



**TOM MIX SOFTWARE**

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Air Traffic Controller is a computer model of an air traffic control situation for the TRS-80 Color Computer. Remotely Piloted Vehicles (RPV's) are operated by the controller in a situation similar to that of a commercial airline in that you must regulate landings and takeoffs of the vehicles.



32K EXTENDED B  
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## INTRODUCTION

ATC SIMULATOR (ATCSIM) is a computer model of an air traffic control situation for the TRS-80 Color Computer. The aircraft simulated are Remotely Piloted Vehicles (RPV's). RPV's are robot aircraft (pilotless) and are used for various military and research related applications. Air traffic control of these vehicles is very similar to that of commercial airliners however there are some interesting contrasts. The most striking difference is that RPV's must be FLOWN BY THE CONTROLLER to a landing or to a recovery area. Takeoffs are usually along a guided rail or catapult thus not requiring a great deal of guidance other than properly programming their on-board auto-pilots.

To load ATC, first cycle the computer off then on again, place the tape in the recorder and be sure it is rewound. Press "PLAY" and type and enter CLOAD. After the "OK" appears type and enter RUN to begin.

## II YOUR OBJECTIVE

Your situation is as follows: You are the RPV air traffic controller for your area. Depending on your DIFFICULTY LEVEL you will be assigned a number of INBOUND aircraft wishing to land and half as many OUTBOUND aircraft on the ground in a departure area awaiting takeoff. You must 1) make successful landings with the INbound aircraft and 2) achieve safe departures (out of your control area) with OUTbound aircraft. Your score for each successful event is dependent on the time into the simulation. The quicker you land or depart the more points you will receive. Errors such as mid-air collisions will result in the loss of the involved aircraft and thus your potential for scoring points. On the highest level of difficulty you must negotiate 10 INbound and 5 OUTbound aircraft through your control area and land in a significant wind (20 knots). Just a few things you must keep track of are active and inactive runways, aircraft positions, velocities, altitudes and headings as well as potential mid-air collisions and INbound aircraft headed OUT of your control area.

## III INITIAL DISPLAYS AND OPTIONS

After the initial display and credits there appears a prompt for you to enter your initials. Enter 1 to 3 capital letters - no numbers or special symbols, please. You will then be asked to enter the difficulty level (1 to 5). You will receive 2 Inbound and one outbound aircraft for each difficulty level, (ex: DIFFICULTY - 1 gives 2 IN/1 OUT; DIFFICULTY - 5 gives 10 IN/5 OUT). Levels 1, 2 and 3 have 10 knot winds. Levels 4 and 5 have 20 knot winds. If this is your first attempt at ATC then it is suggested that you select level 1 and watch the display awhile. The airborne aircraft will eventually fly over the runways or out of the control area resulting in error messages. Don't let this bother you now. Instead continue reading until you become familiar with the HIFES display and your requirements as a controller. Try experimenting as you read and when you think you are "game" press the RESET button in the back/right hand corner of your computer and rerun the simulation.

## IV THE CONTROL SCREEN

### A Control Area

The bottom edge of the white band across the top of the screen (with labels WIND, CLOCK and ERR) is the upper boundary of your CONTROL AREA. The left boundary is the left boundary of the screen; the right boundary is the vertical line just to the left of the "DEPARTURES" label; the lower boundary is the horizontal line just above the "GLIDE SLOPE" label. Headings are assumed to be NORTH—UP; SOUTH—DOWN, EAST—RIGHT; WEST—LEFT.

The following is a description of all the labels on your screen:

## B. Labels

### 1. Across Top

\*WIND SS → NN—Wind at SS knots blowing from the NN direction. Directions are random. Difficulty levels determine the wind speed.

\*CLOCK—Time in minutes into simulation.

\*ERR—Indicates that error message labels appear to the right of ERR.

### 2. Lower Left

\*HEAD—Aircraft heading (ex: NE, SE, W). Parameter may be changed in the SET mode.

\*ALT—Aircraft altitude in 1000's of feet (K), (Limit: 1 to 9 KFT). May be changed in the SET mode.

\*VEL—Aircraft velocity in ft/sec (Limit: 100 to 300). May be changed in the SET Mode.

\*RTE—Either reads "IN" (aircraft is INbound - wants to land) or "OUT" (aircraft is OUTbound - wants to leave your control area).

\*Mode—Indicates the simulation MODE of operation (see CONTROL MODES section V).

### 3. Lower Center

\*GLIDE SLOPE—Indicates that a graphic representation of range versus altitude to the target (landing) pad is below. Display is active when the MODE label reads FINAL.

### 4. Lower Right

\*D RATE—Indicates the descent rate of the aircraft. Parameter is on the vertical axis.

\*DRIFT—Indicates the left-right DRIFT off the runway centerline. Parameter is on the horizontal axis.

NOTE: The GLIDE SLOPE, DRIFT and D RATE labels describe the FINAL approach instruments. These are active when the MODE label reads FINAL.

### 5. Center Right

\*DEPARTURES—Indicates that a graphic representation of the remaining aircraft departures is to the right.

6. Upper Right—Three unmarked blocks. The upper block is the controller's INITIALS. The middle block is the DIFFICULTY LEVEL. The lower block is the current SCORE.

## V CONTROL MODES

ATSCIM is always in one of seven modes of operation; TRACK, POLL, READ, SET, TKOFF, FIN, END. All but TRACK and END have tone or note sequences which signal mode entry. These modes allow the controller to interrogate aircraft, set new flight conditions or initiate sequences. Once the simulation is begun, control is achieved by way of the RIGHT JOYSTICK and fire button.

The data block (lower left) always shows current aircraft flight conditions. Changing a flight parameter does not instantaneously change the display due to the finite update rate of the radar. Your control screen may take as long as seven seconds to display the new setting. While in POLL, READ or SET, the display appears to be "frozen" so that aircraft may be easily interrogated. However, the mission CLOCK continues to run. New aircraft positions are visible only in the TRACK mode.

**A. TRACK**—The primary mode of operation. Calculates aircraft positions and updates the control screen. Also checks for mid-air, low altitudes, routing errors, insufficient velocities, and down takeoffs and landings. MODE label reads TRACK. Simulation must be in TRACK to allow aircraft transition to FINAL approach or depart the control area. Simulation is initially in TRACK and returns to TRACK from "escape" from the modes POLL, READ, TKOFF or FINAL. The POLL and READ mode "escape" is player controlled. The "escapes" from the FINAL and TKOFF modes of operation are automatic.

**B. POLL**—Mode allows the controller to select a particular aircraft in the control or departure area for the purposes of instruction (SET), interrogation (READ) or initialization for takeoff (TKOFF). Mode is entered by pressing and holding the fire button until a beeping tone is heard and the MODE label reads POLL. When the button is released a flashing cursor with a centering dot will appear on the screen. The joystick will move the cursor any place in the control area. To escape the POLL mode, place the cursor center somewhere greater than 3 pixels from any aircraft and press the button until the cursor stops flashing then release it immediately. The cursor will disappear and the mode label will revert to TRACK.

**C. READ**—This mode must be entered from either POLL or SET. To enter from POLL, align the cursor dot to within 3 pixels of the center of an aircraft's forward wing suction and press and hold the button until you see (and hear) the data block information being displayed, then release. The MODE label will display the word READ and a white cursor will appear to the left of the labels HEAD, ALT, VEL. To escape the READ mode, place the cursor directly opposite of the multi-colored escape bar (just below the VEL data block label) and press the fire button. The data block will erase and the simulation revert to TRACK.

**D. SET**—This mode can only be entered from READ. It is used to SET the RPV's autopilot parameters. To enter SET move the cursor up and down with forward and back motion of the joystick. Centering the stick will stop the cursor. When the cursor is directly beside HEAD, ALT or VEL press the fire button until you see the cursor change colors (either blue or red), then release. The mode label will read SET. Moving the joystick forward or back will increment the chosen parameter up or down until a limit is reached or the joystick is centered which stops the incrementing process. When the parameter is SET to your liking, center the stick and press the fire button. The mode will revert back to READ where you may SET another parameter or "escape" back to TRACK.

E. **TKOFF**—This mode is entered by escaping from the **READ** mode after having **POLLED** and **READ** an aircraft in the **DEPARTURE** area. In this case the simulation interrupts all flight parameters **SET** as **FLIGHT CONDITIONS AFTER TAKEOFF**. An escape from the **READ** mode under these circumstances starts the **TKOFF** sequence. The aircraft will takeoff on a runway with the assigned **HEADING** (assuming it is legal) and climb and maintain the **VEL**, **ALT** and **HEAD** conditions previously **SET**. After the departing aircraft has cleared the **OUTER MARKER**, the simulation returns to **TRACK** and business as usual.

F. **FINAL**—This mode is entered automatically from **TRACK** when the approaching aircraft has crossed the **OUTER MARKER** (lines at the ends of each runway at right angles to the flight path) with the proper flight conditions (see sections VI-C & D). Control is transferred to the joystick and the landing instruments become active (**GLIDE SLOPE**, **DRIFT** and **D RATE**). Forward/back joystick motion results in downward/upward **VELOCITIES**. Left/right motion results in left/right drift **VELOCITIES**. Unless you land exactly "head-into-the-wind" you will have to fight the cross wind with left or right joystick motion to maintain an acceptable drift for landing (see section VI-D for details concerning a success landing).

G. **END**—This mode results in a flashing **END** mode label at the end of the simulation. All aircraft whether initially airborne or awaiting departure must have disappeared from your control area before the simulation will **END**. The **END** mode simply lets you know this has happened. Pressing **<SPACEBAR>** will exit you to "HOW YOU DID" where your score, time and difficulty level will be compared to the current top 5 scores (see section VIII).

## VI. REQUIREMENTS

### A. General

\*Initially aircraft appear one at a time until the appropriate number are present (depending on the difficulty level). You may address an aircraft as soon as it appears in the control or departure areas.

\*Scoring is accomplished in only two ways; 1) successful landings and 2) successful departures from the control area.

\*To land, you must first successfully cross the **OUTER MARKER**.

\*To depart the control area, you must first successfully **TAKEOFF**.

\*All airborne aircraft must avoid mid-air collisions.

\*Inbound flights must not touch or come very close to the control area boundaries.

\*All aircraft must avoid flying over an imaginary box surrounding the runways and outer marker thresholds. Therefore, don't fly over the runway.

\*The center of the forward wing section of each aircraft is considered to be the center of motion.

\*Response to a given command is at the update rate of the control area screen (< 7 seconds). The fewer the aircraft, the faster the update.

\*Aircraft are allowed to be "stacked" on top of one another as long as they are at different altitudes. However, this is a confusing situation and (as in real ATC) should be avoided. READING a group such as this will always result in the data associated with the first aircraft to be updated in the bunch.

\*All takeoffs and outer marker approaches must be made on an ACTIVE RUNWAY. Active runways are defined by those which have headings (N, S, NW, SE) that produce "head" to "cross" wind components with respect to approaching or departing aircraft. For example, suppose you have lined up an aircraft on a given runway heading approaching the outer marker. The wind relative to your aircraft nose must be coming from a direction described by a semi-circular arc starting from either your left or right and swinging **FRONT** of your aircraft. Winds are **NOT** allowed to be **BEHIND** you or **DOWNWIND** to any extent. There are always at least two active runways and a maximum of three.

#### B. TAKEOFF/DEPARTURE

1. Takeoff must be on an ACTIVE and EXISTING runway.
2. VEL > 0; ALT > OK
3. Airborne aircraft must leave control area to score.

#### C. OUTER MARKER APPROACH

1. Center of wing crosses the OUTER MARKER approach threshold within 2 pixels of an ACTIVE runway centerline.
2. Heading - Runway heading (N, S, NW, SE).
3. VEL - 100 f/s; ALT - 1K (1000 feet)

#### D. FINAL APPROACH (LANDING)

1. Aircraft image resting completely on the target pad.
2. Point (apex) of "V" must be within the landing "BOX".

NOTE: The vertical center of the BOX is the GLIDE SLOPE rate of descent. The horizontal center is the runway centerline.

#### VII. ERROR MESSAGES (ERR LABELS)

As in real air traffic control situations, things can go wrong. Since you probably won't have the time to diagnose everything you do incorrectly in real-time, an error message system has been provided. The messages briefly appear just to the right of the ERR label in the upper right of your screen and are usually accompanied by a very high pitched, rasping tone. Errant aircraft first blink then disappear. In the case of CRASH landing the results are a consuming FIRE!

The following is a description of the six error messages and their causes: \_\_\_\_\_

## A. ROUTE

\* Inbound aircraft has left the control area

\* Outbound aircraft has crossed the OUTER MARKER and is attempting to land

\* Inbound aircraft has made an out of tolerance outer marker approach (VEL, ALT, HEAD or position is incorrect)

\* Aircraft has violated runway airspace

## B. RUNWAY

\* Aircraft is attempting to land or takeoff DOWNWIND or on a non-existent RUNWAY.

## C. FLIGHT

\* Commanded (SET) FLIGHT conditions are inadequate for takeoff (ex. ALT or VEL = 0)

## D. MIDAIR

\* At least two aircraft have the same ALT and have passed within 4 pixels of one another's center wing positions

## E. CRASH

\* While on FINAL - Aircraft has drifted to the left or right extreme of the DRIFT meter, or aircraft has flown past the end of the target pad without landing.

\* On landing - Aircraft DRIFT or D RATE (DESCENT RATE) is NOT in the 'BOX', or aircraft is NOT COMPLETELY ON THE TARGET PAD

## VIII. SCORING/HOW YOU DID

**SCORING:** A successful landing is 100 points the first minute and decreases 2 points for each minute thereafter. A successful departure (outbound flight leaves control area) is worth 50 points initially and decreases 1 point for each subsequent minute. After 30 minutes the scores limit to 40 points for a landing and 20 points for a departure.

**HOW YOU DID--** After the simulation has ended, the mode label reads a flashing "END". Pressing <SPACEBAR> will exit to "HOW YOU DID". These are the top 5 scores and initials. Your initials are NOT recognized unless your score is greater than zero and in the top 5. If you achieve a score greater than 1000 we would like to know!!!

Follow the displayed instructions to replay or exit. HAPPY LANDINGS!!!