

# INM Version 7.0d Software Update

05/23/2013

## Version Information

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

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

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

The Version 7.0 User's Guide is the current manual for INM Version 7.0d software. The Version 7.0 Technical Manual is the current technical description of the methods used by INM Version 7.0d to calculate aircraft noise around airports. Release notes *Inm70a.pdf*, *Inm70b.pdf*, *Inm70c.pdf* and this document, *Inm70d.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 *INM7.0c* directory. Select your *INM7.0c* 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 INM7.0c*".
2. Use the right button of your mouse to select the *Copy of INM7.0c* directory created in step 1. Select "Rename" and rename the directory *INM7.0d*.
3. **Make sure that the attributes for the new *INM7.0d* 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 *INM70d.EXE* file from the FAA Web site. Put it in the new *INM7.0d* directory.
5. Double click on the *INM70d.EXE* file name to automatically extract the updated files into the new *INM7.0d* directory. Select the "Unzip" button. This process will overwrite the old INM Version 7.0c files and replace them with those required for INM Version 7.0d. The distributed files are presented in Table 1:

**Table 1. Files Distributed For INM Version 7.0d<sup>1</sup>**

<b>File</b>	<b>Date</b>
<i>inm.exe</i>	05/23/2013
<i>flight.exe</i>	04/26/2013
<i>compute.exe</i>	04/26/2013
<i>compu50.dll</i>	04/26/2013
<i>graph.dll</i>	04/26/2013
<i>Inm70a.pdf</i>	09/17/2008
<i>Inm70b.pdf</i>	09/29/2009
<i>Inm70c.pdf</i>	01/03/2012
<i>Inm70d.pdf</i>	05/22/2013
<i>sys_data\*.dbf (24 files)</i>	05/22/2013
<i>sys_data\acdb70.bin</i>	05/22/2013
<i>sys_data\spectra.bin</i>	10/24/2011
<i>Process/census/census*. *(3files)</i>	05/23/2013

## Database Modifications

1. Data for three new Boeing aircraft were added to INM Version 7.0d, including the 7478, 7773ER and 7878R. These data were recently developed by the manufacturer, and each aircraft data set includes a single STANDARD procedural arrival profile at a standard 3-degree descent, and three sets of departure profiles: ICAO\_A, ICAO\_B and STANDARD, all of which have stage lengths 1 through 9. The data also include new Noise data (NPDs, and spectral classes), shown in Table 2. The departure noise contour size and shape of the 7773ER is different from that of the other two 777 variants (the 777-200 and the 777-300) in INM. The 7773ER has significantly higher takeoff thrust and weight as well as different noise characteristics at the highest thrust levels. Also, the three 777 variants have differences in required thrust during the early arrival segment (the 3 degree descent from 6000 ft).

**Table 2. New Boeing Data**

Aircraft	Aircraft Identifier	Engines	Noise Identifier	Spectral Classes		
				DEP	APP	OVF
Boeing 747-8F Freighter	7478	GENx-2B67	GENX67	107	205	-
Boeing 777-300ER	7773ER	GE90-115B-EIS	GE9015	107	204	-
Boeing 787-8 Dreamliner	7878R	T1000-C/01 Family Plan Cert	T1KBFP	103	205	-

<sup>1</sup> Note that “*italicized and bolded*” entries indicate that these files were updated in INM Version 7.0d.

2. Data for four new Embraer aircraft were added to INM Version 7.0d, including the **EMB170**, **EMB175**, **EMB190** and **EMB195**. These data were recently developed by the manufacturer, and each aircraft data set includes a single STANDARD procedural arrival profile at a standard 3-degree descent, and three sets of departure profiles: ICAO\_A, ICAO\_B and STANDARD, which have stage lengths 1 through 3 for the **EMB170** and **EMB175**, and stage lengths 1 through 4 for the **EMB190** and **EMB195**. The data also include new Noise data (NPDs, and spectral classes), shown in Table 3. Data for the EMB170 and EMB190 substitution aircraft available in previous versions of the INM have 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.

**Table 3. New Embraer Data**

Aircraft	Aircraft Identifier	Engines	Noise Identifier	Spectral Classes		
				DEP	APP	OVF
Embraer ERJ-170-100	EMB170	GE CF34-8E	CF348E	113	216	-
Embraer ERJ-170-200	EMB175	GE CF34-8E	CF348E	113	216	-
Embraer ERJ-190-100	EMB190	GE CF34-10E	CF3410E	105	205	-
Embraer ERJ-190-200	EMB195	GE CF34-10E	CF3410E	105	205	-

3. NPD data for five existing Bell helicopters were updated in INM Version 7.0d, including the **B206B3**, **B407**, **B427**, **B429** and **B430**. The update consists of new EPNL and PNLTM NPDs developed by the manufacturer (INM Version 7.0c only included SEL and LAMAX NPDs for these five helicopters).
4. The data for the Dornier **DO328** (PW119C) were updated in INM Version 7.0d to resolve a noise extrapolation issue that could occur when modeling departures. In previous releases of INM, modeling DO328 departures under certain circumstances could result in unrealistically high noise levels. To resolve this issue, updated jet thrust coefficients and departure NPDs were developed by the Volpe Center.

5. The STANDARD approach profiles for the Cessna CNA182FLT and De Havilland DHC-2FLT floatplanes were updated in INM Version 7.0d. Each of these approach profiles was updated with a final ground-roll step to define the end of the profile.
6. Owner Category (OWNER\_CAT) data for 12 existing aircraft were updated in INM Version 7.0d. These updates replace the OWNER\_CAT data found in INM Version 7.0c, which were incorrectly labeled. These updated data are shown in Table 4.

**Table 4. Updated OWNER\_CAT Data**

ACFT_ID	ACFT_DESCR	OWNER_CAT (INM 7.0c)	<b>OWNER_CAT (UPDATE for INM 7.0d)</b>	NOISE_ID
CNA182FLT	Cessna 182S/Wipline amphibious floats	C	<b>G</b>	IO540AB
CNA510	Cessna Mustang Model 510 / PW615F	C	<b>G</b>	PW615F
CNA525C	Cessna Citation CJ4 525C /FJ44-4A	C	<b>G</b>	FJ44-4
CNA560E	Cessna Citation Encore 560 / PW535A	C	<b>G</b>	2PW535
CNA560U	Cessna Citation Ultra 560 / JT15D-5D	C	<b>G</b>	2J155D
CNA560XL	Cessna Citation Excel 560 / PW545A	C	<b>G</b>	PW545A
CRJ9-ER	CL-600-2D15/CL-600-2D24/CF34-8C5	G	<b>C</b>	CF348C5
CRJ9-LR	CL-600-2D15/CL-600-2D24/CF34-8C5	G	<b>C</b>	CF348C5
DHC-2FLT	DHC-2 Beaver Floatplane	C	<b>G</b>	R985
DO228	Dornier 228-202 / TPE 311-5	G	<b>C</b>	TPE331-5
DO328	Dornier 328-100 / PW119C	G	<b>C</b>	PW119C
ECLIPSE500	Eclipse 500 / PW610F	C	<b>G</b>	PW610F

7. The C56X substitution has been removed from the database. This is no longer needed because the CNA560XL was added in INM 7.0c. Studies utilizing the C56X should be updated to use the CNA560XL.
8. Two new aircraft substitutions were added to the INM database due to the addition of the data for the 7773ER shown in Table 5:

**Table 5: New INM Aircraft Substitutions**

Substitution Identifier	Substitution Description	Aircraft Identifier
7772LR	Boeing 777-200LR	7773ER
777FRE	Boeing 777 Freighter	7773ER

## Documentation Updates

1. The FAL20A was errantly added to the INM 7.0c Release notes **Table 4: Modified INM Aircraft Substitutions**. There were no changes to this substitution in INM 7.0c.
2. The following is a newly developed INM substitution list for helicopters, shown in Table 6. Although this substitution list is not coded in INM7.0d, it should assist users in selecting appropriate helicopter substitutions for those helicopters that are not in the INM database.

**Table 6: New INM Helicopter Substitutions**

Substitution Helicopter Name	Substitution Helicopter Description	Helicopter Identifier
SA316	Aerospatiale Alouette III	SA350D
SA313B	Aerospatiale SA 313B Alouette II	B206L
SA315B	Aerospatiale SA-315B	SA350D
AS-350	Aerospatiale SA-350 Astar (AS-350)	SA350D
SA360C	Aerospatiale SA-360C	SA365N
SA365C3	Aerospatiale SA-365C3	SA365N
A109N	Agusta A-109N	B429
A109E	Agusta A-109 E	A109
A109C	Agusta A-109C	A109
A109K2	Agusta A109K2	A109
A109LUH	Agusta A-109LUH	A109
A119 MKII	Agusta A109-MKII	A109
A109S	Agusta A109S	A109
A109SP	Agusta A109SP	A109
A119	Agusta A119	A109
AB139	Augsta/Bell 139	SA330J
B206L-1	Bell 206L-1 Long Ranger	B206L
B206L-3	Bell 206L-3 Long Ranger	B206L
B206L-4	Bell 206L-4 Long Ranger	B206L
B206L-4 STC	BELL 206L-4 STC00036SE	B206L
B206L-4T	Bell 206L-4T Long Ranger	B206L
Bell 214B-1	Bell 214B-1	B212
B222B	Bell 222B	B222
B222U	Bell 222U Fxd Skd Gear	B222
B230	Bell 230 Fxd Skd Gear	B222
B230	Bell 230 RTR WHL GR	B222
B407	Bell 407 / Rolls-Royce 250-C47B	B407

B412EP	Bell 412 EP	S76
B412	Bell 412 HP	S76
B412SP	Bell 412 SP	S76
B427	Bell 427 (Light)	B427
B47G2	Bell 47 G2	R44
B47G4	Bell 47 G4	R44
Bell OH-58A Kiowa	Bell OH-58A Kiowa	B206B
AH-64 Apache	Boeing AH-64 Apache	S70
MD600N	Boeing MD 600N	MD600N
MD900	Boeing MD 900	MD600N
MD520N	Boeing MD520N	MD600N
BO105LSA-1	Boelkow BO-105 LS A-1	BO105
EH101/300/500	EH Industries EH101/300/500	S65
EH110/510	EH Industries EH110/510	S65
Enstrom 280 FX	Enstrom 280 FX	R44
E 280C	Enstrom 280C	R44
E 280FX/F-28F	Enstrom 280FX/F-28F	R44
E 480	Enstrom 480	H500D
E 480B	Enstrom 480B	H500D
F28C	Enstrom F28C	S300C
F28F	Enstrom F28F	S300C
E TH28/480	Enstrom TH28/480	H500D
BK 117A1	Eurocopter 117A1	B429
BK 117A3	Eurocopter 117A3	B429
BK 117A4	Eurocopter 117A4	B429
BK 117B1	Eurocopter 117B1	B429
BK 117B2	Eurocopter 117B2	B429
BK 117B2C	Eurocopter 117B2C	B429
BK 117C1	Eurocopter 117C1	B429
BK 117C1+	Eurocopter 117C1+	B429
BK 117C1C	Eurocopter 117C1C	B429
BK 117C2	Eurocopter 117C2	B429
AS 332L2	Eurocopter AS 332L2	S70
AS 350 B1	Eurocopter AS 350 B1	SA355F
AS 350 B2	Eurocopter AS 350 B2	SA355F
AS 350 B3	Eurocopter AS 350 B3	SA355F
AS 350 BA	Eurocopter AS 350 BA	SA355F
AS 350 BB	Eurocopter AS 350 BB	SA355F
AS 355F1R	Eurocopter AS 355 F1R	SA355F
AS 355F	Eurocopter AS 355F	SA355F
AS 355F1	Eurocopter AS 355F1	SA355F

AS 355F2	Eurocopter AS 355F2	SA355F
AS 355FR2	Eurocopter AS 355FR2	SA355F
AS 355N	Eurocopter AS 355N	SA355F
AS 355NP	Eurocopter AS 355NP	SA355F
AS 365 N2	Eurocopter AS 365N2	SA365N
AS 365N3	Eurocopter AS 365N3	SA365N
BK 117B2	Eurocopter BK 117B2	B429
EC 120	Eurocopter EC 120	SA341G
EC130B4	Eurocopter EC-130B4	EC130
EC130T2	Eurocopter EC-130T2	EC130
EC135	Eurocopter EC-135	EC130
EC135 (CDS)	Eurocopter EC-135 (CDS)	EC130
EC135T1 (CDS)	Eurocopter EC-135 (CDS)	EC130
EC135 (CDS/CPDS)	Eurocopter EC-135 (CDS/CPDS)	EC130
EC135T1 (CDS/CPDS)	Eurocopter EC-135 (CDS/CPDS)	EC130
EC135P1	Eurocopter EC-135P1	EC130
EC135P2	Eurocopter EC-135P2	EC130
EC135P2 (CPDS)	Eurocopter EC-135P2 (CPDS)	EC130
EC135P2+	Eurocopter EC-135P2+	EC130
EC135T1	Eurocopter EC-135T1	EC130
EC135T2	Eurocopter EC-135T2	EC130
EC135T2+	Eurocopter EC-135T2+	EC130
EC155B	Eurocopter EC-155B	SA365N
EC155B1	Eurocopter EC-155B1	SA365N
EC225LP	Eurocopter EC-225LP	S70
EC635T1	Eurocopter EC-635T1 (CPDS)	EC130
EC635T2+	Eurocopter EC635T2+	EC130
EC135T2(CPDS)	Eurocopter EC-T2 (CPDS)	EC130
MD500C	Hughes MD500 C	H500D
K-1200	Kaman K-1200 (2 Interneshing Main Rotors)	B427
KA32A11BC	Kamov KA-32A11BC	S70
Kawasaki BK-117	Kawasaki BK-117	B429
UH72	Lakota - EC145 mili version	B429
MD500N	McDonnell Douglas MD-500N	H500D
SW4	PZL Swidnik SW-4	SA350D
W3A	PZL Swidnik W-3A	SA330J
W3AS	PZL Swidnik W-3AS	SA330J
R22BETA	Robinson R22 Beta	R22
R22MARINER	Robinson R22 Mariner	R22

S269C-1	Schweizer 260C-1 (Upturned Exhaust and Diff.)	S300C
S269C	Schweizer 269C (Includes Muffler & Resonator)	S300C
S269C	Schweizer 269C (Includes Muffler)	S300C
S269C	Schweizer 269C (Upturned Exhaust)	S300C
S269D(Conf. A)	Schweizer 269D (Config. A)	H500D
S269D(330SP)	Schweizer 269D(330SP)	H500D
S300C	Schweizer 300C (1)/ Upturned Exhaust	S300C
S300C	Schweizer 300C (2)/ Includes Muffler	S300C
S300C	Schweizer 300C (3)/ Muffler & Resonator	S300C
S330	Schweizer 330 / Allison 250-C20 Turboshaft	H500D
S269D/330	Schweizer S269D/330	H500D
S76A+	Sikorski S-76A+	S76
S76B	Sikorski S-76B	S76
S-76C+	Sikorski S-76C+	S76
S64-F	Sikorsky S-64-F	S65
S-76A STC 568NE	Sikorsky S-76A STC 568NE	S76
S-76C	Sikorsky S-76C	S76
S92	Sikorsky S-92	S70

## Program Modifications

1. Updated the census.exe program for compatibility with Census 2010 data. Data can be downloaded at:

[http://www2.census.gov/census\\_2010/01-Redistricting\\_File--PL\\_94-171](http://www2.census.gov/census_2010/01-Redistricting_File--PL_94-171)

## Reported Problems Fixed

1. Fixed a problem where the incorrect units were being reported for weather data in the “Scenario Run Input Report” for metric studies. Calculations using headwind, temperature and pressure were not affected as this was due to a conversion issue specific to the report generator.
2. Fixed a bug that generated an unnecessary message ("One or more track segment records are out of order") in the Error&Warning.txt file for studies using helicopters.

3. Fixed a bug where the “Dispersed Track” dialog window would ignore user input for half-width for points next to runways. Previously, INM would force the value to 0.0002 nautical miles. The user input value is now applied.
  
4. Fixed a bug affecting metric studies in the “Runway End” dialog box. Previously, a duplicate conversion was applied when displaying latitude and longitude values. This bug did not affect computational results.