward firing weapon using readily available equipment.