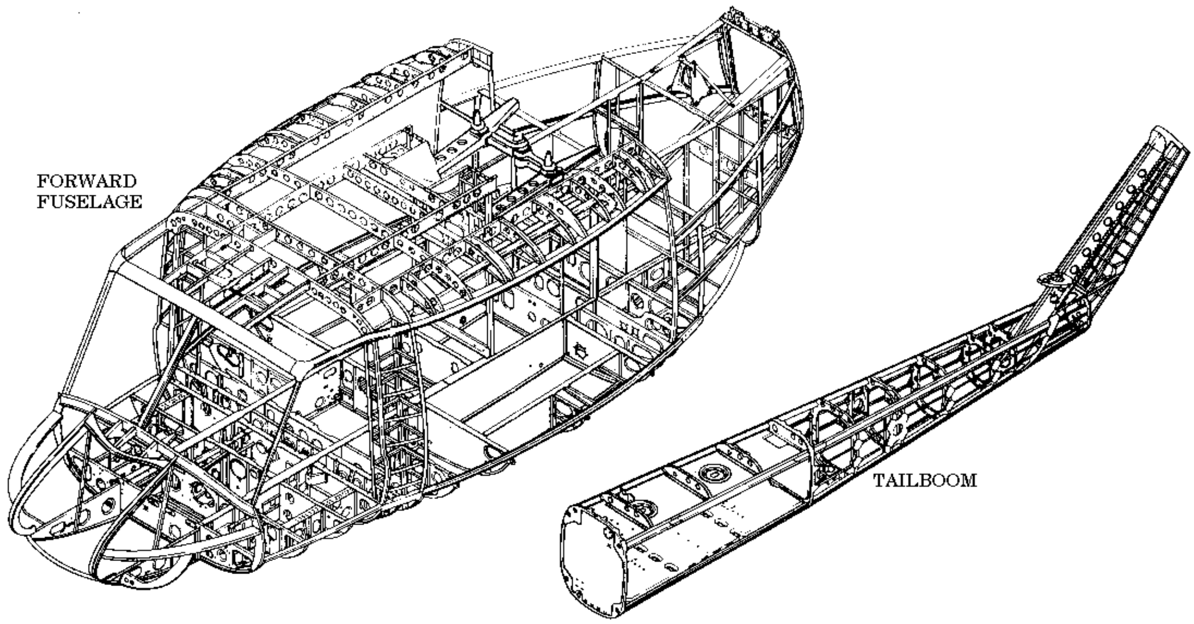
CHAPTER 4

FUSELAGE

TABLE OF CONTENTS

ILLUSTRATIONS

Airframe



INTRODUCTION

The Model 212 is a twin engine helicopter designed for high performance, low maintenance and maximum versatility. Crew doors and passenger-cargo doors on both sides permit easy entrance and exit to cockpit and cargo-passenger compartments. Transmission and engine cowling provide easy access to major components.

General

The airframe consists of two major sections, the forward fuselage and the tail boom.

The major components associated with the forward fuselage are:

- Landing gear
- Powerplant
- Transmission and mast
- Main rotor assembly and rotating controls
- Cowling
- Fuel system

The major components associated with the tail boom are:

- Tail rotor drive shafting
- Tail rotor gear boxes
- Tail rotor assembly
- Synchronized elevator
- Tail skid

The forward fuselage is the major load carrying area although the tail boom does incorporate a baggage compartment.

Forward Fuselage

Structure

The fuselage has two main longitudinal "I" type beams, 28 inches apart that form the major load carrying structure. The two main longitudinal beams provide the primary support structures for the cabin structure, landing gear, fuel tanks, transmission, powerplant and tail boom. From Station 129 (the front edge of the pylon island) the main beams are cantilevered forward to Station 23. At Station 129, the beams extend upwards to form mounting structure for the transmission. The beams continue aft and curve inward to Station 243.937 at which point they terminate in mounting points for the tail boom. The upper edges of the main beams aft of the transmission provide mounting points for the engine Deck and powerplant installation.

The lower edge of the main beams serve as mounting points for the landing gear cross tubes, the tubes being held in place by four padded caps.

The traverse "lift beam" is located between the two vertical main beams in the area of the pylon island.

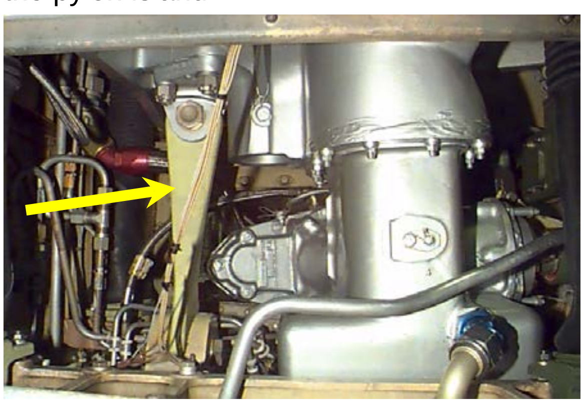


Figure 4-1 Lift Link

In flight, cabin loads are transferred to the main beams. From the main beams, the loads transfer to the transverse lift beam, then to the lift link, to the transmission case, to the mast, and then to the main rotor. External loads are attached to the lower edge of the traverse lift beam at or near the 138.0 CG point. The fuselage outside of the main beam area is basically a secondary structure for the support of useful loads, including the side and nose racks for radios and electrical gear, roof and door frames, fuel cell support panels and floor.

The cabin airframe is considered primarily made of aluminum alloy, except for titanium work deck areas, titanium fuel cell panels and the stainless steel firewalls. Titanium and aluminum bonded honeycomb sandwich type construction is used in the floor panels, roof and engine work decks for strength. Some areas, such as nose access doors and nose panels, are made of fiberglass bonded honeycomb panels.

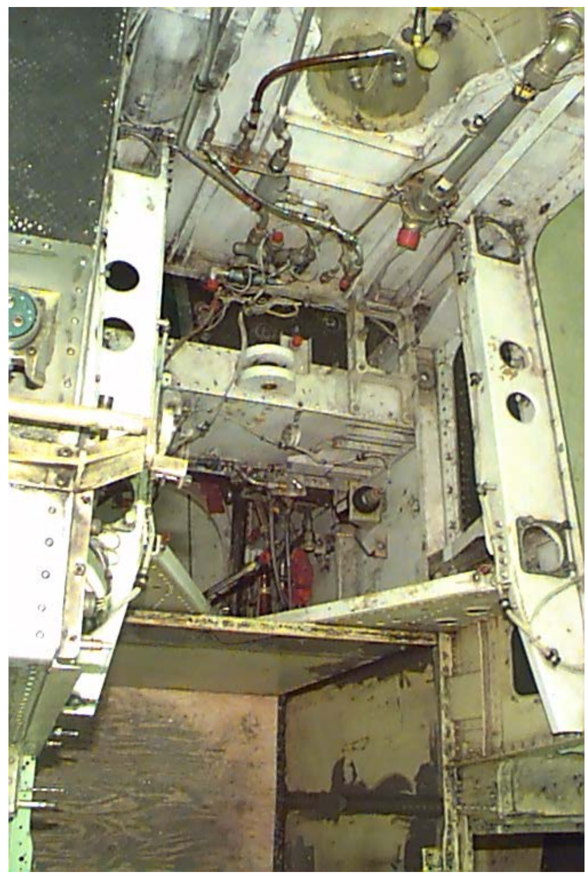


Figure 4-2 Transmission Mount Area

[Note: The original Bell IFR 212 System aircraft had a fin or dihedral sail. The sail is a vertical, aerodynamic fin, 6 square feet in area, mounted on the top of the cabin roof forward of the mast. This sail (now removed) provided positive dihedral stability so that when the helicopter is yawed, it will roll and turn in the direction of yaw. This allowed the pilot to more easily coordinate turns, and the helicopter will exhibit handling characteristics similar to fixed wing aircraft as specified under FAA criteria.]

The forward end of the main beams supports the nose section. The structure is primarily fiberglass covered honeycomb formed panels supported by aluminum bulkheads and beams. The nose section provides the support for the windshields, crew doors and nose bubbles.

Figure 4-3 Nose Compartment

The closure formed by the honeycomb structure and bubbles houses the electrical and electronic gear, which are readily accessible through a large hinged door and lower access panel.

Cargo tie down fittings, installed in rigidified floor, have a load capacity of 1250# vertical and 500# horizontal. The aft cabin bulkhead tie downs and seat belt rings have the same strength. When cargo is hauled internally, cargo restraint equipment is required.

Maximum cabin floor loading is 100 lbs./Ft^2

To protect the floor Campbell normally places wood panels on the floor. These panels also help to distribute the weight of all loads.

Figure 4-4 Cargo Tie down Fittings

The aft portion of the forward fuselage consists of the main vertical beams, the engine work deck for the powerplant, and the structure at the sides that provides upper fuel cell cavities. It contains the pylon island structure for transmission support.

The work deck is the top closure of the aft fuselage and is made of a honeycomb sandwich type of construction with titanium upper skin, aluminum honeycomb, and fiberglass lower skin.

The transmission/pylon assembly is mounted as an integral unit on 5 isolation mounts, located about a rigid structure, 4 main mounts plus a 5^{th} mount. These mounts provide the isolation of oscillatory and torsion loads from the rotor.

Windshields and Windows

The glass (IFR) or plastic (VFR) windshields are set in watertight sealer, mounted to the nose section and cabin roof. Transparent plastic nose bubbles are also incorporated for ease of visibility forward and down.

Two transparent green or gray blue, tinted plastic cabin roof windows are located directly above the pilot and co-pilot positions for additional visibility. These windows are mounted to the roof structure.

Crew Doors

Access to the crew compartment is through two wing-out doors hinged to the nose section at the forward end of the door by two hinges. Each door incorporates three transparent windows, two of which are stationary and one that is adjustable.

A latch assembly, operated from inside or outside, secures the crew doors in the closed position. The latch is spring-loaded to the closed position, spring compressed in the open position and mechanically held (over-center) in the locked position. A door strap is provided to pull in on the door to ensure the upper rollers are inside the strikers at the top of the doorframe. Doors not closed at the top leave a gap that causes warping of the door possibly breaking the roller pins.

Figure 4-5 Emergency Exit Handle

In an emergency, the pilots doors may be jettisoned by pulling the EMERGENCY RELEASE handle forward inboard of the door. This action releases the forward hinge pins that retain the door. At the same time, a cable to the doorpost latch striker pulls the striker latch up to release the aft portion of the door. The door, as an emergency exit, can be pushed out by pivoting on the rollers at the top of the door. As mentioned in an earlier chapter, with floats inflated, the bottom and back of the door is blocked by the float. The crew door is removed by opening the door, pulling the emergency release and lifting the door from the helicopter. To install the door, position the door in the hinges on the nose, rotate the bellcrank of the release mechanism to insert the pins in the hinges and close the door.

Hinged Panel

An 18" hinged panel is attached to the doorpost on each side, to provide a wider opening for cargo loading. With the hinged panels open, the cargo opening is increased from 74" to 92". Each panel has a plexiglas window, retained by rivets.

Figure 4-6 Hinged Panel

The hinged panel is attached to the doorpost by two quick release pins in the two hinges. It is retained in the closed position by retracting pins in the upper and lower channels, operated by a latch handle on the inboard side of the hinge panel. The hinge panel is held in the open position for cargo loading by a spring and stud at the top of the panel. An upper and lower fitting in the hinged panel provide a contact point for the cargo door locking system.

Cargo/Passenger Doors

A large sliding door on each side of the helicopter provides access to the cargo/passenger area. Each sliding door has a latch for securing the door, and two windows that can be jettisoned for emergency escape exit. Two micro switches located on the cabin ceiling by the upper forward edge of each sliding door activate a caution panel segment titled DOOR LOCK if either cargo door (or Baggage Compartment Door) is not fully closed.

Figure 4-7 Passenger Door

The door can be secured in the open position by a retractable stop in the cabin roof near the aft cabin bulkhead, and against a bumper in the lower track in the aft fuselage. CAUTION: Be sure the door handle is in the open position when the door is being closed, to prevent the latch from riding over the spring lock in the hinge panel, causing the door to be jammed shut. If this occurs, the two plastic guard covers must be removed to release the spring locks.

Flight operation is approved for both crew doors on or off, both cargo doors open or removed, both hinge panels installed or removed, as long as it is the Bell Helicopter standard interior and symmetrical configuration. The hinged panel cannot be removed unless the cargo door is also removed or locked in the open position.

Powerplant Cowling

Cowling encloses the powerplant and air management systems. It consists of two engine inlet fairings, two engine cowl top panels with the two engine upper cowls attached, two engine lower cowl, two combining gearbox top cowls, two combining gearbox side panels, an oil cooler support cowl, two combining gearbox and engine side cowls, with an oil cooler fairing.

Figure 4-8 Powerplant Cowling

Two quick release latch assemblies are used in each engine upper and lower cowing. One quick release switch latch and two screws secure the air inlet fairings. Screws secure the remainder of the cowls, fairing and panels.

XMSN Fairing

A one-piece fairing covers the front of the upper transmission area and is secured by two latches. This fairing hinges at the front and can be held open by a brace.

Figure 4-9 Transmission Fairing

Landing Gear

The landing gear is constructed of formed aluminum alloy tubes, consisting of two skid tubes attached to the ends of two arched cross tubes. The cross tubes are secured to the fuselage structure at the main beam points by four padded cups, two front and two rear. Missing or bad pads may cause a medium frequency vibration in a hover.

Figure 4-10 Landing Gear

Each skid tube is fitted with a forward end step, a tow ring fitting, two saddles with sockets for cross tubes, a rear end cap, two eyebolt fittings for ground handling wheels and a two piece skid shoe along the bottom.

The complete landing gear can be removed as an assembly or skid tubes and/or cross tubes may be removed separately. Inspect landing gear cross tubes after hard landing or overloading, or when deflection is suspected.

Passenger Steps

Campbell normally installs high clearance skid gear and associated with that also installed a fixed passenger step to facilitate easier entry and exit. (Note: Retractable steps can be installed on each landing skid tube for access to the passenger/cargo compartment. The steps are raised and stowed by means of a 28 volt DC operated electrical actuator on each skid tube, through a switch on the miscellaneous panel of the pedestal, RAISED-STOWED. In the STOWED position, the step is faired against the top of the skid tube. (Figure 2-16) shows the passenger step. No weight is to be on the step when raising or lowering. Weight on it at that time will burn out the motor. The step is made of plastic and is therefore susceptible to breaking if something is dropped on it.

Tail Boom

Structure

The tail boom is attached to the fuselage by four NAS bolts at station 238.08 and 243.937. The tail boom supports the tail rotor drive shafting and covers, tail rotor, vertical fin, the synchronized elevator, tailskid and two gearboxes. The tail boom is a semi-monocoque, tapered construction with "J" stringers and hat section longerons. The bulkheads are approximately 21" apart. The primary construction is aluminum alloy, with aluminum skin.

The vertical fin is an integral part of the tail boom, since proper alignment of the drive shafting is necessary. The upper portion of the vertical fin forms the mount for the tractor type tail rotor and 90 degree gearbox.

A 42-degree gearbox is mounted on the tail boom and provides a change in direction but no reduction in speed. A 90-degree gearbox mounted on the top of the vertical fin provides a change in direction of drive and a 2.6 to 1 reduction in speed.

Driveshaft

Three hanger assemblies mount the tail rotor drive shafting on the top surface of the tail boom. A fourth hanger assembly is mounted on a support on the powerplant work deck. A total of 6 drive shafts connect from the transmission to the 90-degree gearbox, 5 are identical and one is shorter.

Driveshaft Covers

Two dust covers, hinged on right, protect the drive shafting on the tail boom. A cover assembly protects the 42-degree gearbox. A dust cover, hinged on the left, protects the drive shaft on the vertical fin. Spring fasteners release the drive shaft covers and full-length pins provide for the hinge action.

Tail Skid

A tubular steel tailskid is attached to the lower aft section of the tail boom, to warn the pilot of tail low landing attitude. It is removed by removing the two light fairings at the aft of the boom. Caution should be used not to over stress the skid during ground handling and servicing operations.

Replace cracked or permanently buckled skid. Eight degrees of bend is allowed providing it is not stressed.

Figure 4-11 Sync. Elevator

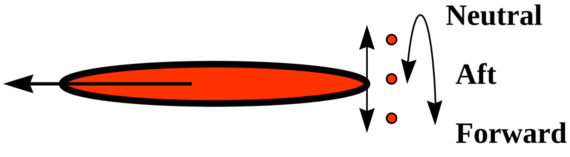
Synchronized Elevator

The synchronized elevator aids in flight controllability, effectively insures a greater CG range, permits higher forward speeds and gives more stability in all modes of flight.

The elevator consists of two negative lift airfoils, with 2' 6.58" chord, mounted near the aft end of the tail boom. Movement of the Sync Elevator is controlled by the fore - aft cyclic movement.

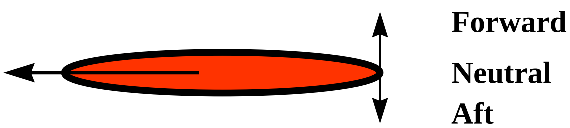
A Bell IFR 212 Sync Elevator has a linear movement. The trailing edge will be at its highest position when the cyclic stick is full forward. The trailing edge will move down as the stick is moved aft.

A Bell VFR 212 synchronized elevator (Figure 4-9) has a non-linear movement. The trailing edge will be at its lowest position when the cyclic stick is full forward. As the Cyclic is moved AFT to the neutral position the trailing edge will move up to its' highest point. When the cyclic stick is moved to full aft the trailing edge will move down again to the neutral position.



Rivets indicate correct position

Figure 4-12 VFR 212 and Sperry 212



Rivets do not indicate anything

Figure 4-13 Bell IFR 212

To equalize the download on the synchronized elevator (a bending moment resulting from rotor downwash swirl), the trailing edge of the right hand elevator is approximately 4 degrees lower than the trailing edge of the left-hand elevator. The non-symmetrical airfoil is built around a tubular aluminum spar with ribs and aluminum alloy skin.

Baggage Compartment

The baggage compartment is an integral part of the forward end of the tail boom. The structure forming up the baggage compartment is composed basically of aluminum faced honeycomb panels. The baggage compartment provides an additional 28 cubic feet of internal cargo loading space. Maximum compartment loading is 400 pounds. Loading density is limited to a maximum of 100 pounds per sq. ft. Normal loading is started at the forward end working aft.

Access to the baggage compartment is through a door approximately 28" by 21" located on the right side of the tail boom. The door incorporates a key lock and a switch.

Figure 4-14 Baggage Compartment

The switch activates internal lighting and will also illuminate a caution panel segment titled DOOR LOCK to inform the pilot that the door is not secured for flight. This same caution panel segment is connected to the two passenger/cargo doors; therefore, the pilot will have to determine which of the three doors is not secured for flight.

Figure 4-15 Smoke Detector

In the forward left hand roof area of the baggage compartment, there is located a smoke detector which is wired to the BAGGAGE FIRE warning light. A cockpit push to test switch allows checking the system for operation prior to flight.

INTENTIONALLY LEFT BALNK