

Software 64

SUPER HUEY
HELICOPTER
SIMULATIONSS027
For use with
Commodore
64
Computers64 **SUPER HUEY** UH-1X**THE NEW SUPER-REALISTIC
HELICOPTER SIMULATION**

by Paul Norman



**INCLUDES
SOLO-FLIGHT
TRAINING PLUS
3 SPECIAL MISSIONS -
RESCUE, EXPLORATION & COMBAT**

Audiogenic

Super Huey by Paul Norman

OVERVIEW

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

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

Also employed is a new VLV (very light weight) piston engine moulded 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 percent and increase forward speed potential substantially.

Structurally based on Bell Helicopters' UH-1 series, the UH-1X fuselage is made of a carbon fibre material and moulded for optimum aerodynamic 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 in 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 operating 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 defence 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 FOR THE FIRST TIME

The Super Huey game consists of two cassettes with the sides numbered 1 - 4. When you are playing Super Huey for the first time you will need to load Side 1 first to get your Flight Instruction.

Place the cassette in the cassette deck with Side 1 uppermost and rewind if necessary. Press SHIFT and RUN/STOP together at the same time, then press the PLAY key on the cassette deck. The program will now load - it incorporates the Novaload fast loader, so all loading will be done very quickly. After a while the title display will appear. As soon as that has finished, the rest of the program will load, and you will be ready to start your Flight Instruction.

IMPORTANT NOTE: The joystick must be plugged into control port 2.

Super Huey - the new super-realistic Helicopter Simulation. With Super Huey you don't just move a helicopter around on the screen - you are in there flying it! Your joystick gives you full control over throttle, rudder, cyclic and collective! Your fully computerised instrument panel provides you with all the information you need.

First you have to learn to fly Super Huey. Then when the rigorous flight training is over you can have a crack at the special missions...

Explore - Fly a survey mission over previously uncharted territory and map the terrain!
Rescue - Locate and attempt to pick up stranded military personnel!

Combat - Use your rockets and machine guns to defend a secret desert installation from unknown hostile forces!

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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 equalising the force and stabilising 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 the 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 synchronisation 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 co-ordination 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 centre (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 complement 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 in a single unit. The stick itself is not dissimilar to a video game controller (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.

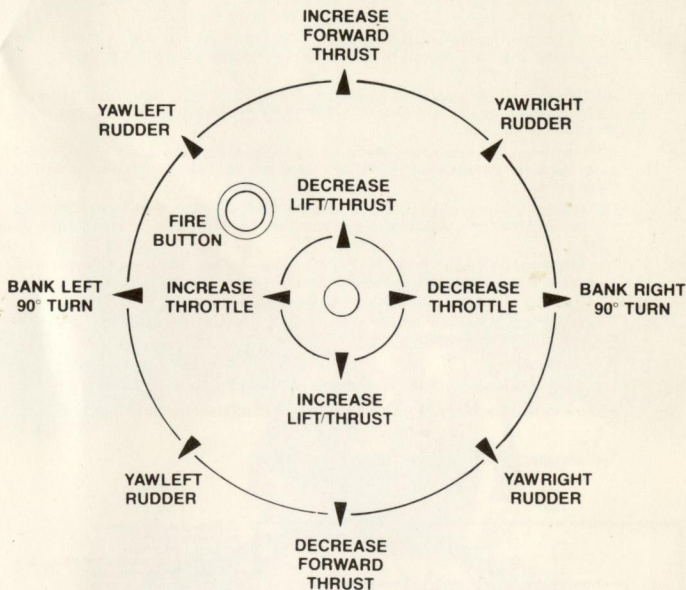
The schematic illustrates the function of the UH-1X control stick. A geographical convention will be used to indicate the direction of stick movement. For example, pushing the stick forward, away from the pilot, will be designated as North, and pulling back on the stick or toward the pilot, will be designated 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. Stabilisers will level the ship as soon as the stick is returned to centre. Northeast/Southeast stick will change the heading to the right through use of the anti-torque, or tail, rotor. Northwest/Southeast 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 manoeuvre is executed by the pilot to the same degree.

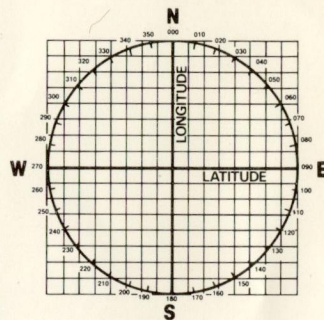


For example, pushing the stick to the Northwest will lessen tail rotor thrust, thus allowing the fuselage to begin turning to the left. The longer the stick is held in that direction, the greater the reduction in tail rotor thrust. Returning the stick to the centre will not eliminate this change. The 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 re-establish 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 manoeuvre.

PLEASE KEEP FOR REFERENCE

RESCUE

- Find the heading computed from the homing signal on the HOM/RES panel. (ie 340).
- Bring your compass heading (COM) to the same direction. (ie 340).
- As the RES readout changes, continue to match your course (COM) to it. These headings will lead you to the stranded survivors. If the RES indicator "flips" between "000 and 180" or "180 and 000" you have crossed over the target position.
- If you are unable to follow the course directly, and the RES number "flips" between a northern and southern heading (ie. 340 to 200) the target latitude has been crossed. At this point, the heading is either due east or due west depending upon the direction of the flip" (ie. from 280/350 to 190/260 target due west or from 010/080 to 100/170 target due east.)
- If the RES number "flips" between an eastern and western heading (ie. 290 and 070) this indicates a longitudinal crossing and the target is either due north or due south. (ie. from 280/350 to 010/080 target due north or from 190/260 to 100/170 target due south.)



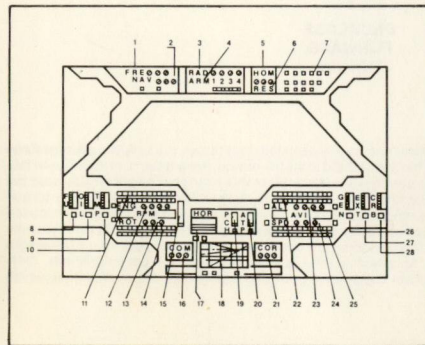
- A "flip" between 000 and 180 (or 180 and 000) indicates the helicopter is over the target. The survivors will fire a flare when they see you.
- After landing and rescuing the stranded personnel, enter the "VOR" command on the onboard computer and the "NAV" instrument will give you the heading back to your base.

INSTRUMENTS

- FRE - VHF omnidirectional range transmission from a local station or base used by the navigation computer to set a heading to the transmitting station.
- 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.
- 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).
- 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.
- 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.
- 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.
- 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.
- FUL - Fuel gauge.
- OIL - Oil pressure gauge. Optimum reading is centre mark.
- TMP - Engine temperature gauge. Normal cruise reading is centre mark.

YAW RIGHT RUDDER

Turn on radar tracking without engaging weapons.



- 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.
- Rotor Tachometer Set includes sliding needle gauge and digital readout. Red, yellow and green areas are explained above.
- 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.
- Magnetic Compass is digitised and corrected to show true north at 000 degrees.
- Artificial Horizon indicates fuselage attitude to relative horizon line.
- On-Board Computer Screen.
- Collective pitch gauge shows degree of blade pitch change from 'full low' (0 angle of attack) to highest pitch angle.
- 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.
- Automatic course setting indicates preset heading (using COR Command) that will be followed if there is no manual control input.
Note: Although many stabilisation features are incorporated in the UH-1X, the helicopter is still inherently unstable enough to make the ACS only 70-80 percent reliable.
- Altitude set includes sliding needle gauge and digital readout. Red, yellow and green areas are explained above.
- Speedometer set includes sliding needle gauge and digital readout. Red, yellow and green areas are explained above.
- Generator/Ammeter gauge indicates electrical power output. Normal output is centre mark.
- Exhaust/cylinder head temperature gauge indicates engine operating conditions. Optimum reading is centre mark.
- Carburettor 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 carburettor air temperature.
- Most instruments include indicator lights that illuminate in the event of malfunction or excessive readings.

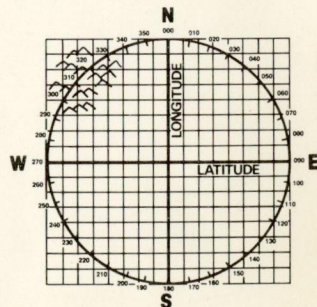
COMPUTER CONTROL

Function switches -

- Turn on the on-board computer. No instruments will operate until the computer is on.
- Start the engine. The engine will not start until power is turned on by the POW command.
- Engage rotor clutch. It is not advisable to engage the rotor until engine RPM is 1600-1700.
- 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.

EXPLORE

Mapping terrain requires plotting the relative position of any area to some fixed point. For example, select your Base as the center point. If you follow a steady course from the Base, use the DST command to find the distance you have gone on that line. If you do not follow a straight course, use the VOR command to find your return heading to base. The reciprocal of that number is your direction from Base. The scale of the grid above is 2 miles per square side. The hilly area shown is in the Northwest quadrant. 15 miles from Base on a heading of 316. Maps of any size and scale may be made with distances based on time/airspeed calculations.



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.
- 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 co-ordinates 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 carburettor 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. Equalise 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 comfortable 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 centre and begin levelling 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 manoeuvre wherein, by failure or intent, the engine has stopped and the rotor is spinning freely. Control during autorotation is similar to a powered landing with the exception that the 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 manoeuvre 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 SIDE 1

Computer controlled flight training. The computer will lead you through a series of manoeuvres 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 SIDE 2

Fly a survey mission over previously uncharted territory. Map out the general terrain, major geographical features, water supply, timberland or signs of habitation.

3) RESCUE SIDE 3

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 SIDE 4

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, defence. Determine enemy's ground and air strength and decide if engagement is feasible.

LOADING THE ASSIGNMENTS

To load the assignments, switch the computer off and on again, and find the cassette that contains the assignment you want. Put it in the cassette deck with the label of the correct side uppermost. Rewind the tape if necessary, and press SHIFT and RUN/STOP in the normal manner. All the programs have Novaload and will load quite quickly.

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

Refuelling 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.

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