

# INM Version 7.0b Software Update

9/29/2009

## Version Information

INM Version 7.0b is a software update to Version 7.0a. You must already have INM Version 7.0 or 7.0a to use this software update. The INM 7.0b software update may be downloaded from the FAA web site at:

[http://www.faa.gov/about/office\\_org/headquarters\\_offices/aep/models/inm\\_model/](http://www.faa.gov/about/office_org/headquarters_offices/aep/models/inm_model/)

If you do not have INM 7.0, you can order a CD-ROM containing INM 7.0 by downloading the INM Order Form from the FAA web site (above). After installing INM 7.0, you can download and apply the INM 7.0b software update.

The Version 7.0 User's Guide is the current manual for INM Version 7.0b software. The Version 7.0 Technical Manual is the current technical description of the methods used by INM 7.0b to calculate aircraft noise around airports. Release notes *Inm70a.pdf* and this document, *Inm70b.pdf*, record the changes to INM since the User's Guide and Technical Manual were published.

## Installation Instructions

1. Use MS Windows to make a copy of your existing *INM7.0a* directory. Select your *INM7.0a* directory and, using the Windows File Manager under the "Edit" menu, select "copy" and then select "paste". This will create a new directory called "*Copy of INM7.0a*".
2. Use the right button of your mouse to select the *Copy of INM7.0a* directory created in step 1. Select "Rename" and rename the directory *INM7.0b*.
3. **Make sure that the attributes for the new *INM7.0b* directory as well as for all sub-directories and files are not set to "Read-only"**. The attribute settings for each file and folder can be viewed by right-clicking that file or folder within Windows Explorer and selecting "Properties".
4. Download the *INM70b.EXE* file from the FAA Web site. Put it in the new *INM7.0b* directory.
5. Double click on the *INM70b.EXE* file name to automatically extract the updated files into the new *INM7.0b* directory. Select the "Unzip" button. This process will overwrite the old INM 7.0a files and replace them with those required for INM 7.0b. The distributed files are presented in Table 1:

Table 1. Files Distributed For INM 7.0b

File	Date
<i>inm.exe</i>	09/28/2009
<i>flight.exe</i>	09/28/2009
<i>compute.exe</i>	09/28/2009
<i>compu50.dll</i>	09/28/2009
<i>graph.dll</i>	09/28/2009
<i>terraincheck.dll</i>	09/28/2009
<i>inm70a.pdf</i>	09/17/2008
<i>Inm70b.pdf</i>	09/29/2009
<i>sys_data\*.dbf (24 files)</i>	09/28/2009
<i>sys_data\acdb70.bin</i>	09/28/2009
<i>sys_data\spectra.bin</i>	08/26/2008

## Documentation Updates

- The following is an update to Appendix G.3.3 of the INM 7.0 Technical Manual, expanding the speed coefficient table to include three values corresponding to the three level flight noise curves (left, center, and right). Changes from the Technical Manual are **bold and underlined**:

### 3. SPEED COEFFICIENTS

B<sub>0</sub>, B<sub>1</sub> and B<sub>2</sub> are regression coefficients used in the calculation of a source-noise correction *for level flight only*. The correction accounts for changes in sound level associated with the deviation of advancing blade Mach number from that associated with the source data reference conditions (see Section 3.6.1). The coefficients **are tied to the three level flight noise curves (left, center and right) and** are derived using a least-squares, 2nd order regression through **corresponding** measured LPNTSmx data as a function of test speed.

	<b><u>Left</u></b>	<b><u>Center</u></b>	<b><u>Right</u></b>
B <sub>0</sub>			
B <sub>1</sub>			
B <sub>2</sub>			

- Appendix J of the INM 7.0 User's Guide currently incorrectly lists the helicopter flight operation DBF operation type character as "T" for Taxi instead of the "X" actually used by the INM. Similarly, it incorrectly lists the helicopter procedure step

DBF OpMode character as “X” for level flyover at constant speed, and “T” for taxi at constant speed, instead of the correct characters “L” and “X” respectively. Updated version of the tables appearing in Appendix J.2 and J.2.1 are below, changes from the User’s Guide are **bold and underlined**:

DBF	List	GUI	Begin	End
A	APP	Approach	In air	Helipad
D	DEP	Depart	Helipad	In air
<b><u>X</u></b>	TAX	Taxi	Helipad	Helipad
V	OVF	Overflight	In air	In air

NPD Index	DBF OpMode	Procedure Step Description	State	Parameters	HNM Code
0	A	Approach at constant speed	move	dis alt	APPR
1	D	Depart at constant speed	move	dis alt	TO
2	<b><u>L</u></b>	Level flyover at constant speed	move	dis	LFLO
3	G	Ground idle	static	dur	GIDLE
4	H	Flight idle	static	dur	FIDLE
5	I	Hover in ground effect	static	dur	HIGE
6	J	Hover out of ground effect	static	dur	HOGE
7	V	Vertical ascent in ground effect	static	dur alt	VASC
8	W	Vertical ascent out of ground effect	static	dur alt	VASC
9	Y	Vertical descent in ground effect	static	dur alt	VDSC
10	Z	Vertical descent out of ground effect	static	dur alt	VDSC
11	B	Approach with horizontal deceleration	move	dis spd	DCLH
12	C	Approach with descending deceleration	move	dis alt spd	DCLD
13	E	Depart with horizontal acceleration	move	dis spd	ACLH
14	F	Depart with climbing acceleration	move	dis alt spd	ACLC
15	<b><u>X</u></b>	Taxi at constant speed	move	spd	TAXI
--	S	Start altitude at constant speed	--	alt spd	

## Database Modifications

1. New STANDARD arrival procedural profile data for nine Airbus aircraft including the **A300-622R, A310-304, A319-131, A320-211, A320-232, A321-232, A330-301, A330-343, and A340-211** were added to the INM database, replacing their existing STANDARD arrival fixed-point profiles. Supporting arrival flap setting data were also added to the database. The new STANDARD procedural profiles match the existing fixed-point profiles with a level segment at an altitude of 3000 ft Above Field Elevation, but the switch from fixed-point to procedural data makes calculated flight paths reflect non-standard weather conditions when appropriate and provides more flexibility for users who wish to create user-defined arrival profiles for these aircraft.
2. Data for the Airbus A340-642 with Trent556 engines were added to the INM database. The aircraft identifier is **A340-642** and the noise identifier is **TRENT5**.

The single procedural arrival profile is a standard 3-degree descent with a level segment at an altitude of 3000 feet Above Field Elevation. There are three sets of procedural departure profiles: ICAO\_A, ICAO\_B, and STANDARD, all of which have stage lengths 1 through 7. The STANDARD departure profiles are identical to the ICAO\_B profiles. It is important to note that the SAE A-21 Aircraft Noise Committee is currently researching the process of NPD derivation to implement a more representative way of modeling approach noise generated by aircraft. At the time of the release of INM 7.0b, that research is still on-going. Therefore, approach noise data for the **A340-642** were added to INM 7.0b with the understanding that the approach noise data and modeling methodology may be updated in future releases of INM pending the results of this research.

3. Data for the Airbus A380-841 with Trent970 engines were added to the INM database. The aircraft identifier is **A380-841** and the noise identifier is **TRENT9**. The single procedural arrival profile is a standard 3-degree descent with a level segment at an altitude of 3000 feet Above Field Elevation. There are three sets of procedural departure profiles: ICAO\_A, ICAO\_B, and STANDARD, all of which have stage lengths 1 through 8. The STANDARD departure profiles are identical to the ICAO\_B profiles. It is important to note that the SAE A-21 Aircraft Noise Committee is currently researching the process of NPD derivation to implement a more representative way of modeling approach noise generated by aircraft. At the time of the release of INM 7.0b, that research is still on-going. Therefore, approach noise data for the **A380-841** were added to INM 7.0b with the understanding that the approach noise data and modeling methodology may be updated in future releases of INM pending the results of this research.
4. Data for the Airbus A380-861 with GP7270 engines were added to the INM database. The aircraft identifier is **A380-861** and the noise identifier is **GP7270**. The single procedural arrival profile is a standard 3-degree descent with a level segment at an altitude of 3000 feet Above Field Elevation. There are three sets of procedural departure profiles: ICAO\_A, ICAO\_B, and STANDARD, all of which have stage lengths 1 through 8. The STANDARD departure profiles are identical to the ICAO\_B profiles. It is important to note that the SAE A-21 Aircraft Noise Committee is currently researching the process of NPD derivation to implement a more representative way of modeling approach noise generated by aircraft. At the time of the release of INM 7.0b, that research is still on-going. Therefore, approach noise data for the **A380-861** were added to INM 7.0b with the understanding that the approach noise data and modeling methodology may be updated in future releases of INM pending the results of this research.
5. Data for the Eclipse 500 Very Light Jet (VLJ) with PW610F engines were added to the INM database. The aircraft identifier is **ECLIPSE500** and the noise identifier is **PW610F**. The single procedural arrival profile is a standard 3-degree descent. There are two sets of procedural departure profiles: HI\_ALT and STANDARD, both of which have stage lengths 1 through 3. The HI\_ALT profiles are intended for use in

6. Data for the Bombardier CRJ705/900ER with CF34-8C5 engines were added to the INM database. The aircraft identifier is **CRJ9-ER** and the noise identifier is **CF348C5**. The **CRJ9-ER**'s noise data are shared with the **CRJ9-LR**. The single procedural arrival profile is a standard 3-degree descent. There are three sets of procedural departure profiles: ICAO\_A, ICAO\_B, and STANDARD, all of which have stage lengths 1 through 5. The STANDARD departure profiles are identical to the ICAO\_B profiles.
7. Data for the Bombardier CRJ705/900LR with CF34-8C5 engines were added to the INM database. The aircraft identifier is **CRJ9-LR** and the noise identifier is **CF348C5**. The **CRJ9-LR**'s noise data are shared with the **CRJ9-ER**. The single procedural arrival profile is a standard 3-degree descent. There are three sets of procedural departure profiles: ICAO\_A, ICAO\_B, and STANDARD, all of which have stage lengths 1 through 5. The STANDARD departure profiles are identical to the ICAO\_B profiles.
8. The **CRJ701** and **CRJ900** substitution aircraft are now equated to the new **CRJ9-ER**.
9. Data for the Cessna 182H with a Continental O-470-R engine were added to the INM database. The aircraft identifier is **CNA182** and the noise identifier is **O470R**. The single procedural arrival profile is a standard 3-degree descent. There is a single STANDARD stage length 1 procedural departure profile. A fixed-point overflight profile identified as LEVEL that uses the **Flyover/Afb** operational mode is also included in the database for this aircraft. Data for the **CNA182** substitution aircraft available in previous versions of the INM has been deleted. Operations assigned to the former **CNA182** substitution aircraft within studies created in older versions of the INM may need to be modified to reconcile the profile identifiers called for in the operation definitions with the profile identifiers available within the new data set.
10. Data for the Cessna 208 with a PT6A-114 engine were added to the INM database. The aircraft identifier is **CNA208** and the noise identifier is **PT6A114**. The single procedural arrival profile is a standard 3-degree descent. There is a single STANDARD stage length 1 procedural departure profile. A fixed-point overflight profile identified as LEVEL that uses the **Flyover/Afb** operational mode is also included in the database for this aircraft. Data for the **CNA208** substitution aircraft available in previous versions of the INM has been deleted. Operations assigned to the former **CNA208** substitution aircraft within studies created in older versions of the INM may need to be modified to reconcile the profile identifiers called for in the operation definitions with the profile identifiers available within the new data set.
11. Data for the Dornier 228-202 with TPE 331-5 engines were added to the INM database. The aircraft identifier is **DO228** and the noise identifier is **TPE331-5**. The

single procedural arrival profile is a standard 3-degree descent. There is a single STANDARD stage length 1 procedural departure profile. A fixed-point overflight profile identified as LEVEL that uses the **Flyover/Afb** operational mode is also included in the database for this aircraft. Data for the **DO228** substitution aircraft available in previous versions of the INM has been deleted.

12. Data for the Dornier 328-100 with PW119C engines were added to the INM database. The aircraft identifier is **DO328** and the noise identifier is **PW119C**. The single procedural arrival profile is a standard 3-degree descent. There is a single STANDARD stage length 1 procedural departure profile. A fixed-point overflight profile identified as LEVEL that uses the **Flyover/Afb** operational mode is also included in the database for this aircraft. Data for the **DO328** substitution aircraft available in previous versions of the INM has been deleted. Operations assigned to the former substitution aircraft within studies created in older versions of the INM may need to be modified to reconcile the profile identifiers called for in the operation definitions with the profile identifiers available within the new data set.
13. Data for the Piper PA-42 Cheyenne with PT6A-41 engines were added to the INM database. The aircraft identifier is **PA42** and the noise identifier is **PT6A41**. The single procedural arrival profile is a standard 3-degree descent. There is a single STANDARD stage length 1 procedural departure profile. A fixed-point overflight profile identified as LEVEL that uses the **Flyover/Afb** operational mode is also included in the database for this aircraft. Data for the **PA42** substitution aircraft available in previous versions of the INM has been deleted.
14. Data for the Bell 407 helicopter with a Rolls-Royce 250-C47B engine were added to the INM database. The helicopter identifier and the corresponding noise identifier are both **B407**. The data include STANDARD departure, arrival, and taxi profiles following the same conventions as other helicopters currently in the INM database.
15. Data for the Robinson R44 Raven helicopter with a Lycoming O-540-F1B5 engine were added to the INM database. The helicopter identifier and the corresponding noise identifier are both **R44**. The data include STANDARD departure, arrival, and taxi profiles following the same conventions as other helicopters currently in the INM database.
16. Data for the Schweizer 300C helicopter with a Lycoming HIO-360-D1A engine were added to the INM database. The helicopter identifier and the corresponding noise identifier are both **SC300C**. The data include STANDARD departure, arrival, and taxi profiles following the same conventions as other helicopters currently in the INM database.
17. Modified the RPM value representing rotor speed in revolutions per minute for the **S65** helicopter, changing it from 0.0 to 184.9. This value appears in the Helicopter // Helicopter Data window.

18. Modified the Description field for the **H500D** helicopter within the Helicopter // Helicopter Data window, correcting a typographical error by changing “Huges” to “Hughes”.
19. Modified the **B206L** Left Departure NPD, correcting an error in the data set. These data appear in the Helicopter // NPD Data window.

## Program Modifications

1. Extended the range of values available within the Refinement drop-down box within the Run // Run Options window, increasing the maximum Refinement value available from 11 to 14 for recursive contour grids. The maximum Refinement value is still 11 for fixed contour grids due to the larger number of points generated.
2. Modified the limits applied when reporting the dB value at a cursor location within the Output Graphics window. Previously, whenever the dB value at the cursor location was below -50 dB the value displayed in the lower right corner of the window was defaulted to “outside”. For INM 7.0b, the displayed value will only be defaulted to “outside” when the dB value at the cursor location is less than – 200 dB.

## Reported Problems Fixed

1. Fixed a problem causing helipads to not be displayed within the Output // Output Graphics window.
2. Fixed a problem with incorrect Latitude and Longitude values calculated from X, Y values in kilometers for runway end locations within metric INM studies. While this problem resulted in improper Latitude and Longitude values being displayed in the Tracks // Runway End and Helipads window it did not adversely impact noise calculations unless runway end locations were originally entered by a user as Latitude and Longitude values. If they were entered as X, Y values in kilometers then all subsequent display and calculation results were correct.
3. Fixed a problem that caused the SEL metric to not be “grayed-out” within the Grid section of the Run // Run Options window when SEL was selected within the Noise Metric drop down box within that window. Metrics within the Grid section of the window are intended to be “grayed out” when the same metric has already been selected within the Noise Metric drop-down box to prevent results for that metric from showing up twice within Standard Grid output.
4. Fixed a problem with C-weighted noise calculations for helicopters that was the result of an incorrect value for the total number of available NPD curves being written to the INM’s flight.pth and flight.txt files.

5. Fixed a problem that resulted in the App Vertical procedure step being unavailable within the Step Type drop down box within the Helicopter // Helicopter Procedural Profiles window when defining helicopter overflight profiles.
6. Fixed a problem that resulted in a failure of the INM version 6.x to 7.x version conversion process when the INM attempted to report a warning about deleting substitution aircraft OPS\_APRT.DBF records which do not have group percent records assigned to them.
7. Fixed a problem introduced in INM 7.0a that caused the incorrect assignment of reverse thrust to all landing ground roll segments within calculated flight paths.
8. Fixed a problem with improper INM version labeling within the Scenario Run Input Report produced via the Output // Scenario Run Input Report menu item, the flight.txt file produced via the Output // Flight Path Report menu item, and in the lower left corner of the INM main window.
9. Fixed a problem causing incorrect alignment of vector-type helicopter ground tracks within DXF files that have been exported from the INM.
10. Fixed a problem with logic identifying flight segments occurring when the aircraft is still on the ground (e.g., on the runway), which resulted in improper noise calculation methods being used for these segments
11. Fixed a problem with the logic behind the application of the helicopter Source Noise Adjustment Due to Advancing Tip Mach Number to level flyover segments. In previous versions of INM, this adjustment was only applied to Level Flyover operations. The revised logic applies the adjustment to Level Flight segments, regardless of the operation mode (e.g., level segments part of approach or departure).
12. Fixed a problem with the logic behind the computation of noise contours for C-weighted and P-weighted metrics. This problem was introduced in INM 7.0a, and only affected the aforementioned contours; standard and detailed grids, as well as location and population point results were unaffected by this problem. A-weighted contours were also unaffected in INM 7.0a.
13. Fixed a problem that prevented flight path unit vectors within flight.txt/flight.pth files from being updated after flight paths had been modified to account for the effects of bank angle.
14. Fixed a problem with the File // Export as ShapeFile function. Previously, identifiers for Location Points were not being exported.