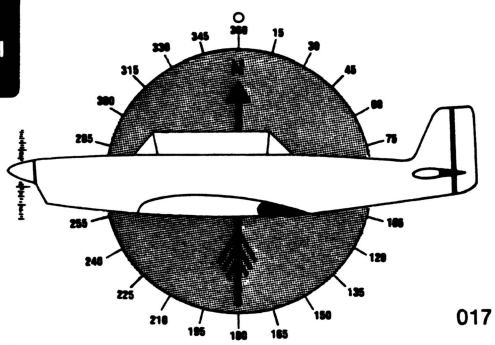
Instant Software™ Inc.
Peterborough, N.H. 03458 603-924-7296

PROGRAM DOCUMENTATION

Designed for use on TRS-80* 16K LEVEL II

Flight Path



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*A trademark of Tandy Corporation

TRS-80 LOADING

Unless otherwise indicated on the labels, Level I will be on one side of the cassette and Level II on the other. Make sure that your system is on, the recorder is plugged in, and the tape is rewound. Punch out the tabs on the cassette to prevent accidental erasure. Now insert the tape into your recorder and press PLAY.

Type NEW and press ENTER (E). Check the available memory by typing P.M.(E) for Level I or ?MEM(E) for Level II. Now press PLAY on the recorder and type CLOAD(E). In about ten seconds two asterisks should appear on your screen, with the right-hand one blinking. If it doesn't blink, you're not loading.

The TRS-80 is very sensitive to audio levels. If the program doesn't load, rewind the tape, adjust the volume level, and repeat the loading sequence above.

After each load, run a memory check and note how much memory the program uses.

Should you be unable to load, check the cassette with another system. If it's still no go, return it to:

Instant Software Miseries
Peterborough NH 03458

We'll check to see whether it was the cassette or your system that was awry and get you a replacement.

DISCLAIMER

Nothing in this world is completely perfect, including this program. I say this despite the yeoman efforts of the programmer who originally wrote and debugged it and the people in the Instant Software lab who worked far into the New Hampshire nights, all toward providing you with the best possible program.

Please enjoy it. If you come up with any improvements, you should let me know so I can pass along your ideas to other users.

Please note that there is no warranty expressed or implied that this program is going to do anything other than load and work. We don't guarantee that you will enjoy the game programs, that you will make or save money with business programs, or learn anything from educational programs. We don't guarantee that you will lose weight with a dieting program or avoid disasters with a biorhythm program. But if any program causes suffering (other than acute aggravation) or misfortune, we want to hear about it by mail, not through your lawyer. You are entirely on your own in using the programs.

If you run into problems while using a program, you can communicate with us . . . preferably by mail, and we'll try to help out. If a problem turns out to be commonplace, we'lo put the update information in MICROCOMPUTING. You are supposed to read MICROCOMPUTING anyway.

Wayne Green

Flight Path

Mountain Pilot

In this simulation you are flying supplies and equipment from Mountain Home to Goldtown and returning with bullion from the gold mine there.

This is the map of the entire area. The white areas are mountains over which your plane cannot fly with the load it is carrying. Notice the marked features. They are marked only on this map.

FLIGHT MAP

Most of the responses to the controls of a light aircraft have been included this simulation. The following diagrams will help you to take-off, fly and then land your aircraft.

It is not easy to complete the round trip safely, without a number of hints which are included in the program. The compass directions are difficult to remember for novice pilots, and you will find it very helpful to keep the Compass Rose (Figure 14) near at hand while you are navigating.

How to control your aircraft

THROTTLE SETTINGS ARE IN INCREMENTS OF 10%	KEY NUMBERS	THROTTLE SETTINGS
	1	10%
	2	20%
	3	30%
	4	40%
(Use the numeric keys on the keyboard)	5	50%
	6	60%
	7	70%
	8	80%
	9	90%
	0	100%

NOTE: The throttle cannot be reduced to zero.

DIRECTION OF TRAVEL . . . . . Use the directional arrows on the keyboard to turn the aircraft to the left and right.

LEFT . . . . . ←

RIGHT . . . . . →

NOTE: The RIGHT arrow adds 3 degrees to the compass course as long as it is held down.

The LEFT arrow subtracts 3 degrees from the compass course as long as it is held down.

ASCENT AND DESCENT ..... Use the directional arrows on the keyboard to ascend or descend (known as the Rate-of-Climb).
UP ..... ↑
DOWN ..... ↓

NOTE: The UP key adds 1/2 increment to the rate-of-climb indicator as long as it is held down.

The DOWN key subtracts 1/2 increment from the rate-of-climb indicator as long as it is held down.

IMPORTANT NOTE: A directional key, a rate-of-climb key and a throttle key may all be used at the same time.

Some flight characteristics of the aircraft in this program

(1) Flying speed is attained at 65 M.P.H. If you let the airspeed fall below 65 M.P.H. (except during the final phase of landings) a stall or spin will occur, finally resulting in a dive. The compass course will alter quite rapidly in this process.

(2) If you attempt to land at too high an airspeed, the aircraft will bounce. The airspeed is basically controlled by the throttle settings, but is also affected by the angle of attack of the wings. (Refer to Figures 5 through to 9).

(3) When the aircraft nears either of the landing areas, the map of the entire area will be replaced (on the display screen), with a map showing only the landing strip and your aircraft.
NOTES: ALL LANDINGS IN THIS SIMULATION MUST BE MADE ON A COMPASS COURSE OF 90 DEGREES.

If you wish to practice landings, press the P key during the take-off run. The Goldtown landing area will then be displayed, and all instruments will read as they might during a normal approach to Goldtown.

(4) Random factors have been inserted to simulate varying wind conditions, also to simulate stall and spin.

The varying wind conditions affect the following:
(a) The flight characteristics of the aircraft
(b) The fuel consumption

(5) The following hints will help you while flying through the mountains from the township, called Mountain Home, to the mining area, called Goldtown.
(a) Take-offs demand a minimum speed of 65 M.P.H. to achieve flight. Use 90% to 100% of engine power to reach 65 M.P.H., then pull back on the stick slightly, (refer to Figures 7 and 8). Note that attempts to pull back on the stick before achieving flying speed will slow the aircraft and cause you to use up a greater length of the runway. You could easily find yourself short of runway space!
(b) After you achieve the required altitude, level off the aircraft and reduce the throttle to 50%, to maintain flying speed in level cruising flight (refer to Figures 1 and 2).
(c) To fly over Eagle Pass requires at least 90% throttle and 3 plus increments on the rate-of-climb indicator, to attain sufficient altitude.
NOTE: Most of your fuel will be expended in flying over Eagle Pass. Consequently, to accomplish the trip without exhausting your fuel supply, reduce the throttle setting to 10% as soon as you have flown over the Pass, then maintain flying speed by keeping the aircraft altitude at 3½ negative increments (refer to Figures 4 and 5).
(d) Upon entering the Goldtown area, change course and commence to execute a slow turn, to align your aircraft with the runway. Begin adjusting your rate-of-descent (refer to Figures 5 and 6).
NOTE: During a turn you will lose altitude. The execution of a 90 degree turn causes a loss of 24 feet of altitude.

(e) For a good landing, you should be over the West end of the runway on a course of 90 degrees, at an altitude of two (2) feet, with an approximate airspeed of 70 M.P.H. At this point, reduce throttle setting to 10%. Align the aircraft with the runway, and remember that landing an aircraft combines a triple set of factors:
Altitude
Rate-of-descent
Airspeed
Your landing attitude should be nose slightly up, wings level, airspeed just above stalling, and the glide-slope should be as shallow as possible.

(f) Stall recovery will need a throttle setting of about 95%, accompanied by forward pressure on the control stick (refer to Figures 7 and 8). Readjust the stick and throttle for level flight configuration as soon as possible after stall recovery.

DISCUSSION OF THE BASIC PRINCIPLES OF FLIGHT

Refer to Figure 2. The wing of an aircraft is an airfoil; the bottom is much flatter than the top. When the wing is accelerated through an air mass, the air moves undisturbed across the bottom, but is accelerated across the top cambered surface. This causes a drop in air pressure on the top of the wing, and the normal (higher) pressure under the wing pushes it upward, providing "lift".

LIFT can be increased in two ways:

(a) By increasing the speed of the wing through the air. This is done by increasing the throttle setting. The aircraft begins to climb, immediately.

(b) The second way to increase lift is to increase the angle of attack. Refer to Figure 9, which illustrates that by pulling backwards on the control column (stick), you cause the elevators to rotate the aircraft into a "nose-up" position. The angle of attack is increased, and the aircraft begins to climb for altitude. NOTE THAT THERE IS A SEVERE INCREASE IN DRAG, WITH CONSEQUENT LOSS OF AIRSPEED.

CONTROL REACTIONS

The enclosed flight diagrams plus our discussion thus far reveal the following facts:

The throttle is used to climb for altitude, or allow the aircraft to lose altitude.

The elevators are used to control the angle of attack of the wings to the relative wind.

By raising or lowering the elevators, you either increase the angle of attack with consequent drag, or you decrease the angle of attack with lowered amount of drag.

RELATIVE WIND

Refer to Figures 2 through to 10. When the aircraft is in level flight (Figure 2) the relative wind is attacking the leading edge of the wing head-on.

When the aircraft is descending (Figures 5 and 6) you will note that the relative wind is attacking the leading edge of the wing from below. These diagrams illustrate that the angle of attack varies, even when the nose of the aircraft is in ROUGHLY level position, as long as the climb, or glide of the aircraft varies. Referring to Figure 7 shows that you can stall even when the aircraft is in moderately level position, due to the steep descent angle.

FINAL FLIGHT REVIEW

Mountain Pilot is a primary flight simulation. With some practice, you will learn that (contrary to popular opinion), the stick and throttle have differing effects on airspeed and climb characteristics. You will need coordinated use of both of these controls to fly the aircraft.

Increase the throttle to climb, and pull gently back on the stick. Decrease the throttle to descend, and gently push the stick forward. To maintain level flight, set the throttle and stick at mid-point.

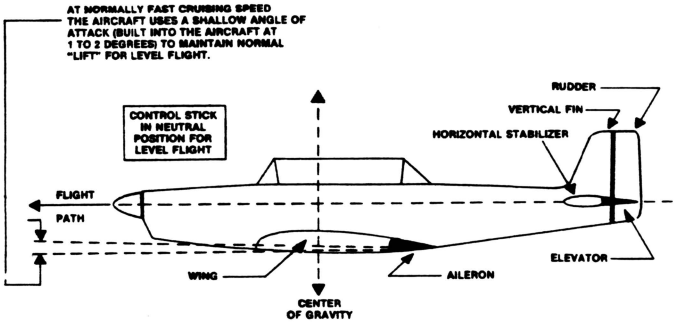


FIGURE 1. LEVEL FLIGHT AT CRUISING SPEED.

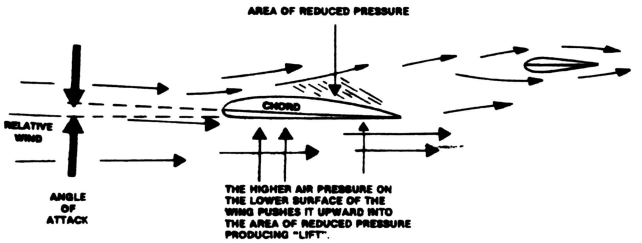


FIGURE 2. THEORY OF "LIFT" PRODUCED BY THE MOTION OF RELATIVE WIND ACROSS AIRFOIL SECTION OF A WING.

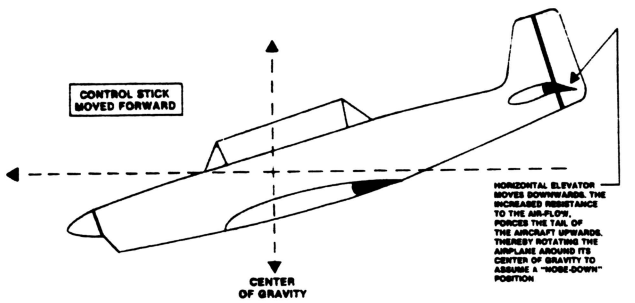
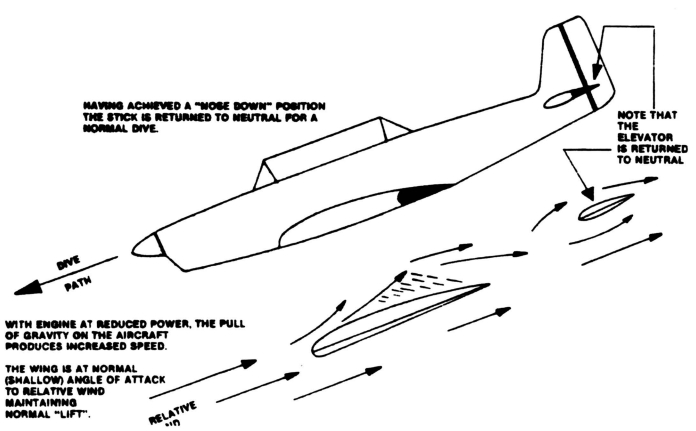


FIGURE 3. THE ELEVATOR



EXECUTED SLIGHTLY NOSE HIGH, AT REDUCED ENGINE POWER. THE NORMAL GLIDE IS USED DURING LANDING APPROACH DESCENT, (PARTICULARLY WHEN LANDING LIGHT AIRCRAFT).

IT IS ALSO USED AFTER ENGINE FAILURE, WHEN SEEKING A (POWER-OFF) EMERGENCY LANDING AREA.

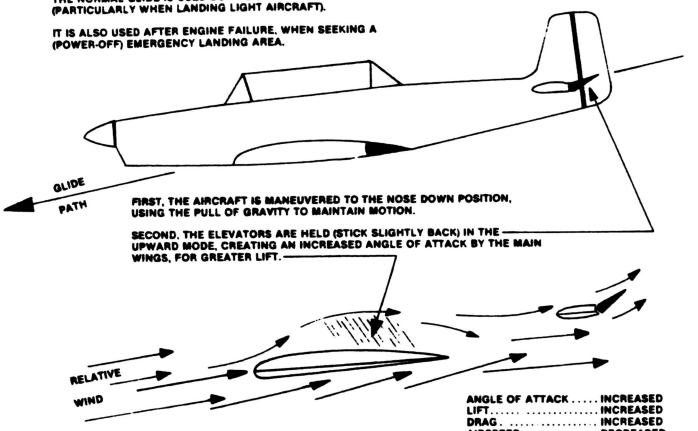


FIGURE 5. THE NORMAL GLIDE.

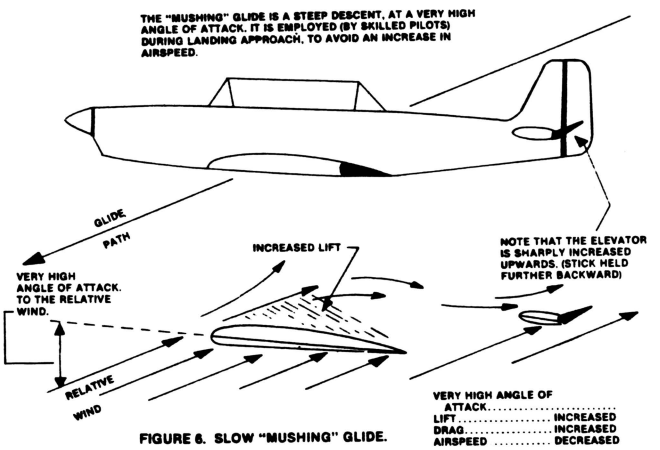
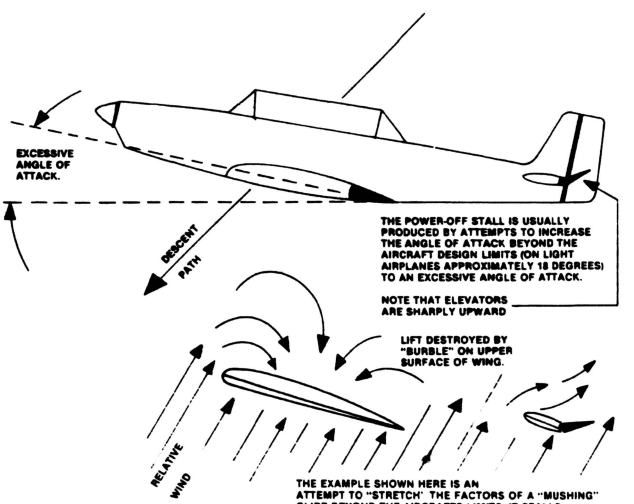


FIGURE 6. SLOW "MUSHING" GLIDE.



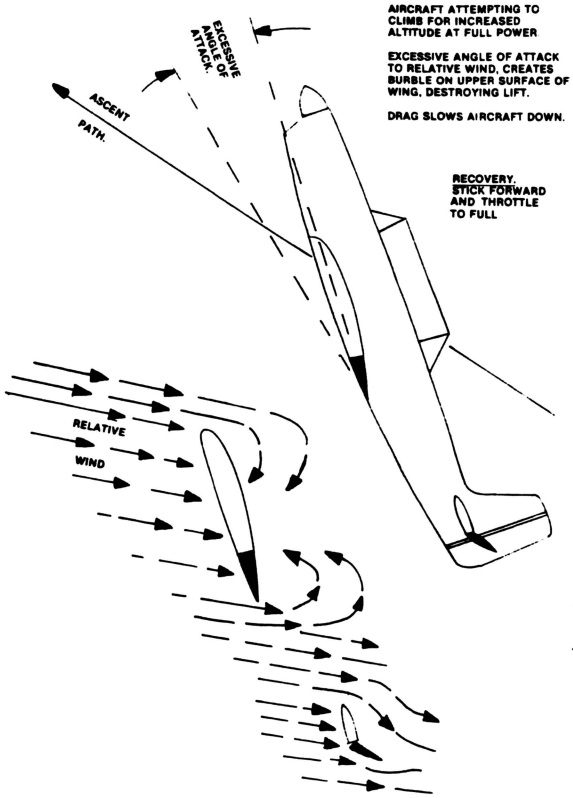


FIGURE 8. POWER-ON STALL

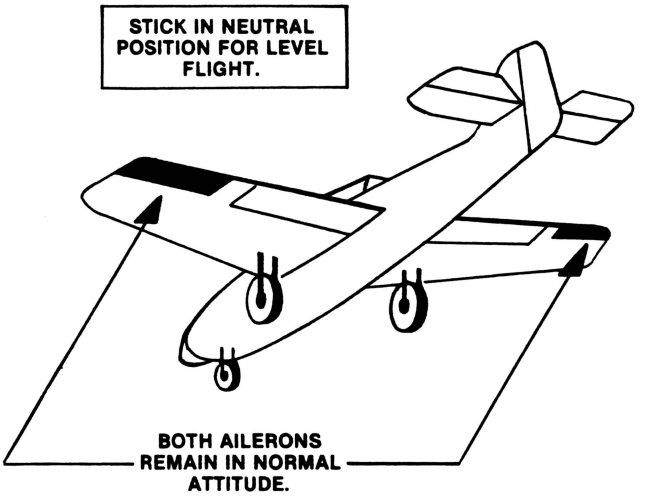


FIGURE 10. THE AILERONS IN LEVEL FLIGHT.

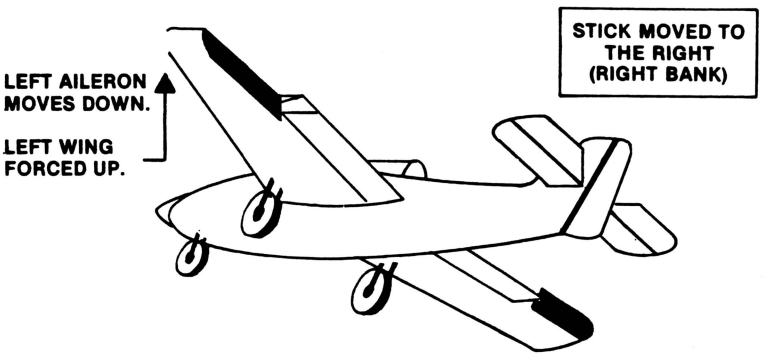


FIGURE 11. THE AILERONS IN A RIGHT BANK.

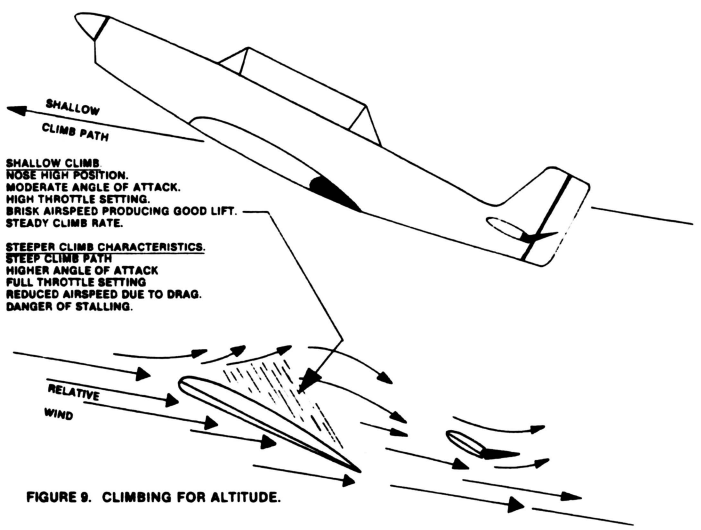


FIGURE 9. CLIMBING FOR ALTITUDE.

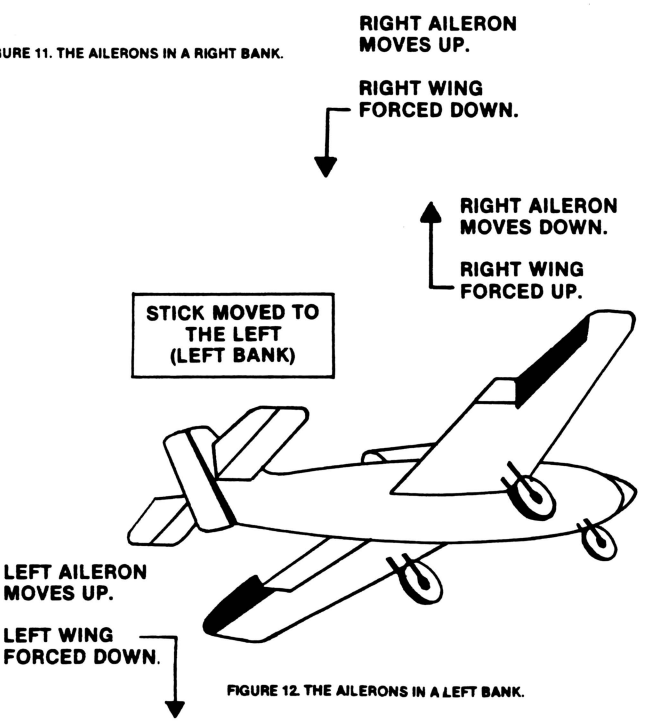


FIGURE 12. THE AILERONS IN A LEFT BANK.

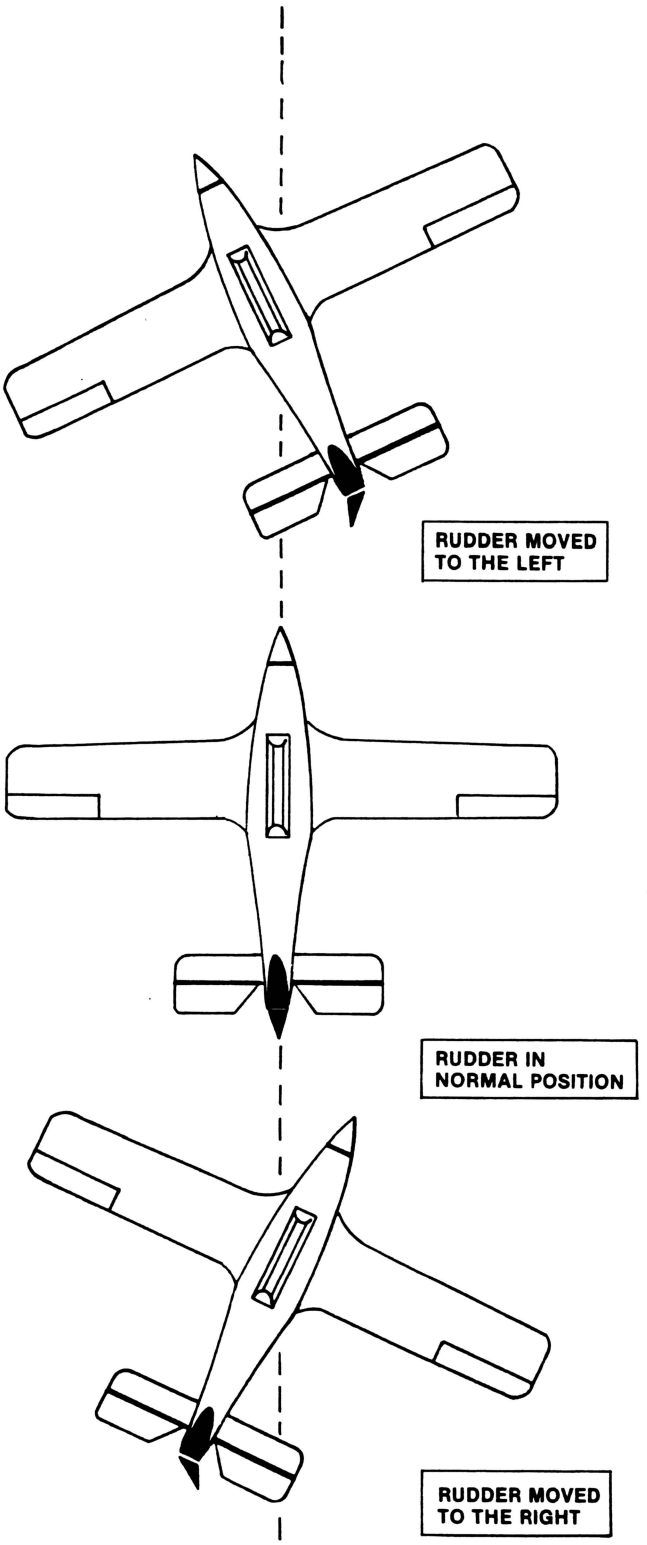


FIGURE 13. RUDDER MOVEMENTS

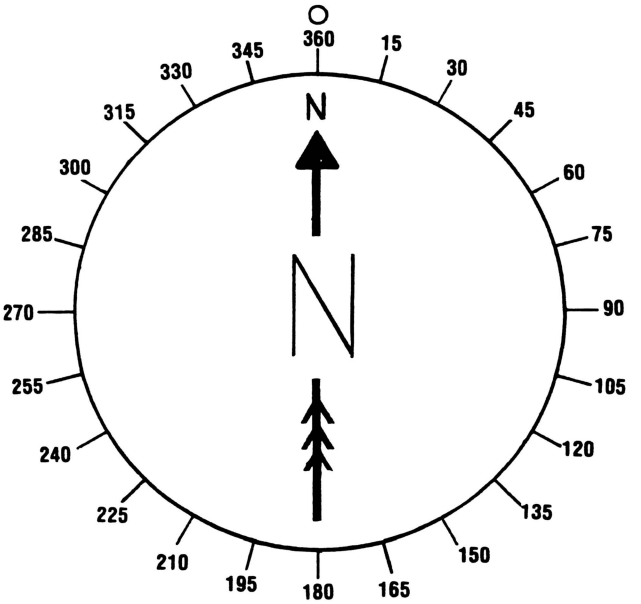
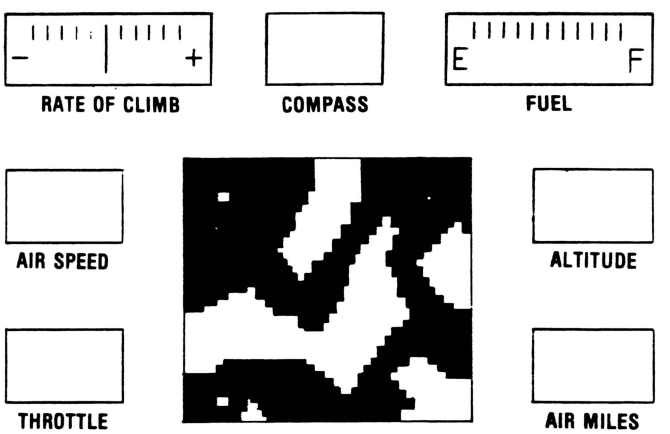


FIGURE 14. THE COMPASS ROSE



TO TAKE OFF SELECT A THROTTLE SETTING (1 to ZERO)

FIGURE 15. CONTROL PANEL

PRECISION APPROACH RADAR

Precision Approach Radar (PAR), also known as GCA (Ground Controlled Approach), is a simulation which allows you to become an Air Traffic Controller.

How to use PAR

(a) The TRS-80 display screen becomes your radar-scope.
(b) The keyboard directional arrows allow you to guide the pilot.
(c) The objective is to issue precise instructions to the pilot which will enable him to land the aircraft in bad weather (e.g., 100 foot ceiling, ¼ mile visibility, or fog).

(d) There are five levels of increasing difficulty from which you can choose the type of aircraft to be landed.
(e) The directional flight-path of the incoming aircraft is guided from side-to-side by use of the right and left arrow-keys on the keyboard.
LEFT ← RIGHT →
(f) The glide-path (rate of ascent/descent) is controlled by the
UP ↑ DOWN ↓
arrow-keys on the keyboard.

Reading your radar-scope

The radar-scope is divided into two sectors:

The upper sector is a side-view of the airfield runway and airport buildings.

The lower sector is a top-view of the runway approach and the actual runway.

Guiding the incoming aircraft

(a) You will first sight your incoming aircraft at the top left corner of the lower sector of the radar-scope.
(b) The incoming aircraft will be moving from left to right (across your radar-scope), on the right downwind leg of the runway.
(c) You must guide it (using the LEFT/RIGHT directional arrow keys) through a full 180 degree turn to align with the runway approach. NOTE: You will not sight the moving aircraft on the upper sector (side-view) until it is aligned on the final runway approach.
(d) As soon as you have the aircraft aligned with the runway (and it appears on the upper sector), you will then be able to use the UP/DOWN arrow keys (simultaneously) with the LEFT/RIGHT arrow keys, to control its rate-of-descent.
(e) Once the aircraft has touched-down on the runway, the rate of ascent/descent must be zero (level flight).
(f) If the aircraft is too high to land, turn 180 degrees to the right until it is established on another right downwind leg.
NOTE: In this "go-around" procedure, be sure to observe the upper sector carefully. You will see that the "blip" ceases to move in the upper sector when the aircraft achieves the fresh right downwind leg. As soon as movement in the upper sector ceases, press the UP arrow key. This will re-establish the aircraft at a safe altitude for the new landing approach.

O'HARE

O'Hare simulates the situations faced by air traffic controllers at a large, busy airport.

Your objective is to guide all aircraft which appear on the Cathode Ray Tube/Planned Position Indicator (CRT/PPI) to a safe landing.

You will have individual control of the heading and speed of each aircraft. In this simulation, you do not have control of altitude, which is left to pilot discretion.

The radar-scope (CRT/PPI) displays a control sector of approximately 20 × 27 statute miles. All aircraft within that sector move at scale speeds as you command them. All turns which you command are executed as "procedure" turns at three degrees/second.

Your complete duty-period as traffic controller will consist of the successful routing and landing of 20 aircraft, which will arrive at the boundaries of your control sector from four directions. The spacing of these aircraft is governed by the level of difficulty which you select (6 levels of difficulty from novice to senior controller).

In general, aircraft arrivals occur on headings which conform to a counter-clockwise traffic-flow around the airport.

NOTE: All aircraft enter the sector at a speed of 180 knots.

Aircraft movements are under the explicit command of air traffic controllers.

COMMANDS

The letters C, L, R, S are used for commands.

SXXX – Set airspeed to XXX knots.
NOTE: If an error is made during the issuance of a command, repeat the entire command, starting with the correct letter.

EXAMPLE OF A TYPICAL COMMAND SEQUENCE

COMMAND	MEANING	ACTION
CA	Call Flight "A"	Flight data will appear in upper left corner
L175	Left turn to a heading of 175 degrees	Aircraft "A" will execute a "procedure turn" left from present heading, to a heading of 175 degrees. Actual headings during the turn will be displayed on the CRT/PPI. Flight data will be updated.
R000	Right turn to a heading of 000 degrees	Aircraft "A" will execute a "procedure turn" right from present heading, to a heading of 000 degrees. Actual headings during the turn will be displayed on the CRT/PPI. Flight data will be updated.
S150	Set airspeed to 150 knots	Aircraft "A" will assume an airspeed of 150 knots. Flight data will be updated.

An aircraft call (CX) is acknowledged by the display of appropriate flight data at upper left corner of radar scope, allowing consequent turn or speed commands to be issued to that aircraft.

NOTE: All turn and speed commands must be issued commencing with the appropriate letter (L=LEFT, R=RIGHT, S=SPEED) followed by a 3-digit number (e.g. 000, 045, 180, 165, etc.). The command will only be executed after the third digit is entered. The ENTER key is not used. Each digit of the 3-digit sequence being entered is "echoed" at the upper left corner of the radar scope.

The flight-data will always reflect the latest commanded heading. The heading-data which appears next to the aircraft "blip" is the actual heading. The commanded heading and the actual heading will agree if the aircraft is not executing a turn.

GENERAL FLIGHT DATA

STROBE LIGHTS	Strobe lights will appear on the radar scope, aligned with the only runway on which landings are permitted (called the "active" runway, to allow landings into the prevailing wind).
FLIGHT DATA UPDATE	Updating of flight information will occur at specific intervals.
WIND CHANGE WARNINGS	Changes of wind direction will be given at the time of Flight Data Update. The change of wind-direction will usually mean a change of "active" runways, shown by the strobe lights aligning with a different runway.
TOUCHDOWN SPEEDS	Aircraft must be precisely aligned with the runway at touchdown speeds ranging between 120 to 150 knots. A crash or an abort will ensue if these conditions are disobeyed. NOTE: Landings are aborted for two conditions: (a) If the aircraft heading is not exactly aligned with the [illegible]

SCORING (You commence with an initial score of 10,000 points).

Deduction of points . . . . . Points are deducted at the rate of one per second, for each second of elapsed time, from the beginning of your tour of duty until all aircraft are landed.

You lose 5000 points for each mid-air collision.

You lose 250 points for each aborted landing.

You lose 2500 points for each crash landing.

POINTS EARNED . . . . . You gain 100 points for each safe landing.

NOTE: A landing is considered safe when the aircraft touches down at the end of the "active" runway (indicated by the strobe lights), landing into the wind, at a speed ranging between 120 to 150 knots, on a heading which matches the runway direction.

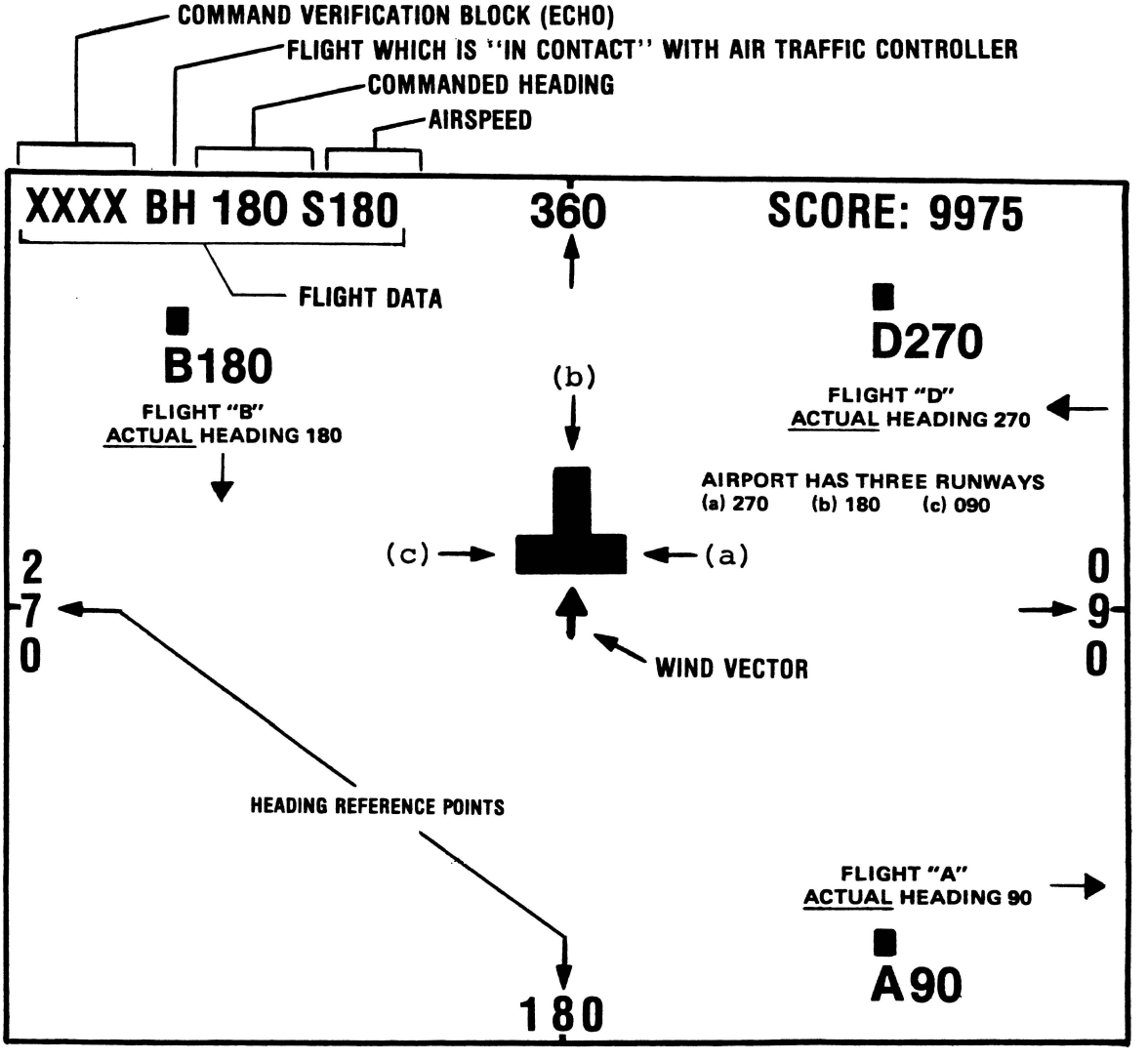


FIGURE 16. SAMPLE DISPLAY OF CRT/PPI RADAR SCOPE

Note: Pilot acknowledgement of commands displayed at aircraft position on screen.