Detailed Example Using of the Integrated Noise Model

CEE 4674 – Airport Planning and Design

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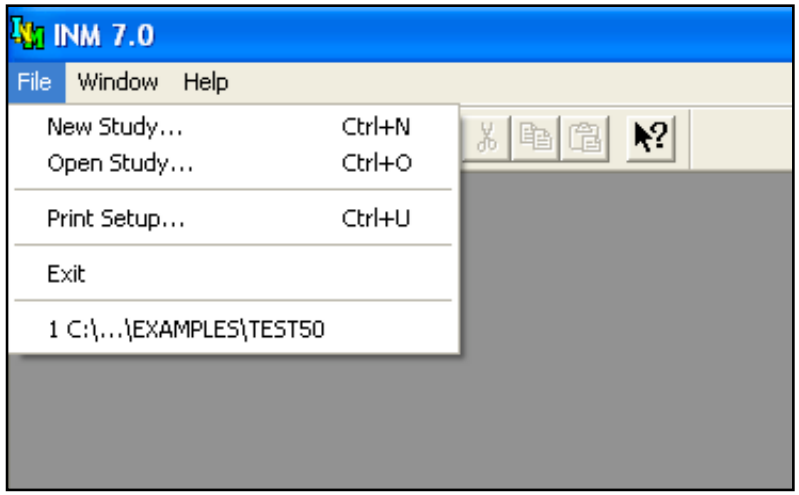
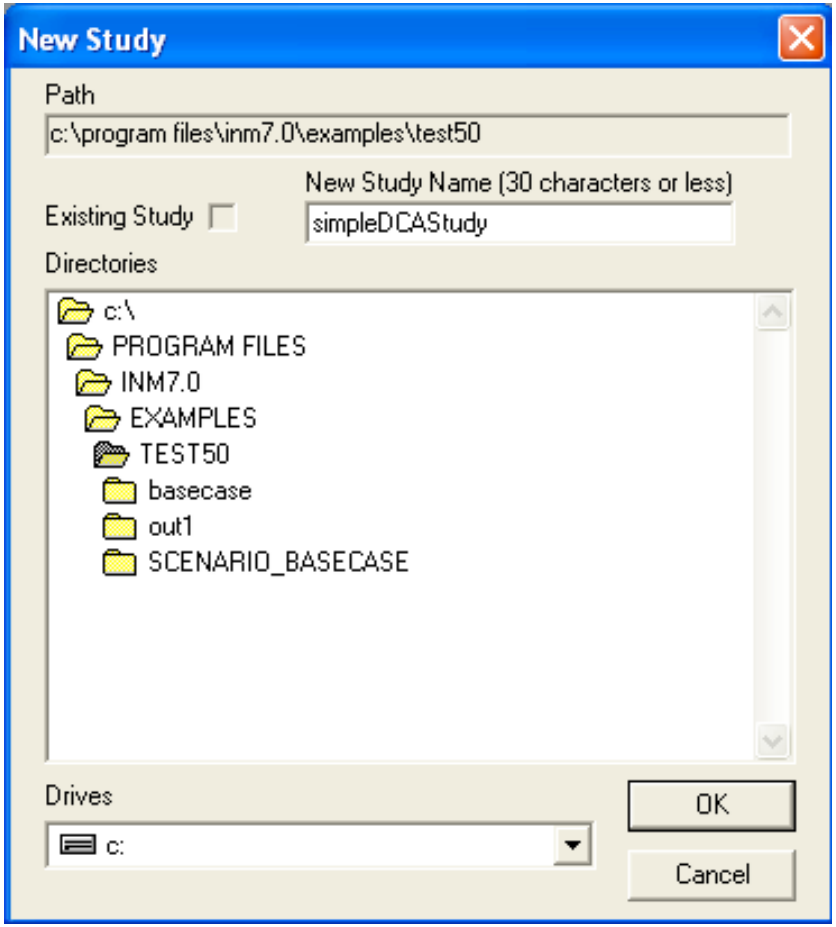
Purpose of the Analysis

- Predict noise contours for two distinct aircraft and compare their noise signatures
- Determine departure noise contours for:
  - Boeing MD-80
  - Cessna Citation 500
- Use Ronald Reagan National Airport runway 01 in our case study

Starting a New Case in INM

- Start a new case in the INM menu



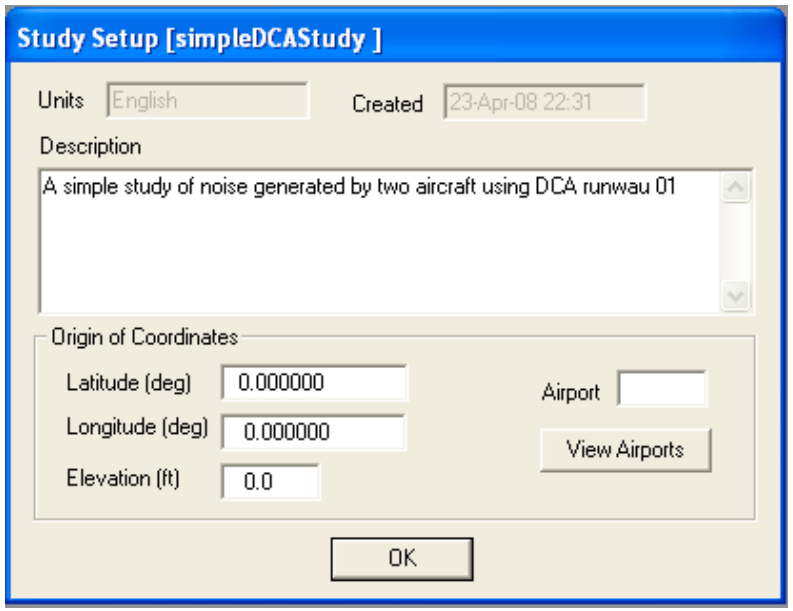


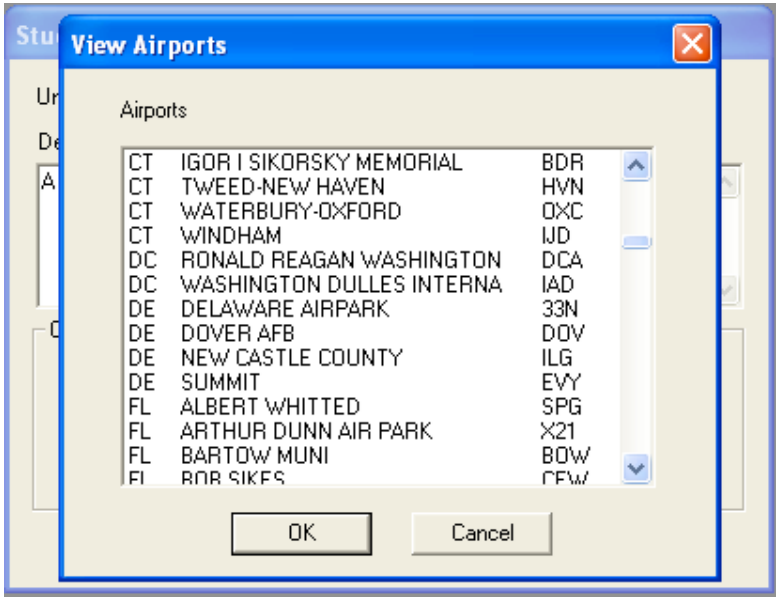
DCA Airport (source: Google Earth)

- Use a satellite picture to help you guide the process of creating tracks
- The red track simulates a departure track from DCA runway 01

Selecting the Airport for Our Case Study

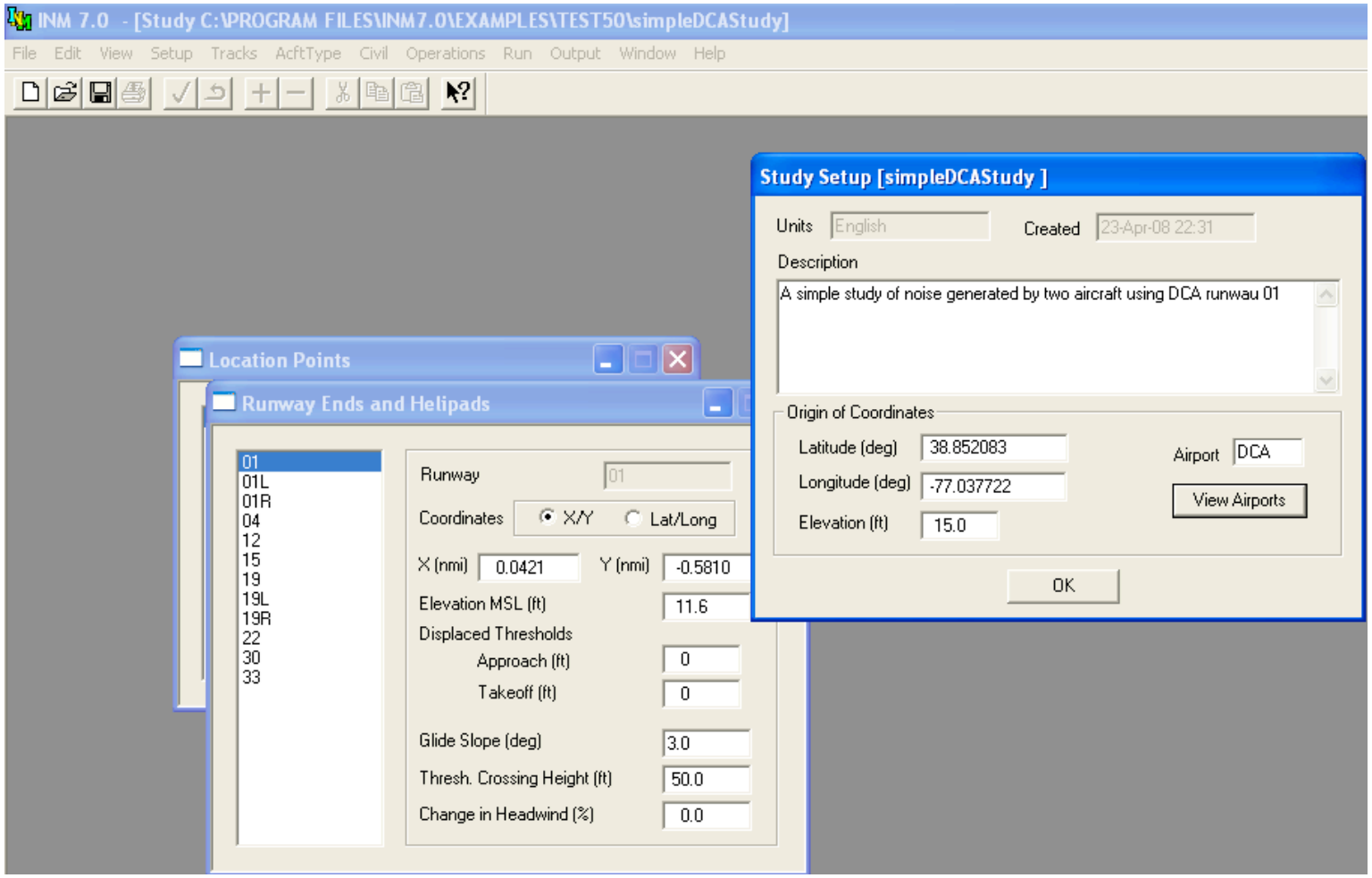
- View the airports available and select the one to be used in the study





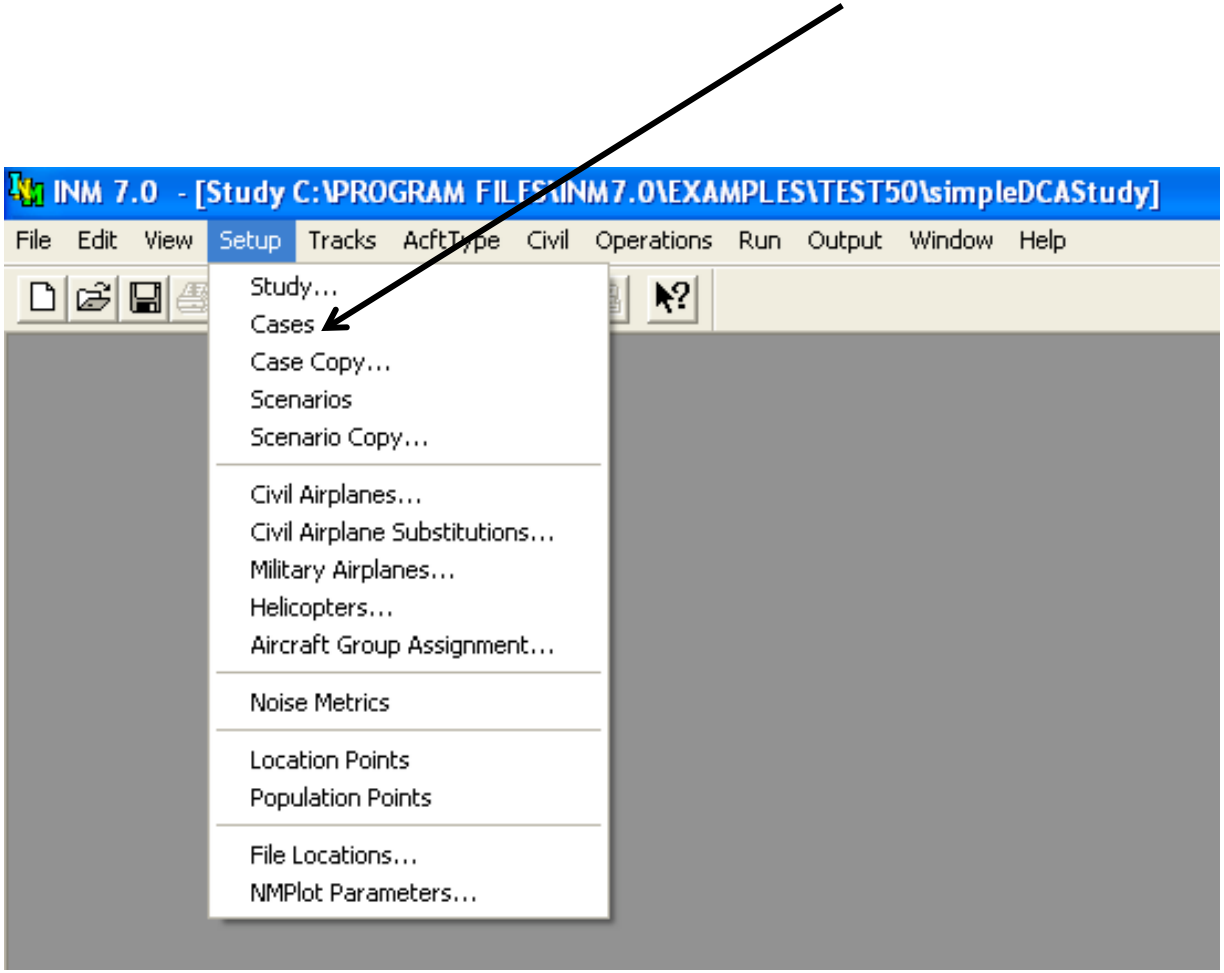
Verify Information about the Airport

- Always check the runway and setup information in INM



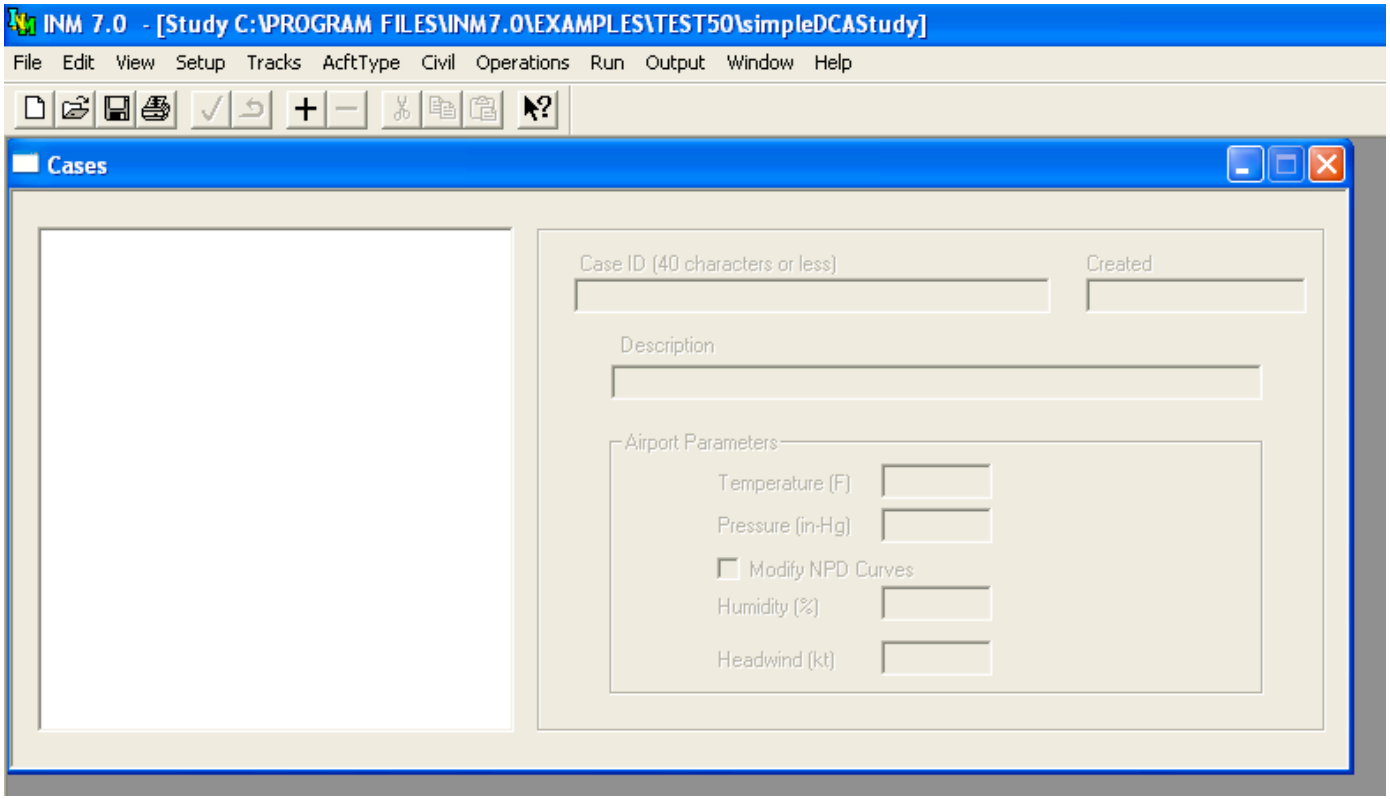
Adding a Case Inside Our Study

- Click here to go start the process to add a new case



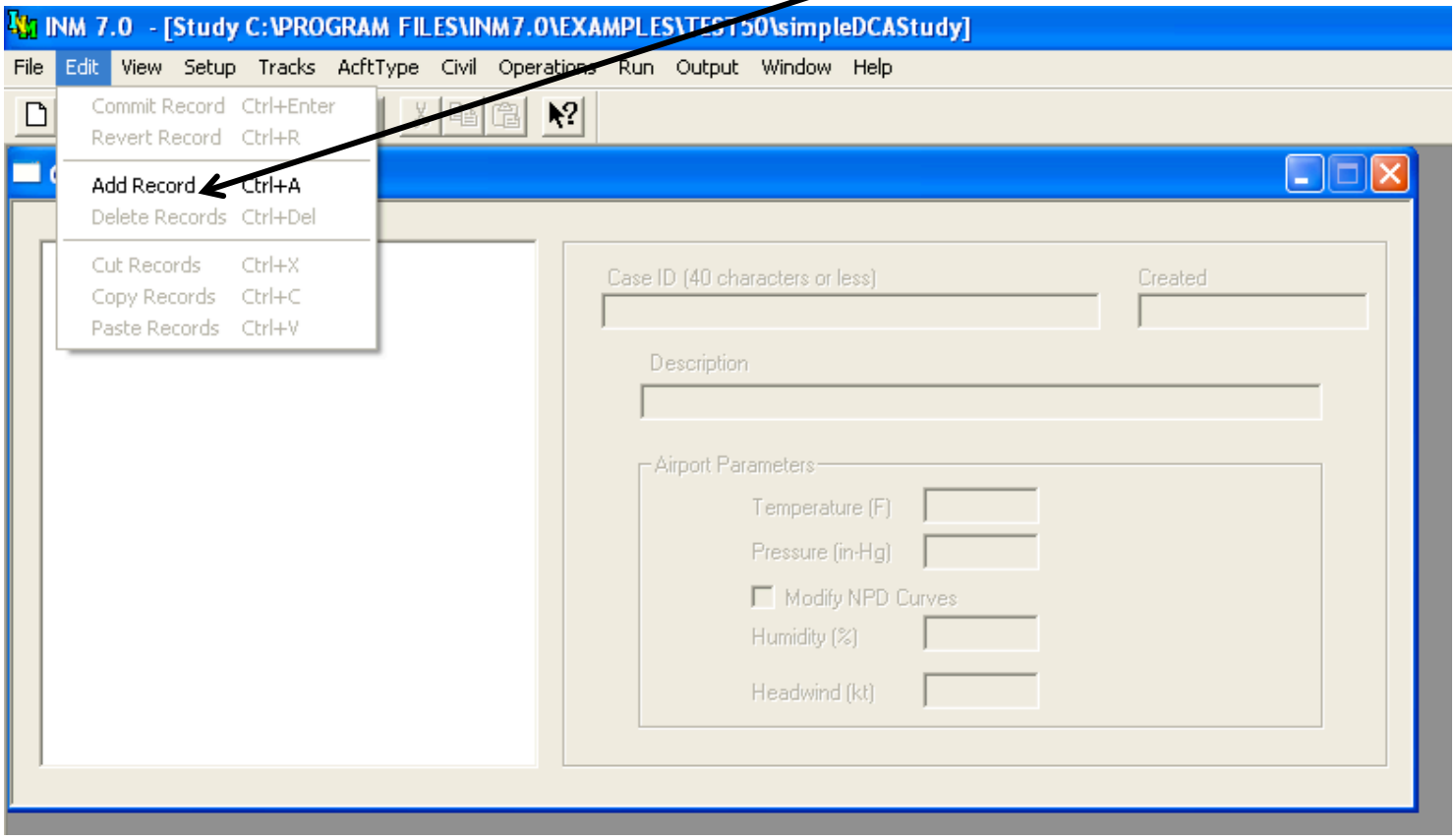
Empty Case Window

- Each new case is presented in the case window pane



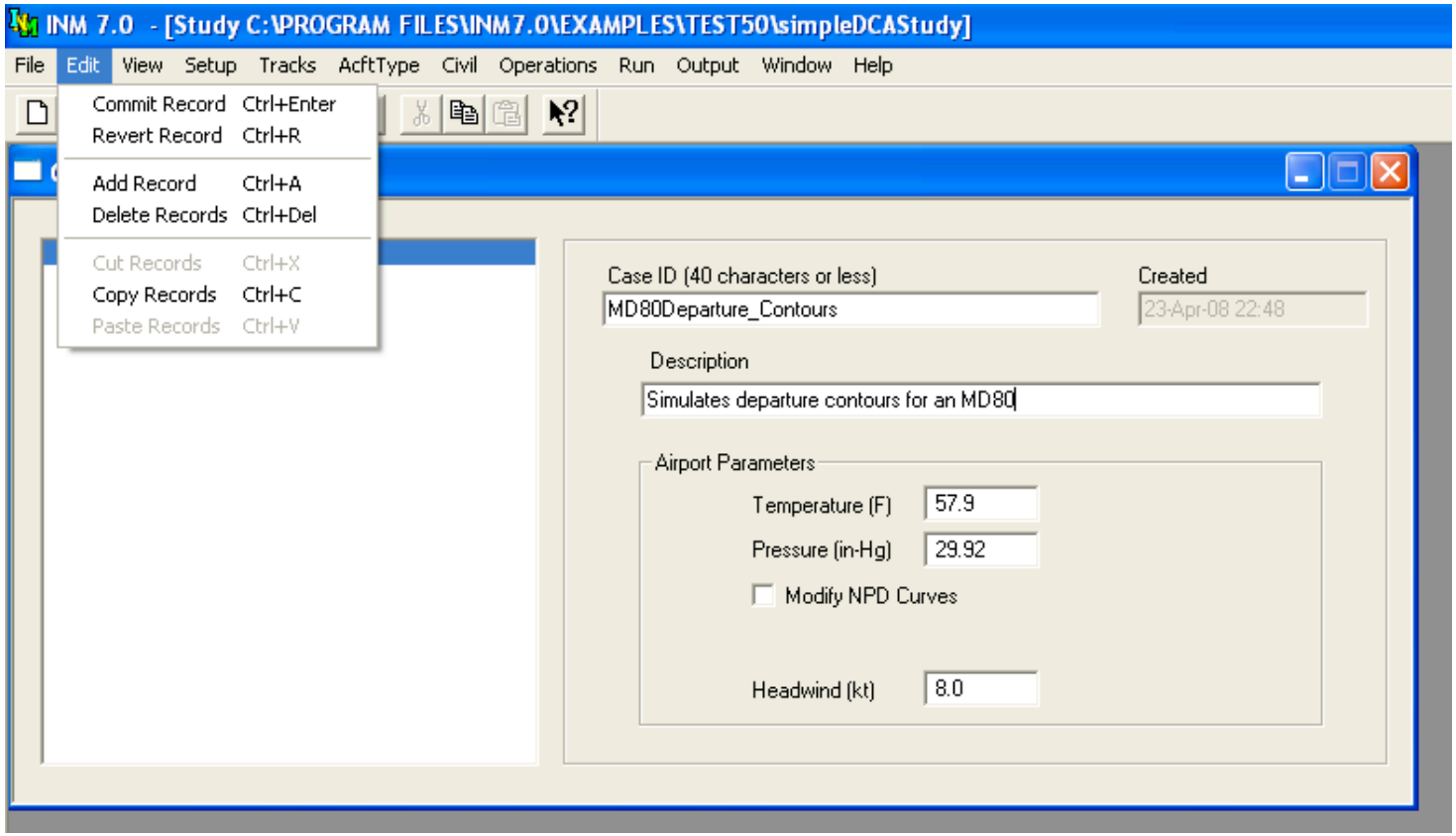
New Case in the Analysis

- Adding a record to start a new case in the INM menu



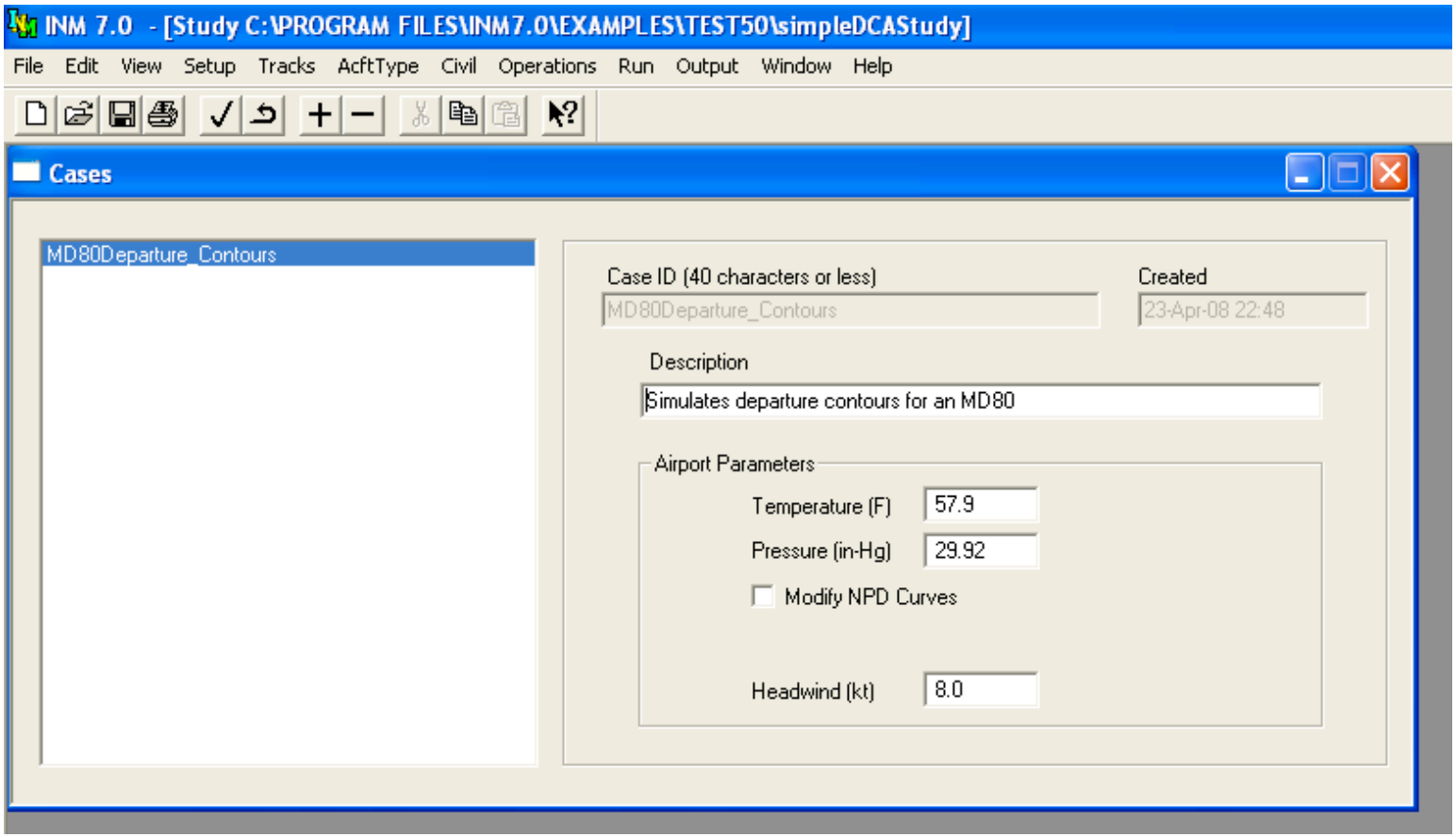
Always Commit Records in INM

- Specify the new case



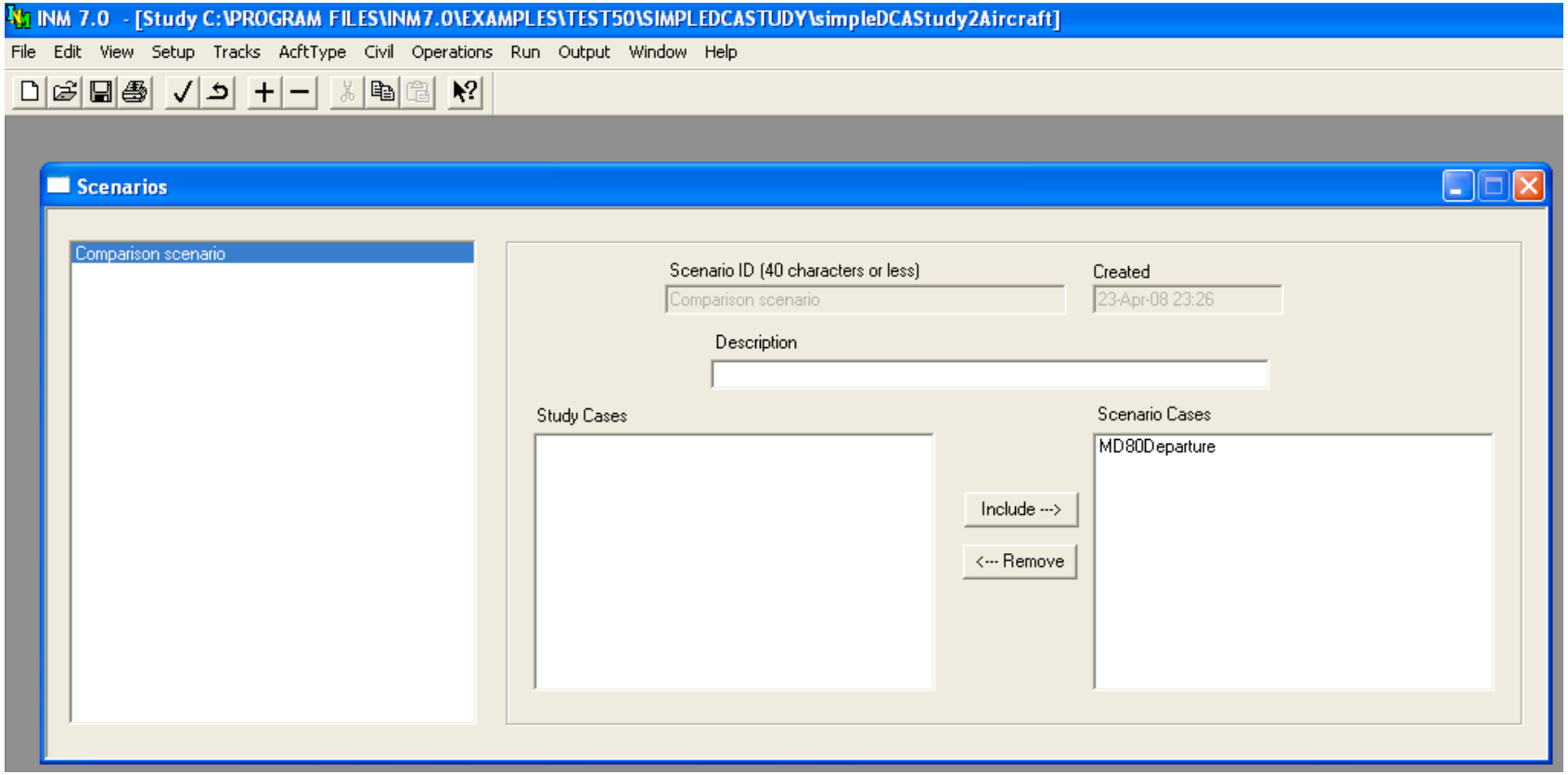
New Case Added to the INM Study

- Write a comment so that you know what the case is about



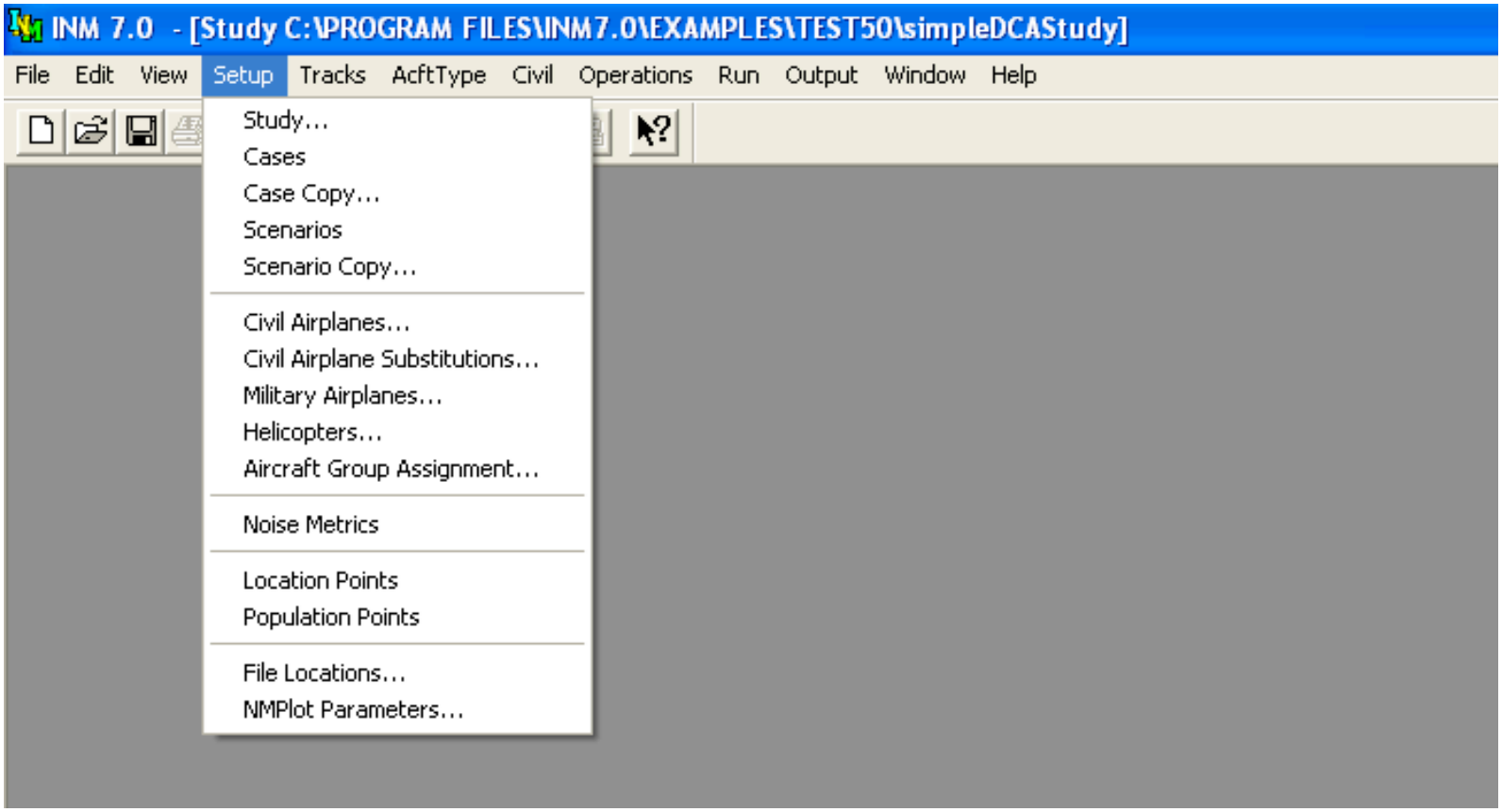
Adding a Scenario in INM

- Add a scenario to your analysis



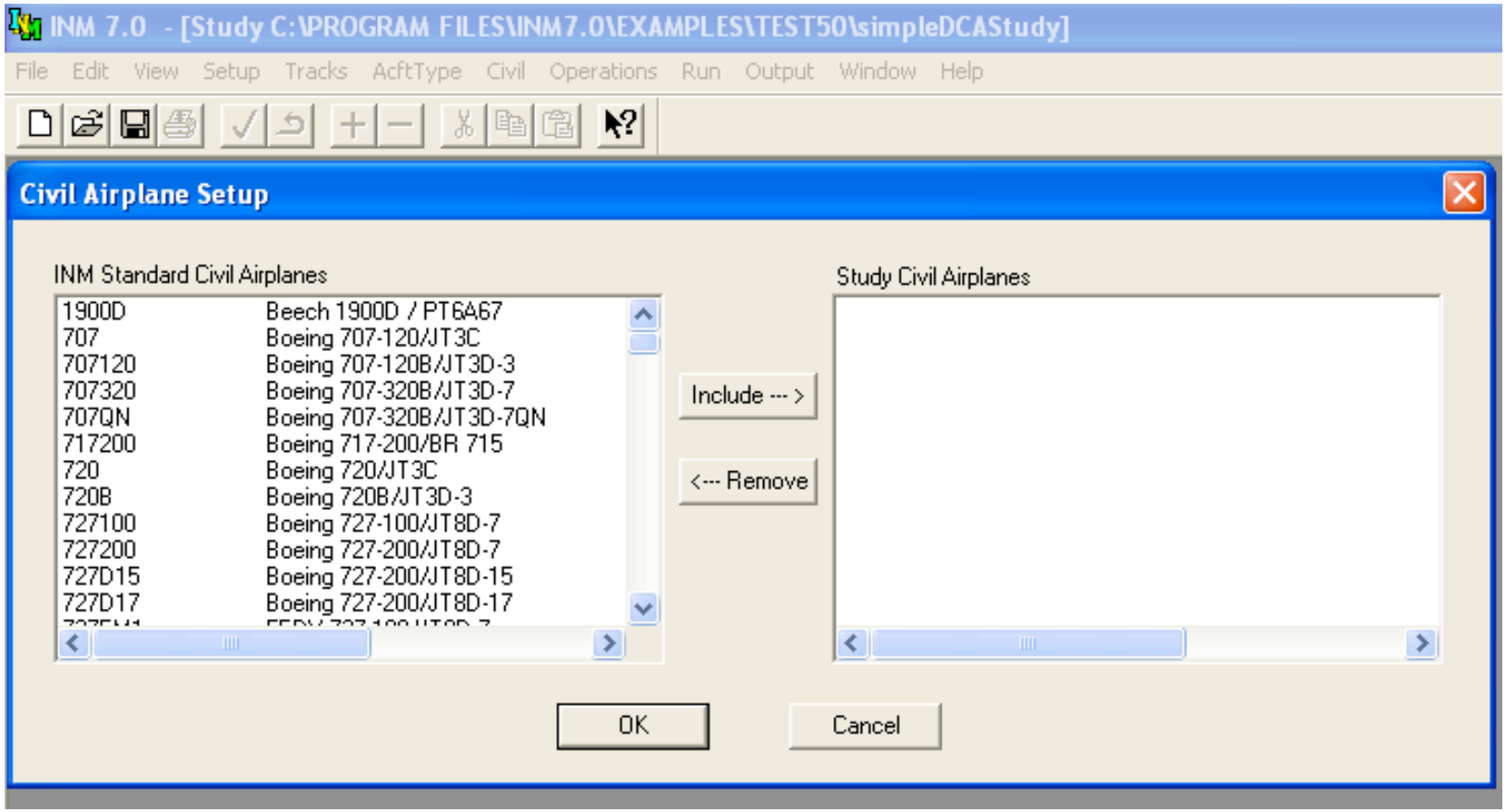
Adding Aircraft to the Case Study

- INM has civilian and military aircraft



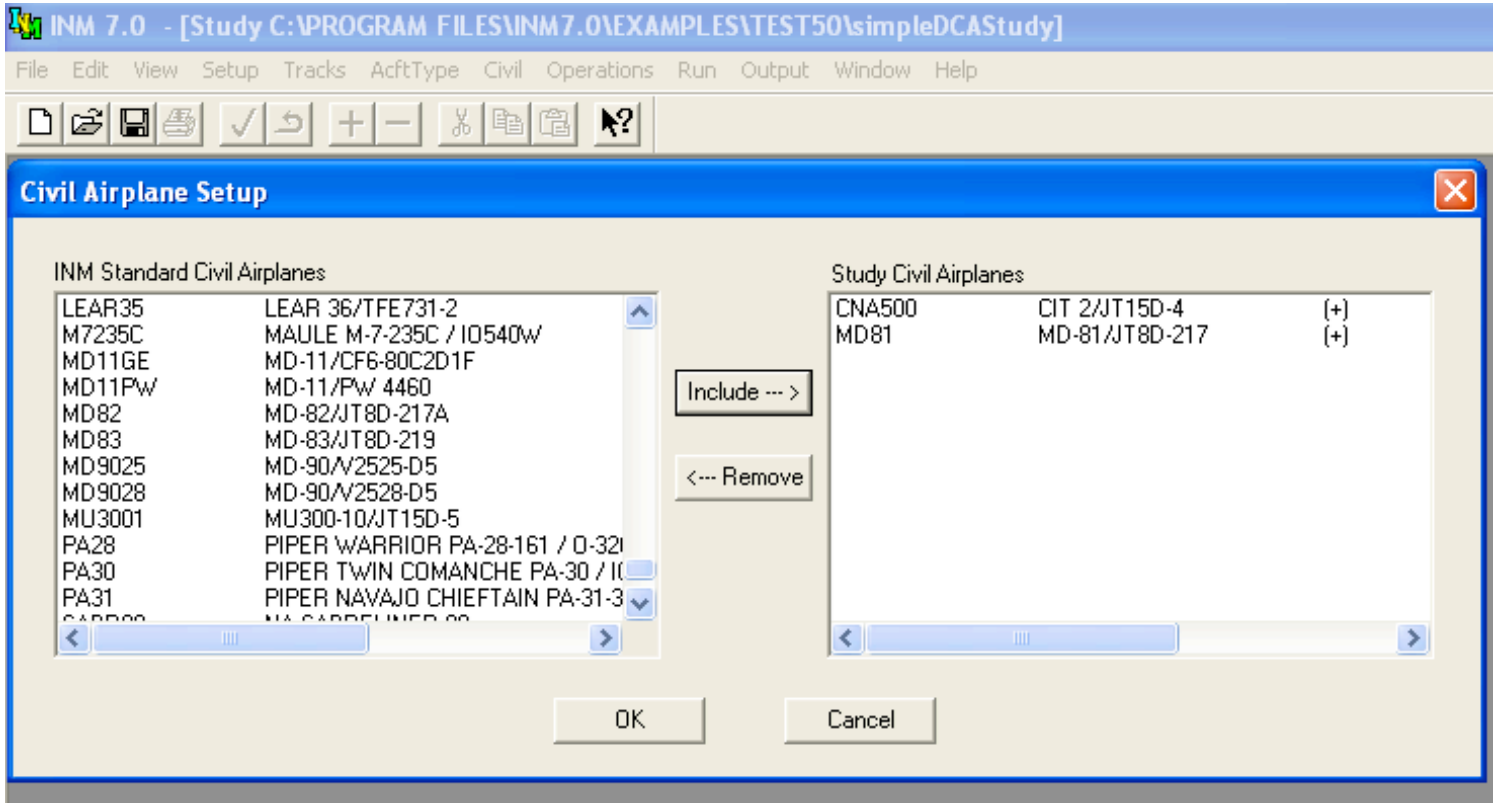
List of Civilian Aircraft

- Civilian aircraft list



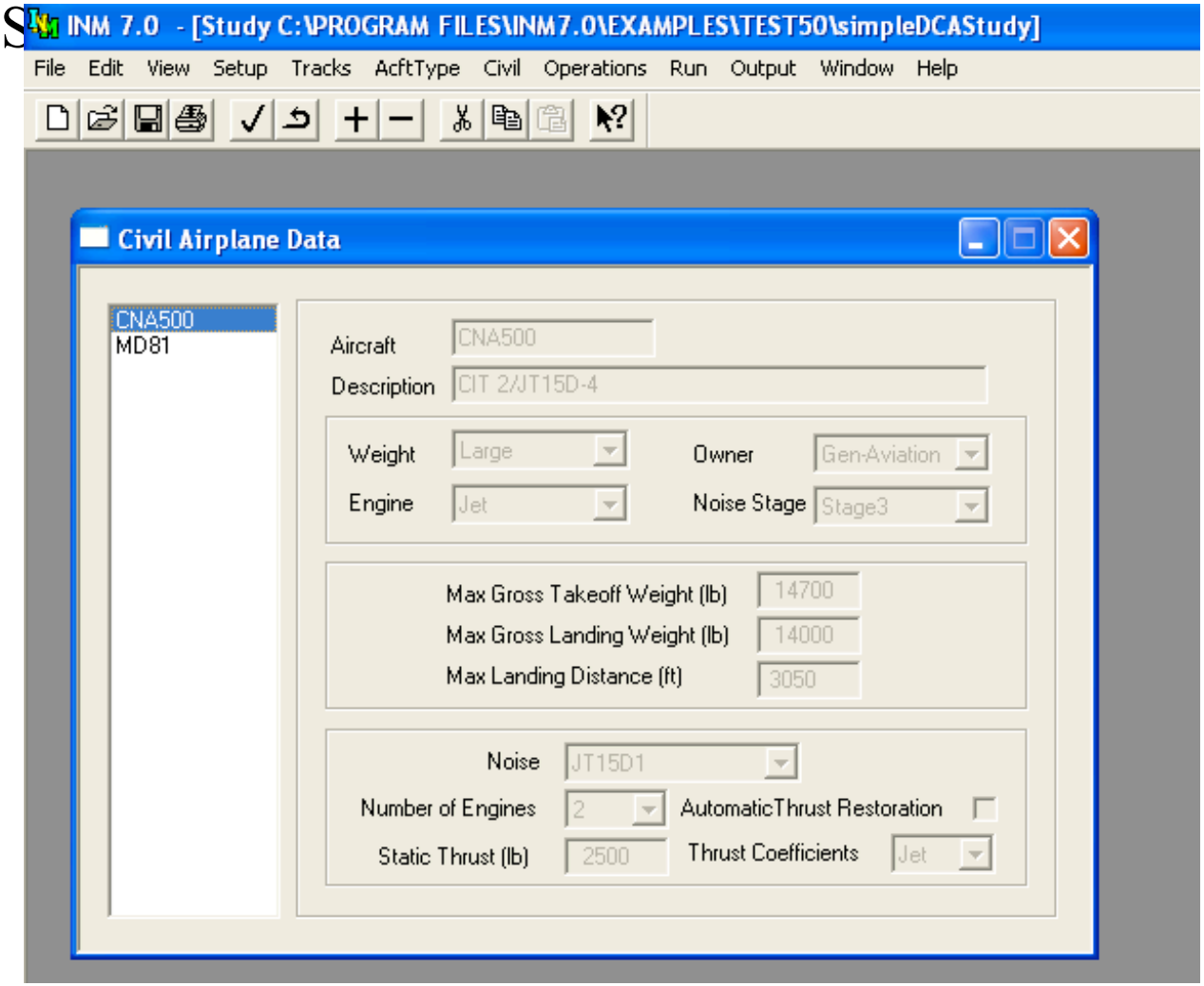
Adding Two Aircraft to the Case Study

- Added Cessna 500 and Boeing MD-81 aircraft

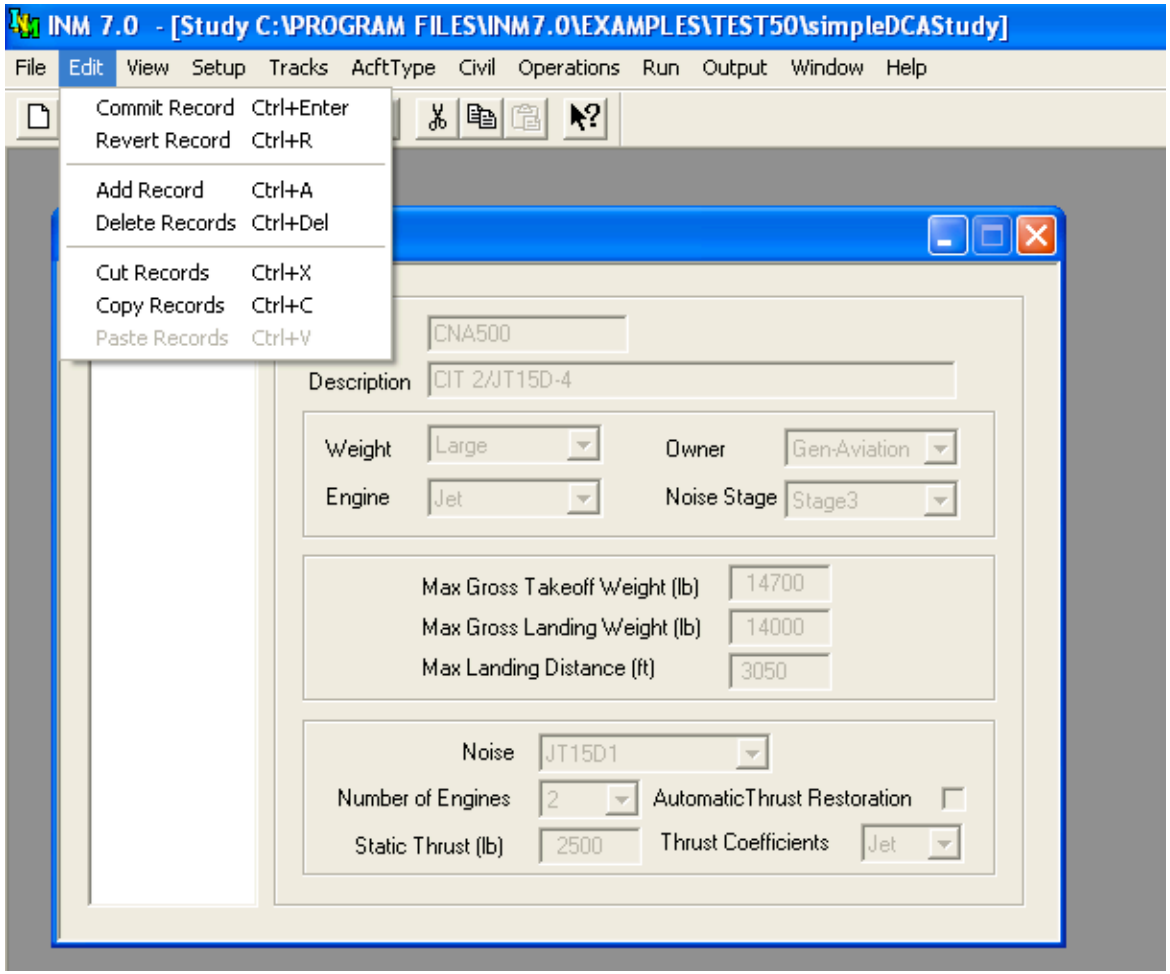


Verifying Aircraft Data

- S

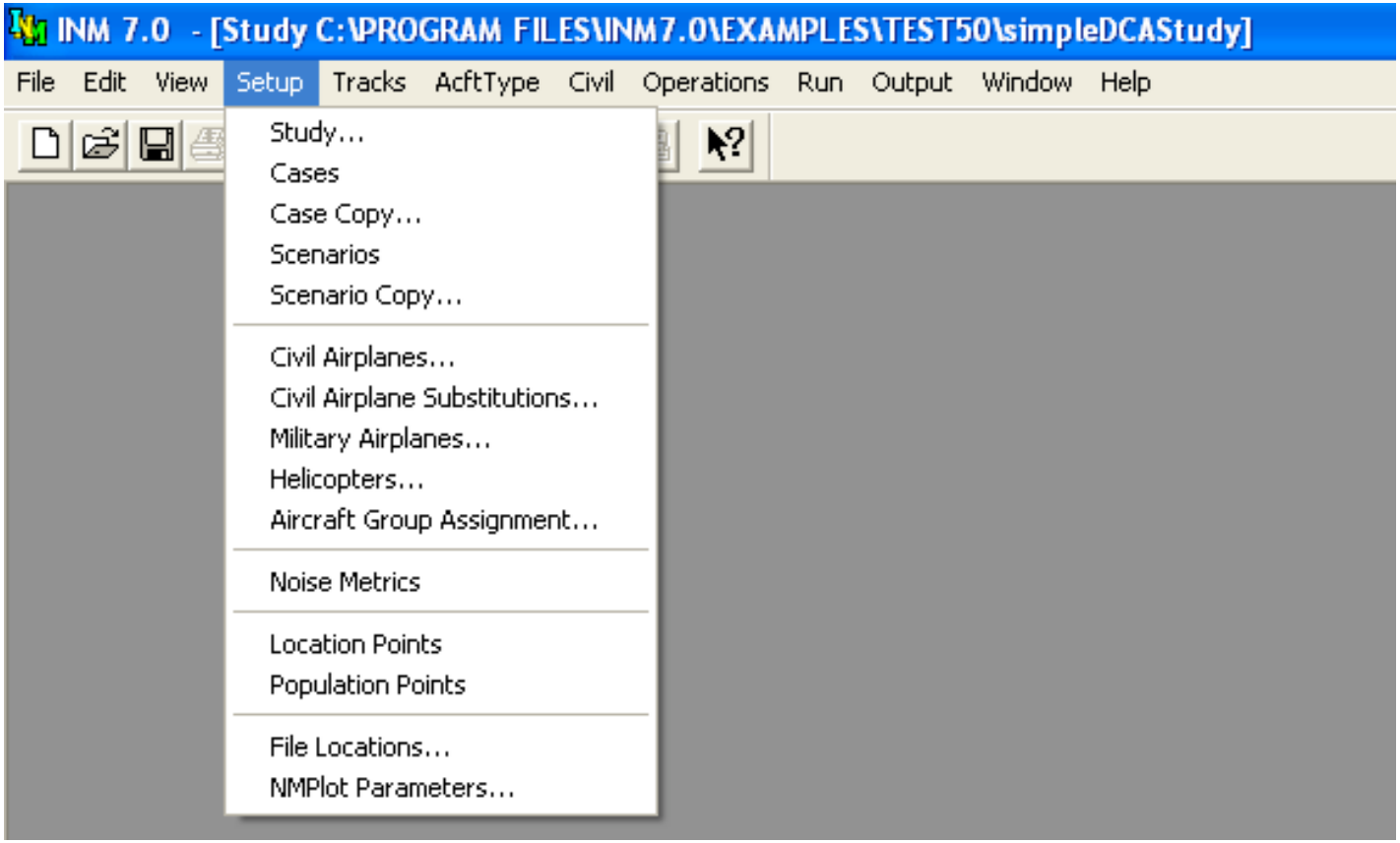


Commit the Records Added



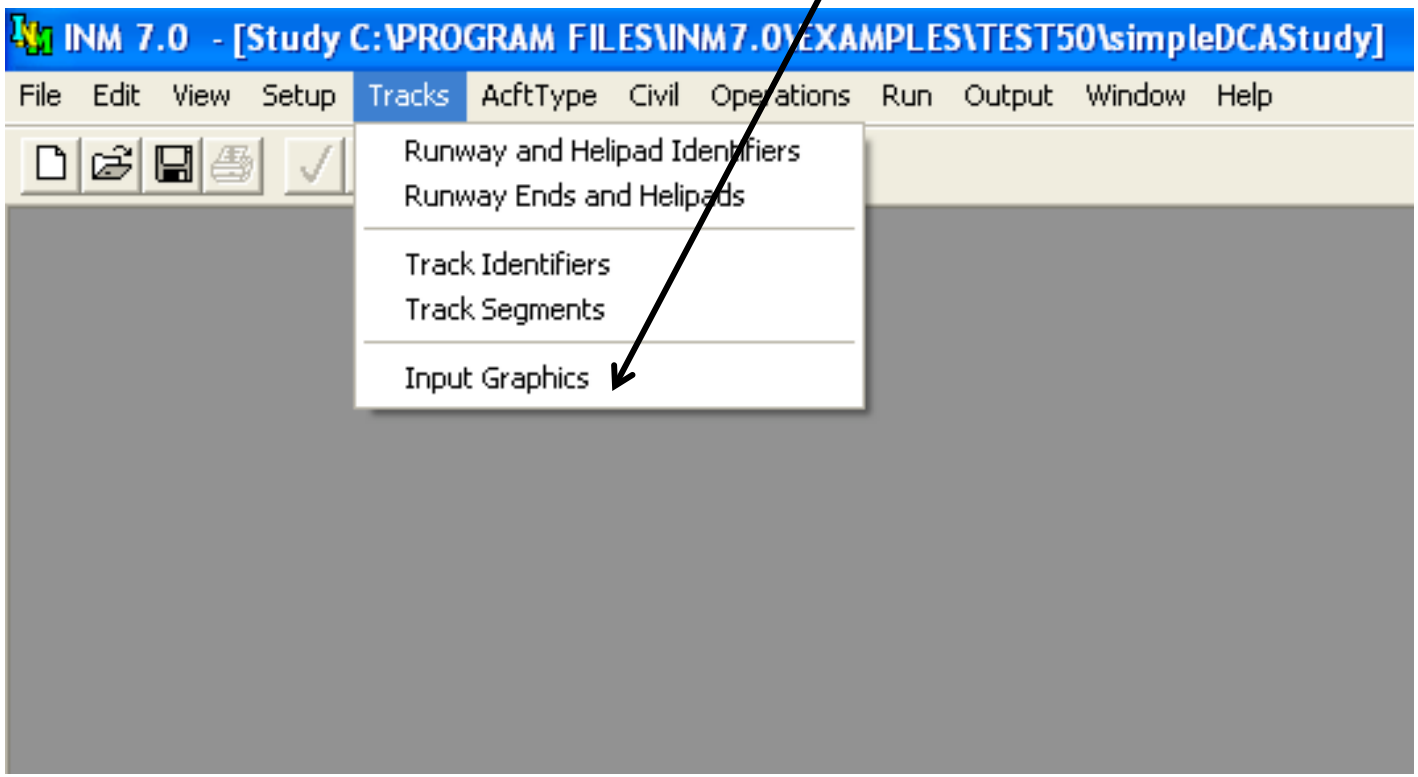
Defining the Noise Metric of the Case Study

- Any INM study requires at least one noise metric to be defined. In the U.S. we use DNL



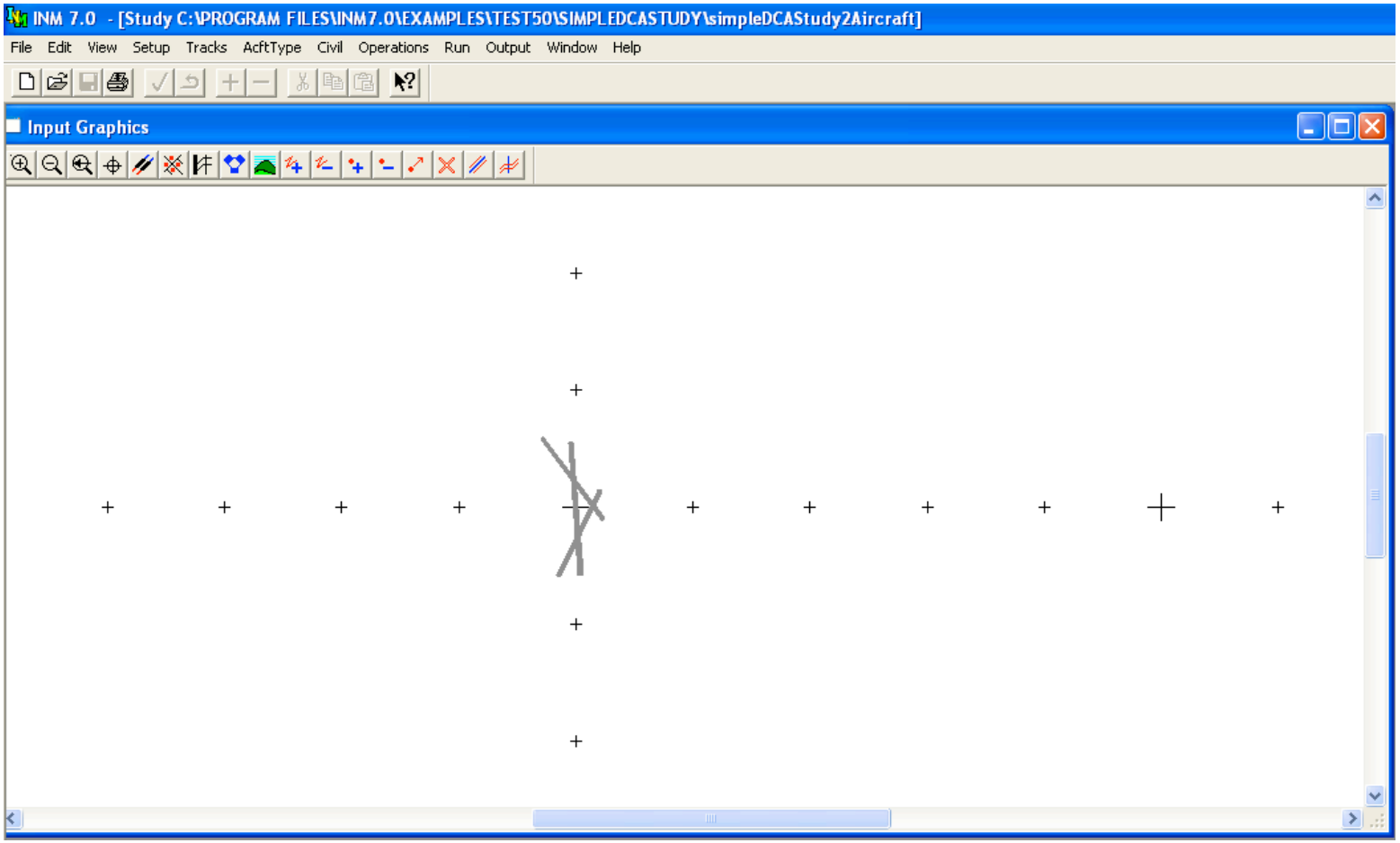
Define the Tracks Around the Airport

- Select the input graphics from the Tracks pull down menu



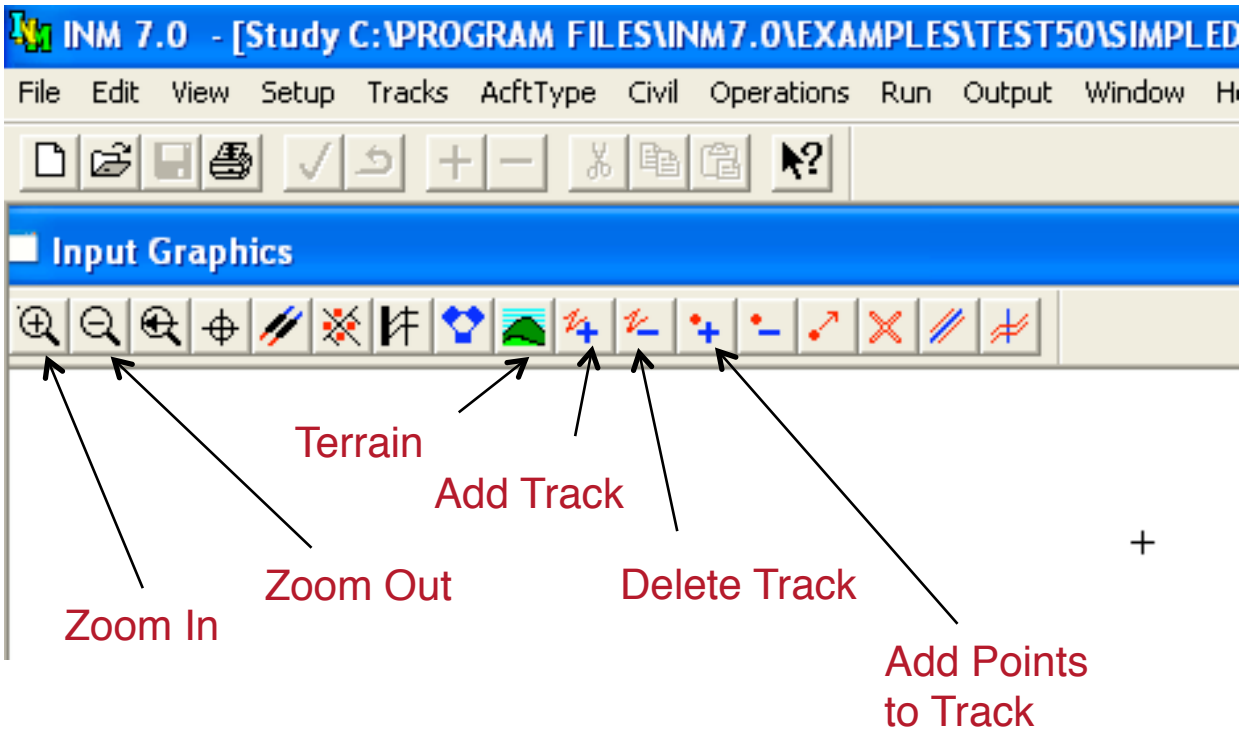
Adding Tracks Manually

- Note the runways at DCA airport



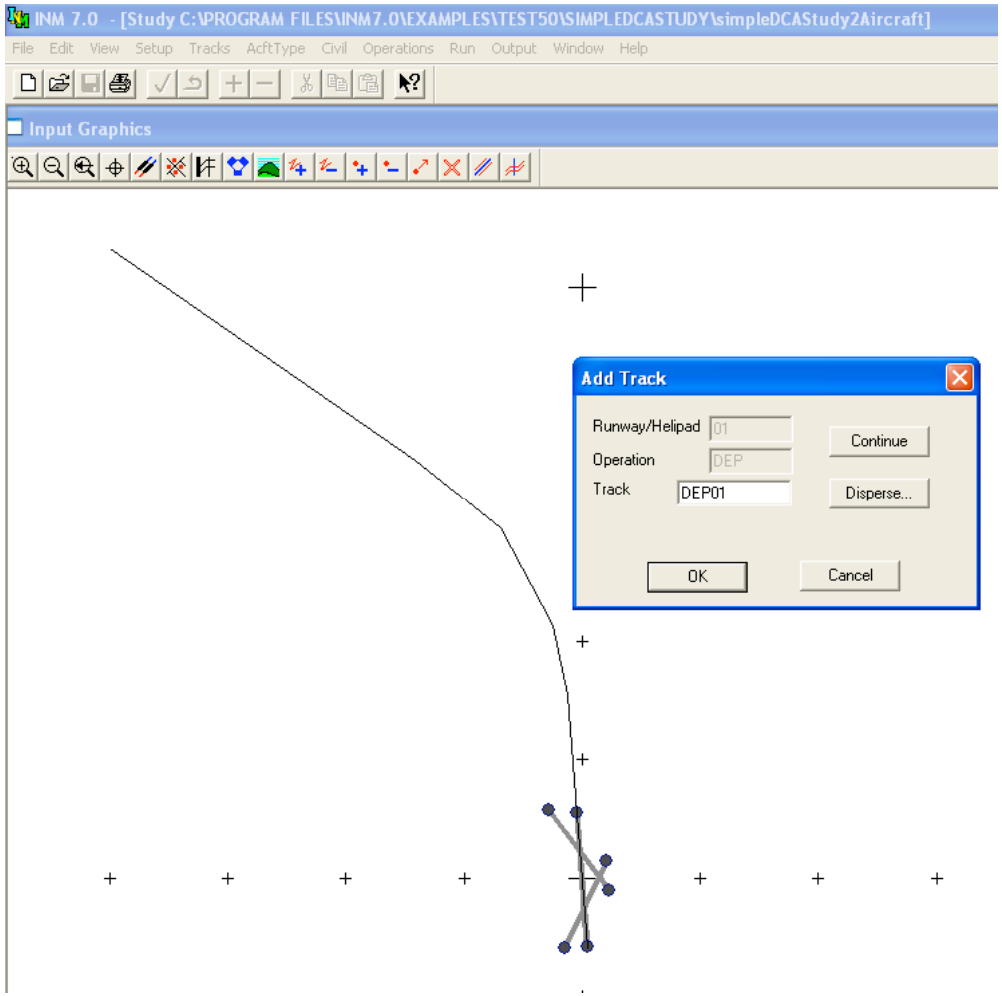
Input Graphic Options

- Zoom in, Zoom out, terrain, adding tracks, deleting tracks are some of the options



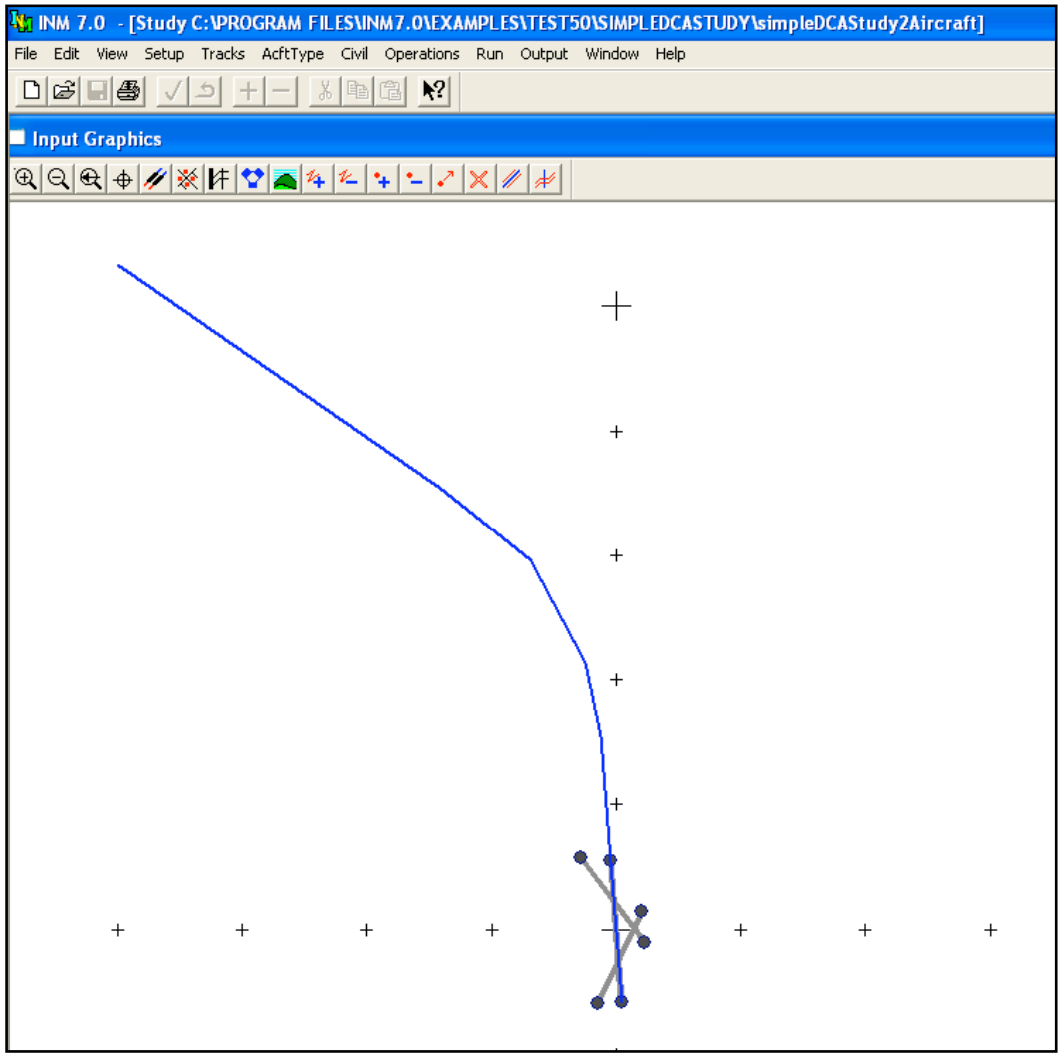
Adding a Departure Track (DEP01)

- Start the departure track at the beginning of the runway where the aircraft is supposed to depart
- Arrival tracks start in the airspace into the runway (make sure the arrival ends at the end of the runway – the final segment of the arrival is over the runway)



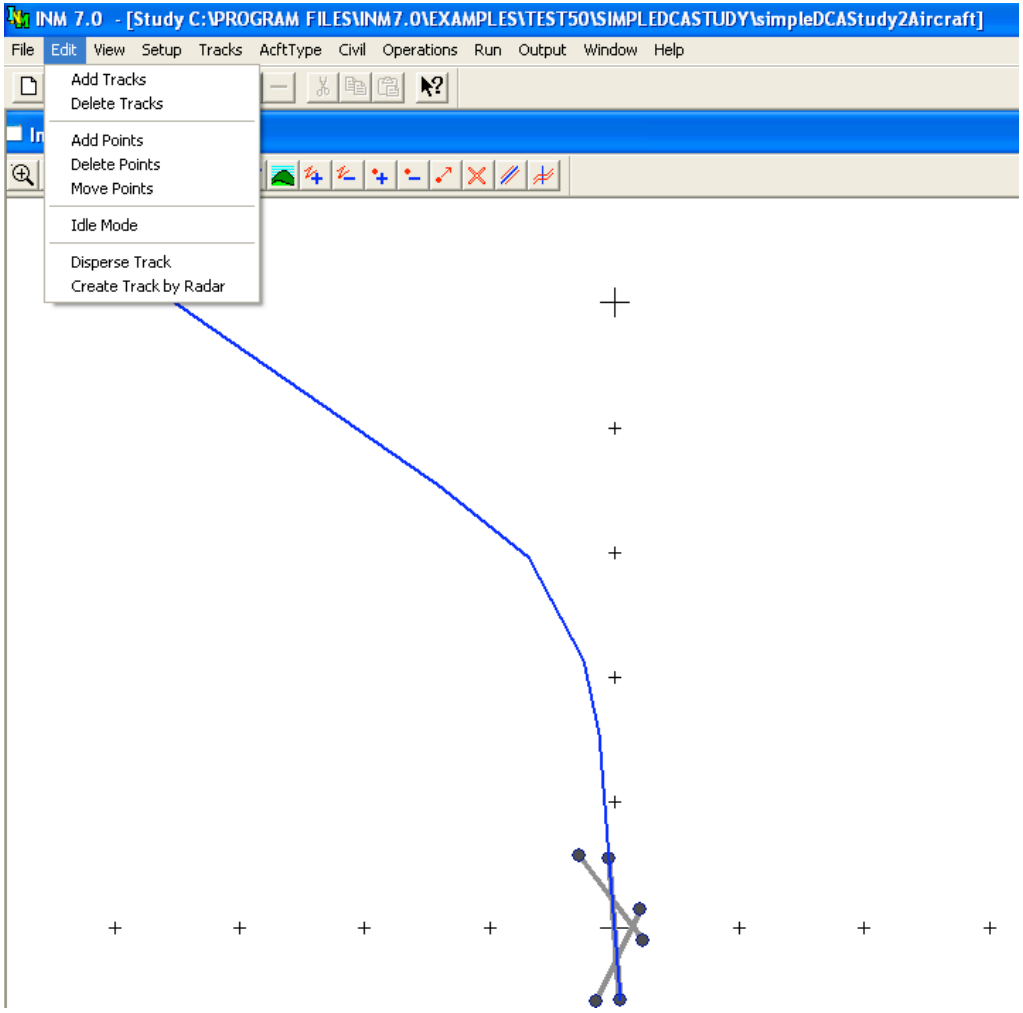
Departure Track Added
(Note Color Change to Blue)

- Departure tracks are blue
- Arrival tracks show in red



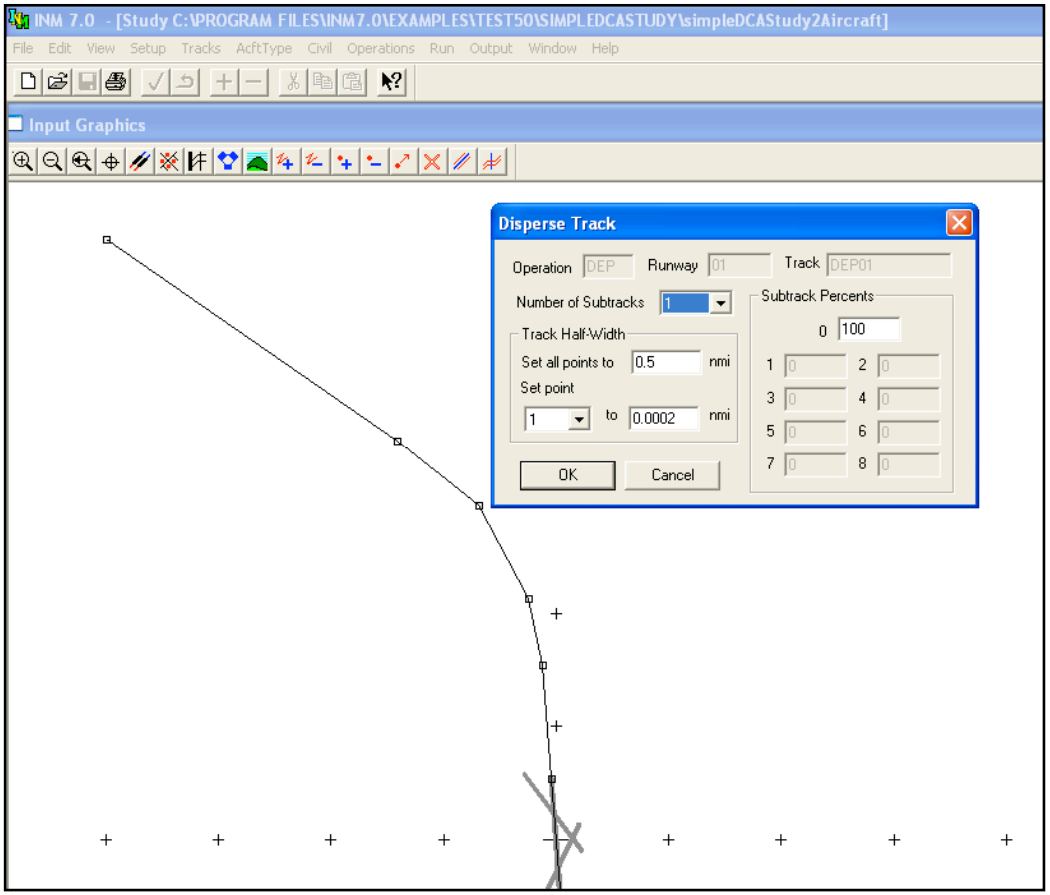
Dispersing a Track

- Dispersion of a track is to realistically simulate stochastic profiles
- Go to Edit pull down menu and “Disperse Track”

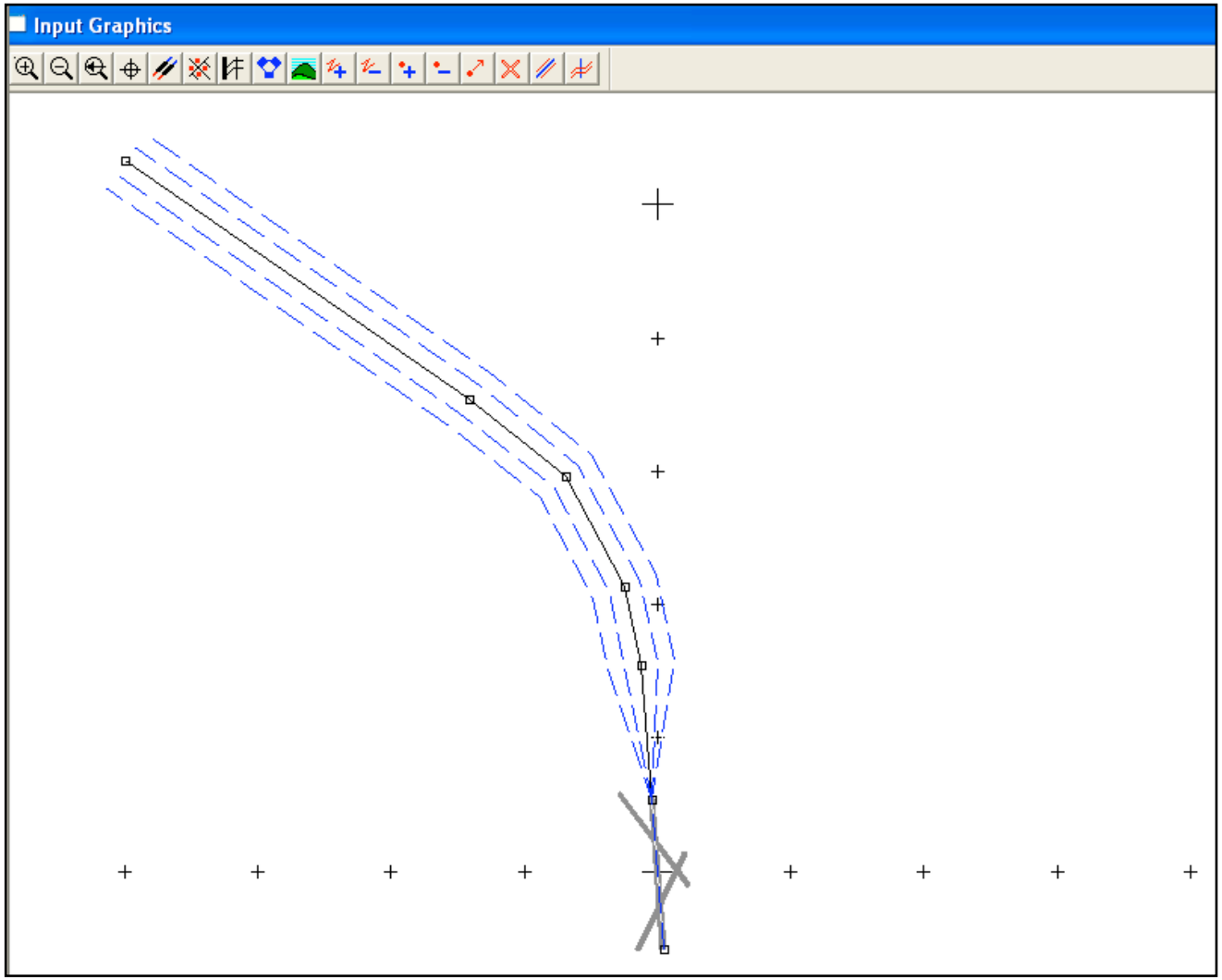


Specify the Dispersion Pattern

- The dispersion is accomplished by specifying the number of subtracks and their position from the original track

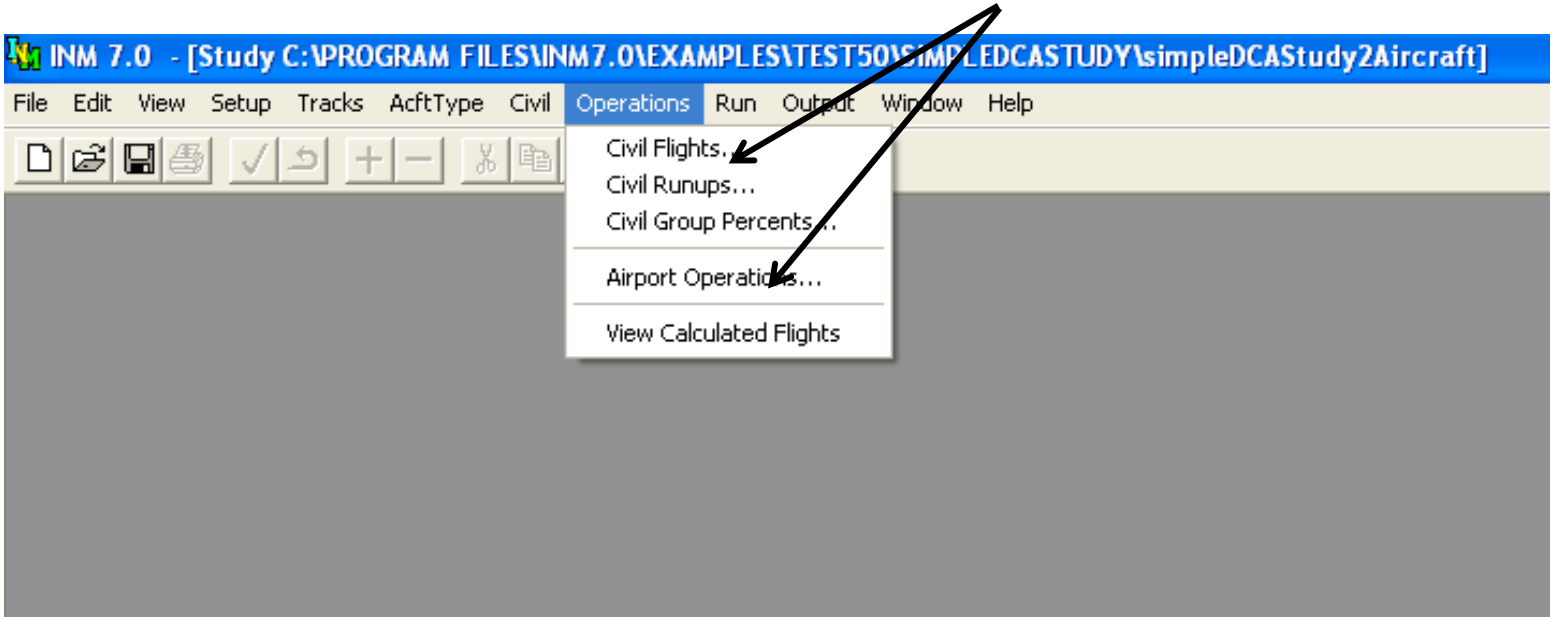


Dispersed Track (5 subtracks)

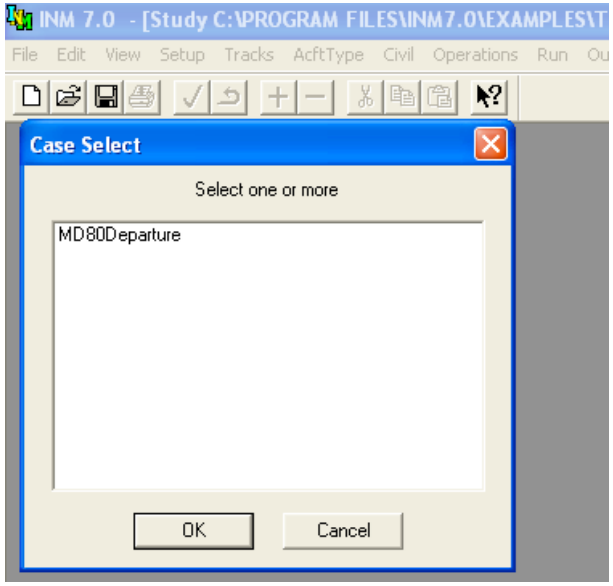


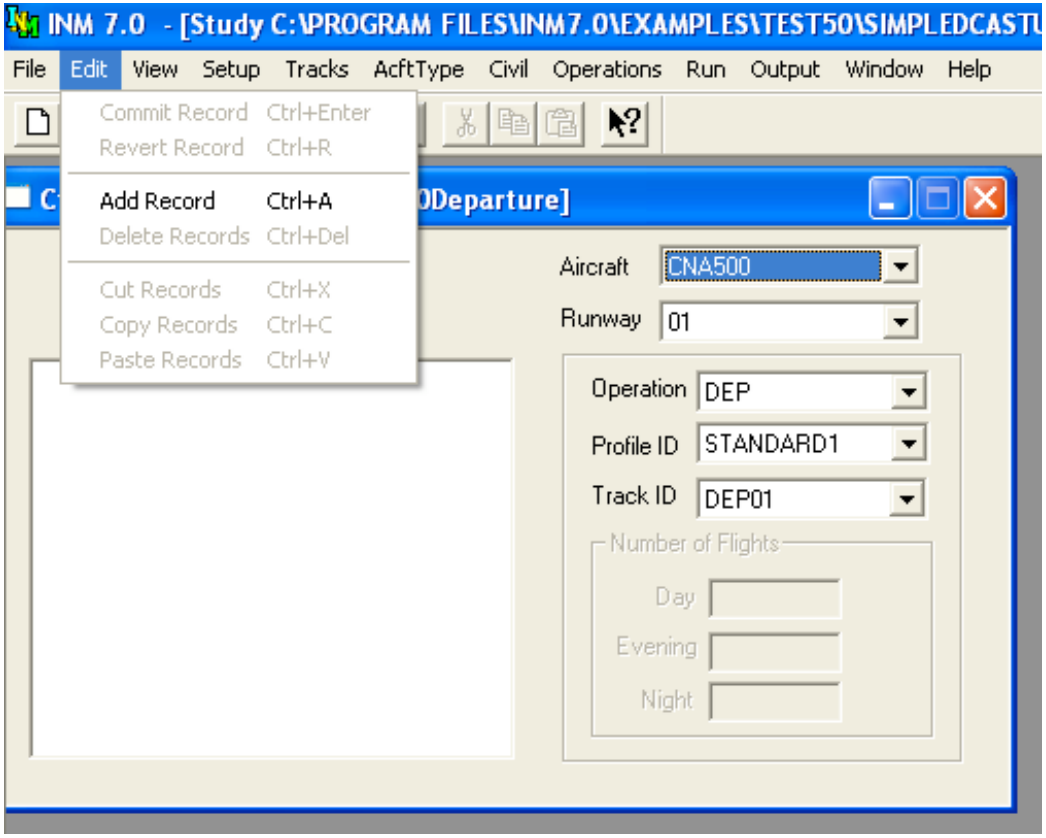
Adding Operations to the Case Study

- Use the Operations pull-down menu



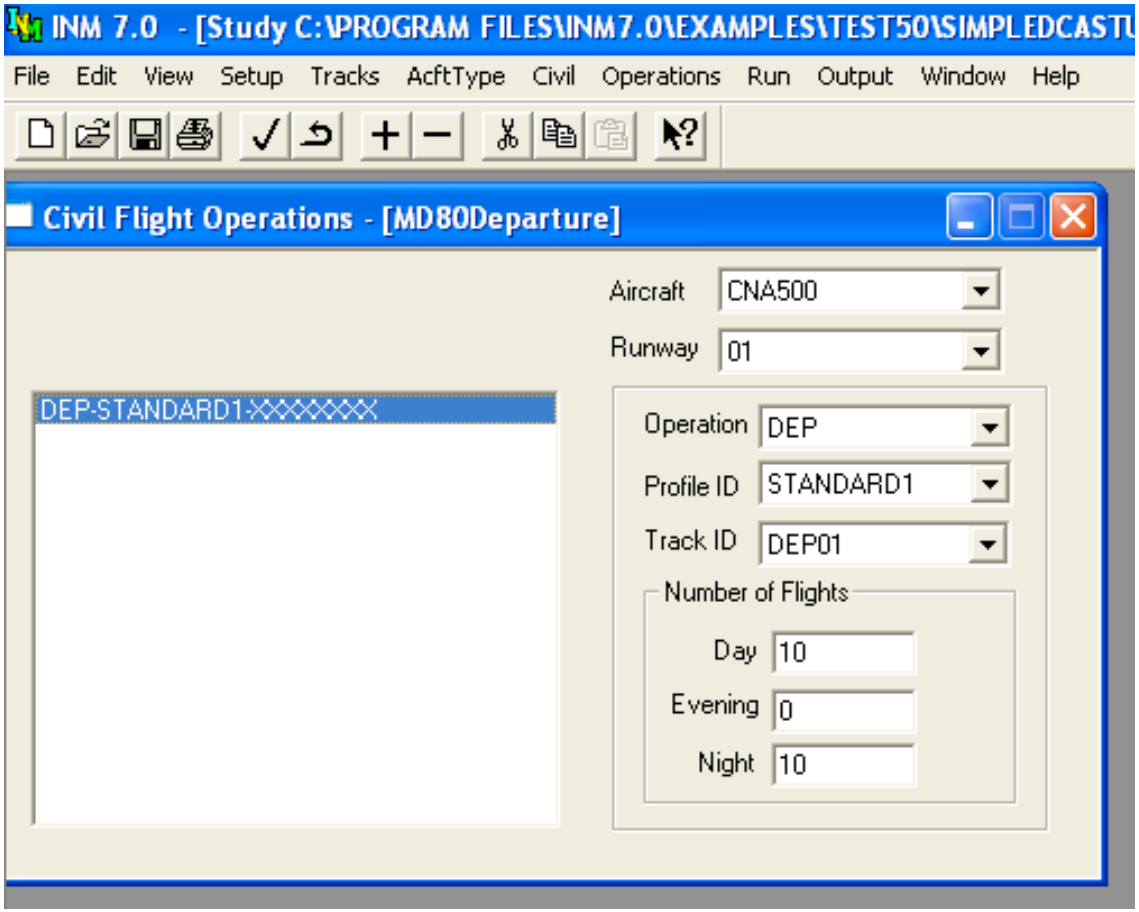
Adding a Record for Aircraft Operations





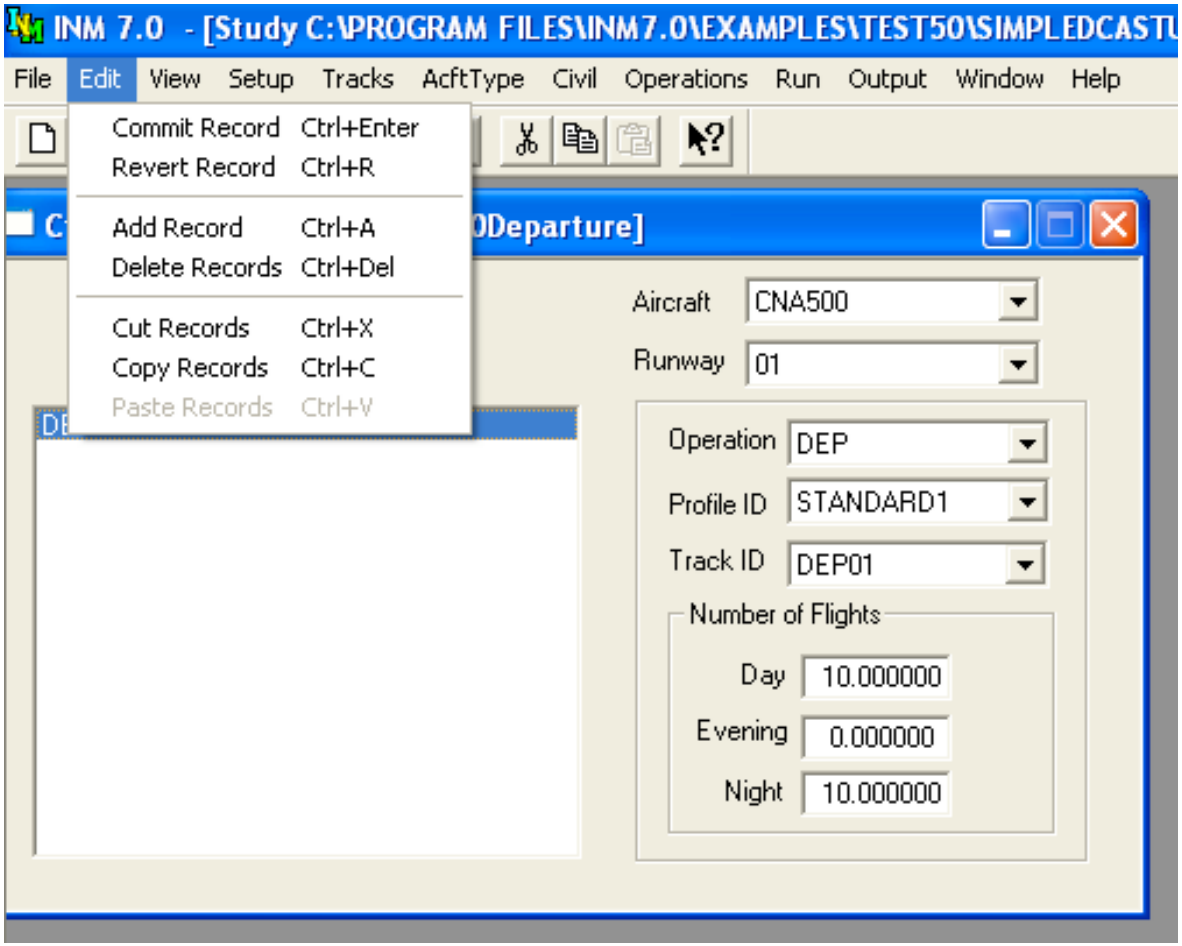
Adding Number of Operations

- Add daily, evening and night operations for every aircraft and every track



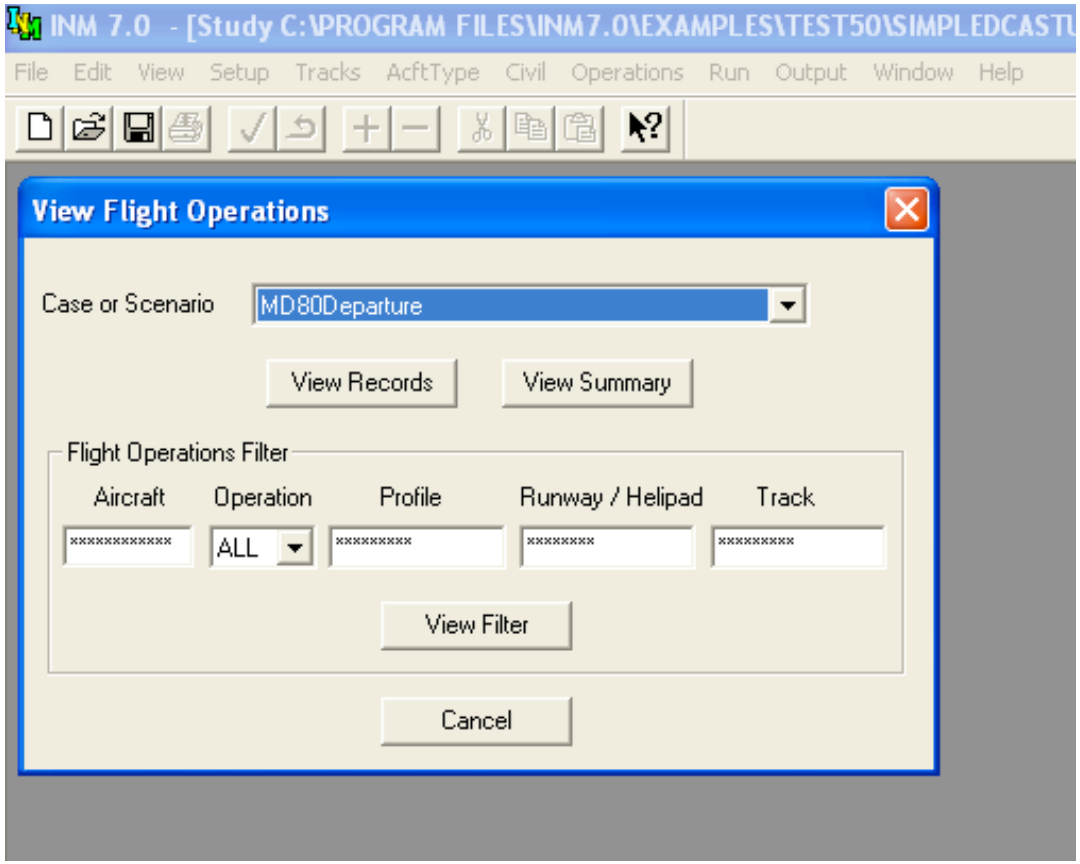
Commit the Records Added

- Do not forget to commit the records added



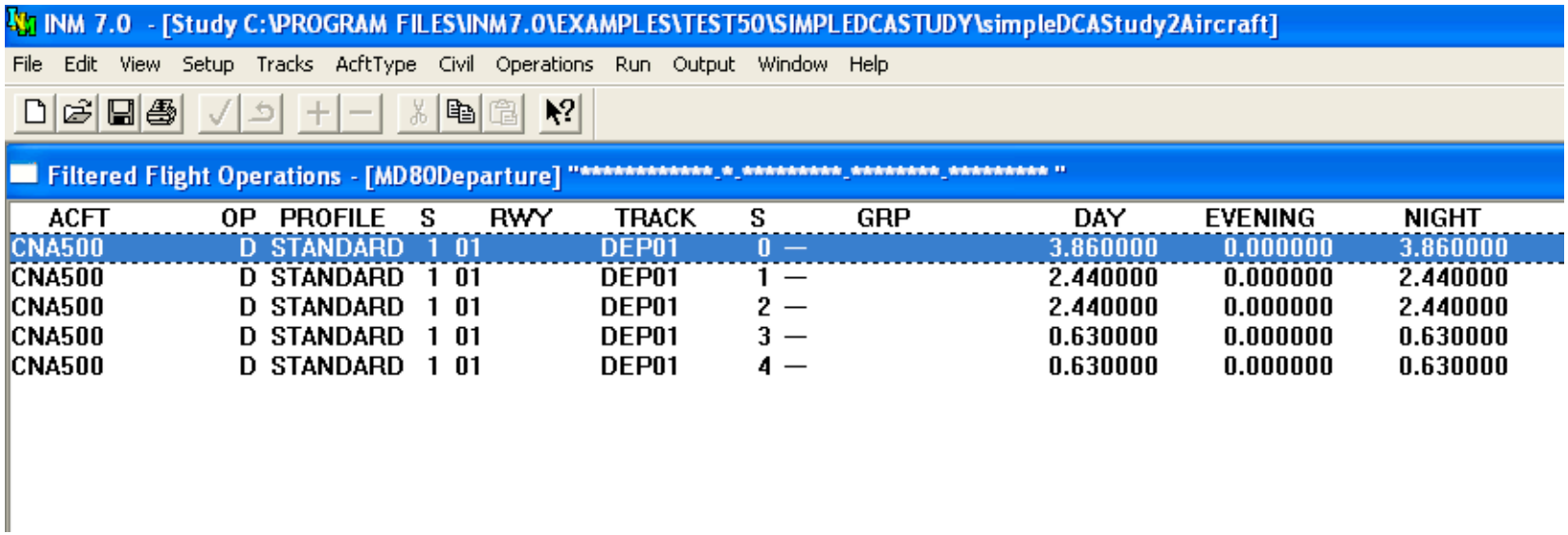
View Flight Operations

- You should always view the flight operations before running a case study



Summary of Flight Operations

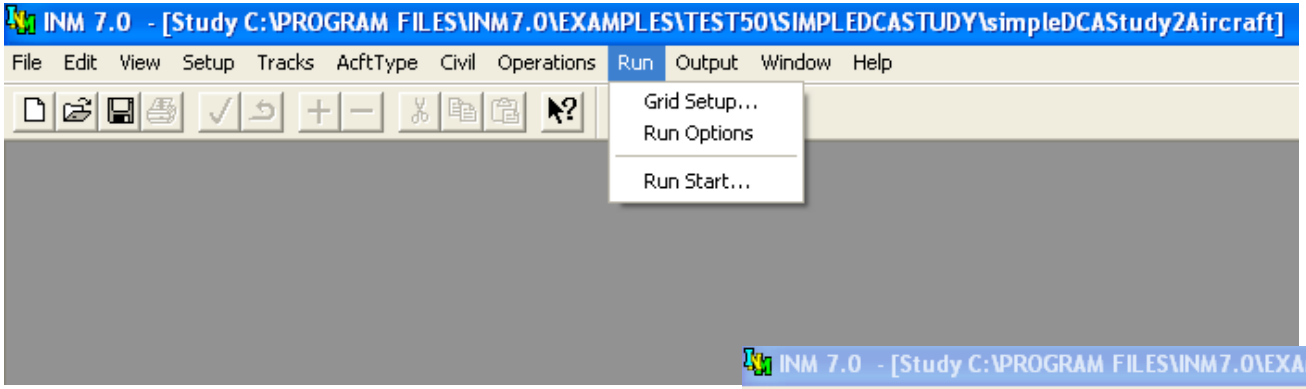
- This window shows the summary of the flights added to the case study

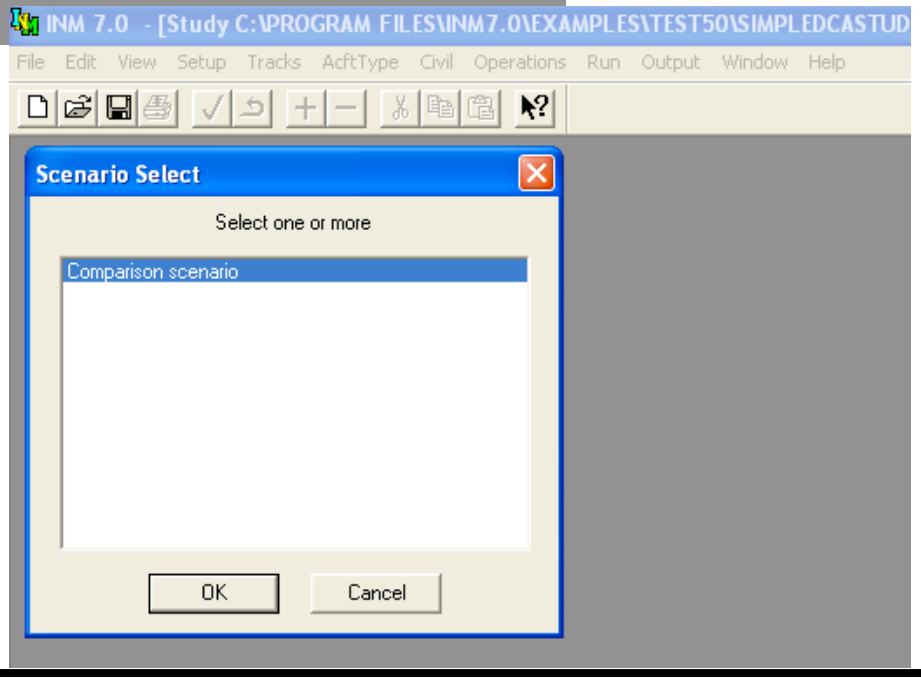


ACFT	OP	PROFILE	S	RWY	TRACK	S	GRP	DAY	EVENING	NIGHT
CNA500	D	STANDARD	1	01	DEP01	0	—	3.860000	0.000000	3.860000
CNA500	D	STANDARD	1	01	DEP01	1	—	2.440000	0.000000	2.440000
CNA500	D	STANDARD	1	01	DEP01	2	—	2.440000	0.000000	2.440000
CNA500	D	STANDARD	1	01	DEP01	3	—	0.630000	0.000000	0.630000
CNA500	D	STANDARD	1	01	DEP01	4	—	0.630000	0.000000	0.630000

Setup the Airport Grid for Noise Calculations

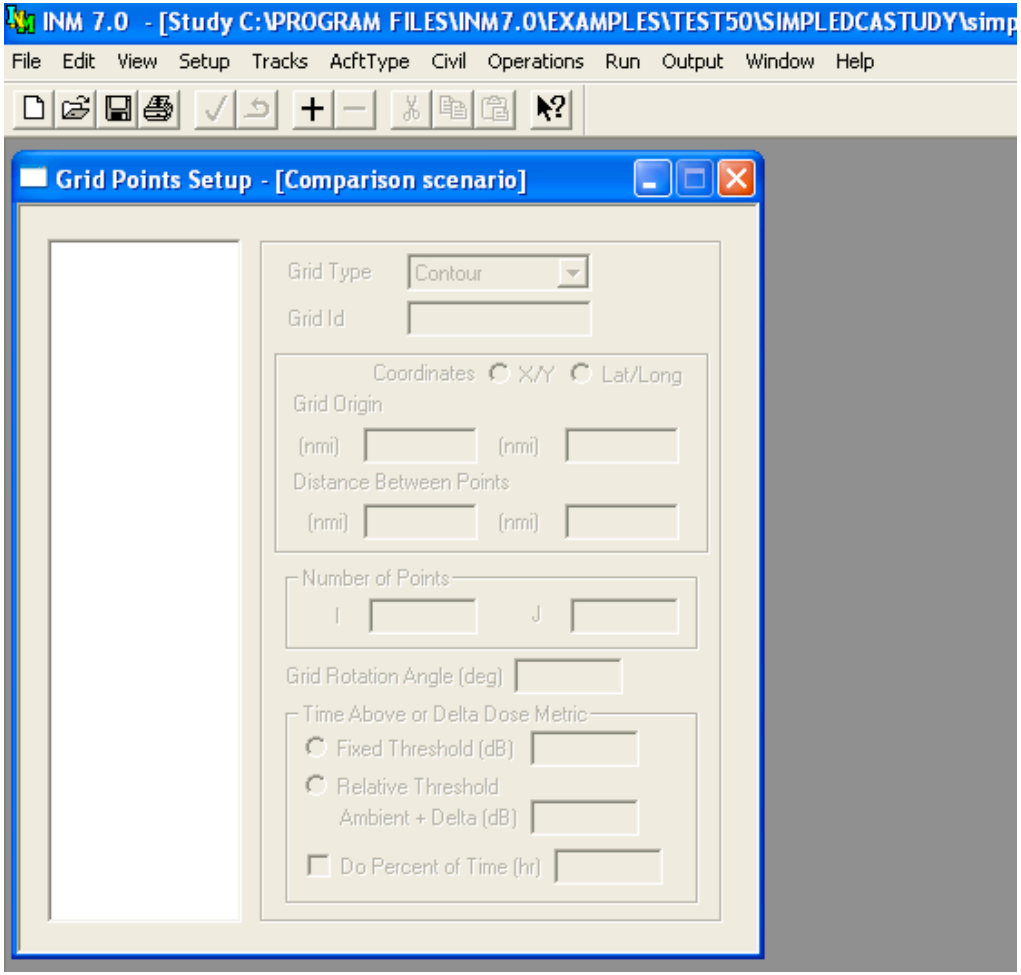
- Here we tell INM about the specific grid to calculate noise



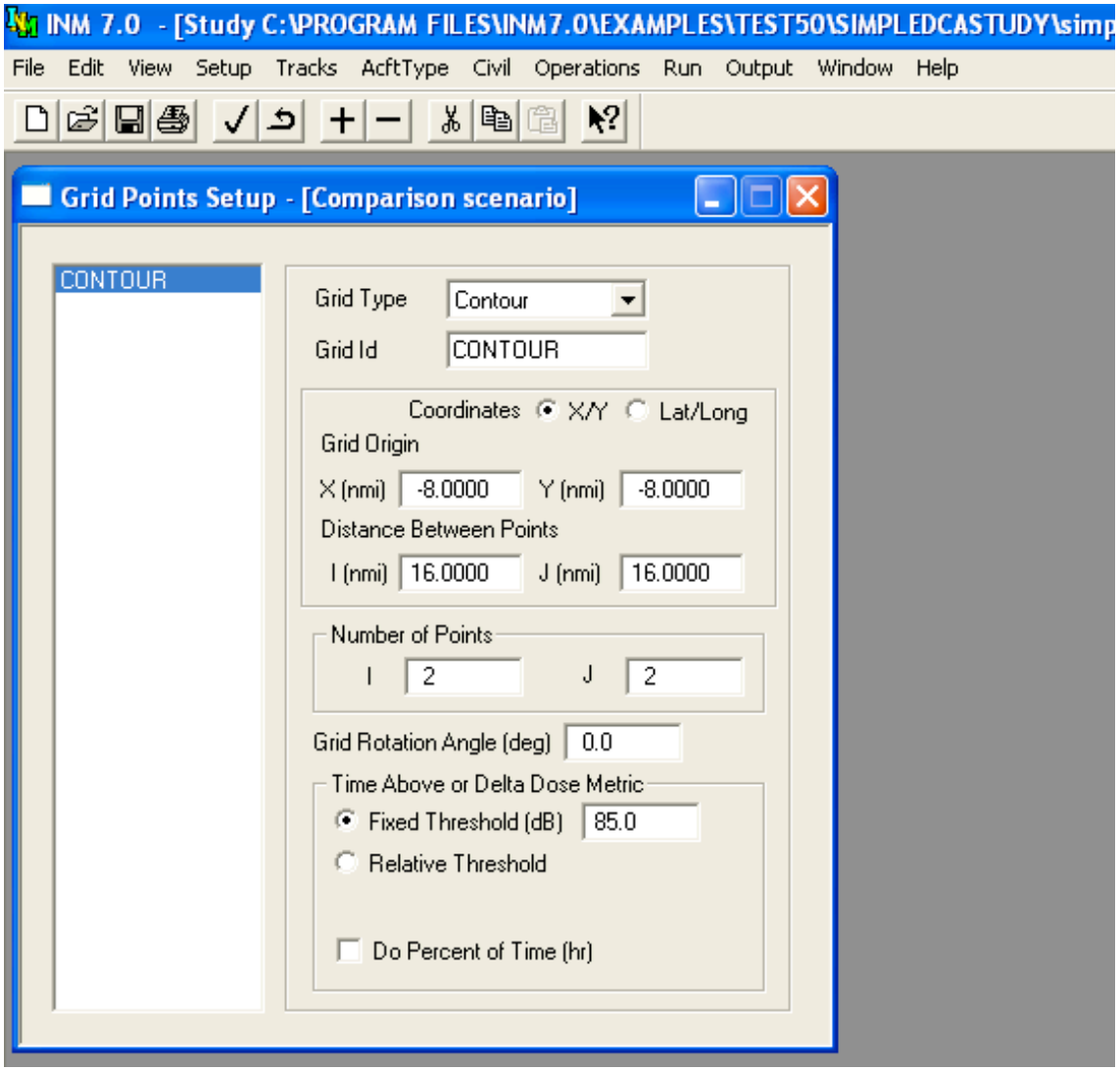


Grid Setup

- You need to add a grid point setup
- Usually, defaults work well
- Sometimes if the noise contours go outside of the default grid, increase the grid size changing the distance between points

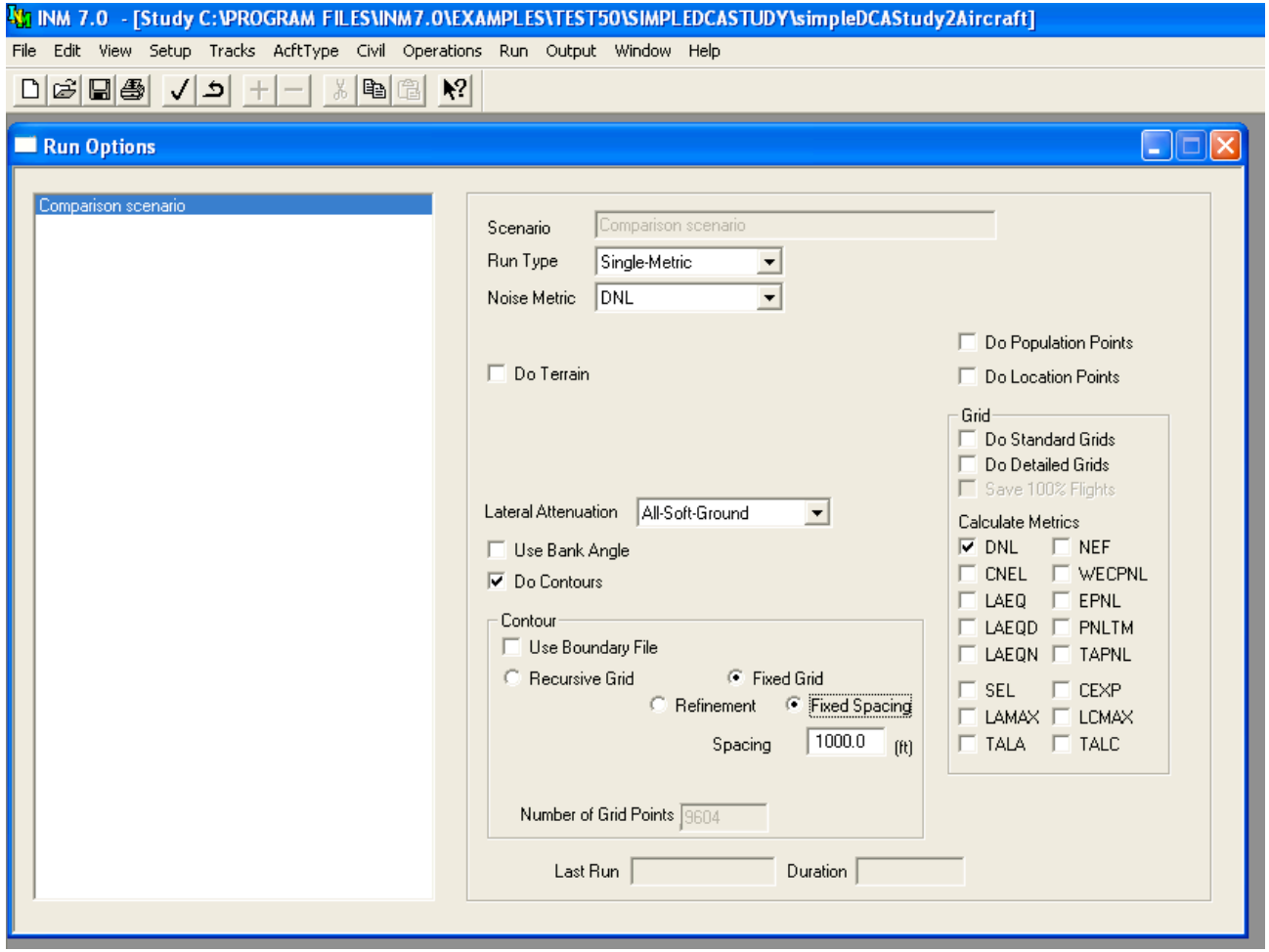


Adding a Grid Setup

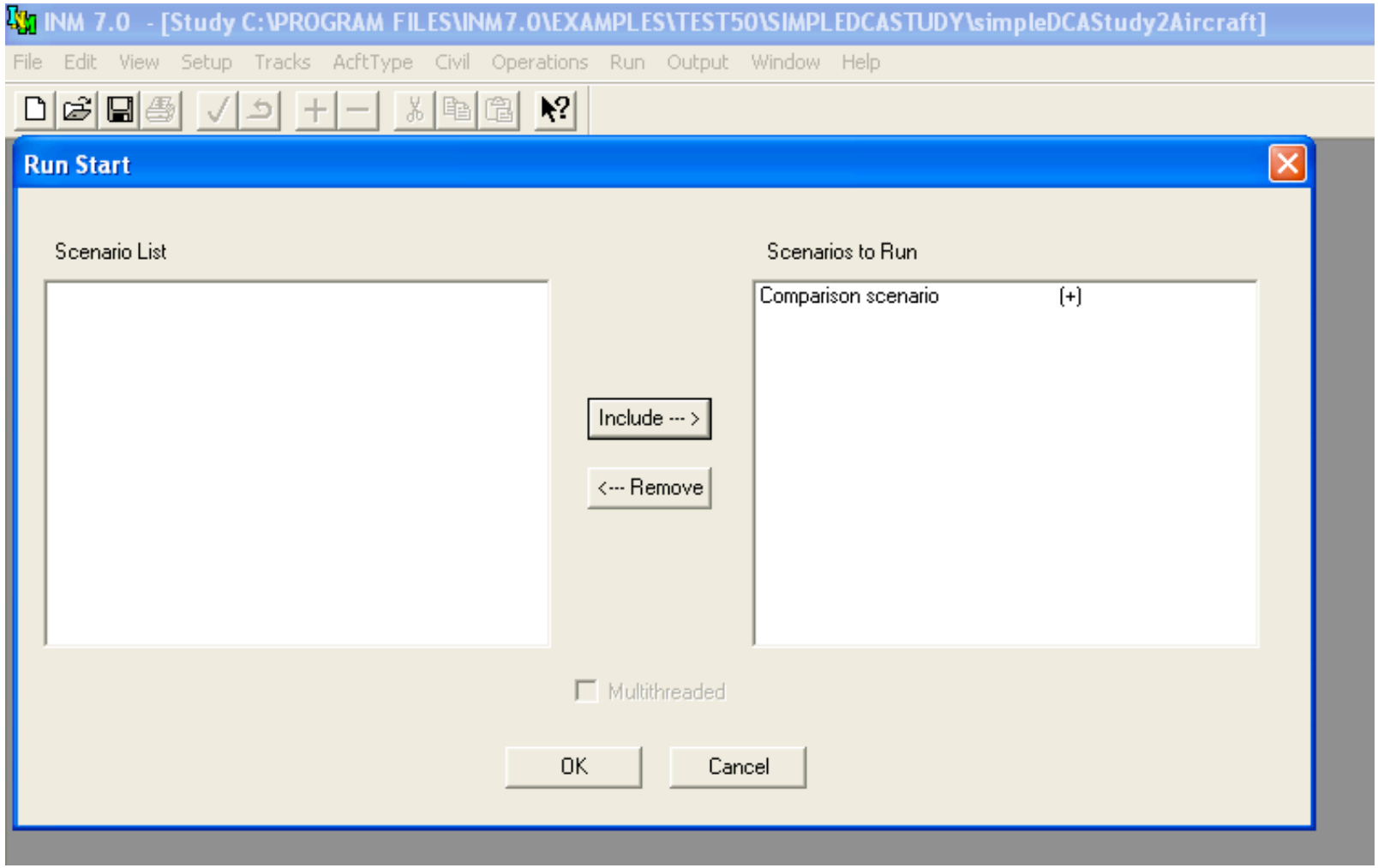


Run Options

- Here we specify the metric to use and the noise calculation run parameters (contour, points)

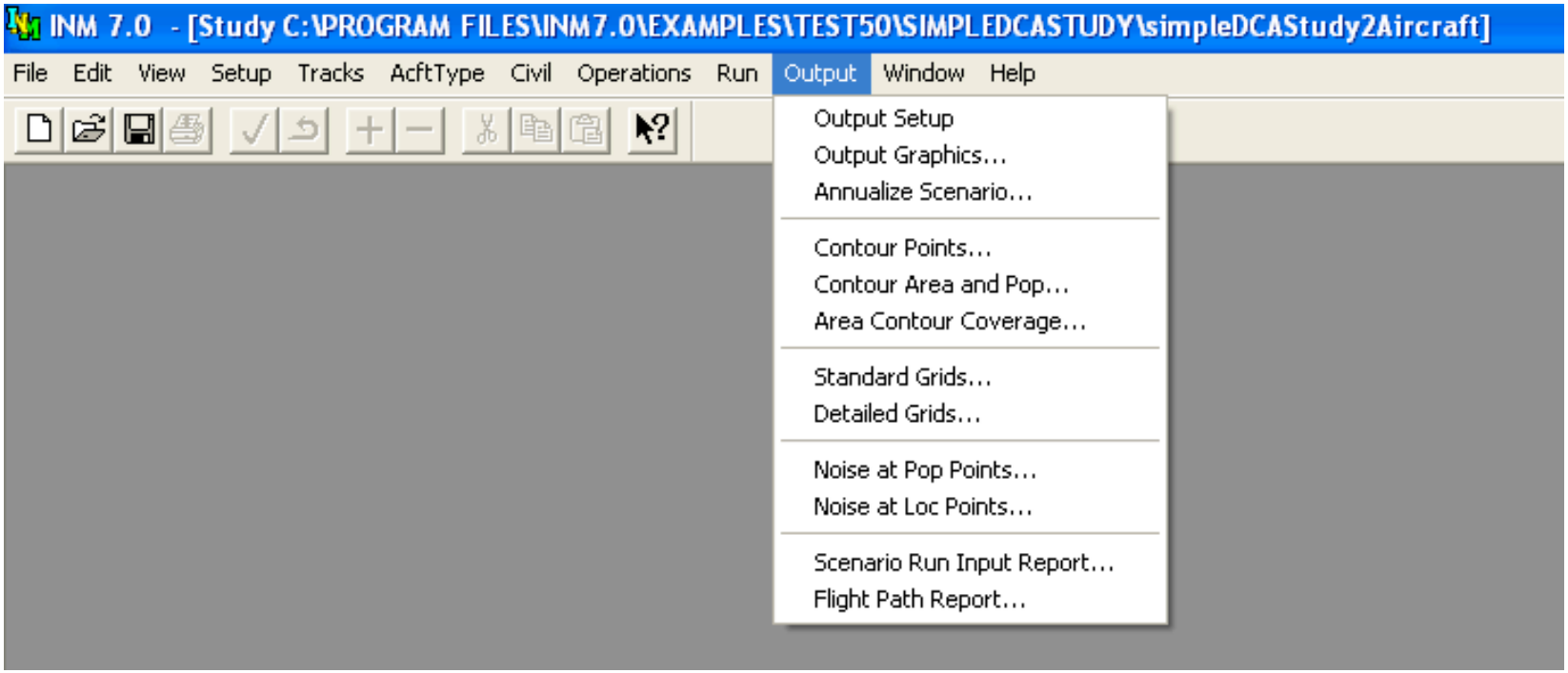


Specify What Scenario to Run



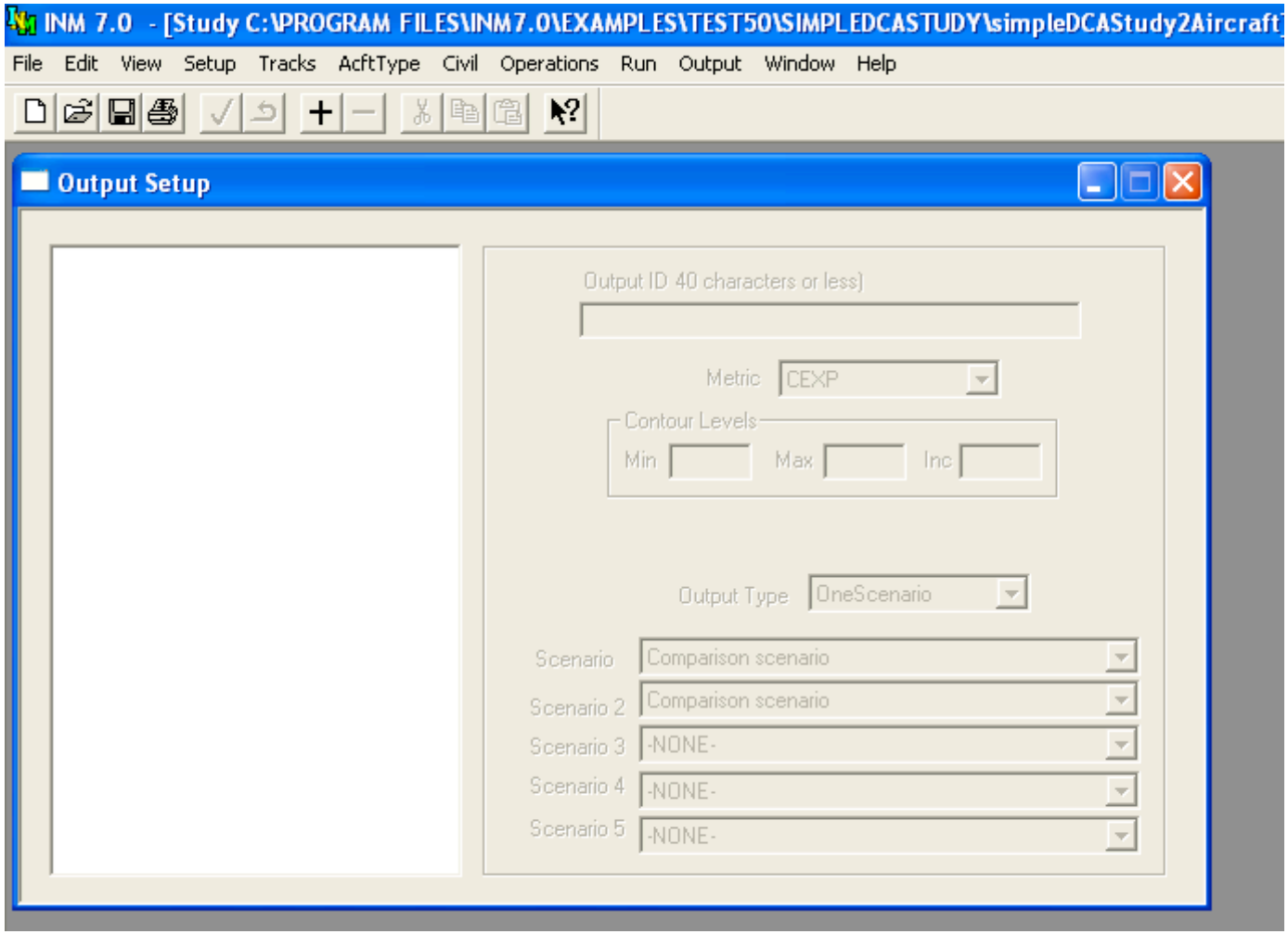
Specify the Output

- Go to Output Setup to create a new output scenario for INM to save your results

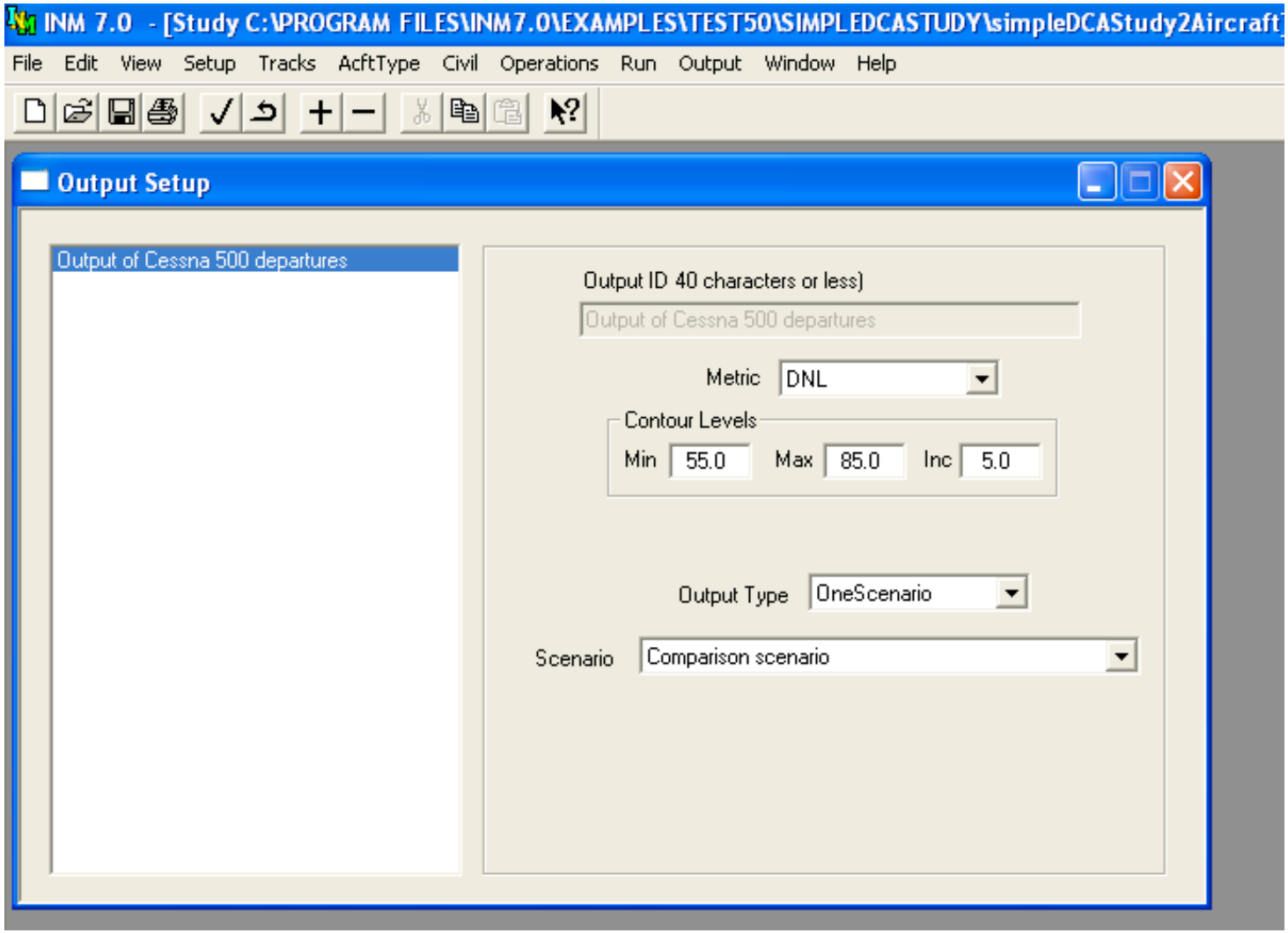


Creating a New Output Scenario

- Add a new record to create a new output

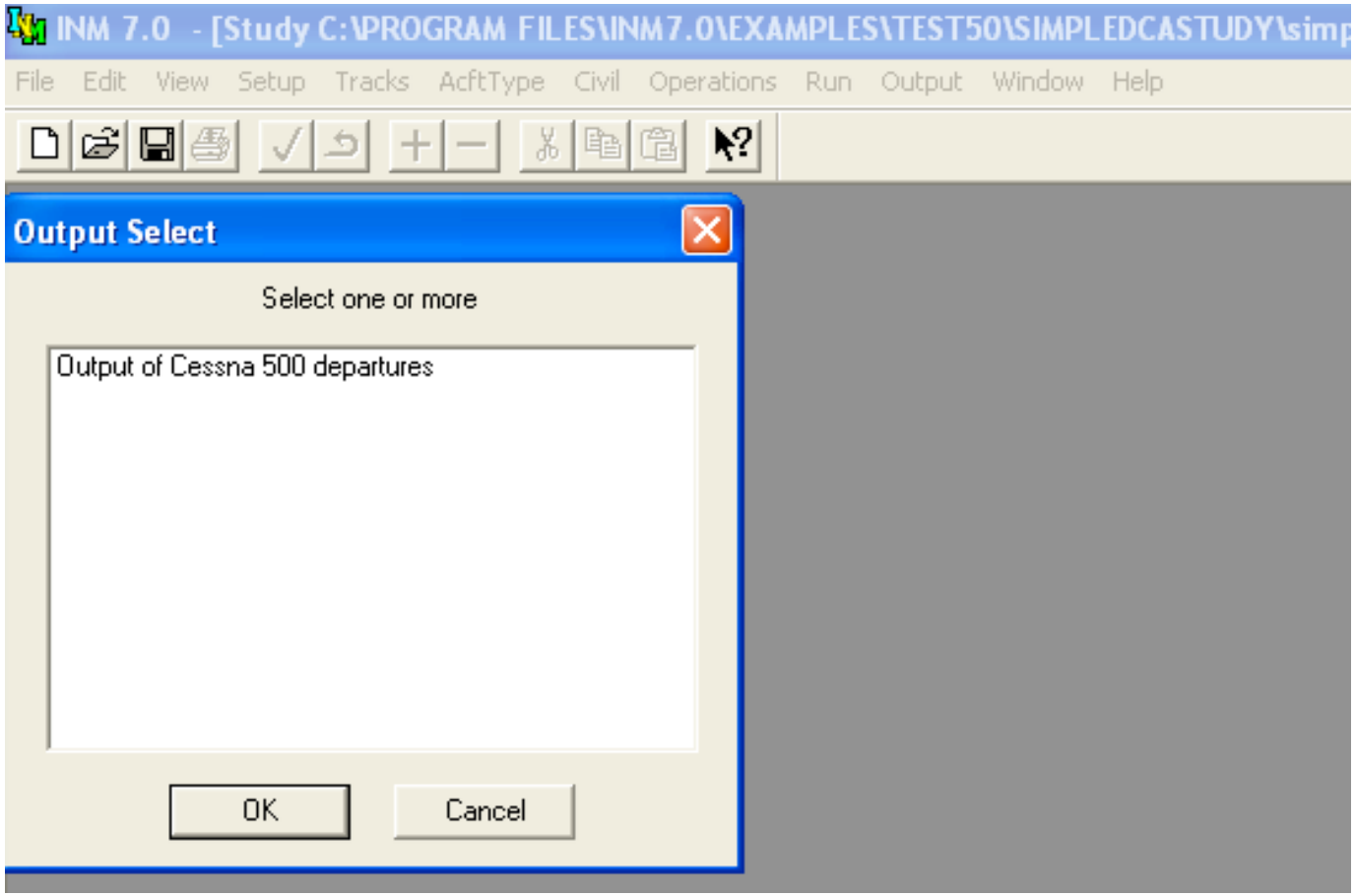


Specifying the Output Scenario



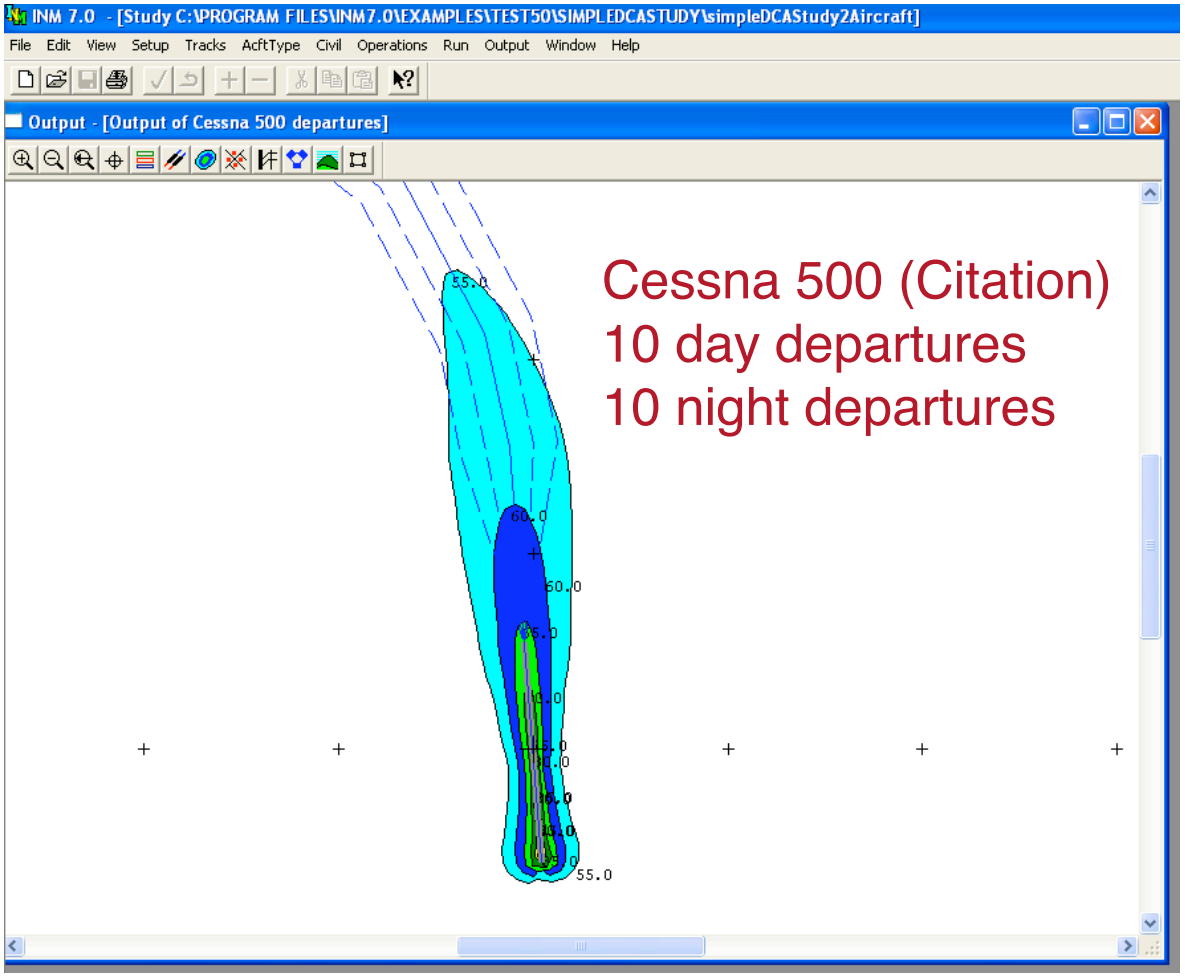
Viewing the Output of INM

- Every output scenario created will show in the Output window



Output Graphics (Contour)

- Once the program runs, the noise contours are generated

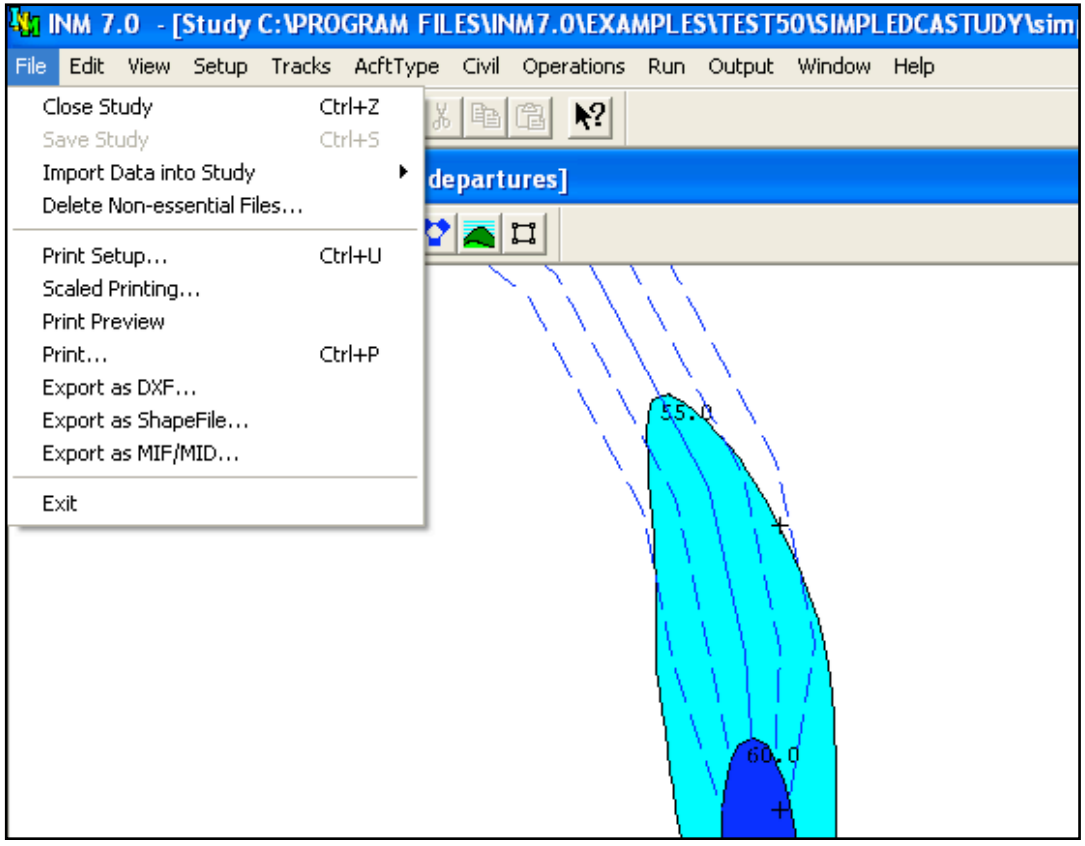


Next Steps

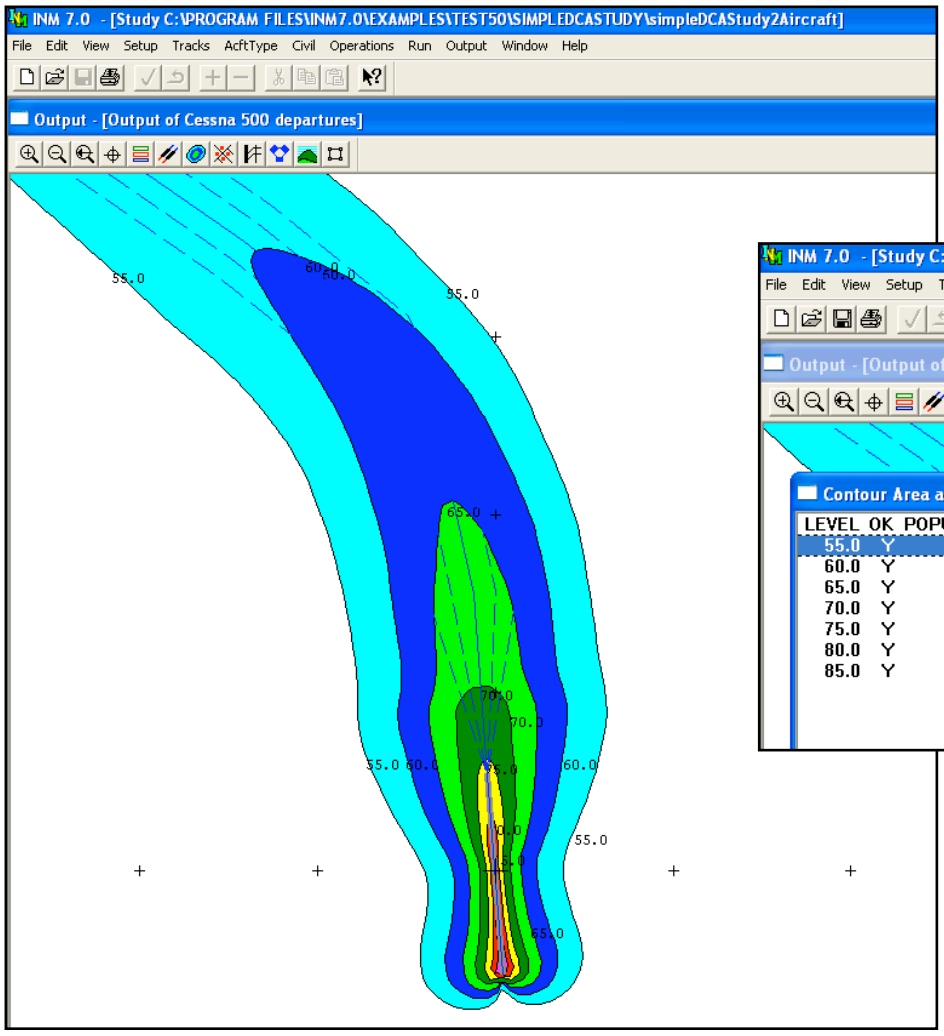
- Add other aircraft and other tracks
- Export to Autocad (DXF file)
- Perform sensitivity analysis (adding more scenarios)

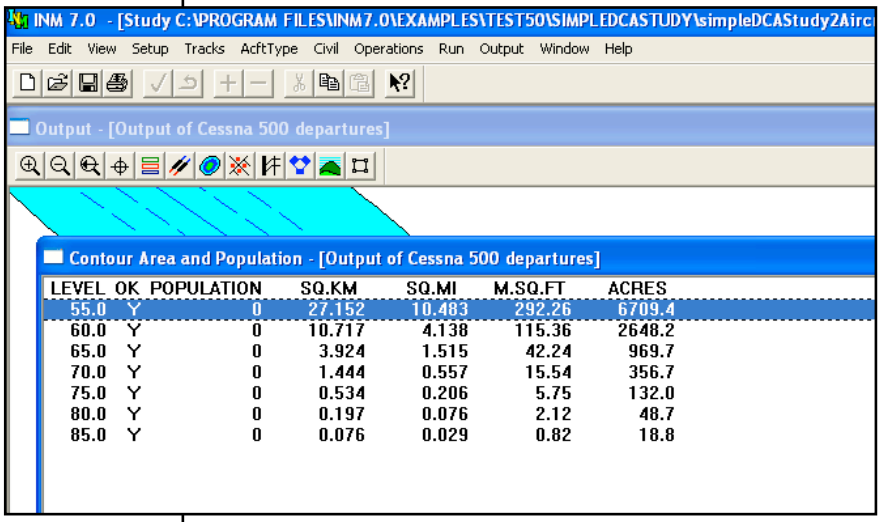
Exporting to Other Programs

- INM can export noise contours in DXF and Shape file formats



Running the MD-80 Contours





LEVEL	OK	POPULATION	SQ.KM	SQ.MI	M.SQ.FT	ACRES
55.0	Y	0	27.152	10.483	292.26	6709.4
60.0	Y	0	10.717	4.138	115.36	2648.2
65.0	Y	0	3.924	1.515	42.24	969.7
70.0	Y	0	1.444	0.557	15.54	356.7
75.0	Y	0	0.534	0.206	5.75	132.0
80.0	Y	0	0.197	0.076	2.12	48.7
85.0	Y	0	0.076	0.029	0.82	18.8

Comparing Noise Contours

- Ran the INM 7 model with individual profiles for MD-81 and the Cessna 500 (Citation)
- The results show the striking difference between two aircraft noise contours (at 55 DLN level)