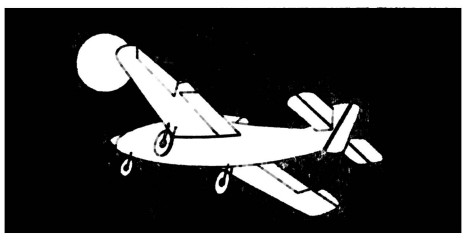
Instant Software Inc.
Peterborough, N.H. 03458 603-924-7296

PROGRAM DOCUMENTATION

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

Night Flight



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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 your 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'll put the update information in MICROCOMPUTING. You are supposed to read MICROCOMPUTING anyway.

Wayne Green

Night Flight

Night Flight

INTRODUCTION

Night Flight is a TRS-80 Level II program which simulates takeoff, flight, and landing, of a light aircraft. You can practice approaches and landings, or fly over enemy territory on a photo-reconnaissance mission (hopefully, returning safely to your base without being shot down!!).

This program simulates actual flight characteristics. Therefore, the enclosed description of basic aerodynamics and principals of flight, will help you to "fly" your first few missions without a "crash".

HOW THE PROGRAM WORKS

(1) You will be offered a choice of flights.

(2) Wind conditions will then be given. (Note: The program always uses runway No. 18, which is situated on a heading of 180 degrees, due South, directly into the wind). Refer to Figure 16.

(3) A "COMMAND" group offers a choice of controls:

(S)tick (T)hrottle (S)lip ta(R)get (G)o

You can enter two commands in each 10 second period, (allowing approximately 3 seconds for each command).

Each of the control commands is activated by pressing a designated key.

The DEGREE of control movement, is achieved by:

(a) Choosing a numbered key (for the amount of movement).

(b) Pressing the ENTER key.

The (G)o command, allows you to interrupt, and proceed to the next 10-second group, without making any further control adjustments.

(4) **Reconnaissance Photographs**

(A) The ta(R)get command clears the screen, then advises location relative to the photo-reconnaissance mission target itself. With this information, you can either continue the flight, or trigger the aerial camera for a reconnaissance photo. (Refer to Figures 14 and 15, for the circumstances which will affect your photo-recon mission.)

CONTROLS AND FLIGHT INSTRUMENTS

ALTITUDE	ALTIMETER — Height in feet.
AIRSPEED	AIRSPEED INDICATOR — Miles per hour.
HEADING	COMPASS HEADING (TRUE) — Degrees
GLIDE	The vertical speed of ascent and descent will be represented as a positive value when climbing, and a negative value when descending.
ELAPSED TIME	The elapsed time into the flight, will be shown in minutes and seconds as E.T.
PITCH	This will be representing the pitch of the aircraft nose relative to the ground, not to the thrust-line of flight. In DEGREES.
FUEL.	Fuel is indicated in gallons.
THROTTLE . . . . . (Controls Engine, Rate of climb, Rate of Glide, Airspeed).	DOWN setting — Lowest setting 5 degrees. MID-POINT setting — 50 degrees No change occurs to Glide rate at this setting. UP setting — 99 degrees (Maximum power setting.)
CONTROL COLUMN (STICK)	BACKWARD moves elevator UPWARD — FORWARD moves elevator DOWNWARD (Refer to Figure 3.) LEFT moves FOR BANKING RIGHT ailerons AIRCRAFT (Refer to Figures 10, 11, and 12.)
RUDDER	BANKING . . . The computer overrides attempts to bank the aircraft more than 60 degrees. (Refer to Figure 13.) Rudder motions have been substituted by command (S)lip. Since there is no rudder on this aircraft, all turns are considered as coordinated. However, without a rudder, "side-slip" adjustments to aircraft attitude during landing approach would be impossible. Consequently, the "SLIP" command allows you to move the aircraft 20 feet to either left or right (without adopting the banking attitude or the usage of any controls during landing procedure). Note: Since this is a very primary flight simulator, the use of FLAPS and retractible landing gear is omitted.
INSTRUMENT WARNINGS.	LOW FUEL STALL WARNINGS HIGH SPEED (Structural damage will occur at speeds above 125 mph!)

FLIGHT AND AIRCRAFT PARAMETERS

Stalling Speed

58 Miles per hour.

Stall Warnings

Commence at 63 Miles per hour.

Stalling speed increases with bank-maneuver.

In a 60 degree bank, stalling speed is 30% higher (75.4 mph). Stall angle is 19 degrees to the angle of flight (relative wind). Note that the glide-angle of the aircraft is a considered part of this parameter. Stall warnings commence at 16 degrees.

A (standard) rate-of-turn in this simulator is 3 degrees/second, during the execution of a 20 degree banking maneuver, at an airspeed of 100 mph. This rate-of-turn will accomplish a 180 degree change of direction in precisely 60 seconds. (In simplified terms, a reversal of direction in the time-space of 1 minute.)

Stall Recovery

Move (T)hrottle "UP" as far as possible to maximum power settings of 99 degrees.

Move stick forward to at least minus 20 degrees. If there is sufficient altitude to recover from the stall, re-adjust the stick and throttle as soon as possible after regaining normal flight configuration.

Takeoffs

Throttle setting — at least 70 degrees.

At 58 mph (minimum speed to achieve flight), stick back slightly, and liftoff.

Note: At take-off speeds near 58 mph, do not pull the stick back more than 2 degrees. At 65-70 mph the stick can be back about 3 more degrees when lifting off.

Attempts to pull the stick back, before attaining the minimum flight speed of 58 mph will simply slow the aircraft down, with consequent greater usage of available length of runway. You could easily find yourself short of runway space!!

Landing Procedures

Much practice required.

Turn the aircraft to align with runway (compass = 180°). Watch headings (compass readings in degrees).

Landing the aircraft is a triple set of functions:

Altitude
Rate of descent
Airspeed

The novice will need at least 4 miles distance from the runway to the point at which the aircraft will intersect the glide-slope. (You will probably need that much distance when attempting to line-up with the runway, then later the runway center line.)

Landing attitude — Nose-level slightly up. Wings level.

Landing airspeed — Just above stalling.

Glide rate — As shallow as possible.

The computer allows you a total runway length of 3500 feet to land your aircraft. This is more than adequate, and is deliberately calculated to compensate for the fact that split-second adjustments to landing approach attitude are not

available, since the command groupings are of 10 seconds duration.

Additional Flight Information

Full screen messages will be displayed during your flight, as follows:

ALTITUDE – If altitude drops below a safe minimum, you will be advised to gain altitude during final approach.

Other advisory messages will appear, including those vital instrument changes, on the upper sector of the TRS-80 screen.

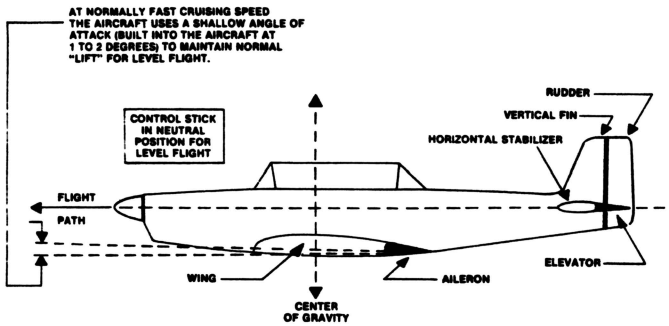
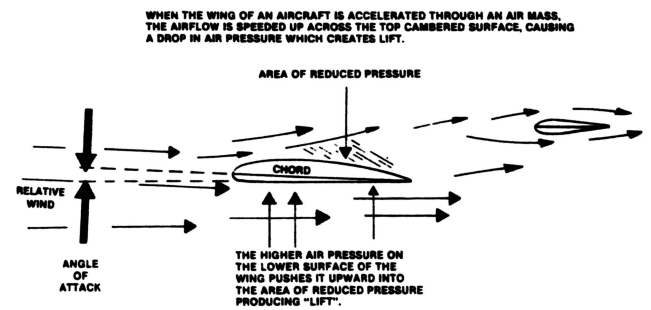


FIGURE 1. LEVEL FLIGHT AT CRUISING SPEED.



RELATIVE WIND ..... THE AIR FLOW (OVER THE SURFACE OF AN AIRCRAFT, CREATED BY ITS MOTION THROUGH THE AIR.

ANGLE OF ATTACK..... THE ANGLE AT WHICH THE AIRFOIL (CROSS SECTION OF THE WING) CHORD MEETS THE RELATIVE WIND.

STALL..... THE ANGLE OF ATTACK IS TOO HIGH TO MAINTAIN LIFT. AIRCRAFT BEGINS TO FALL.

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

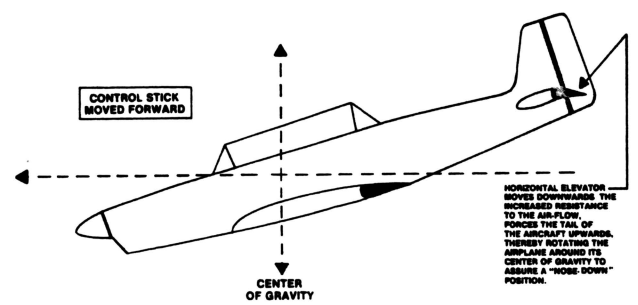


FIGURE 3. THE ELEVATOR.

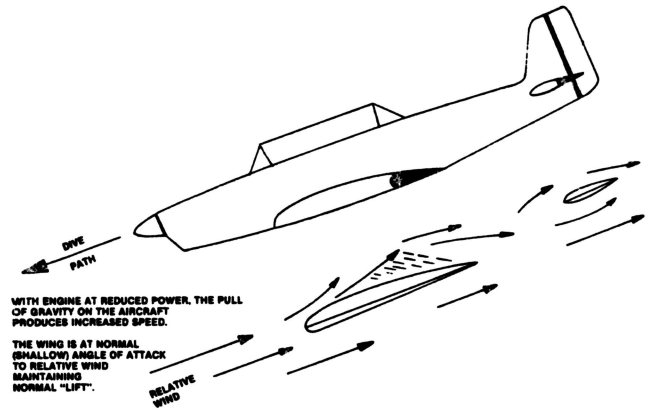


FIGURE 4. THE NORMAL DIVE.

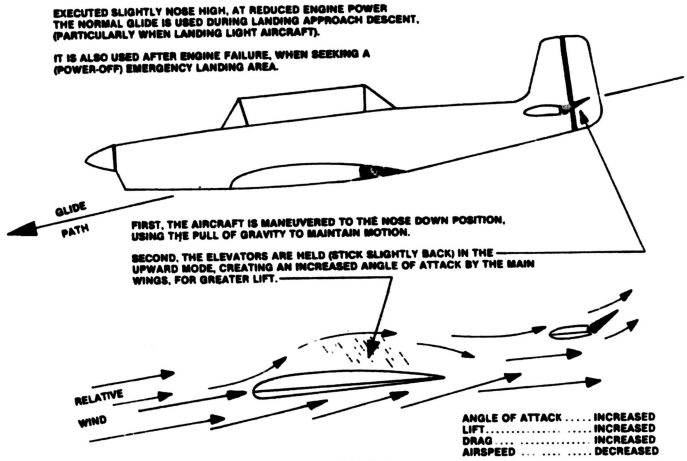


FIGURE 5. THE NORMAL GLIDE.

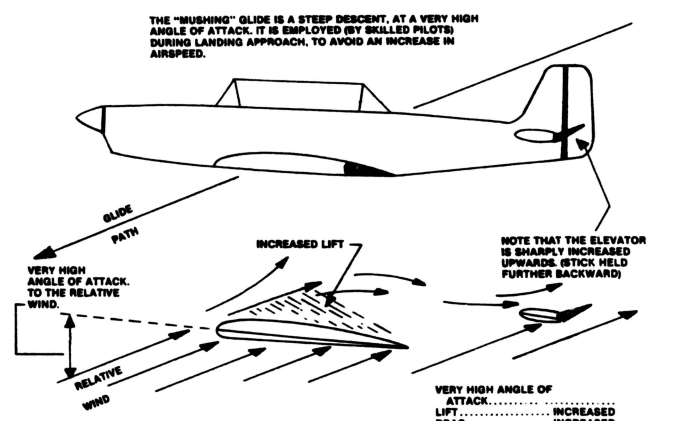


FIGURE 6. SLOW "MUSHING" GLIDE.

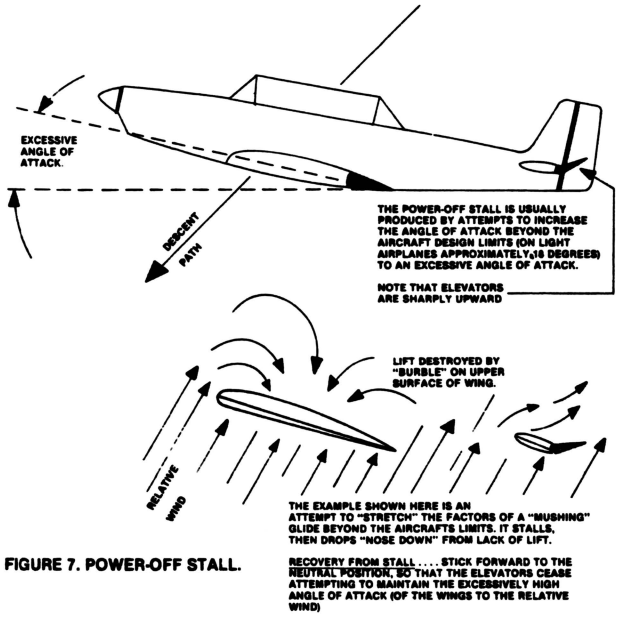


FIGURE 7. POWER-OFF STALL.

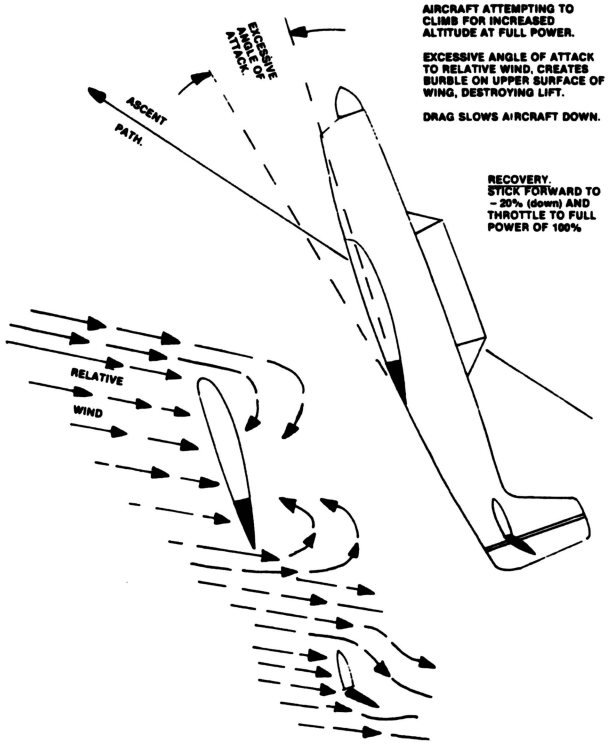


FIGURE 8. POWER-ON STALL.

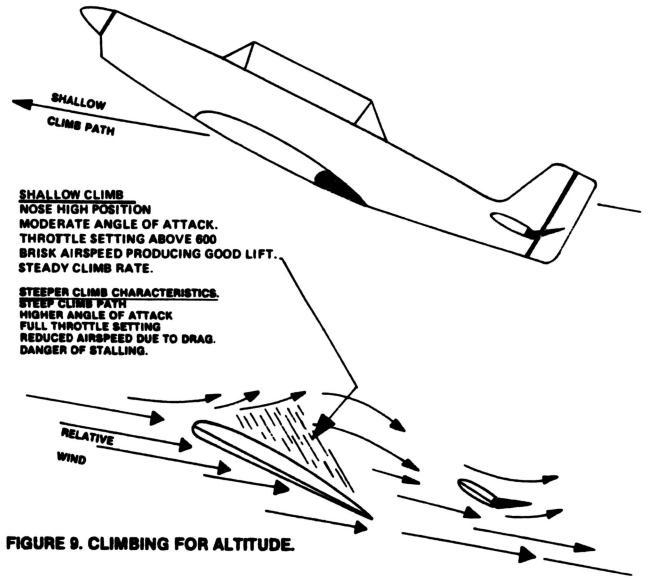


FIGURE 9. CLIMBING FOR ALTITUDE.

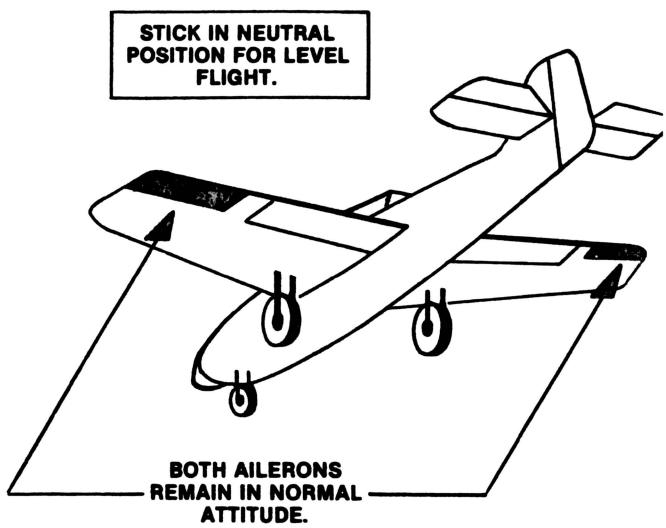


FIGURE 10. THE AILERONS IN LEVEL FLIGHT.

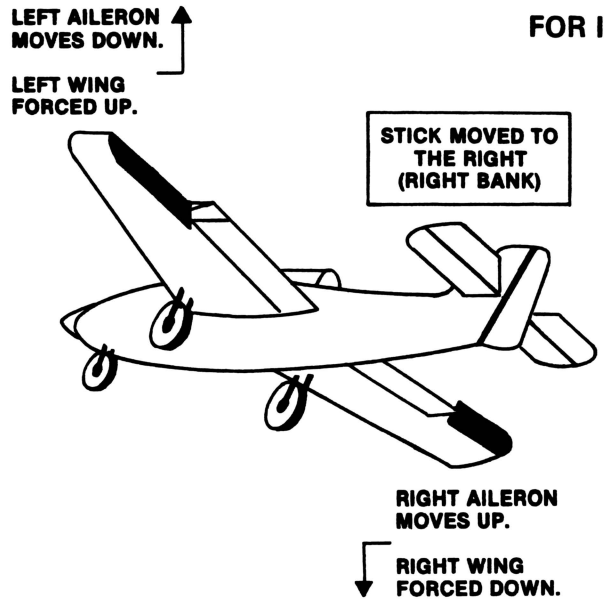


FIGURE 11. THE AILERONS IN A RIGHT BANK.

NOTE THAT THE TRS-80 OVERRIDES ATTEMPTS TO BANK THE AIRCRAFT MORE THAN 60 DEGREES

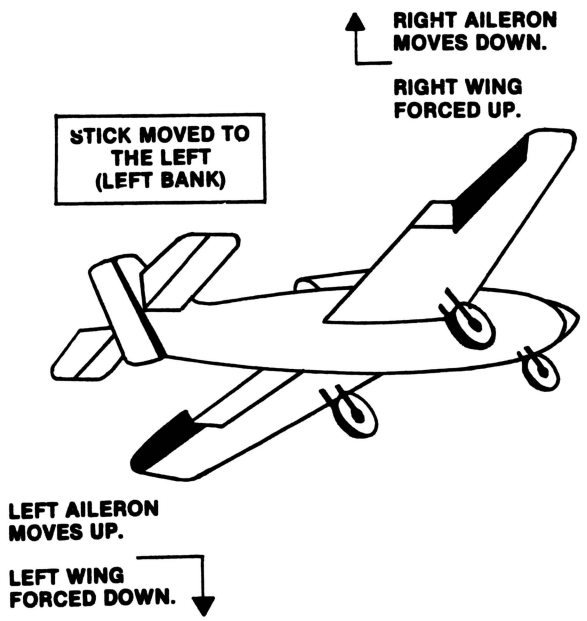


FIGURE 12. THE AILERONS IN A LEFT BANK.

NOTE THAT THE TRS-80 OVERRIDES ATTEMPTS TO BANK THE AIRCRAFT MORE THAN 60 DEGREES

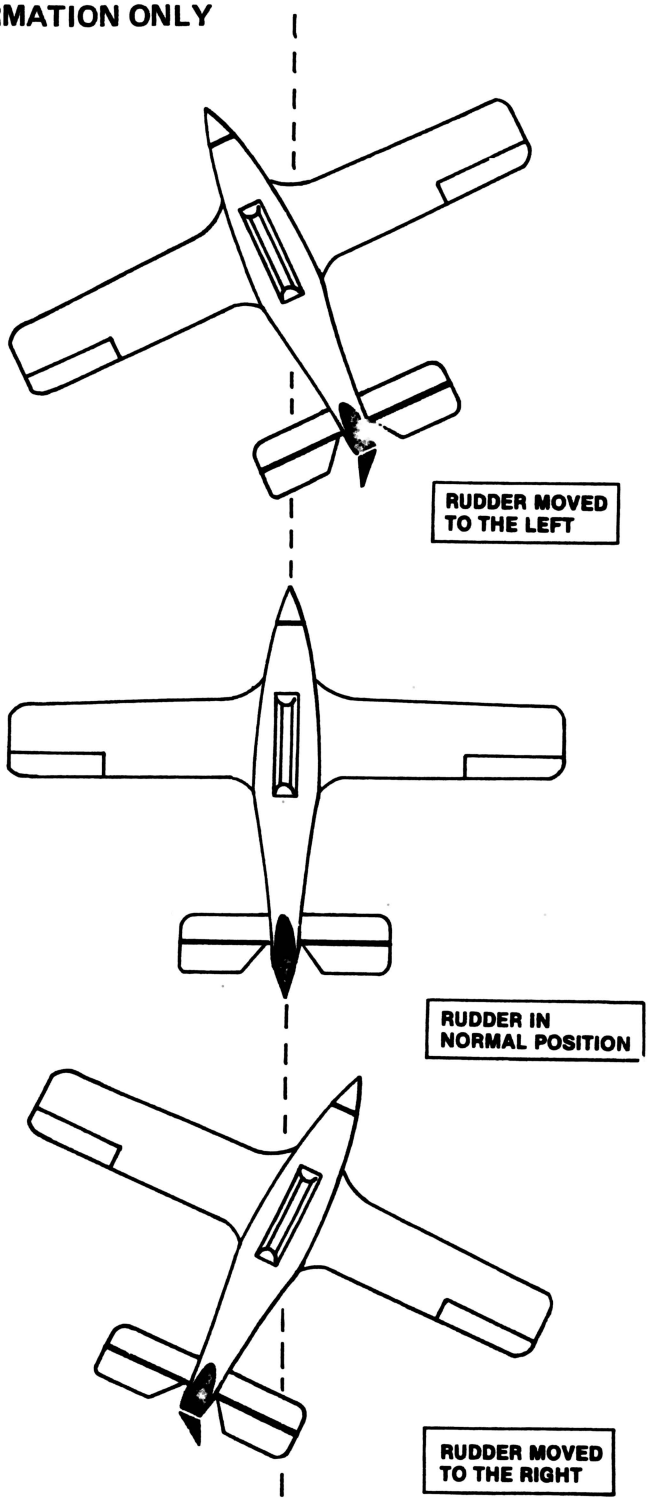


FIGURE 13. RUDDER MOVEMENTS.

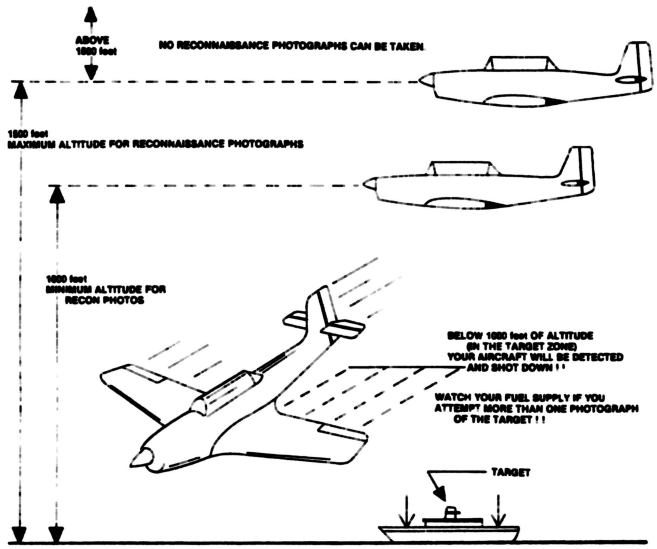


FIGURE 14. PHOTO RECONNAISSANCE MISSIONS.

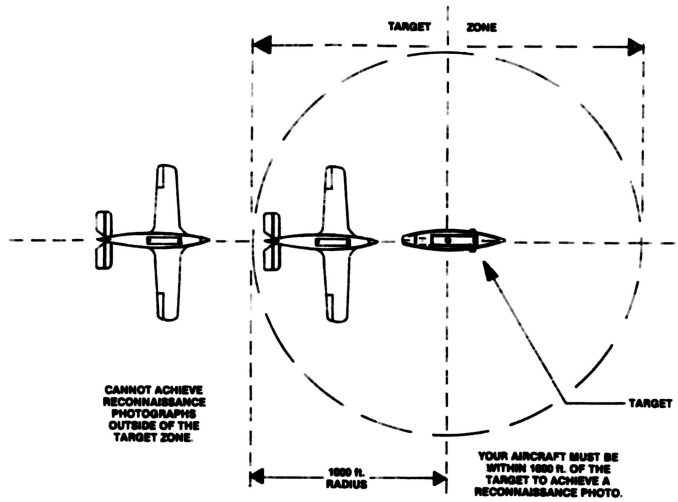


FIGURE 15. PHOTO RECONNAISSANCE MISSIONS.

DISCUSSION ON 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 the air pressure on the top of the wing, and high pressure below the wing. The wing is pushed upwards into the lower air pressure, providing wing "LIFT".

Lift

Lift can be increased in two ways.

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

The second way to increase lift, is to increase the angle of attack.

Refer to Figure 9. This is accomplished by pulling back on the control column (stick), causing 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 an increase in drag, with consequent loss of airspeed.*

Observations

If you study the various flight diagrams, also the brief discussions (in this set of instructions), you will note the following:

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

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

By raising or lowering the elevators, (moving the stick forward and back) you either increase the angle of attack with consequent "DRAG", or you decrease the angle of attack with lowered amount of drag. The speed of the plane is primarily controlled this way.

Relative Wind

Refer to Figures 2 through 10. When the plane is in level flight (Figure 2), the relative wind is striking the wing head-on.

When the plane is descending (Figures 3, 4, 5 and 6), you will note that the relative wind is attacking the leading edge of the wing from below.

These four diagrams illustrate that the angle of attack varies, even when the nose of the aircraft remains in (roughly) level position as long as the *climb,* or *glide,* of the aircraft *varies.* Refer to Figures 6 and 7. You can *stall* even when the aircraft is in a *moderately level position,* due to the *steep descent angle.*

FINAL FLIGHT REVIEW

This flight simulation, Night Flight, is a primary flight experience. The usage of Rudder, Flaps and Retractible Landing Gear have been circumvented, to help you fly this program.

With some practice, you will learn that (contrary to popular conception), the stick and throttle have differing effects on airspeed and climb characteristics, needing coordinated use of both 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.

UP AND AWAY! . . . . . HAVE A NICE FLIGHT.

SOME NOTES ON THE FLIGHT DISPLAY

(1) The runway lights appear on the center of your screen when you are on landing approach. The runway is shown in true perspective, based on your altitude, distance and heading.

(2) At bottom center of your screen, is the horizon-line. The wing "bar" is situated in the center of it. The bar is up when the nose of your aircraft is up, and down when the nose of your aircraft is down. The bar will bank to the left or right as you bank the aircraft. (Note that the exact degree of bank is displayed to the left, or right of the bar, as necessary, so that you can judge your turns with more accuracy).

(3) At the bottom corner of your screen, are the navigational aids. The instrument at lower left displays the number of miles TO and FROM the airport. (Example...3.4 miles N.E. of the airport indicates that the airport is to your South West).

The other display is your distance (in feet) to the point at which you will intersect the glide slope, which (in the TRS-80) is considered to be the center line of the runway. To help your flight arrival back to the airport, you will pick up the glide slope even when you are within 3 miles (on either side of it) to left or right, no matter how far you are from the airport.

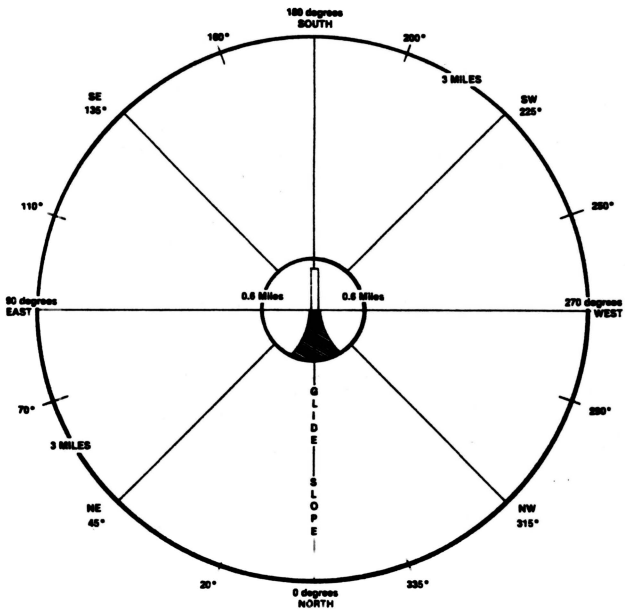


FIGURE 16. "GETTING YOUR BEARINGS."

ACCIDENTAL ERASING

Until you've tried it, you won't believe how easy it is to screw up a data cassette. For instance, the magnet in any loudspeaker can do a fantastic job of removing part of the data . . . and you'll find loudspeakers in portable radios, cassette recorders, TV sets, etc. Power supplies will do even better. No one can even estimate how many tapes have been wiped out by these little TRS-80 power units . . . or by putting cassettes on top of the monitors, where its electromagnetic field can weave its subtle work.

Do not treat your cassettes casually. Give them extra care and attention. Keep them away from anything electrical, magnetic or dusty at all times.

Well, accidents can happen, even to the most careful of us. One of your kids can try out a data cassette and push the record button . . . etc. You should ward this off by punching out the tabs on the back of the cassette to prevent recording. If things do go awry, we'll redo your cassette for you for a nominal service charge of $2. Just send back the original cassette, a note as to what went wrong (we like to keep statistics) and the $2. We'll fix it up for you and get it back as quickly as we can. Try not to get worried if it takes three weeks . . . one week each way for the post office (when they are up to that rigorous a schedule) and a week for us to horse around.

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IMPROVEMENTS

There are very few programs which cannot be improved. If you work out some improvements to this program, it could be worth your while to send them in for possible use in an updated version of the program. Those who contribute to an updated program will share in the royalties which result. Instant Software Inc., Peterborough NH 03458.

NOTES