

CD64-055

COMMODORE® 64™



SUPER HUEY

by
Paul Norman

Authentic HELICOPTER FLIGHT SIMULATOR, that not only teaches you how to fly rotary wing aircraft, but also sends you on four separate and exciting missions.

GAMES WORTH PLAYING

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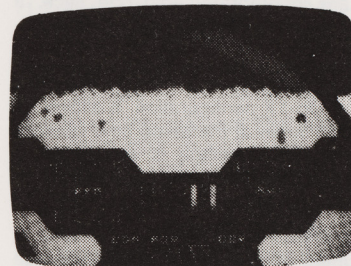
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INSTRUCTIONS



SUPER HUEY
UH-1X

by Paul Norman

OVERVIEW

The UH-1X is a new, experimental high performance helicopter utilizing the latest in electronic control systems and stabilization.

Features include a state-of-the-art electronic instrument console; an on-board computer that regulates and monitors ships' systems as well as providing pilot commands for special functions; automatic pitch control/engine power linkage for RPM equilibrium including synchronization of anti-torque pitch unless directly controlled by the pilot.

Also employed is a new VLW (very light weight) piston engine molded with a super-strength, super-light material, still classified by the military, which rivals the weight/thrust ratio of most turboshaft engines. Mounted vertically, the engine is coupled to the main rotor shaft through a custom/direct drive transmission system with a 10 to 1 reduction ratio.

The rotor assembly consists of semi-rigid blades and a hub articulation system that is electronically adjustable through varying flight conditions. The effect of this system is to reduce drag by 40 to 60 per cent and increase forward speed potential substantially.

Structurally based on Bell Helicopters' UH-1 series, the UH-1X fuselage is made of a carbon-fiber material and molded for optimum aero-dynamic characteristics and low weight.

The streamlined interior seats one pilot in front with room for one passenger or co-operator directly behind. The main controls are incorporated into one stick, a revolutionary and controversial innovation that replaces the collective, cyclic, and anti-torque controls of conventional helicopters.

While this arrangement offers some new problems for novices and experienced pilots, it also provides a few advantages necessary for the UH-1X configuration. It allows for solo flight, enabling the single pilot to control the craft while at the same time operate the on-board computer, radio or weapons controls. The fuselage is vulnerable to weapons fire although the material has an elasticity component which can resist or deflect hits better than metal exteriors.

The Weapon System includes rockets that can be armed in sets of four and fired at one-second intervals. Two machine guns are mounted on either side of the fuselage and fire in tandem. Maximum rocket supply is sixteen and the guns have 2000 rounds each. The UH-1X was not specifically designed as a military aircraft. Its high speed and long range is useful for reconnaissance or rescue and its armaments provide adequate defense capability.

The UH-1X represents a step in a new direction in helicopter flight design and control. See your Huey dealer and test fly one soon. In the meantime, prepare yourself with the Super Huey Flight Simulator from Cosmi, Inc.

LOADING THE PROGRAM

SUPER HUEY is a machine language game program which will load into any standard Commodore® 64™ Computer by following the instructions below exactly.

IMPORTANT NOTE: The joystick controller must be plugged into CONTROL PORT NO. 2. (It will not function in CONTROL PORT NO. 1.) SUPER HUEY is a two part program. Do not remove the disk until the entire program has loaded.

DISKETTE VERSION

- 1.) Attach the Commodore® VIC-1540™ or VIC-1541™ Disk Drive to the computer according to the Disk Drive Instruction Manual.
- 2.) Turn on the computer and wait for the flashing cursor and the READY message. Now turn on the Disk Drive. Wait for the red light on the drive to go out.
- 3.) Insert the program Diskette and close the drive latch. Type on the computer: LOAD "SH", 8 and press the RETURN key. The computer will respond with the message, SEARCHING FOR SH.
- 4.) After a moment, it will read, FOUND SH-LOADING. When the READY message returns, type: RUN and press RETURN. The program title card will appear and the program will start loading automatically. When the program is loaded, the game will begin immediately.
- 5.) Do not turn off disk drive with diskette in disk drive.
- 6.) When the instrument cluster appears on the screen, turn on the on-board computer using the F1 function key. Enter the ASN command to select an assignment and stand by for the automatic loading of further program material.

When the disk drive stops, leave the disk in place and proceed with normal helicopter operations (See Instructions).

A BRIEF SUMMARY OF CONVENTIONAL HELICOPTER CONTROLS

This is not intended as a tutorial on helicopters but rather a general description of the traditional and well understood characteristics of rotary-wing aircraft.

The physics of flight are the same for fixed wing and rotary wing aircraft but the helicopter introduces some complex problems over airplanes. In the first place, airplanes are inherently stable whereas helicopters are inherently unstable. As a result, planes require less constant controlling than do helicopters. Both the wing of an airplane and the rotor blade of a helicopter are "airfoils" and interact with the air in the same way through the "Bernoulli effect." Briefly, this describes the effect of the curvature of a wing causing a higher air pressure area below the wing and a low pressure area above, producing lift, as the wing moves through the air. A fixed-wing craft requires forward thrust to produce lift. A helicopter blade achieves forward thrust by spinning on a stationary axis thus producing lift only in a direction parallel to the axis, or vertical thrust. The amount of lift depends on the "angle of attack" of the airfoil, the angle of the blade to the relative wind. The angle of attack is proportional to the pitch of the rotor blade which is controlled

by the pilot, greater pitch producing more lift. At the same time, as pitch increases, so does drag since more blade surface is presented to the airflow, and consequently, more power is required to maintain the rotor RPM.

The relationship between pitch and RPM is perhaps the most important consideration in operating a helicopter. Another factor in a rotary-wing system is the torque reaction of the spinning rotor on the fuselage. The torque of the turning rotor exerts an equal and opposite force on the body of the craft causing it to turn opposite to the blades unless counteracted by another force, in this case the tail, or anti-torque, rotor blades. The tail rotor provides thrust in a direction opposite the torque reaction, thus equalizing the force and stabilizing the heading of the craft. Further, the thrust of the tail rotor is controllable by the pilot providing directional control. This is possible because over-compensation of the torque effect will turn the fuselage in the direction of the spinning blades, and a thrust less than the force of torque will allow the fuselage to turn against the rotor direction.

Four main control systems are found in conventional helicopters. These are the cyclic stick, the collective pitch control, the throttle and the anti-torque (or rudder) pedals. The collective pitch control, or simply, collective, increases or decreases the pitch of all blades equally. The collective is the primary vertical thrust control. Normally, pulling up on the collective stick will produce lift and lowering it will decrease lift. As mentioned above, as pitch increases, so does rotor drag, requiring an increase in engine power to maintain RPM. In many helicopters, this synchronization is provided automatically by a link between the collective and the throttle.

The throttle controls engine power and RPM directly. It is usually located on the collective stick to aid in the coordination of pitch and RPM.

The anti-torque pedals control the pitch of the tail rotor blades, providing torque compensation and directional control. Normally, these are conventional rudder pedals. Finally, the cyclic stick is the main direction control which determines the attitude of the rotor system. Basically, when the plane of the spinning rotor disc is horizontal, all the thrust produced is directed upward, perpendicular to the plane and parallel to the rotor shaft. By moving the cyclic stick in any direction away from center (or neutral) the plane of the rotor, in essence, tilts in the same direction, thereby dividing the thrust between the vertical and the direction of tilt. For example, moving the cyclic forward will cause forward thrust to a degree which is equal to the amount of rotor deviation from the horizontal. At the same time the attitude of the fuselage will change to the same degree (in forward flight, a nose-down condition). Also, a cyclic change will change the "angle

of attack" set by the collective pitch control, which will affect RPM and thereby, torque reaction.

This illustrates an essential characteristic of helicopter controls. Any change in one of the controls will, in most cases, require some adjustment in the other controls. This is why helicopters must be "flown" at all times.

In summation, the four main control systems can be thought of in general as follows:

The cyclic controls the direction and attitude of the helicopter. The collective controls the amount of thrust produced by the rotor blades in the direction set by the cyclic stick. The throttle directly controls engine power output and RPM. The anti-torque pedals control torque compensation and directional control to maintain heading.

THE UH-1X CONTROL SYSTEM

The Super Huey Control System can be divided into two main components. The control stick and the computer keyboard.

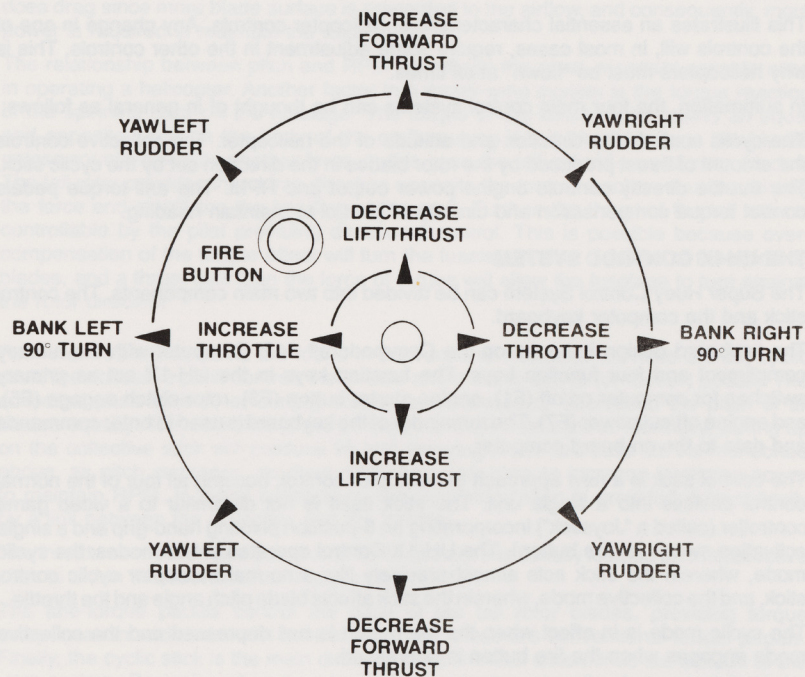
The keyboard design is based on the Commodore® 64™ Computer with the full key compliment and four function keys. The function keys in the UH-1X act as primary switches for computer on/off (F1), engine starter button (F3), rotor clutch engage (F5), and engine off/cut power (F7). The remainder of the keyboard is used to enter commands and data to the on-board computer.

The control stick is a new approach to helicopter control, housing all four of the normal control devices into a single unit. The stick itself is not dissimilar to a video game controller (called a "Joystick") incorporating an 8-position pivoting hand-grip and a single activation switch (or fire button). The UH-1X Control operates in two modes: the cyclic mode, wherein the stick acts almost precisely like a normal helicopter cyclic control stick, and the collective mode, wherein the stick affects blade pitch angle and the throttle.

The cyclic mode is in effect when the fire button is **not** depressed and the collective mode engages when the fire button is depressed.

The schematic illustrates the function of the UH-1X control stick. A geographical convention will be used to indicate the direction of stick movement. For example, pushing the stick forward, or away from the pilot, will be designated as North, and pulling back on the stick or toward the pilot, will be designated as South.

The inner circle describes the four operations of the collective mode which is engaged by pressing the fire button. Pushing the stick North will decrease the pitch angle of the



rotor blades, thus reducing lift/thrust to a point of 0 angle of attack or no lift. Pulling back South will result in a blade pitch angle increase producing more lift/thrust. Pushing the stick West will increase the throttle opening producing more engine power and a higher RPM. A push to the East will close the throttle gradually, reducing power.

The Fire Button is used to switch from cyclic to collective mode unless weapons are activated.

The outer circle describes the function of the stick when in cyclic mode (the fire button is **not** depressed). A North movement of the stick will tilt the rotor forward resulting in forward thrust. Moving the stick South tilts the rotor back to counter the forward thrust, thus slowing the craft. If held long enough, the helicopter will come to a stop supplying only vertical thrust for hovering.

East or West stick movements will result in a hard banking turn in the same direction. Stabilizers will level the ship as soon as the stick is returned to center. Northeast/Southeast stick will change the heading to the right through use of the anti-torque, or tail, rotor. Northwest/Southwest will produce a change to the left. Small course corrections should be made with the rudders and significant turns should be handled by banking the ship left or right. With the exception of hard bank left/right turns, all other control changes are designed to "set and hold" in both cyclic and collective mode. This means that any change in flight attitude by the control stick will be continuous until an opposite control maneuver is executed by the pilot to the same degree.

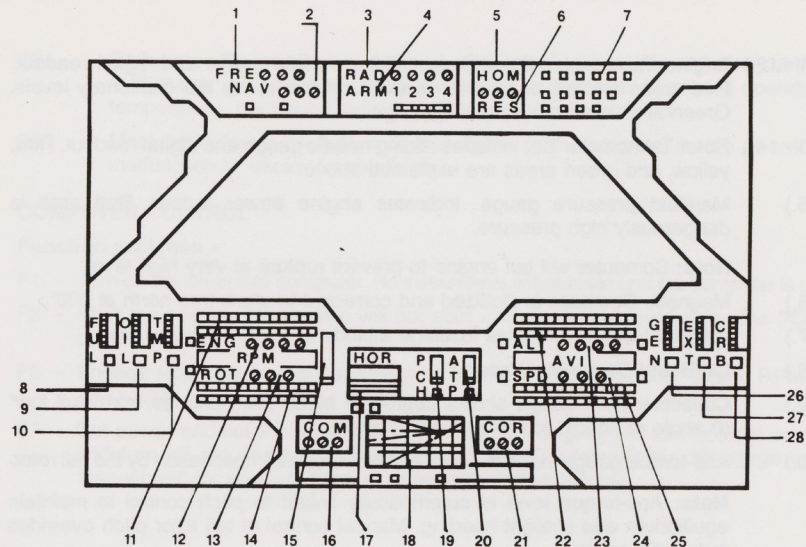
For example, pushing the stick to the northwest will lessen tail rotor thrust thus allowing the fuselage to begin turning to the left. The longer the stick is held in that direction, the greater the reduction in tail-rotor thrust. Returning the stick to center will not eliminate this change. The pilot must move the stick to the northeast to begin counteracting the thrust change which will bring the level of anti-torque effect back to neutral to reestablish a straight-ahead attitude. Similarly, an increase in lift produced by moving the stick south, in the collective mode, will build vertical thrust which will remain the same until the collective is lowered (stick north) reducing lift. If the lift is not enough to overcome the weight of the helicopter, then it will begin to descend (this is how landings are accomplished). Only experience will allow the pilot to discover the precise points of equilibrium required to achieve the desired maneuver.

INSTRUMENTS

- 1.) **FRE** – VHF Omnidirectional range transmission from a local station or base used by the navigation computer to set a heading to the transmitting station.
- 2.) **NAV** – Compass heading computed from the VOR Transmission (1) The COR Command may be used to copy this heading to the automatic course setting; (2) or the NAV heading may be followed manually.
- 3.) **RAD** – Radar is activated by entering combat mode (LAR Command). This readout then gives the line-of-sight range of the radar trace from the helicopter (multiple traces are resolved to the closest target).
- 4.) **ARM** – Numbers 1 2 3 4 are lighted indicating which rockets are in the launch tubes (1 to all 4 are selectable). The indicator lights below the numbers show which rockets are armed and ready to fire.
- 5.) **HOM** – A homing device may be dropped using the HOM Command. The heading to return to the drop spot is then transmitted and displayed here. The homing device has a range of 20 miles.
- 6.) **RES** – This displays the transmitted heading of a homing device used by ground personnel to be located. This readout will activate (and take precedence) when in range.
- 7.) **INDICATOR LIGHTS** – Routine automatic systems check will light the appropriate indicator if a malfunction is found in any electronic system. The pilot has no control over such malfunctions and should return to base for repairs.
- 8.) **FUL** – Fuel gauge.
- 9.) **OIL** – Oil pressure gauge. Optimum reading is center mark.
- 10.) **TMP** – Engine temperature gauge. Normal cruise reading is center mark.

YAW RIGHT RUDDER

Turn on Radar tracking without engaging weapons.



- | | |
|---|--|
| 1.) Radio Frequency (Incoming) | 16.) Magnetic Compass |
| 2.) Direction Finder | 17.) Artificial Horizon |
| 3.) Range (Radar Track) | 18.) On-Board Computer Screen |
| 4.) Rockets Status Indicators and Arming Lights | 19.) Collective Pitch Gauge |
| 5.) Homing Frequency/Heading | 20.) Anti-Torque Gauge |
| 6.) Rescue Frequency/Heading | 21.) Automatic Course Setting |
| 7.) Systems Status Indicator Lights | 22.) Altimeter Slide Gauge |
| 8.) Fuel Gauge | 23.) Altimeter Digital Indicator |
| 9.) Oil Pressure Gauge | 24.) Speedometer Digital Indicator |
| 10.) Engine Temperature Gauge | 25.) Speedometer Slide Gauge |
| 11.) Engine RPM Slide Gauge | 26.) Generator (ammeter) Indicator |
| 12.) Engine RPM Digital Indicator | 27.) Exhaust (Cylinder Head) Temperature |
| 13.) Rotor RPM Digital Indicator | 28.) Carburetor Mixture/Temperature |
| 14.) Rotor RPM Slide Gauge | 29.) Malfunction Indicator Lights |
| 15.) Manifold Pressure Gauge | |

11 - 12.) Engine Tachometer Set includes sliding needle gauge and digital readout. Red areas are low or excessive levels. Yellow areas are cautionary levels. Green area is normal operating range.

13 - 14.) Rotor Tachometer Set includes sliding needle gauge and digital readout. Red, yellow, and green areas are explained above.

15.) Manifold pressure gauge. Indicates engine power output. Red area is dangerously high pressure.

Note: Computer will cut engine to prevent rupture at very high level.

16.) Magnetic Compass is digitized and corrected to show true north at 000°.

17.) Artificial Horizon indicates fuselage attitude to relative horizon line.

18.) On-Board Computer Screen.

19.) Collective pitch gauge shows degree of blade pitch change from "full low" (0 angle of attack) to highest pitch angle.

20.) Anti-torque gauge indicates level of rotor torque compensation by the tail rotor.

Note: Anti-torque level is automatically linked to pitch control to maintain equilibrium and straight heading. Manual control of tail rotor pitch overrides automatic control.

21.) Automatic course setting indicates preset heading (using COR Command) that will be followed if there is no manual control input.

Note: Although many stabilization features are incorporated in the UH-1X, the helicopter is still inherently unstable enough to make the ACS only 70-80 per cent reliable.

22 - 23.) Altimeter set includes sliding needle gauge and digital readout. Red, yellow and green areas are explained above.

24 - 25.) Speedometer set includes sliding needle gauge and digital readout. Red, yellow and green areas are explained above.

26.) Generator/Ammeter gauge indicates electrical power output. Normal output is center mark.

27.) Exhaust/cylinder head temperature gauge indicates engine operating conditions. Optimum reading is center mark.

28.) Carburetor Gauge. During warm-up, this gauge shows fuel mixture starting at "full rich" for primary ignition and falling to medium. At normal operating temperature, the gauge indicates carburetor air temperature.

29.) Most instruments include indicator lights that illuminate in the event of malfunction or excessive readings.

COMPUTER CONTROL

Function switches -

F1 - Turn on the on-board computer. No instruments will operate until the computer is on.

F3 - Start the engine. The engine will not start until power is turned on by the POW command.

F5 - Engage rotor clutch. It is not advisable to engage the rotor until engine RPM is 1600-1700.

F7 - Cut power and cut the engine. This will stop the engine, cut all electrical power and turn off the computer. The rotor clutch will automatically disengage and "free-wheel" for winding down or in an autorotative landing.

Computer commands –

- ABT – Abort current mission. End assignment and stop all activity.
- ACS – Set automatic course correction. When prompted by SET, enter compass heading. ACS works only when there is no manual control input.
- ASN – Select a new assignment. After the command, enter one of the following:
- INS – flight instruction.
 - EXP – exploratory mission.
 - COM – combat.
 - RSC – rescue mission.
- CLM – Displays current climatic conditions including temperature, humidity, air density and pressure, and barometric reading.
- DST – Calculate line-of-sight distance from take-off point.
- GTK – Displays map grid for ground tracking based on Homing signal.
- HOM – Drop a homing device that transmits directional signal to the navigation computer.
- LAR – Load and arm rockets. At the LOAD prompt, enter numbers 1-4 to select the number of rockets loaded into the tubes. At the ARM prompt, enter numbers 1-4 to arm the corresponding rockets. The Fire Button is then engaged for firing.
- MAC – Activate machine guns. The Fire Button is engaged.
- POW – Turn on power.
- SAF – Send coordinates when landing or during emergency.
- RAD – Turn on Radar tracking without engaging weapons.
- TRK – Displays grid for Radar tracking and targeting.
- VOR – Activate VHF Omnidirectional Range reception for navigation.
- VSI – Display digital vertical speed reading.
- XXX – Cancel previous command input. (Not available on immediate action commands.)

STANDARD TAKE-OFF, FLIGHT AND LANDING PROCEDURES

- 1.) Turn on the computer (F1). Enter ASN to select an assignment. Enter three-letter designation for mission. Standby for computer collating.
- 2.) Enter POW command to turn on power.
- 3.) Start the engine (F3). Increase Throttle to bring engine RPM to 1600-1700.
- 4.) Engage Rotor clutch (F5). Wait for rotor RPM to reach engine RPM. Monitor Oil pressure gauge and Carburetor gauge for normal operating levels. Also watch for high or low temperature levels.
- 5.) Increase throttle to build RPM to take-off speed (3000-3100 engine, 300-310 rotor).
Note: If helicopter has been previously operated, make sure collective pitch is at FULL LOW before increasing throttle.
- 6.) With engine at proper RPM begin to increase pitch with the control stick (collective South). As lift is attained, watch for wind drift and stability. Control position and heading with Rudder control (cyclic NW, NE, SW, SE). Continue to control pitch angle as necessary to obtain smooth vertical movement. Equalize lift to attain a stationary hover at 20-30 feet.
- 7.) Select heading with the rudder control and begin moving the control stick, in cyclic mode, forward (cyclic North). As some airspeed is achieved, add more collective pitch to go into a climbing forward attitude. Forward cyclic will increase RPM and back collective will maintain RPM due to a throttle link. It is most important to hold RPM at a constant rate during cyclic/collective adjustments. Also, forward cyclic will tilt the fuselage forward bringing the nose down. Hold the ship at the proper attitude with some back cyclic modification. Increase forward thrust and airspeed with the collective control rather than further cyclic control to maintain attitude but monitor the degree of pitch and manifold pressure to stay at safe levels. Keep in mind that holding the control stick too long in any position will result in over-controlling. Make adjustments small and gradual to achieve a steady and controlled rate of change.
- 8.) Bring airspeed to between 70 and 90 knots and continue climbing to at least 500 feet, a minimum altitude from which to make an autorotative landing in the event of engine failure.
- 9.) Once desired altitude is reached, decrease collective to a point of equilibrium to enter straight-and-level flight. Watch the Airspeed indicator and altimeter for steady and consistent readings.

- 10.) Once in straight-and-level flight, maintain altitude and airspeed with cyclic and collective control and hold your course with the rudders. Watch the magnetic compass for heading.
- 11.) To return to base, enter a full 180 turn with cyclic West or East. Watch the compass to follow your heading through the turn. Slightly BEFORE reaching your desired return heading bring the control stick back to center and begin leveling off.
- 12.) Begin the descent by gradually decreasing pitch. As altitude begins to fall, maintain airspeed with the cyclic control. Keep the rate of descent constant by collective adjustments. As the altitude reaches 100 feet, slowly begin to increase collective pitch to reduce vertical speed. Also begin applying back cyclic to "flare" the helicopter, bringing the nose up and further reducing the speed of descent. At 10-20 feet, go into a hovering attitude and bring the ship to 0 airspeed with the cyclic control. Adjust pitch to hover and then very gradually decrease pitch with the collective to lower the helicopter to the ground. Just before touchdown, add some degree of pitch increase to cushion the landing and once on the ground immediately decrease the pitch angle to the FULL LOW position.
- 13.) Cut the engine and power (F7). The rotor clutch will disengage and gradually slow to a stop. **Note:** The engine cannot be started again until the rotor has come to a complete stop.

AUTOROTATIVE LANDING

Autorotation is a maneuver wherein, the failure or intent, the engine has stopped and the rotor is spinning freely. Control during autorotation is similar to a powered landing with exception that rotor RPM is maintained by either forward or vertical movement through the air. Therefore, speed or altitude is required to make a successful landing. In this regard, the main considerations are holding a high forward glide airspeed, which is aided by reducing collective pitch which reduces drag, and yet keeping enough lift to check the vertical descent speed. Near the ground, a full flare maneuver with back cyclic combined with a fairly quick and substantial collective pitch increase should cut vertical speed enough to allow for a fairly soft touch-down.

Note: Further reading materials are available on the flight characteristics of helicopters and, with the specific exception of the control configuration, will be helpful in learning to operate the UH-1X with confidence.

GENERAL DESCRIPTION OF AVAILABLE ASSIGNMENTS

- 1.) **FLIGHT INSTRUCTION** (*enter INS*) – Computer controlled flight training. The computer will lead you through a series of maneuvers from take-off to landing with simple control prompts. However, the trainee is in full charge of aircraft performance and should have a satisfactory understanding of the instruments and controls before attempting this test flight.
- 2.) **EXPLORATION** (*enter EXP*) – Fly a survey mission over previously uncharted territory. Map out the general terrain, major geological features, water supply, timberland or signs of habitation.
- 3.) **RESCUE** (*enter RSC*) – Military personnel are either lost or incapacitated in a mountainous region. Their route cannot be determined because of the irregularities of the terrain. The mission is to locate, transmit heading and distance and, if possible, land and attempt pickup of injured. The helicopter's maximum passenger capacity is two.
- 4.) **COMBAT** (*enter COM*) – A secret desert installation to which you are assigned is under possible threat of attack by unknown hostile forces. Your job is reconnaissance and, if necessary, defense. Determine enemy's ground and air strength and decide if engagement is feasible.

All mission assignments are unrestricted in form and within the general outline are non-repetitive. All command decisions are the responsibility of the pilot.

Refueling and repairs are available at the original take-off point only. In the event of crash landings, damage or emergency set-downs, the current mission will be terminated.

FLIGHT INSTRUCTION CARD

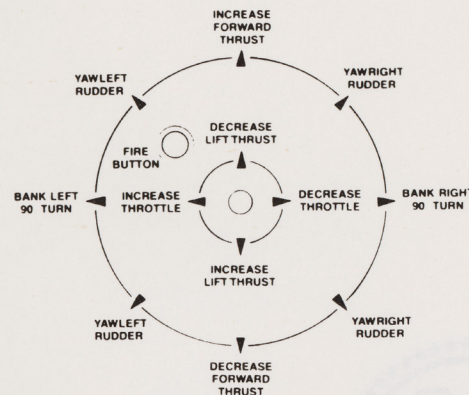
SUPER HUEY

POWER UP

1. Press F1 to turn on computer.
2. Type ASN to select an assignment. Select assignment.
3. Type POW to turn on console power.
4. Press F3 to start engine.
5. Increase Throttle to 1600-1700 engine RPM.
6. Press F5 to clutch Rotor. Allow Rotor RPM to match engine RPM (at 10 to 1 ratio).
7. Increase Throttle to 3000 engine RPM.

LANDING

12. To descend, decrease Collective. Slow speed with Cyclic.
13. At low altitude, cut rate of descent with Increased Collective and speed with Cyclic back.
14. To land, slow to zero airspeed and increase Collective to enter a stationary hover. Reduce Collective slowly to touch down.
15. On the ground, Decrease Throttle to 1000 engine RPM and press F7 to cut engine.



TAKE OFF

8. Pull back on Collective (w/firebutton) to lift. Rise to safe altitude above 30 feet.
9. Push forward on Cyclic (wo/firebutton) to add forward thrust. Increase airspeed to desired rate.
10. At desired altitude and airspeed, level off with Collective and maintain speed with Cyclic.
11. Coordinate direction with Rudders and Compass. Make hard turns with Cyclic.



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