UH-1Y Pocket Guide

Bell Helicopter
A Textron Company

- EXPANDS THE ENVELOPE -

The Bell UH-1Y is the most modern, capable and cost-effective tactical utility helicopter available. It shares a full 84% of it's leading-edge technologies and systems with the Bell AH-1Z attack helicopter for dramatically improved maneuverability, supportability and survivability. All of which means you can operate the UH-1Y with total confidence in the harshest environments and the hottest battle zones.

***THE UH-1Y MULTI-MISSION
CHOICE OF THE USMC
FOR THE 21ST CENTURY!***

- DELIVERS PERFORMANCE WITH A VENGEANCE -

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Introduction

The UH-1Y is one of two new aircraft being developed for the United States Marine Corps (USMC). The other aircraft is the AH-1Z, a dedicated attack aircraft. Together, these two aircraft comprise the H-1 Program. The AH-1Z and UH-1Y share a common tailboom, engine, rotor system, drive train, avionics architecture, software, controls and displays, and electronic warfare suite – greatly reducing the manufacturing/ procurement costs for both the US and participating allies.

The all new UH-1Y utility helicopter incorporates the latest advances in military avionics and rotary wing technology to provide a totally integrated platform for airborne command and control, aeromedical evacuation of casualties, transport of troops, supplies and equipment, and search and rescue. An **Improved Defensive Armament System** (IDAS) provides the aircrew organic capability for suppressive fire from 2.75 inch (70mm) rockets and a variety of machine gun systems. A state of the art, 3rd Generation staring focal plane array FLIR is presently being fielded on the current UH-1N, and will be carried forward to the

UH-1Y. The electro-optical system provides for day and night operation and the externally mounted weapon systems enhance survivability on both urban and conventional battlefields.

Glass Cockpit

The UH-1Y is fully marinized and capable of shipboard operations anywhere in the world. Manufactured for the US Department of Defense by Bell Helicopter Textron, Inc. the UH-1Y is the most capable utility helicopter of the 21st Century.

Background/History

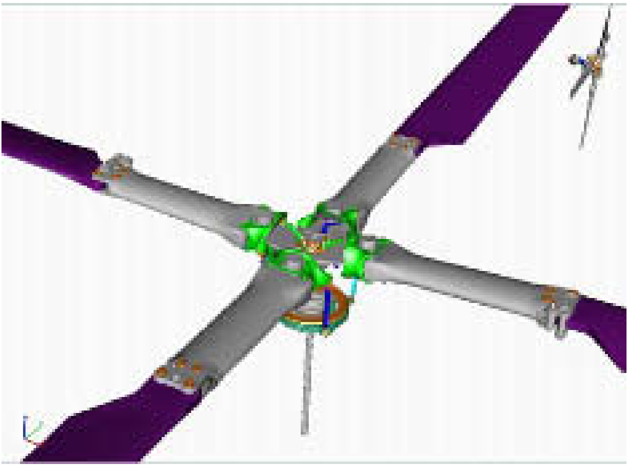
The UH-1 family of helicopters are the most successful military helicopters ever produced. Over 16,000 UH-1 series helicopters have been produced. Their operations span the globe and they are well known to armed forces throughout the world. The UH-1 set the standard by which all other utility helicopters are measured. Known for it's ease of operation and maintenance, large cabin doors which permit rapid ingress/egress, and battlefield survivability, the UH-1 series aircraft are in service with over 43 armed and paramilitary forces. Many early UH-1's are still flying today, some airframes having logged over 30,000 hours. The UH-1Y program offers the maximum acquisition flexibility to prospective operators. A familiar silhouette and proven heritage are about the only common features that the new UH-1Y shares with its famed predecessors. Bell Helicopter Textron has applied the latest aerospace technologies and manufacturing processes to create the new UH-1Y tactical utility helicopter. New four-bladed all composite, ballistically tolerant main and tail rotor systems are the most noticeable external changes that have been made. These airframe improvements, in conjunction with twin General Electric T700-GE-401C engines, the 21st century "glass" crew station, and other advanced systems, deliver substantial increased in tactical capability.

·Payload is over 170 % greater than the UH-1N, allowing the commander to move more troops and material, with fewer sorties.
·Range and maximum cruise speed have been increased by almost 50% over the UH-1N, delivering combat assets to their objective faster.
·High G loads can be sustained during tactical or evasive maneuvers.
·Significantly reduced vibration provides pilots better responsiveness and agility.
·A fully integrated, night vision goggle (NVG) compatible "glass" cockpit maximizes situational awareness, by easily delivering critical navigation, threat, communications, and aircraft system data to the crew.
·An advanced electronic warfare (EW) self protection suite and ballistically hardened components protect against a broad range of modern threat weapons.
·A proven crashworthy fuel system reduces the risk of fire and fully stroking energy attenuation seats protects the crewmembers and passengers from injury, in the event of a crash.

General Characteristics

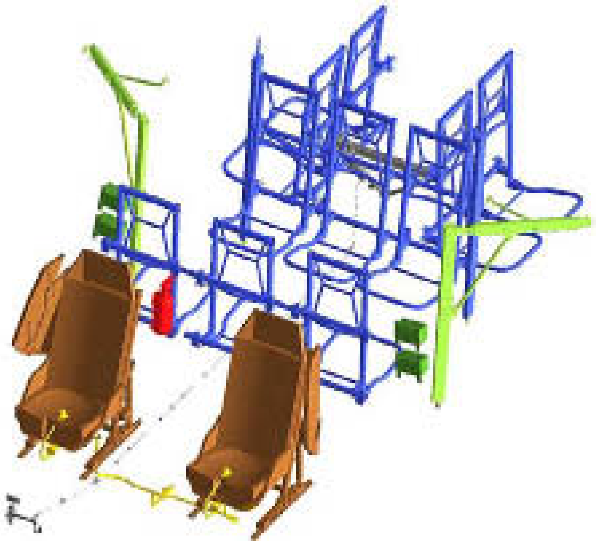
The UH-1Y is a twin engine, medium class, 18,500 pound maximum gross weight, utility helicopter designed to meet the military specifications of the United States Marine Corps for helicopter operations worldwide. Dual controls accommodate single or dual pilot operation. When coupled with appropriate mission equipment, the UH-1Y is capable of performing the following battlefield missions:

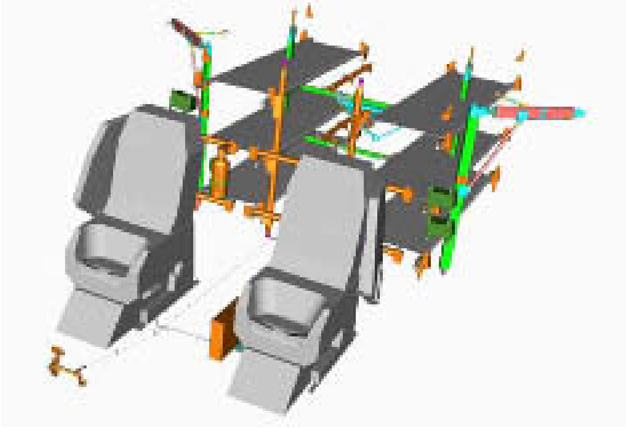
1. Airborne command, control, and coordination for assault support operations
2. Control, coordination, target acquisition, and terminal guidance for supporting arms
3. Assault transport and maritime special operations
4. Aerial reconnaissance
5. Aeromedical evacuations of up to six litter patients at the same time
6. Search and rescue operations
7. Tactical recovery of aircraft and personnel (TRAP)
8. Forward air controller (Airborne) [FACA] mission
9. Suppressive weapons capability against ground-to-air threats and a defensive capability against air-to-air threats
10. Operations from amphibious shipping, other floating bases, and austere shore bases.
11. Operations at night, in adverse weather, and other instrumented flight conditions at extended ranges.



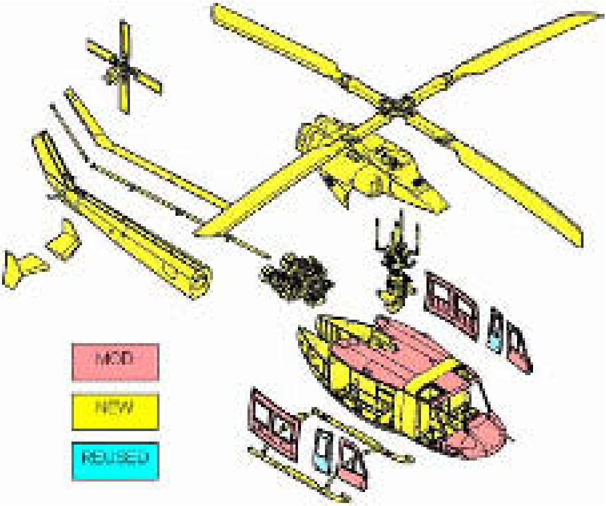
The UH-1Y rotor / drive system is comprised of a low maintenance, highly reliable, low vibration four-bladed composite main rotor, a bearingless rotor head with semiautomatic blade folding system, a new main transmission with higher output capability, and a high output tail rotor drive system with a four-bladed tail rotor. The incorporation of this new drive system gives the UH-1Y enhanced performance, increased payload, speed, and range, along with lower vibrations.

The UH-1Y comes equipped with crashworthy crew seats and provisions for either 10 crashworthy troops seats or 6 litters, and two permanent fast rope gantry installations.





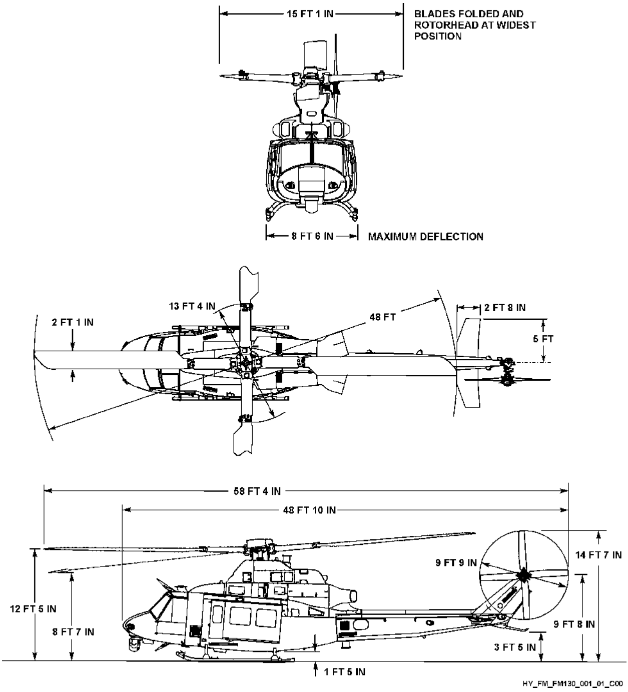
84% of the maintenance significant parts which make up the UH-1Y are interchangeable with the AH-1Z attack helicopter.



For the USMC H-1 Upgrade Program, modified and reused components come from existing UH-1N aircraft. The UH-1Y is also available as a totally new airframe.

The UH-1Y has a new fuel system with a capacity of 380 U.S. Gallons internal fuel. The fuel system is ballistically tolerant with built-in fire suppression and internal, self-sealing, crashworthy tanks in the fuselage. Two 77 U.S. Gallon auxiliary fuel tanks may be mounted to the external stores system for extended mission range. An On Board Inert Gas Generating System (OBIGGS) prevents fuel vapor from accumulating in the tanks and creating a potential fire hazard from ballistic penetrations.

External Dimensions



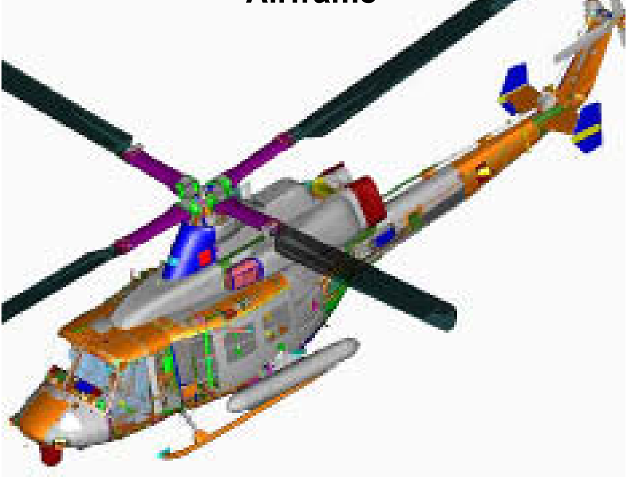
The maximum gross weight is 18,500 pounds and jacking and towing can be accomplished at this weight. Specification mission takeoff gross weights range from 16,983 to 17,480 pounds. The UH-1Y is designed for 2.8 g's normal accelerations, 198 knot dive speeds, 12 feet-per-second landings, and 20-g crash loads. The external cargo hook capacity is 5000 pounds.

HIRSS

Standard UH-1Y survivability equipment includes the Hover Infrared Suppressor System (HIRSS) for the engine exhausts, Radar Warning Receiver, Countermeasure Dispensers, Laser Warning System, and Missile Warning Set. Energy Attenuating and Armored Seats are provided for the aircrew.

Energy Attenuating Crew Seats

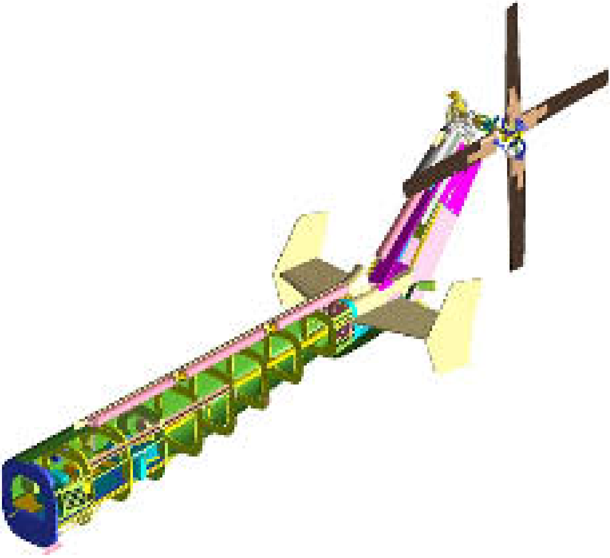
Design Features
Airframe



The UH-1Y utilizes a combination of conventional metal aerospace construction, as well as composite materials where applicable, to reduce cost and weight and improve reliability and ballistic tolerance. The fuselage consists of two main sections; the forward (cockpit) section, and the aft (tailboom) section. The forward section includes the crew cockpits, landing gear, power plant and pylon assembly. The tailboom section supports the tail group, tail skid, tail rotor, and tail rotor drive system. The **minimum design life** of the Airframe is **10,000 flight hours**.

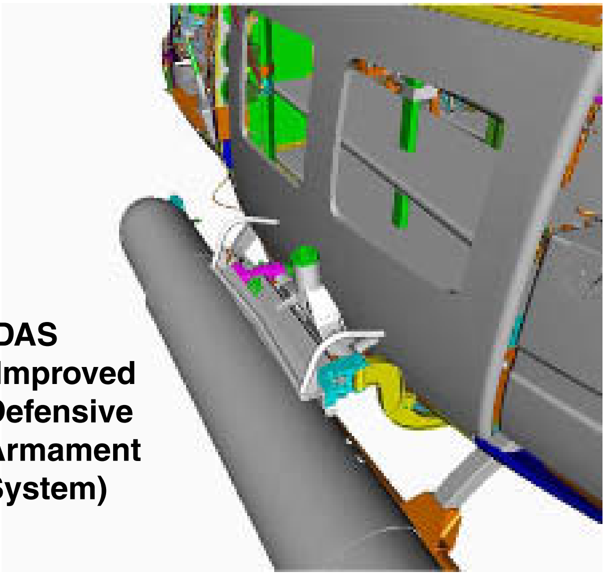
Forward [Cockpit] Section

Aft [Tailboom] Section



The airframe, drive system and the rotor system have the **growth capacity** to accept future increases in gross weight, allowing for heavier external stores capacity such as auxiliary fuel tanks and the full integration and utilization of future weapon systems.

The airframe consists of the main fuselage which includes the crew cockpit, cabin, the structure that supports the main transmission and houses and supports the internal fuel cells, landing gear, and tailboom. To increase the utility of the aircraft, a 21 inch stretch forward of the door post has been incorporated. Avionics racks are also incorporated in the stretch area. The **Improved Defensive Armament System** (IDAS) of the UH-1N is being retained. The **Bomb Release Unit** (BRU) ejectors have been oriented so that the 77 gallon aux fuel tanks can be used. The provisions for the rocket pods and machine guns are also retained.



IDAS (Improved Defensive Armament System)

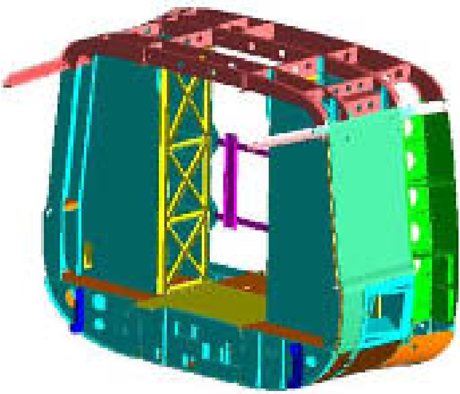
Most of the structure for the fuselage is new to accommodate the increased gross weight and the crash load factor requirements. The new arrangement includes mounting provisions for the glass cockpit, crashworthy crew seats, crashworthy troop seats, accommodations for the new landing gear, support for chaff/flare dispensers (in the stretch area), structure for five new fuel cells, and tie-down provisions for cabin cargo.

Both the fuel cells and the cargo tie-down are designed for 20-g crash loads. The cabin floor is also designed to accept the crash loads from 10 new **energy attenuating troop seats.**

Energy Attenuating Troop Seats

Stretch Area

The stretch area is designed for 4-g crash rollover loads and has avionics shelves on both sides. The center is open so the personnel from the cabin can access the flight crew.

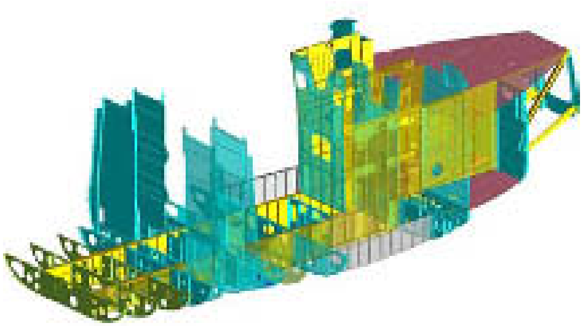


Fast Rope

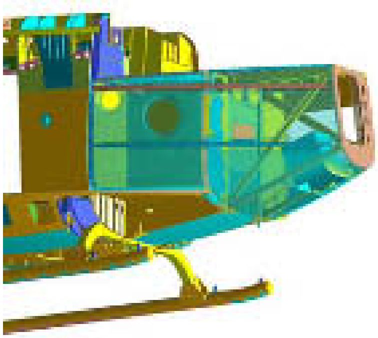
Two Fast Rope Gantries are permanently installed and are deployable from within the cabin. They can be stowed in two different positions to permit either troop seats or litters to be installed in the cabin.

Main Support Beams

The new mid section is made of large components such as the new machined forward and aft pylon bulkheads that support the main transmission and fuel cells. The supports for the main transmission are made from the same forgings as those of the AH-1Z. Foam and Kevlar backing board are used for protecting from dry bay fires caused by ballistic penetration. The new structure has been designed for 10,000 hours service life.



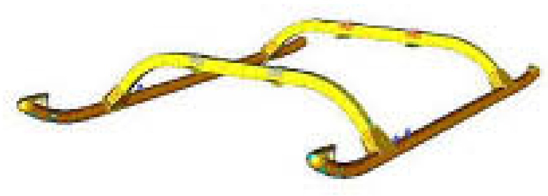
Aft Fuselage



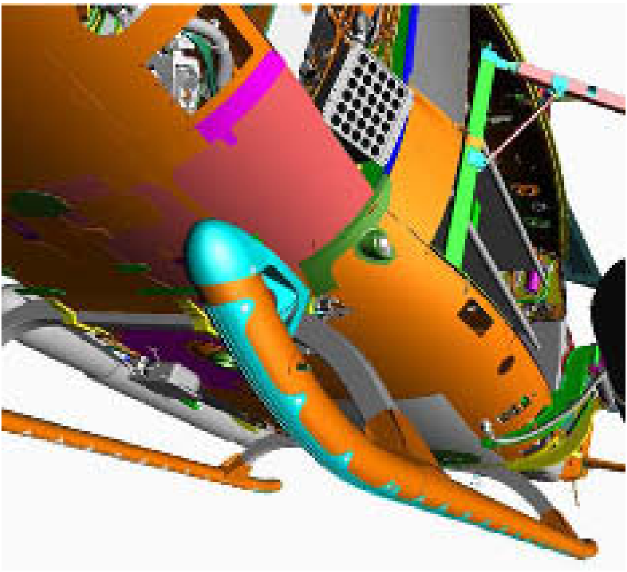
The aft portion of the main fuselage is also new. The machined bulkheads support the aft fuel cells and the aft bulkhead attaches to the tailboom. The aft bay contains the oil cooler and directional actuator among other components. The cargo door tracks are removable and steps have been incorporated to access the engines.

Landing Gear

The **rugged, reliable, low cost skid landing gear** incorporates high strength energy attenuating cross tubes to protect the airframe, crew, and troops in the event of hard landing. Cross tube shape is optimized to give the maximum energy absorption for minimum gear weight. Towing is possible with the aircraft at a maximum weight of 18,500 pounds using forward and aft ground handling wheels. The skid landing gear has demonstrated a limit sink speed of **3.66 m/sec (12 fps)** and a reserve energy sink speed of **4.48 m/sec (14.7 fps) @ Basic Design Gross Weigh**t of 16,700 pounds. The skid gear is attached to the lower fuselage structure and is readily replaceable in the field.



Standard Skid Landing Gear



Cowlings

The cowlings and fairings cover the engine, APU, and transmission area. They direct airflow around and through the engine and transmission areas to provide engine inlet air, cooling air for various components and streamlining to surfaces for flight. Additionally, some of the cowls and fairings provide cooling air for IR suppression. By ducting and mixing cool air with engine exhaust gasses, the IR signature of the aircraft is greatly reduced, increasing survivability. The IR suppressor is a combination of components from both General Electric and Bell Helicopter.

Northrop Grumman Integrated Cockpit & Avionics

THE TOTAL INTEGRATED AVIONIC SYSTEM (IAS)

Northrop Grumman has the responsibility for the design, development, and delivery of the H-1 Integrated Avionics System (IAS), which includes cockpit displays and controls, communications, navigation, external stores and weapons management system, and a central mission computing subsystem.

Maximum commonality of product across platforms; achievement of redundancy and backups in all critical areas of processing, displays, and essential sensors; and planned reserves of processing and 1553 bus bandwidths are delivered within the Integrated Avionics System (IAS). At the heart of the IAS is the Mission Computer, which controls all aspects of mission performance from flight instrumentation to weapons engagement.

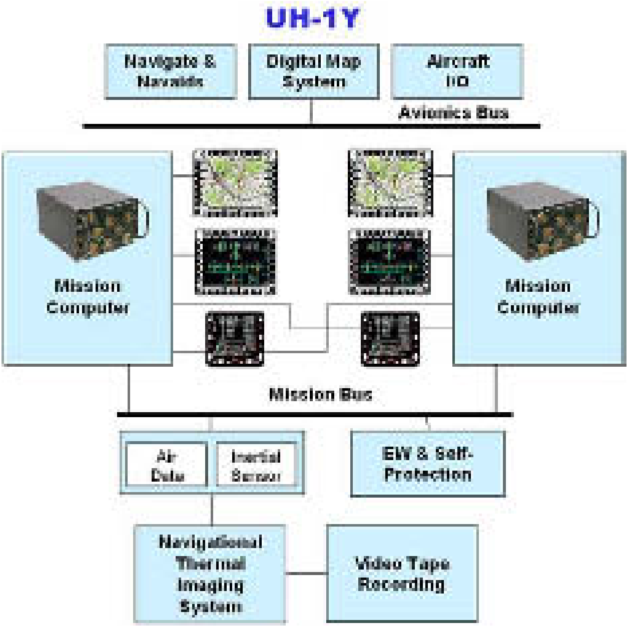
The figure on the opposite page illustrates the IAS of the UH-1Y. The AH-1Z IAS is identical except it has a weapons module. Beyond those items of displays, sensors and weaponry are elements that support other key functions. These include:

Communications: utilizing the new U.S. Navy standard ARC-210 integrated radio, UHF/VHF, COMSEC, SATCOM (UH-1Y only) interface with a high power amplifier, and a tactical data modem are combined into a single unit.

Navigation: is primarily achieved with the U.S. Navy Embedded GPS Inertial (EGI) and air data subsystem. Backup sensors and displays are provided in the event of a total IAS failure. A modern, U.S. Navy standard digital map system is also provided with full capability for Digital Terrain Elevation Data (DTED) and Compressed Arc Digitized Raster Graphics (CADRG). The map is used as a navigator map display source, as a threat visibility indicator, and is part of the in-flight mission-planning mode.

EW/Self-Protection: consists of the Northrop Grumman APR-39B(V)2 radar warning receiver together with the AAR-47(V)2 missile warning/laser detection system.. The APR-39B(V)2 is upgraded to provide full MIL-STD-1553B access of threat warning. It also provides data to the Mission Computer, for optimal integration of threat situational awareness. The ALE-47 countermeasures dispensing subsystem is provided for 360 degree protection.

INTEGRATED COCKPIT / AVIONICS ARCHITECTURE



UH-1Y Integrated Cockpit

The UH-1Y cockpit is designed for maximum commonality and inter-operability. The location of controls and displays at the right and left crew stations are **nearly identical**, allowing crew members to perform the pilot or copilot roles from either station. Flight controls consist of a conventional cyclic, collective, and pedals. To enable maximum hands-on system control by the flying pilot, switch functions on the cyclic and collective control grips include: automatic flight control system adjustment, weapon select and fire, TopOwl Helmet Mounted Sight and Display (HMSD) System boresighting, external stores selection and emergency jettison, electronic warfare counter measures dispensing control, radio select, frequency select, press to talk, search light control, and multifunction display page selection.

COMMON* (UH-1Y / AH-1Z) COLLECTIVE & CYCLIC CONTROLS

*** SOME SWITCHES ONLY FUNCTIONAL ON AH-1Z**

Cockpit

Each crew station has **two 8 x 6 inch multifunction displays (MFD's)** with which the crew interfaces with the majority of subsystem functions. Each crew station also has a **4.2 x 4.2 inch dual function display** and a data entry keyboard, both located in the console in the center of the cockpit. During normal operation the dual function display presents standard display page formats. However, in the unlikely event of a total avionics system failure, it will present the standby flight instrument symbology.

Multifunction & Dual Function Displays

Both the multifunction and dual function displays are **active matrix liquid crystal color displays**. The display page formats are organized based on mission requirements.

The **flight display** presents horizontal and vertical situation indication displays for instrument flight as well as engine and drive train status and other status indications.

Standby Flight Symbology on DFD

The **systems display** presents the status of the engines, drive train, hydraulic, electrical, and critical aircraft systems.

The **warning caution advisory display** in conjunction with verbal and nonverbal signals alerts the crew that a system limitation has been exceeded or a system is operating in a degraded mode.

The **warning caution alert** function presents critical information on the flight display to prompt the crew to call up the detailed warning caution advisory page.

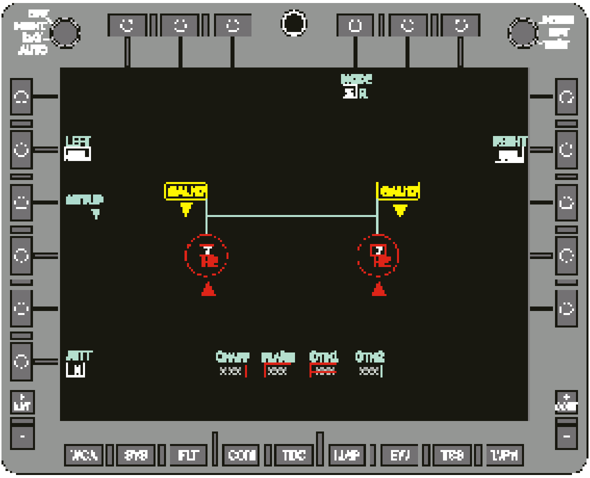
The **voice communications display** format presents selectable and editable lists of frequencies and call signs. The **tactical digital communications display** presents formats for composing and transmitting various tactical digital messages, as well as receiving incoming messages.

Voice Communications Display on DFD

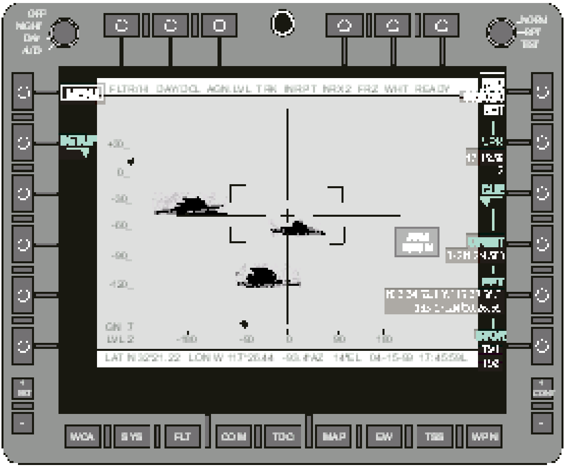
The **digital moving map display** in conjunction with the aircraft's embedded GPS/INS system allows precise navigation and enhanced situational awareness by displaying battlefield graphics including threat locations and inter-visibility indications.

The **electronic warfare display** provides warning indications of radar, laser, and missile launch threats, as well as allowing the setup of the counter measures dispensing functions.

The **weapon display** graphically depicts the munitions onboard the aircraft and allows the setup of weapon inventory and deployment modes.



The **Navigation Thermal Imaging System (NTIS) display** presents the selected picture (standard FLIR, or future video upgrades) and provides controls for various NTIS modes.



The UH-1Y Helicopter Integrated Avionics System (IAS) has been developed utilizing the software open architecture approach. The computer has a **reserve growth capacity**. This growth capability in the Avionics and Weapons Systems, plus that in the Airframe, Drive System, and Rotor System, add significantly to the useful mission life and long term effectiveness of the UH-1Y Helicopter.

THALES *TopOwl* Helmet Mounted Sight and Display System

An important functional element of the UH-1Y cockpit display is the TopOwl Helmet Mounted Sight and Display (HMSD) System. This helmet supports improved communication and reduces cockpit workload leading to improved mission effectiveness. Manufactured by THALES Avionics, the TopOwl HMSD is the most technically advanced helmet currently available and in service, offering unparalleled supportability and the capacity of technology insertion as additional requirements develop. The TopOwl HMSD combines both avionics functions with the aircrew life support and protection functions into a single unit.

Key features of the TopOwl HMSD include:

·True 24 hour day/night capability using image intensified night vision technology

·High accuracy head tracking system

·Provides a binocular display with a 40 degree, visor projected field of view

·Visor projection can include FLIR or video imagery

·Operational applications of navigation, target designation, and weapons aiming and firing

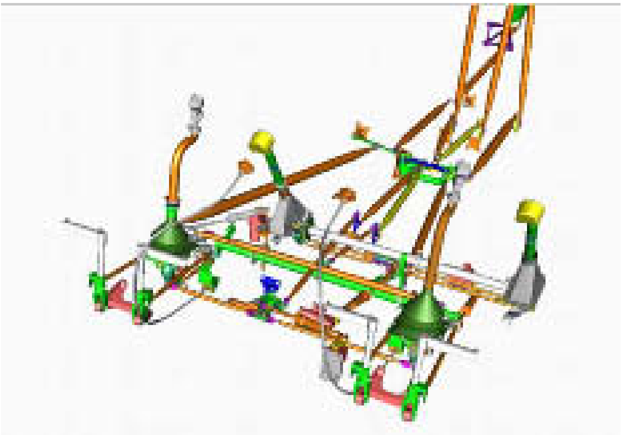
·Optimum center of gravity

·Custom fit helmet liner

·In production and service with 9 other countries

Flight Controls

Flight controls consist of a conventional cyclic, collective, and directional pedals at each crew station. Mechanical linkages and push-pull tubes transmit pilot inputs to the hydraulic boosted controls. The control tubes are sized for maximum tolerance to damage from ballistic threats.



Center Console

Automatic Flight Control System

The AFCS incorporates a four-axis (pitch, roll, yaw, and collective) fail passive Stability Control Augmentation System (SCAS). The AFCS also has the following additional modes of operation: Heading Hold, Attitude Hold, Speed Hold, Cruise Hold, Altitude Hold, Hover Hold, Hover Wave-off, and Force Trim.

Heading Hold mode holds heading within ±1.0 degree, steady state, of the heading existing at the time of engagement.

Attitude Hold mode operates in conjunction with SCAS to provide pitch and roll attitude stabilization. This mode maintains the pitch attitude within 1.0 degree, and roll attitude within 1.0 degree of the attitude existing at the time of engagement.

Speed Hold mode maintains airspeed, or groundspeed, at the time of engagement within ±3 kts steady state from the reference and within ±10 kts, (or ±10% of the reference speed) in moderate turbulence.

Altitude Hold mode maintains the altitude existing at the time of engagement through the collective axis. This mode holds either barometric (BARO) or radar (RALT) altitude depending on the altitude reference source selected and the flight condition.

Cruise Hold mode automatically engages and maintains heading hold, altitude hold, and speed hold.

Hover Hold mode causes the helicopter to make a smooth deceleration from 15 kts (or less) groundspeed to a stable hover while maintaining a constant radar altitude and constant heading. After achieving a stable hover, the Hover Hold mode maintains a position as measured by the integration of the ground velocity signals. The position for hover hold is the position at which ground velocity becomes less than 0.5 kts. In a steady wind with constant heading, the helicopter maintains a steady state hover within a 10 foot diameter circle.

Wave Off mode causes the helicopter to transition from the flight condition at engagement to a terminal speed and altitude that has been pre-selected and displayed via the Multi Function Display (MFD).

Force Trim capabilities include pilot ability to reduce the control forces to zero by actuation of trim release switches on the cyclic and collective control sticks. Incremental force trim (beep trim) capability is available via the trim actuators and is controlled by appropriate beep switches on the cyclic and collective control sticks.

Incremental Mode Trim (beep trim) capability is provided for all of the modes described above.

Also, when any hold mode is engaged, the pilot is able to move the controls (**Fly-Through**) by overriding the force feel spring force and control friction forces. Displacement of the controls from the trim position results in temporary disengagement of the mode. When the control is returned to the trim position, the mode reengages and returns the helicopter to the trim condition existing prior to override.

Weapons

Rockets

The **rocket system** employed on the UH-1Y uses 2.75 inch (70mm) rockets. All available Mk66 rockets are supported with warheads of three general types; i.e. unitary, airburst cargo, and training warheads.

Airburst, Cargo, and Unitary Warheads:

(1) M151 High Explosive-Fragmentation [HE-FRAG]
(2) M229 HE-FRAG
(3) M261 HE-Multipurpose Submunition [HE-MPSM]
(4) M255A1 Flechette
(5) M262 Illumination Flare
(6) M264 Smoke[RP]

Either **LAU-68** (7 tube) or **LAU-61** (19 tube) launchers can be loaded onto the BRUs of the DAS. With additional software in the mission computer either **M-261** (7 tube) or **M-260** (19 tube) launchers can be used for the remote set fusing function. The pilot launches the rocket/s by a trigger squeeze, enabling single, pairs or salvo firing as commanded on the MFD.

Machine Guns

The **M-240 D, GAU-16, and GAU-17A machine guns** can be fired by the crew chiefs.

M-240D 7.62-mm Machinegun

The M-240 is a belt-fed, recoil operated, air-cooled, machinegun with a rate of fire of 750 to 950 rounds per minute.

GAU-16/A .50 Caliber Machinegun

The Browning GAU-16/A .50 caliber machinegun is a belt-fed, recoil-operated, air-cooled, machinegun with a rate of fire of 750 to 850 rounds per minute.

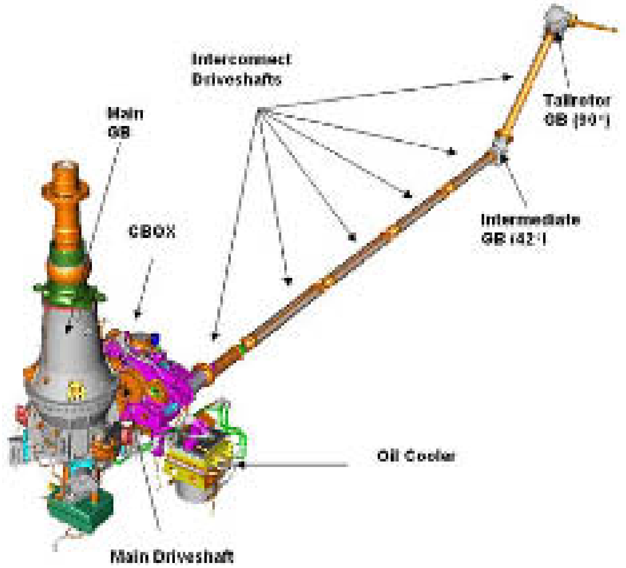
GAU-17A 7.62-mm Aircraft Machinegun

The GAU-17A is an air-cooled, multibarrel, electrically powered gun. The gun is capable of firing 3000 rounds per minute. The weapon system is broken down into three main parts: the control box, the ammunition storage system, and the aircraft machinegun.

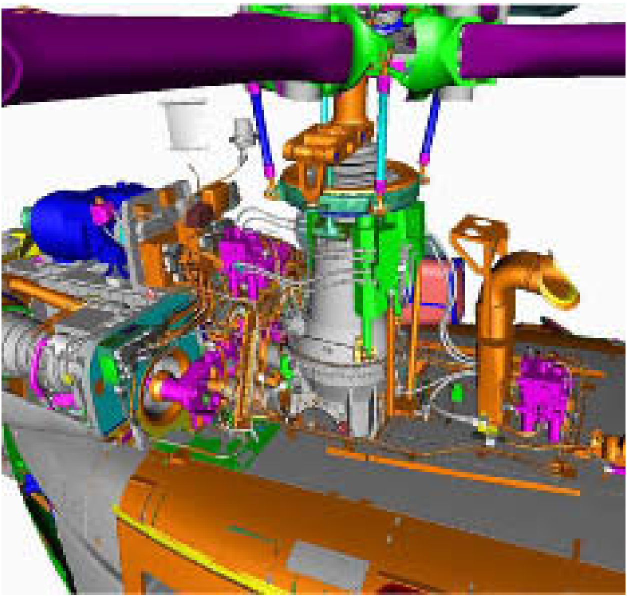
The **GAU-17A machine guns** can also be fired by either flight crew member when in fixed forward position.

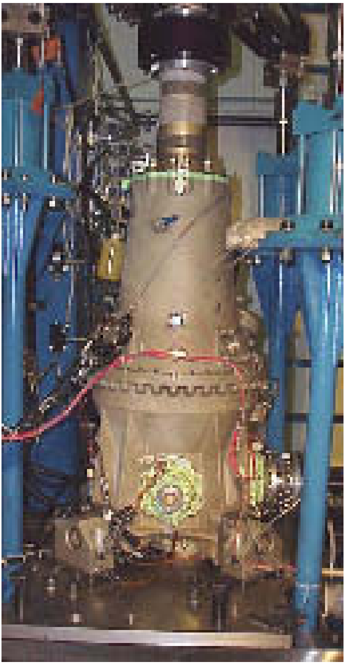
Powertrain System

The Powertrain or Drive System transfers power from the two **T700-GE-401C** engines on the UH-1Y to the main rotor, the tail rotor, and various other aircraft accessory systems. The drive system consists of a combining gearbox, a main drive shaft assembly, a main rotor gearbox, an oil cooling system for the main and combining gearboxes, and a tail rotor drive system consisting of two gearboxes (42° and 90°)



The H-1 main rotor gearbox contains a newly designed drive train capable of accepting **2625 SHP** from the engines for distribution to the main rotor, tail rotor, and various other gearbox mounted accessories.





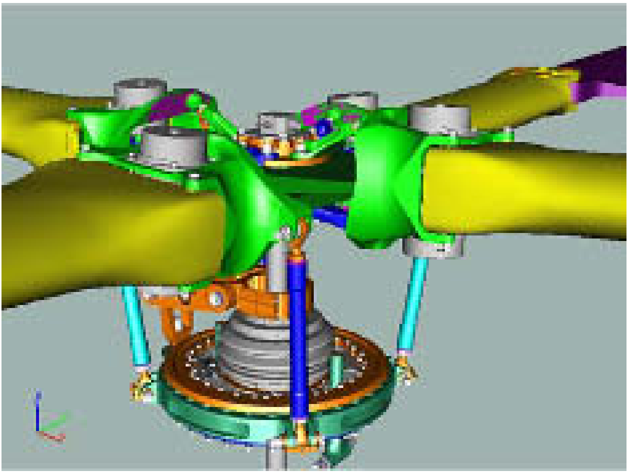
MRGB in Bench Test Fixture

Rotor Systems

The high performance UH-1Y Main Rotor System represents a major breakthrough in technology. The simplicity of the UH-1Y main rotor design has eliminated all bearings, hinges and rotor mounted vibration absorbers. The result is a highly maneuverable, fast, long-range reconnaissance helicopter.

Main Rotor System Features

·All-composite main rotor blades, yokes and cuffs provide very stable handling qualities and high cruise speeds
·75% fewer parts than 4 blade articulated systems
·Rotor hub weighs 15% less than conventional hubs
·Lower levels of vibration than any competing rotor systems
·Lower Life Cycle costs than any competing rotor systems
·10,000 hour life components
·Increased ballistic survivability
·Can sustain 23mm direct hit and continue to operate
·Doubles the payload capabilities
·Semiautomatic blade fold for shipboard operations
·Field camouflage
·Aircraft hangaring capabilities
·Reduces spare parts by 77%



Main Rotor

The primary structural members of the main rotor hub are **two fiberglass yokes**. Each yoke is a multifunctional component which transmits torque from the mast to the blades, accommodates flapping, lead-lag, and pitch change motions, and retains the blades. A stacked yoke arrangement is chosen in lieu of one four-armed yoke. It permits the use of two identical stacked two arm yokes, which allows higher flapping angles and reduced manufacturing complexity. Logistics support problems are also reduced due to the smaller physical size of the two-armed yoke as compared to a single four-arm yoke. The **main rotor blade** is constructed primarily of composite materials. The blade body consists of a spar assembly, leading edge protective strips, skins, honeycomb core, and trailing edge strip.

The **main rotor blades** incorporate a pilot-adjustable formation tip light on the upper surface. The rotor blades include forward and aft product balance pockets for spanwise and chordwise dynamic balance. The main rotor blade design includes adjustable trim tabs to facilitate tracking of the individual rotor blade. The main rotor blades are individually interchangeable and provide removable balance weights to ensure track and balance capability following field repairs. The main rotor blades have a design life of **10,000 hours**.

The blade leading edge is protected by a single piece **abrasion strip** made from stainless steel. The outer two-thirds of the strip is electroplated with nickel. An electroformed nickel tip cap is bonded to the blade tip to protect it from sand and rain erosion.

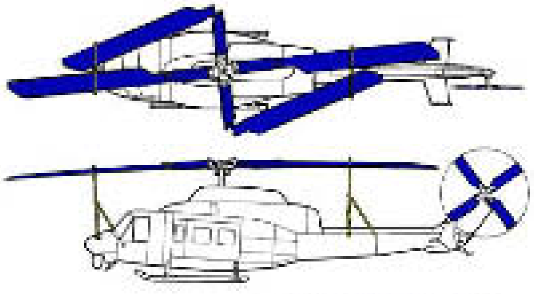
Tail Rotor

The Tail Rotor Assembly consists of two stacked, teetering rotors, independently mounted on a single output shaft using splined trunnions on the **pusher side** of the aircraft. Elastomeric bearings installed in the trunnion provide the load path for the drive torque and thrust loads, and provide for flapping motion.

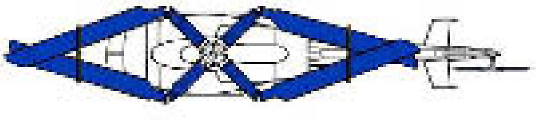
The Tail Rotor Hub consists of titanium yokes, elastomeric flapping bearings, shear restraints, and pitch horns. The hub assembly has a design life of **10,000 hours**. Like the main rotor blade, the tail rotor blade leading edge is protected by a single piece **abrasion strip** made of stainless steel. The outer two-thirds of the abrasion strip is electroplated with nickel for enhanced wear characteristics.

Blade Folding

Blade folding is accomplished by a combination of automatic and manual means to lock out the blade pitch, position the blades for folding, disengage the blade pins, and rotate the blades for folding and spreading. Design of the blade pin powered lock and unlock mechanism prevents any possible motor backdrive situation. Safeties are provided to prevent the blade pin from disengaging in flight. The lockout and blade pin mechanisms are commanded by controls in the cockpit. Visual indication of the locked condition is also provided in the cockpit. An interlock system, independent of the cockpit indicator, prevents rotor start while the pins are in the unlocked condition. The ground crew is not required to climb atop the aircraft for the blade folding operation. Retracking or balancing of blades is not required after blade folding. Manual backups are provided for the automatic blade folding sequences in the event of failures of the automatic system. The system is capable of folding and unfolding the rotor blades in horizontal winds up to and including **45 kts** from any azimuth direction.



SHIPBOARD FOLD CONFIGURATION



HEAVY WEATHER CONFIGURATION

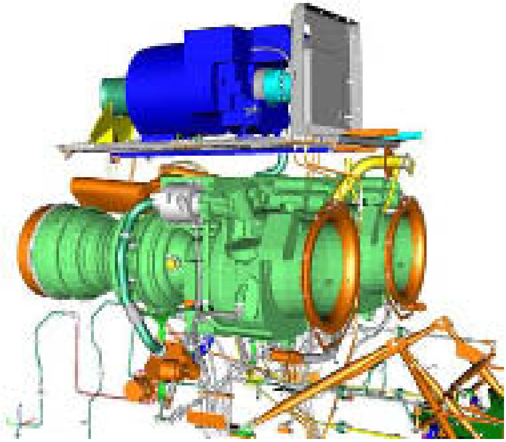
Marinization

The UH-1Y is fully marinized and capable of shipboard operations including takeoff, landing, refueling and rearming, and is securable for deck motions encountered up to sea-state 5. The UH-1Y has been designed for compact stowage of the assembled aircraft aboard ship and for spotting on the flight decks of the standard US Navy LHA, LHD, LPH, LPD, and LSD class ships. The UH-1Y is compatible with the elevators of the above class ships. The aircraft fits on the deck edge (50' X 34') and stern (60' X 35') elevators of the LHA, and starboard and port (50' X 40') elevators of the LHD. A minimum of 18 inch clearance between the aircraft and the ship's structure is maintained while the elevator is in transit and at the hangar deck level.

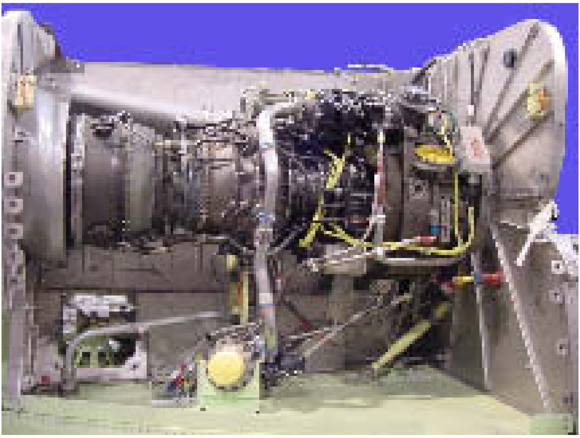
Propulsion System

Widely acknowledged for their proven reliability and low fuel consumption, the modular designed T700 series engine, two of which power the AH-1Z and UH-1Y, also power both the Bell AH-1W and 214ST, as well as UH-60 Blackhawk and other US Government and International aircraft. The T700 engine has an integral particle separator, and a self-contained lubrication system that uses fuel flow to cool the engine oil. Only **ten tools** are required to perform field maintenance. With over 19 million service hours accumulated on 10,000 T700/CT7 engines in service, this engine is mature and has already earned an enviable reputation for reliability.

The installed rated **Contingency Power** [2.5 minute OEI (one engine inoperative)] for the T700-GE-401C engine is 1828 SHP (for a sea level standard day).
The installed rated **Intermediate Power** [Twin Engine, 30 minute rating] for the T700-GE-401C engine is 1695 SHP (for a sea level standard day).
The installed rated **Maximum Continuous Power** [Twin Engine, continuous rating] for the T700-GE-401C engine is 1546 SHP (for a sea level standard day).

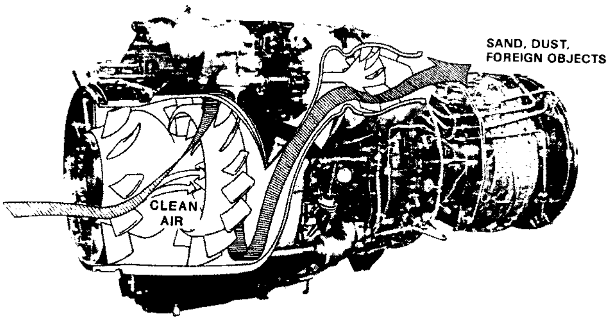


The **T700-GE-401C** engine has an **emergency lubrication system** to allow operation following damage that totally interrupts the normal supply of oil. The engine accessory gearbox and C-sump components can continue to operate at least six minutes with residual oil present. The engine specification requirement is that the engine shall operate at intermediate power for a period of 30 seconds during which no oil is supplied to the engine oil pump inlet. As a result of this operation, there shall be no detrimental effects to the engine during the oil flow interruption period or during engine operation thereafter.



Particle Separator & Engine Systems

The T700 engine has a unique inlet **particle separator** integrated into the forward main engine frames. The fully anti-iced separator provides a high level of compressor protection against damage from foreign objects such as sand, dust, birds, and ice. The separator imparts a swirl to the entering airflow and directs that part of the flow containing the centrifuged sand and foreign material through a scavenge system energized by a mechanically driven blower. The clean air is then deswirled before entering the engine core.

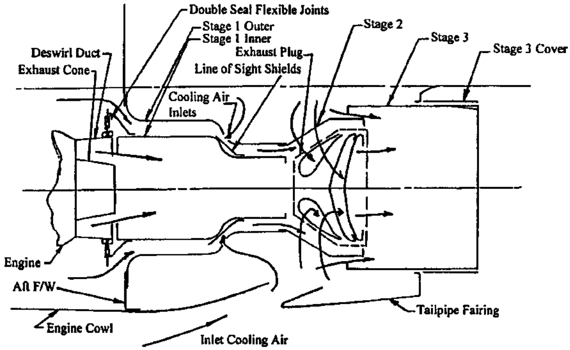


Engine **compressor cleaning** provisions include the necessary plumbing required to interface to the fresh water wash spray ring. The installation is a permanently installed system, which permits simple and rapid connection of standard United States Navy wash carts. An alternate fitting could be used if need to mate with other desired wash carts.

The T700-GE-401C engine includes a **Digital Electronic Control Unit** (DECU) for Isochronous Governing of the engine. The DECU also maintains tight limiting of power turbine speed, measured gas temperature, and torque. The DECU provides **automatic overspeed protection**, auto-relight on flameout, and loadshare between the two installed engines. Additionally the DECU contains internal fault accommodation and external fault annunciation.

A **fire extinguishing system** is provided for the engine bay and APU compartments.

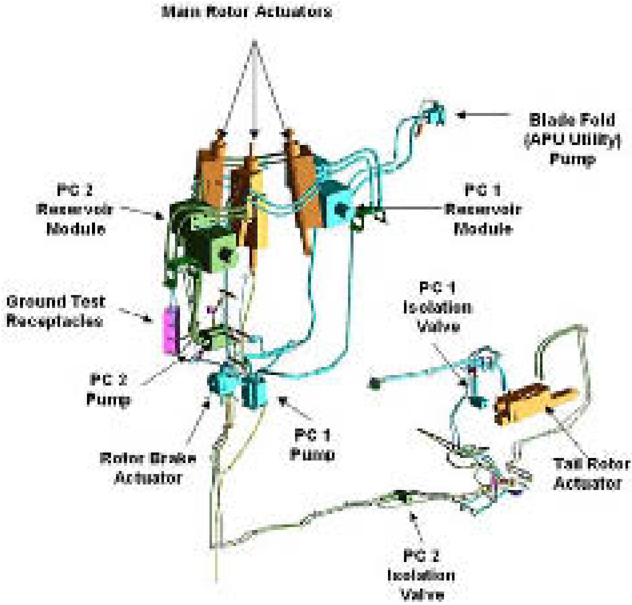
A **Hover Infrared Suppression System** (HIRSS) is an integral part of the exhaust system and uses engine compartment and external air for cooling. The HIRSS is self-powered and nonselectable. The HIRSS is designed/sized for the worst-case temperature and flows of the T700-GE-401C.



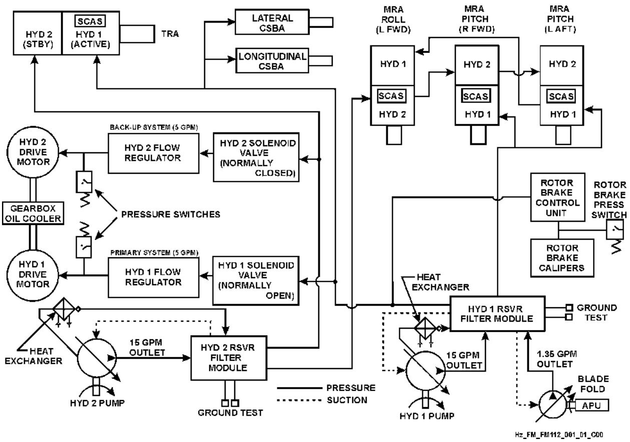
Hover Infrared Suppression System

Hydraulic Systems

The hydraulic subsystem consists of two Primary Flight Control Systems (PC-1 and PC-2), one rotor brake, and one rotor blade fold system. Operating pressure is 3000 psi. PC-1 and PC-2 systems power the three main rotor actuators and the one directional actuator of the flight control system. Each actuator is of dual cylinder design. One cylinder of each actuator is operated by PC-1 and the other cylinder is operated by PC-2. Both PC-1 and PC-2 systems include a transmission driven hydraulic pump, bootstrap (pressurized) reservoir, filter module, flight control actuators, integral Stability and Control Augmentation System (SCAS), oil cooler fan hydraulic motor, and other required components and connection lines. In addition PC-1 includes a rotor brake control unit.



Hydraulic Schematic



Pneumatic Subsystem

Main engine starting is accomplished by first starting the **auxiliary power unit** (APU) which subsequently pressurizes the pneumatic manifold with APU bleed air. A start control valve and air turbine starter are provided for each engine. Opening the start control valve initiates the starting sequence by allowing compressed air from the manifold to drive the starter, thus turning over the engine through the engine start cycle.

A ground connection valve is provided in the pneumatic manifold to allow connection of a hose for pressurized air from a ground cart or from another aircraft pneumatic system.

The pneumatic system also supplies compressed air for cabin bleed air heating and windshield defogging, and On Board Inert Gas Generating System (OBIGGS) for fuel tank inertion. Shutoff valves are also provided for these functions.

Electrical Systems

The primary **DC generating system** consists of two **400 ampere** brushless 28 VDC generators driven from the combining gearbox. Each generator is controlled by a generator control unit which provide regulated 28 VDC MIL-STD-704 quality power and protection from MIL-STD-704 exceedances, ground faults and generator overloads. No load shedding or reduction in mission capability is required, should loss of a single DC generator occur. The aircraft **AC power system** consists of two 1500 VA three phase inverters. The inverters provide MIL-STD-704 quality AC power and protection from MIL-STD-704 exceedances and inverter overloads. The AC power distribution system accommodates load shedding for emergency power.

Sundstrand Auxiliary Power Unit

The **APU driven DC generator** is a **200 ampere** brushless 28 VDC generator capable of providing power to all aircraft buses. A generator control unit provides regulated 28 VDC MIL-STD-704 quality power and provide protection from MIL-STD-704 exceedances and generator overloads. Sufficient power is available so that all equipment may be systematically operated and functionally checked. The APU generator also provides battery charging during this time. The APU is capable of starting on aircraft battery power when cold soaked at a temperature down to **-26°C (-15°F)**. The APU may be started from a 28 VDC external power source down to **-54°C (-65°F)**. When either engine is operating the APU may be started from the aircraft DC bus.

Battery

The UH-1Y's **battery** is a 19 cell Nickel-Cadmium low maintenance type providing a minimum of **25 amp/ hours**. The battery is capable of providing starting and emergency power requirements for a minimum of 1 year without maintenance action. The battery is capable of providing sole power for operation of essential equipment for emergency operation for a minimum of at least **20 minutes**.

Electric Power Schematics

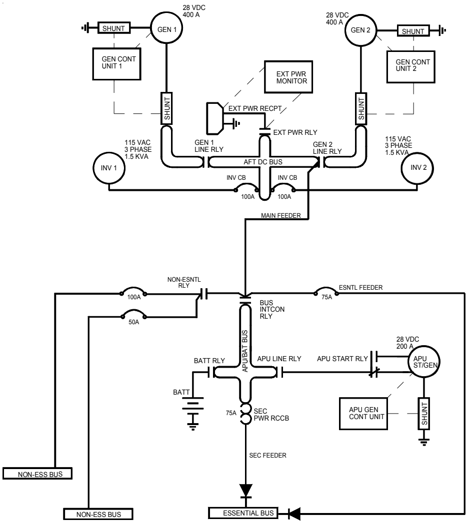


Figure 1. Electrical DC Power System

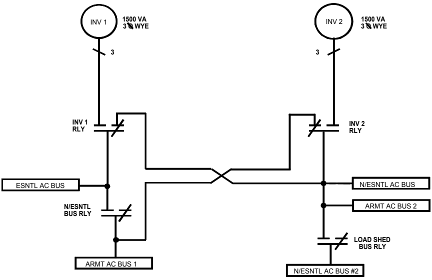
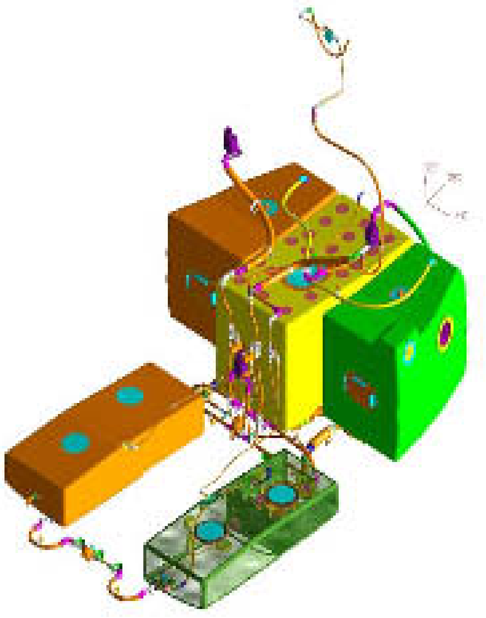


Figure 2. Electrical AC Power System

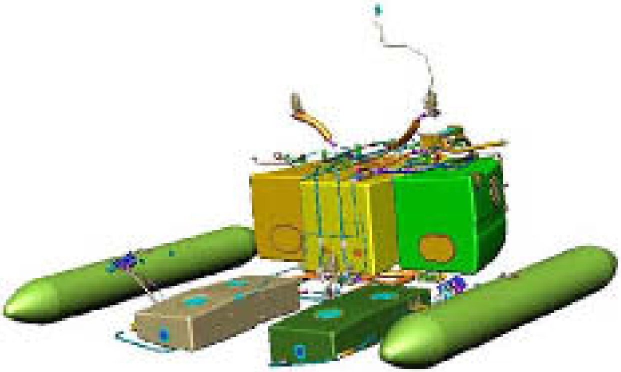
Fuel System

The crashworthy fuel system consists of five interconnected, self-sealing, rubber fuel cells; three main cells aft of the cabin bulkhead and two feed cells under the cabin floor. The system includes firewall shutoff valves, low level switches, fuel feed line check valves, boost pump pressure switches, fuel quantity transmitters and indicators, fuel cell interconnect valves, self-sealing fittings and connecting lines, and drain valves. All fuel system components have an operational life equal to or greater than the aircraft. The fuel system is compatible with fuels **JP-5, JP-8, Jet A and JP-4**.

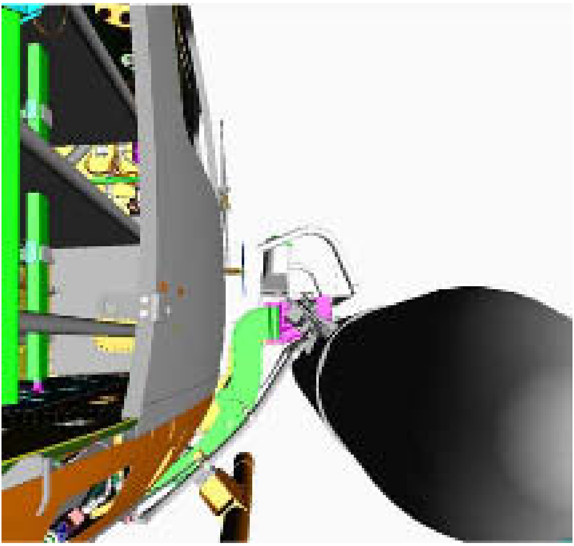


The system is equipped for either **pressure** or **gravity** refueling. Both refueling receptacles are located on the port side of the aircraft in the aft port fuel cell. The pressure fueling system accepts the standard pressure-refueling nozzle. Maximum fuel flow into the cells is 90 gpm at 60-psi nozzle pressure. The gravity refueling port accepts the standard manual-refueling nozzle. The total usable internal fuel capacity is **1443 liters (380 gallons)**.

Complete provisions are included to attach auxiliary tanks to one or both DAS mounts. The auxiliary fuel system utilizes **292 liter (77 gallon)** tanks. With both auxiliary tanks installed, the total fuel capacity is increased to **2021 liters (534 gallons)**. The interconnected and crossfeed system is designed such that both power sections can independently operate from fuel supplied by either feed tank. The feed tanks are gravity replenished from the aft cells. The engine and APU feed systems consist of prime pumps, engine prime solenoid valves, fuel shutoff valves, and pilot-operated controls. The engine fuel system is a **suction feed system** (only during APU operation and engine start is boosted pressure fuel supplied). Each forward fuel cell contains a sump, drain valve and a submerged fuel boost (**prime**) pump. A canister surrounds each suction line inlet to provide a fuel reservoir during zero or negative G aircraft maneuvers.



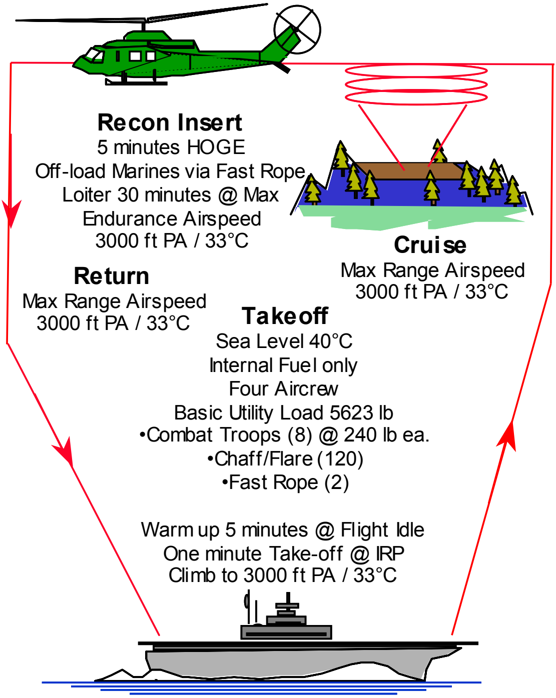
The feed tanks include low-level switches transmitting a caution signal to cockpit panels when the fuel level reaches 30 minutes fuel remaining. The fuel cells are crashworthy and provide self-sealing protection up to 0.50 caliber in selected critical areas. The cells are manufactured to maintain structural integrity in a 20g crash and have integral fittings, which are designed to fail at a load greater than that required to fail the cell material.



Mission Profile

UH-1Y Mission Profile*

Mission Radius
Requirement 110 nm
Actual 130 nm



Landing
Land with Fuel Remaining -
Either 10% initial fuel
or 20 minutes Flight
@ Max Endurance Airspeed

***Preliminary Performance as of November 2001**

Mission Performance

UH-1Y Performance*

{Preliminary performance as of November 2001}

	Kilograms	Pounds
Empty Weight	5,369	11,839
Max Useful Load	3,021	6,661
Max Internal Fuel	1,172	2,584
Max Gross Weight	8,390	18,500
Max Payload	1,460	3,220
HOGE Gross Weight** **(Hover Out of Ground Effect)**	7,817	17,236
LRC Speed** **(Long Range Cruise)**	250 km/hr	135 Kts
MCP Speed** **(Maximum Continuos Power)**	293 km/hr	158 kts
Dash Speed**	304 km/hr	164 kts
Dive Speed	367 km/hr	198 kts
Max Rate of Climb**	12.8 m/s	2,520 fpm
OEI Rate of Climb** **(One Engine Inoperative)**	3.8 m/s	740 fpm
Vertical Rate of Climb**	5.1 m/s	1,007 fpm
Service Ceiling	6,100 + m	20,000+ ft
Max Crosswind	65 km/hr	35 kts
Weapons Stations	2 Pintle Mounted Guns 2 External Store Hard Mounts	
Maneuverability, g's**	-0.5 to +2.8	
Max Endurance, hours**	3.3 hours	
Mission Radius**	241 km 990 kg Payload	130 nm 2182 lb Payload

***Aircraft configured with T-701-GE-401C engines.**

**** Performance for Troop Insertion mission at 3000 ft / 33°C.**

USMC Baseline Configuration

AIRFRAME
Composite/Aluminum alloy fuselage
Plexiglass Canopy
Skid Type Landing Gear
Shipboard Capable Tie Down Fittings
Semi-Monocoque tailboom and vertical fin
Elevator
Tail Skid

ROTORS & CONTROLS
Composite Rigid Bearingless Rotor Heads
4 Bladed Composite Main Rotor Blades w/ 10,000 Service Life
4 Bladed Composite Tail Rotor Blades w/ 10,000 Service Life
Semi Automatic Main Rotor Blade Fold System
Dual Digital 4 Axis Automatic Flight Control System

TRANSMISSION / DRIVE SYSTEM
5,000 Hour TBO Design Goal/10,000 Hour Service Life Drive System
Aluminum Cases

POWER PLANTS
Two General Electric T-700-GE-401C engines
Sundstrand Auxiliary Power Unit
Magnetic chip detectors
Fuel Filter Assembly
Fire Detection System
Fire Extinguishing System
RPM warning system

COMMUNICATIONS
VHF/UHF radio - AN/ARC-210 radio system
Intercommunications System

NAVIGATION
Embedded GPS/INS
ARN-153 TACAN system
VHF/UHF direction finder

IDENTIFICATION FRIEND OR FOE (IFF)
APX-100(V) IFF

COUNTERMEASURES GROUP
ALE-47 Countermeasures System
APR-39B(V)2 Radar warning set
AAR-47(V)2 Combined Missile Warning/Laser Warning Set

SURVIVABILITY
23mm tolerant rotor hub and blades
Large diameter control tubes for tolerance against small arms fire
12 ft/second sink speed landing gear
Crashworthy, self-sealing fuel cells
On Board Inert Gas Generating System (OBIGGS)
Engine IR suppressors
Low IR Reflective Paint
Variable Capacity Energy Attenuating crew/passenger seats
High rotor inertia

MARINIZATION
Simple Semi Automatic Blade Fold
Corrosion Resistant Design
Wet Lay-up Manufacturing Process
30 Degree Turn Over Angle
EMI Shielded
Marinized Engines

INTEGRATED AVIONICS SYSTEM (IAS)
Mission Computers (2)
Multi Function Displays (4)
Dual Function Displays (2)
Keyboard Units (2)
Standby attitude sensor
Air Data Computer
Stores Station Electronics
Station Control Unit

DIGITAL MAP SYSTEM (TAMMAC)
Advanced Memory Unit (AMU) Mission Data Loader
Digital Map System (DMS)

ELECTRICAL
DC Generators (2)
AC Inverters (2)
Ni-Cad Battery
Integrated Flat Wiring

AVAILABLE ARMAMENT
Defensive Armament System (DAS) Mounted Weapons

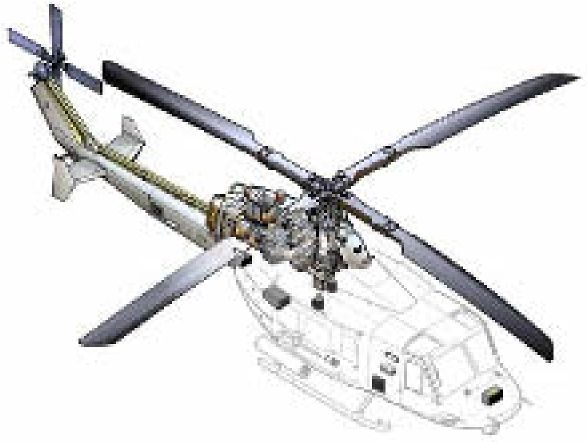
1. M-240D 7.62 Machinegun
2. GAU-16 .50 Caliber Machinegun
3. GAU-17A 7.62 Aircraft Machinegun
4. BRU-20 Series Bomb Ejector Rack
5. LAU-61 2.75 Inch Rocket Pod (19 Rocket Capacity)
6. LAU-68 2.75 Inch Rocket Pod (7 Rocket Capacity)

SENSORS
FLIR Systems BRITE Star Navigation Thermal Imaging System (NTIS)
THALES *TopOwl* Helmet Mounted Sight and Display (HMD) System

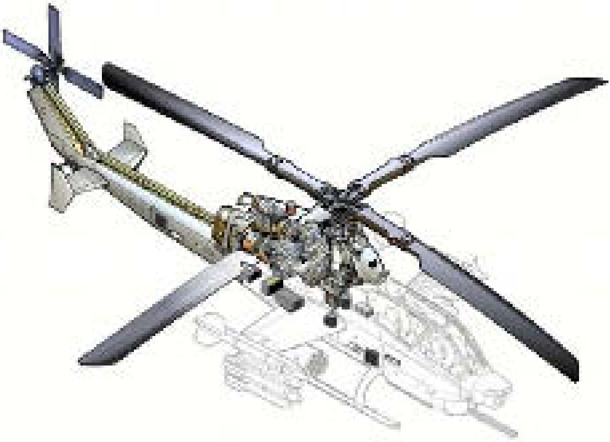
MISCELLANEOUS
Flight Control Computer
Flight Control Panel (2)
Armament Control Panel (2)
Systems Control Panel (2)
Lighting Control Panel (2)
Glareshield Warning Panel (2)
Emergency Switch Panel (2)
IMD HUMS BF Goodrich
77 Gal External Aux Fuel Tank

H-1 Program Benefits

Bell Helicopter will remanufacture USMC AH-1W aircraft into “zero time” AH-1Z attack helicopters and UH-1N aircraft into “zero time” UH-1Y transport helicopters. Both aircraft will receive dramatic increases in range, payload, and speed. The very high level of common components between the two aircraft will facilitate a significant reduction in spare parts inventory, number of maintenance personnel required, simplify training for pilots and maintenance personnel, simplify deployment operations, and virtually provides two new aircraft for the price of one.



UH-1Y – AH-1Z Commonality



For international customers who currently operate either the AH-1W or UH-1 series aircraft, the opportunity exists for benefiting from a similar remanufacturing program. Totally new manufactured aircraft will also be offered.

First flight for the UH-1Y took place in **December 2001**. International customers can expect to take delivery of new aircraft beginning in 2006 concurrent with the USMC program.

Bell UH-1Y

Applications:	*Assault Transport* *Airborne Command & Control* *Control of Supporting Arms* *Aerial Reconnaissance* *Search & Rescue* *Armed Transport* *Aeromedical* *Night & Adverse Weather Operations*
Engines:	*(2) T-701-GE--401C*
Gross Weight:	*18,500 lb / 8,390 Kg*
Useful Load:	*6,661 lb / 3,021 Kg*
Mission Radius:	*130 nm / 241 km* *Ten Troop Insertion* *Cruise @ 3000 ft, 33°C*
Max Endurance:	*3.3 hours*
Max Cruise Speed:	*158 knots / 293 km/h*
Service Ceiling:	*20,000 ft + / 6,100 m +*
Weapon Stations:	*2 Pintle Mounted Guns* *2 External Stores Hard Mounts*
Armaments:	*2.75 inch Rocket Pods (7 or 19 shot)*
Maneuverability:	*-0.5 g's to +2.8 g's*
Identicality with AH-1Z:	*84% at Part Number Level*

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