A I R T R A F F I C C O N T R O L

GeoGraphics Software
(C) 1982

DESCRIPTION

AIR TRAFFIC CONTROL (ATC) is a real-time simulation game for one player in which you, as the air traffic controller, must safely direct aircraft through your sector of approach control to land at a local airport. This program runs on a 16K RAM TRS-80CC and is completely controlled from the keyboard. Information is supplied to the controller via the screen which is divided into a radar display and a flight computer display. The player controls the aircraft under his jurisdiction by directing their altitude and speed and by supplying their pilots with landing information. Each correct action by the controller merits the reward of points to his score while incorrect actions such as those resulting in mid-air crashes or missed approaches will detract from his score.

OBJECT

The object of ATC is to score the highest number of points by effectively directing aircraft to land. Aircraft must be prevented from coming too close to each other in altitude or horizontal separation. They must also be directed to a correct landing altitude and speed before they overfly the airport final approach pattern. In addition, a game option allows extra points for responding to pilot requested information such as landing runway designation and surface winds.

LOADING

ATC loads from cassette using the standard CLOAD command. However, since the program requires extra space in core a PCLEAR 1 instruction should be issued before loading the program. Once loaded the program begins with the execution of a RUN command. Should this command result in an SN ERROR message (because no PCLEAR 1 was issued) simply type RUN again and the program will execute.

DISPLAY LAYOUT

In ATC, information must be relayed between the controller and the pilots of incoming aircraft and between the controller and his computer/radar network. Instructions from the controller are sent by way of the keyboard using special command codes which will be described in detail later. The computer display screen provides information from radar and the ground computers about aircraft location, speed and status. After introductory

prompts which set program options the computer will display a screen divided horizontally. The top area comprises a readout of numerical information about the aircraft status and the bottom area is a radar representation of the sector showing the position of each aircraft under control.

The top screen displays information about each aircraft including (from left to right):

FLT	Flight Number
ALT	Altitude in Thousands of Feet
SPD	Aircraft Speed in Knots (nautical miles per hour)
RANGE	Distance from Airport in Nautical Miles
TARGET	Information About Requested Movements
REQUEST	Requests to Controller from Pilots

The lower portion of the top screen is used to display information from the flight computer to the controller such as directions about which runway or transponder setting should be sent to the pilot of a given flight. This area also displays the total number of aircraft that have been delegated to your jurisdiction. You will initially be given four aircraft and one at a time will be added as each lands. The display will read 10 when the tenth airplane is assigned to your sector and the game will conclude when this tenth aircraft has landed.

The bottom screen is a radar display of the aircraft currently in your sector. Along the right hand side of the display are figures indicating altitude (ALT) in thousands of feet and along the bottom of the display are figures indicating ground track distance from the airport (RANGE) in nautical miles. Each airplane in your sector will be displayed by its flight number shown at its current range and altitude.

SCORING

Points are awarded or detracted from your score based upon the following events:

Safe Landing	4 Pts.	Awarded when aircraft has been safely handed over to the airport tower at the proper altitude and speed.
Go-Around	2 Pts.	Awarded when an aircraft which cannot fit into the current landing pattern is instructed for safety's sake to "Go-Around" for another landing attempt. This will immediately remove aircraft from your sector and send it to another. Used to prevent serious situations when traffic cannot be safely separated.
Requests	1,2 Pts.	Points rewarded upon correct response to pilot requested information. Only operational if selected as game option. More difficult requests receive 2 points.

Overshoot	-1 Pt.	Deduction to score if aircraft passes over airport without either a correct handover to tower or a go-around.
Midair Crash	-2 Pts.	Points deducted when two aircraft are within 10 miles of each other or have less than 2 thousand feet of vertical separation (ALT). No collision can occur until both aircraft are within 90 miles of the airport to allow you time to maneuver positions and speeds.

GAME OPTIONS

Speed - A speed selection of 1 (slow) to 4 (fast) determines how fast the aircraft will actually cross the screen. It does not alter their flight speed in the game, only the time which you have respond to aircraft movements. Beginners should start with Speed 1.

Pilot Requests - Once you have mastered the task of directing aircraft speed and separation, the game introduces an added level of challenge by selecting the option for pilot requests. During the course of flight, pilots will request information which, if supplied properly, will gain extra points. Some of this information is readily available on the controller's console and merely needs to be relayed to the pilot of the requesting flight. Other data is stored in the air traffic computer and must be requested by the controller and then sent on to the pilot of the requesting flight.

AIRCRAFT CONDITIONS

All aircraft enter your sector at altitudes between 6 and 14 thousand feet in increments of 2 thousand feet (i.e., 6,8,10,12 or 14 thousand feet). Their initial ranges will also vary randomly between 91 and 130 nautical miles so some airplanes may appear right away while others may not be apparent until they enter the radar area. Aircraft speeds will always begin between 240 and 340 knots in increments of 20 knots. All requests for changes to speed must be in increments of 20 knots and all changes in altitude must be in increments of 2 thousand feet. Legal ranges are:

	Minimum	Maximum	Increment
Altitude	2 K	16 K	2 K
Speed	200 Kts.	360 Kts.	20 Kts.

K is thousands of feet
Kts is Knots

For a SAFE LANDING an aircraft must not be in a collision situation and must be at 2K altitude, between 200 and 240 Knots in airspeed and within 6 miles of the runway. The landing is credited when the controller "hands off" the aircraft to the airport tower by sending the pilot the correct tower radio frequency (see [T] command later in text).

COMMUNICATION

All transmissions between the controller and the flight computer and between the controller and pilot are handled from the keyboard. To eliminate laborious typing and speed up entry, a simple input code has been developed. Once a keyboard entry has begun the computer stops to receive it in entirety so that typing speed is not a factor. These instructions are in four parts as shown below:

Request in words: "American Airlines Flight 7 please Descend and maintain 12 thousand feet."

Sample Request: AA7 D 12 [space bar]

Part: 1 2 3 4

(The spaces in the above sample instruction are only shown to clarify the parts of the instruction and ARE NOT used when entering an instruction. The space bar is only used to conclude a complete instruction - the ENTER key is not used at all.)

PART 1 is the FLIGHT NUMBER and is always two letters and one digit. The computer ensures that no two flights on your screen at the same time will ever have the same flight digit, thus eliminating ambiguity on the radar display. The letters designate U.S. domestic airlines as follows:

AA American Airlines
EA Eastern Airlines
DL Delta Air Lines
UA United Airlines
AL US Air
SW Southwest Airlines
TW Trans World Airways
PA Pan Am

The computer will always expect the first three characters of your entry to be a valid three character flight number. Since the computer may be busy with another controller (a blue flag is displayed in the lower left corner when the computer is busy), listen for a high chirp after entering the first character and then continue once the computer has your attention (the blue flag will become a "?" when the computer acknowledges attention to your transmission). If an invalid

flight number is received, the computer will give a deep aural signal and the transmission must be repeated. If the flight number is OK, the computer will patiently wait for the other parts of the message.

PART 2 is the COMMAND CODE, always a single letter which specifies what action is being indicated by the controller. PART 3 is the COMMAND DETAIL which specifies a numeric value for that code instruction. Part 4, [space bar], is used to conclude every instruction with the exception of Hold [H] and Go-Around [G]. These two codes are deemed "emergency situations" and are performed immediately.

There are 12 valid command code/detail combinations:

Code Part 2	Code Part 3	Meaning	Message To	Type
D	Y	DESCEND to ALT Y	Pilot	Instruction
C	Y	CLIMB to ALT Y	Pilot	Instruction
S	Y	Change SPEED to Y Knots	Pilot	Instruction
H		HOLD this ALT & Speed	Pilot	Instruction
G		GO-AROUND: Leave Pattern	Pilot	Instruction
T	Y	TOWER radio frequency Y	Pilot	Landing Clearance
A	Y	Airport ALTIMETER Y	Pilot	Information
W	Y	Surface WINDS Y	Pilot	Information
Q	X	QUERY TRANSPONDER	Computer	Data Request
Q	R	QUERY RUNWAY NUMBER	Computer	Data Request
X	Y	TRANSPONDER setting Y	Pilot	Information
R	Y	Landing RUNWAY No. Y	Pilot	Information

The first group of codes [D,C,S] are instructions to pilots to change altitude [D,C] or speed [S] to a new value Y. Y must be a legal value of altitude or speed as specified earlier. This value will appear in the "target" display as acknowledgement by the pilot and will disappear when the aircraft reaches the new condition.

The second set of codes [H,G] are also instructions to pilots but these require no argument (Part 3 or Part 4) and are executed immediately. HOLD maintains the present altitude/speed condition regardless of prior instruction and should be used to stop the descent of an aircraft that might cross in front of another if the descent continued. GO-AROUND has been explained earlier in these instructions.

The TOWER [T] instruction is used to "hand-off" the airplane to the control tower just prior to landing. For this to be successful the airplane must be in a safe landing status as described earlier. Once the aircraft is safely handed off, it will disappear from the screen and the score will be credited.

The remainder of the instruction code list refers to the "pilot request" game option and is not pertinent if this option is not selected.

When pilots request WIND and ALTIMETER data, this information (which appears in the lower portion of the top screen) is simply relayed by the [W,A] commands. If the pilots request RUNWAY or TRANSPONDER settings, however, the controller must first ask the flight computer for this data by using the QUERY command before sending it to the pilots. For example,

AA7 Q R [space bar]

asks the computer to display which runway American Flight 7 should use. Once the data is shown (supposing it was ** AA7 17L **), the controller relays it to the pilot with

AA7 R 17L [space bar]

saying, "American Airlines 7 please land Runway 17 Left." Transponder requests are handled in a similar manner.

If a mistake is made while keying in a command, merely press the slash key [/] and reenter the command (not the flight code). The computer will immediately detect and flag an illegal flight code.

Since these instructions are somewhat cryptic, a help screen is built in to the program. Typing a question mark [?] will automatically display a summary of all of the above instructions. In actual practice these commands are quite easy to use and you should become handy with them quite quickly.

GOOD LUCK AND SAFE LANDINGS !!!

Geo.