

**AERONAUTICAL CHARTING FORUM**  
**Instrument Procedures Group**  
**October 21-22, 2002**  
**HISTORY RECORD**

**FAA Control # 02-02-246**

**Subject:** Turn Angle Limits for RNAV Approaches without TAA's

**Background/Discussion:**

TERPS 2-232 and Chapter 15, paragraphs 1510/1512 limit turns at IAFs to 120 degrees unless a course reversal is designated. TERPS 2-242 specifies similar turn angle limits at Intermediate Fixes.

Procedures such as the Indianapolis RNAV (GPS) Rwy 5L and RNAV (GPS) Rwy 32 have no Hold in Lieu Racetrack reversals but instead use IAF waypoints/intersections that are part of the enroute structure.

In the era of VOR/TACAN navigation, aircraft were not able to navigate randomly to airway intersections; thus the turn angle limits were often intrinsic to the configuration of the approach procedure and surrounding airways. RNAV implies virtually unlimited "direct-to" navigation capability and therefore introduces opportunities for confusion and inadvertent containment busts due to misunderstandings amongst pilots and controllers on the subject of turn angle limits for Initial (and Intermediate) approach segments.

Further, when an approach has a HIL racetrack – and therefore an IF/IAF – it is imperative that pilots and controllers know when it is necessary to begin the approach at the IAF and fly the racetrack reversal. Procedures such as the Fort Lauderdale RNAV (GPS) Rwy 27R have HIL racetracks, but do not specify turn angle limitations on radar monitored clearances direct-to the IF.

**Recommendations:**

Establish a system of criteria and charting specifications that will provide explicitly defined and graphically depicted turn angle limits and arrival sectors.

**Comments:**

This recommendation affects all RNAV SIAPs without TAA's as well as guidance in FAA Orders 8260.3B, 7110.65 and the AIM.

**Submitted by:** Steve Bergner

**Organization:** NBAA

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**Date:** October 4, 2002

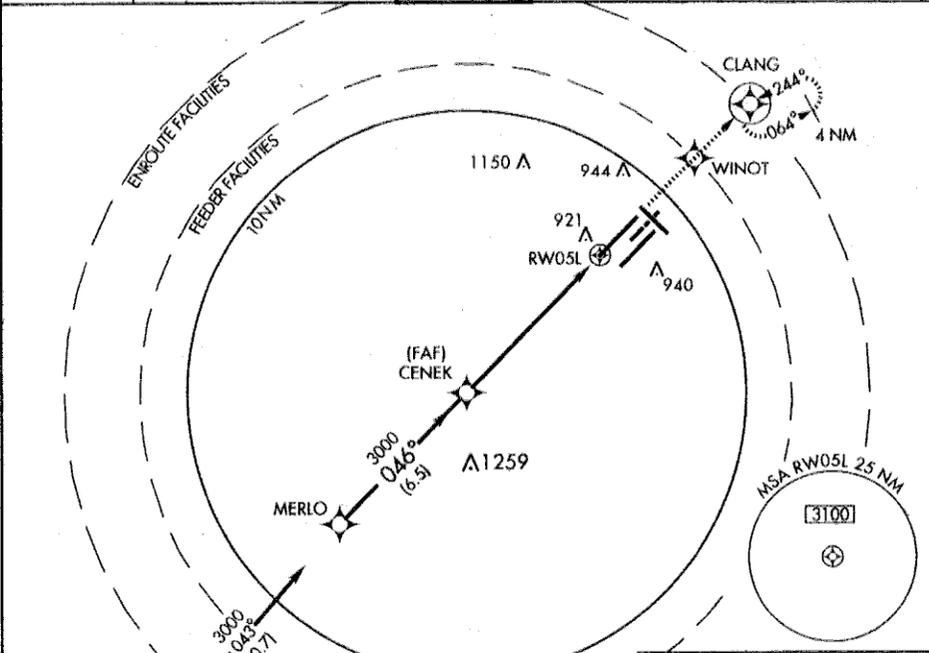
# RNAV (GPS) RWY 5L

INDIANAPOLIS INTL (IND)

APP CRS	Rwy Idg	<b>11200</b>
<b>046°</b>	TDZE	<b>748</b>
	Apt Elev	<b>797</b>

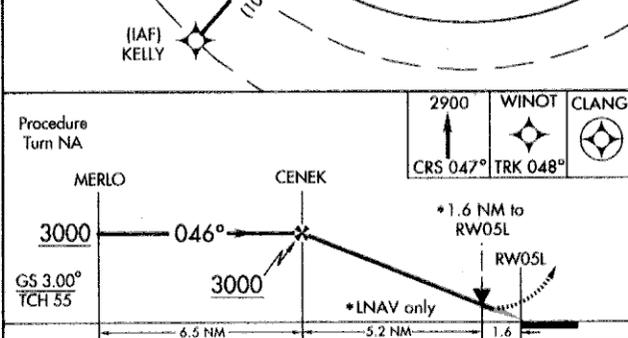
<b>▲ NA</b> ASR	BARO-VNAV NA below -16°C (3°F). GPS or RNP-0.3 required. DME/DME RNP-0.3 NA.	ALSF-2 	MISSED APPROACH: Climb to 2900 via 047° course to WINOT WP and 048° track to CLANG WP and hold.

ATIS <b>124.4</b>	INDIANAPOLIS APP CON <b>119.3 317.8</b>	INDY TOWER <b>120.9 257.8</b>	GND CON <b>121.9 257.8</b>	CLNC DEL <b>128.75 257.8</b>
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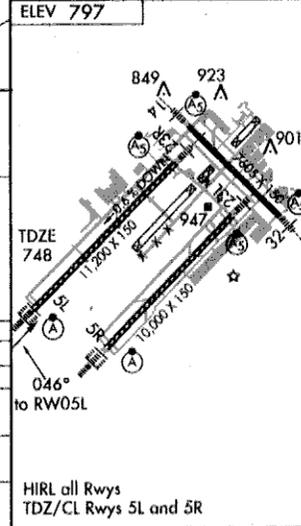


EC-2, 03 OCT 2002

EC-2, 03 OCT 2002



Procedure Turn NA	2900 WINOT CLANG  CRS 047° TRK 048°			
CATEGORY	A	B	C	D
GLS PA DA	NA			
LNAV/VNAV DA	1120/40 372 (400-¾)			
LNAV MDA	1300/24 552 (600-½)	1300/50 552 (600-1)	1300/60 552 (600-1¼)	
CIRCLING	1300-1¼ 503 (600-1¼)	1320-1½ 523 (600-1½)	1360-2 563 (600-2)	



# RNAV (GPS) RWY 32

INDIANAPOLIS INTL (IND)

APP CRS <b>317°</b>	Rwy Idg <b>7605</b>
	TDZE <b>792</b>
	Apt Elev <b>797</b>

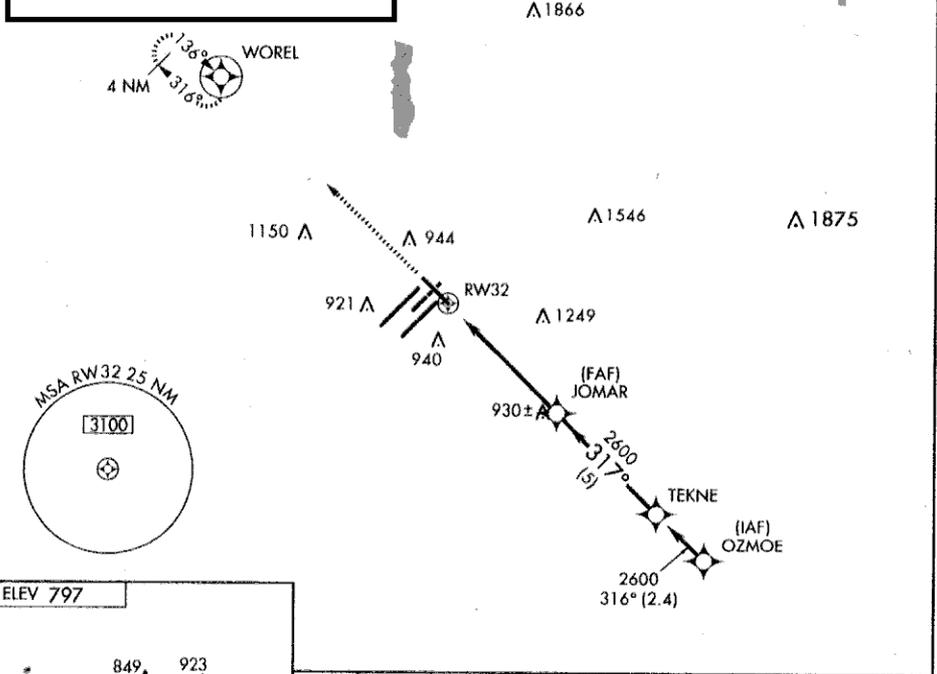
**NA** BARO-VNAV NA below -16°C (3°F).  
**ASR** GPS or RNP-0.3 required. DME/DME RNP-0.3 NA.  
 For inoperative MALSR increase LNAV/VNAV CAT D visibility to RVR 5000 and LNAV CAT D visibility to RVR 6000.



**MISSED APPROACH:** Climb to 2500 direct WOREL WP and hold.

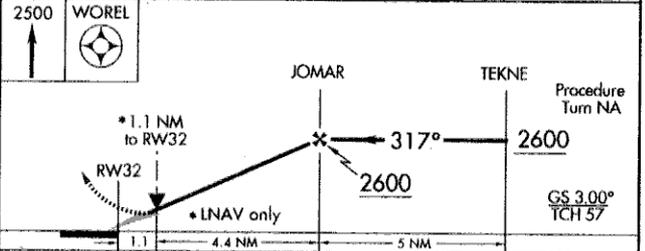
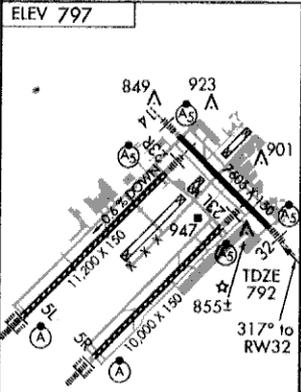
ATIS <b>124.4</b>	INDIANAPOLIS APP CON <b>119.3 317.8</b>	INDY TOWER <b>120.9 257.8</b>	GND CON <b>121.9 257.8</b>	CINC DEL <b>128.75 257.8</b>
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**NOT FOR NAVIGATION**



EC-2, 03 OCT 2002

EC-2, 03 OCT 2002



CATEGORY	A				B		C		D	
GLS PA DA	NA									
LNAV/VNAV DA	1100/24				308 (400-½)				1100/40 308 (400-¾)	
LNAV MDA	1180/24				388 (400-½)				1180/50 388 (400-1)	
CIRCLING	1260-1				463 (500-1)		1320-1½ 523 (600-½)		1360-2 563 (600-2)	

HIRL all Rwy's  
TDZ/CL Rwy's 5L and 5R

INDIANAPOLIS, INDIANA  
Orig 02164

39°43'N-86°18'W

## INDIANAPOLIS INTL (IND) RNAV (GPS) RWY 32

**RNAV (GPS) RWY 27R**  
FORT LAUDERDALE-HOLLYWOOD INTL (FLL)

APP CRS <b>273°</b>	Rwy ldg <b>8396</b>
	TDZE <b>7</b>
	Apt Elev <b>9</b>

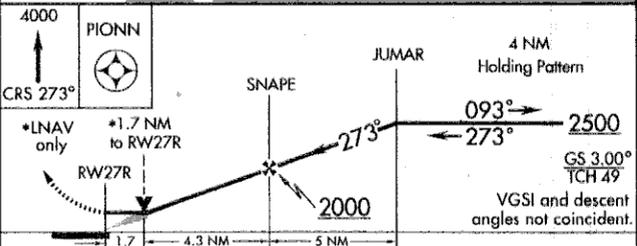
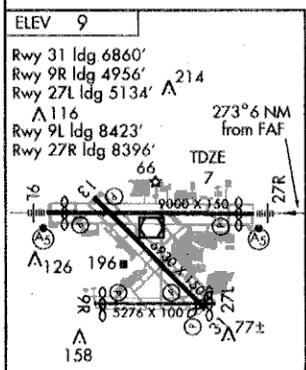
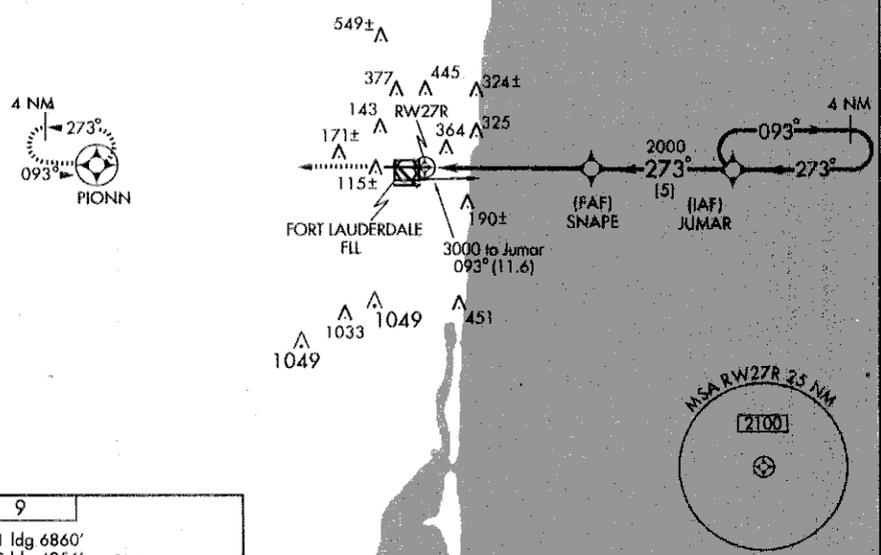
Baro-VNAV NA below -15°C (5°F).  
GPS or RNP-0.3 Required.  
DME/DME RNP-0.3 NA.

**MALS**  
MISSED APPROACH: Climb to 4000 via 273° course to PIONN WP and hold.

▲ NA  
For inoperative MALS, increase LNAV Cat. A, B visibility to RVR 5000.

ATIS <b>135.0</b>	MIAMI APP CON <b>133.775 285.6</b>	FORT LAUDERDALE TOWER <b>119.3 257.8</b>	GND CON <b>121.4</b>	CLNC DEL <b>128.4</b>
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**NOT FOR NAVIGATION**



CATEGORY	A	B	C	D
GLS PA DA	NA			
LNAV/VNAV DA	620-1¾ 613 (700-1¾)			
LNAV MDA	620/40	613 (700-¾)	620/60 613 (700-1¾)	620-1½ 613 (700-1½)
CIRCLING	680-2¼ 671 (700-2¼)			700-2¼ 691 (700-2¼)

SE-3, 03 OCT 2002

SE-3, 03 OCT 2002

**Initial Discussion Meeting 02-02:** New issue presented by Steve Bergner, NBAA. Steve briefed that his organization is concerned that controllers are clearing aircraft direct to IAFs and sometimes IFs on RNAV approaches without TAAs. In many cases, this direct clearance causes confusion as to whether or not a course reversal is required and in some cases violates TERPS procedure design criteria; e.g., requiring a turn greater than 120 degrees at the IAF, intermediate segment too short for the amount of turn, etc. This is especially noted when the IAF is on an airway and the turn is acceptable for one direction of flight, but not the other. NBAA believes the issue is readily resolved by applying the TAA concept. Steve stated that TAAs resolve ambiguity and facilitate operations. Brad Rush, AVN-160, stated that his office has increased QC of these procedures. He further stated that AVN-100 has issued internal policy to ensure that all RNAV approaches have a TAA, a course reversal, or a restricted procedure entry note that conforms to TERPS. Tom Schneider, AFS-420, stated that guidance has been included in Change 3 to Order 8260.19 that should help resolve the issue for future procedures. Bill Hammett, AFS-420 (ISI), commented that this issue was previously discussed at the ACF and taken to ATPAC by ALPA. As a result of the ATPAC Area of Concern, AFS-420, on July 17<sup>th</sup>, 2002, forwarded recommendations to ATP-100 for inclusion in Order 7110.65 that would help resolve the issue. AFS-420 will ascertain the status of the ATP-100 response. Steve suggested that the plan view of the chart could depict entry areas where a course reversal is/is not required. This methodology would require an IACC specification change and may not be necessary if the AFS-420 controller guidance is adopted by ATP-100. **ACTION: AFS-410 and AFS-420.**

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**MEETING 03-01:** Gary Powell, ATP-500, briefed that this issue is being worked through ATPAC. An Air Traffic Document Change Proposal (DCP) based on Air Traffic, Flight Standards, and industry input had been circulated for comment. Comments were received and are being addressed. Steve Bergner, NBAA presented examples from Ft. Lauderdale that demonstrate the confusion. Air Traffic clears aircraft direct to RNAV IAFs and expects the pilot to proceed straight-in when legally a course reversal is required. Additionally, in many cases, the turn angle is greater than the avionics equipment can accept. He re-emphasized that standard guidance must be provided so that pilots and controllers alike are trained on what parameters are allowed so as not to compromise procedure design when a TAA is not published. Steve also recommended that consideration be given to address direct-to-IF clearances for non-RNAV procedures. Kevin Comstock, ALPA, provided feedback directly addressing the DCP keying on the words "RNAV capable". Gary stated that the DCP is attempting to address a current problem. A second DCP is being developed to address RNAV radar vector exceptions. Kevin requested a copy of the second DCP and Gary agreed to provide one. Bill Hammett, AFS-420 (ISI), stated that the issue of "radar monitoring" verses "radar vectoring" must be clarified for pilot/controller understanding. He also recommended proper controller phraseology use; e.g., including the phrase "straight-in" in the approach clearance, may help clarify controller/pilot communications. **ACTION: ATP-500.**

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**MEETING 03-02:** Gary Powell, ATP-500, briefed that this issue is being worked through ATPAC. An Air Traffic Document Change Proposal (DCP) based on Air Traffic, Flight Standards, and industry input had been circulated for comment. In the interim, ATC Notice 7110.329 has been published to provide guidance for controllers. Steve Bergner, NBAA, criticized that the notice does not solve the problem and does not provide examples to clarify the guidance. He also provided several examples where charts are misleading, e.g., there are differences in "IAF" and "IAF/IF" labeling between government and Jeppesen

charts, there are charts where there is no course reversal at an IAF, etc. Steve noted that the examples provided in his presentation also provide strong support for charting the "IF" (See 02-01-237). Lastly, Steve noted that on October 1, Kevin Comstock, ALPA, had forwarded a detailed e-mail message to ATP-500 detailing what has been accomplished and what remains to be done to resolve this issue. Steve's power point slides and Kevin's e-mail synopsis are included as Attachments 4 and 5 to the minutes respectively. Gary agreed to take the issue for further work considering the ALPA and NBAA concerns.

**ACTION: ATP-500.**

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**MEETING 04-01:** Steve Bergner, NBAA, gave a presentation highlighting the problems associated with air traffic control use of "direct-to" clearances in RNAV approach clearances. He noted that in his experience, these clearances continue to proliferate. FAA Notice 7110.329 did not resolve the issues and further clarification is required to resolve contradictions in the AIM and Order 7110.65. Current ATC directives do not allow direct to IF clearances. Pilots and controllers alike desire this option; however, the guidance on using this procedure must be clear and have specific limitations; e.g., no greater than 90 degrees from the final approach course. Steve's briefing also provided several examples of charting anomalies where the charting of (IF) at the intermediate fix and (IAF/IF) at combination fixes would clarify procedures for pilots and controllers alike. Bill Hammett, AFS-420 (ISI) noted that a central issue that will have to be addressed is a Chief Counsel decision on whether a "direct-to" clearance in a radar environment can be considered the same as a "radar vector". Paul Ewing, ATP-500 (AMTI) agreed to coordinate this issue with AGC and work the AIM and Order 7110.65 material with ATP-120. A copy of Steve's briefing slides is included in the meeting minutes as attachment 5. **ACTION: ATP-500 and ATP-120.**

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**MEETING 04-02:** Paul Ewing, ATO-R (AMTI), briefed that a telcon between NBAA and Air Traffic was held to work out differences on the issue. A revised Document Change Proposal (DCP) has been developed and was scheduled to go out for public comment in October; however, it is still in coordination within the Terminal Procedures Branch. It is now targeted for release in November. Bob Conyers, NBAA, questioned controller procedures if final approach courses and intermediate fixes (IFs) are not displayed on radar video maps. Kevin Comstock, ALPA, questioned whether stepdown fixes within intermediate segments could cause confusion. Paul responded that controllers are trained on the approaches for which they are responsible. Kevin Jones, Southwest Airlines, noted that direct-to-IF clearances for non-RNAV approaches are common practice in today's air traffic world and questioned if non-RNAV approaches will be included in the DCP guidance. Paul responded that the DCP would initially only address RNAV approaches; however conventional procedures will be included at a future date. The group consensus is that direct-to-IF clearance procedures should be pursued for all approaches. Paul recommended that this recommendation should be provided when the DCP is released for public comment. ALPA recommends that at a minimum, those representatives and their organizations participating in the ACF-IPG should be allowed the opportunity to comment on the DCP guidance. Bob further asked if a legal interpretation regarding whether a radar monitored "direct IF" clearance can be considered a "radar vector" had been requested [Part 91.175(j)]. Paul responded that an AGC opinion had not been requested on this subject.

**ACTION: ATP-500 and ATP-120.**

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**MEETING 05-01:** Paul Ewing, ATO-R/RNP Division, briefed that there are two DCPs in coordination and awaiting a response from one office. Publication is targeted for February 2006. The DCPs specify a 90-degree turn limit at the IF. Tom Schneider, AFS-420, asked if the DCP would apply to conventional procedures as well as RNAV. Paul responded that if the Terminal Procedures Branch agrees, the DCP would be for both conventional and RNAV approaches. Kevin Jones, Southwest Pilots Association, noted that direct clearances to IFs on conventional approaches are a common practice by ATC at many locations. Bill Hammett, AFS-420 (ISI), asked if an AGC opinion had been requested on the “cleared direct with radar monitors” vs. an actual “radar vector”? Paul replied that it had not. The ATO-R, RNP Division and the ATO-T, Safety and Operations Support Division will continue to work the issue and report. **ACTION: ATO-R/RNP and ATO-T/SOS.**

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**MEETING 05-02:** Paul Ewing, ATO-R, briefed that the Air Traffic Document Change Proposals (DCPs) have been coordinated and approved for a February 16, 2006 publication in both Order 7110.65 and the AIM. The change will allow “direct-to” clearances to the IAF and IF for **RNAV approaches only**. Paul added that industry’s request to allow the procedural change to also apply to conventional (non-RNAV) approaches was coordinated with the ATO-T organization; however, the ATO-T organization non-concurred with the proposal. Paul further noted that the conventional application issue is under consideration by the Air Traffic Procedure Advisory Committee (ATPAC). Kevin Comstock, ALPA, questioned the rationale for Air Traffic’s non acceptance, especially since several line pilots have stated in previous ACF discussions that it is a common practice throughout the NAS for ATC to clear aircraft direct to the IF on conventional approaches. He requested that ALPA be provided the rationale for the decision to exclude non-RNAV approaches. Kevin also noted that there is no guidance to specifically stop controllers from using “direct-to” clearances for conventional procedures; therefore, what is to stop them from continuing the practice. Paul responded that his office was charged to address RNAV application only, and that has been completed through the DCP. Tom Schneider, AFS-420, concurred and recommended ALPA address the request for Air Traffic’s rationale directly to the ATO-T organization or through the ATPAC. Steve Bergner, NBAA, noted that the provision will not work for RNAV (RNP) SAAAR procedures due to containment constraints. Don Porter, ATO-R, stated that appropriate controller training material would be distributed. Tom Schneider stated that the original ACF recommendation applied to RNAV approaches and that issue has been resolved and the non-RNAV application should be worked through ATPAC. He recommended the issue be closed from further discussion and tracked until the applicable Orders and AIM have been updated. The group agreed. **ACTION: None required – open, pending publication.**

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**MEETING 06-01:** Paul Ewing, ATO-R, briefed that the Air Traffic Document Change Proposals (DCPs) have been incorporated in both Order 7110.65 and the AIM on February 16, 2006. The change allows “direct-to” clearances to the IAF and IF for **RNAV approaches only**. As noted at the last meeting, the application for conventional procedures is being addressed at ATPAC. **ITEM CLOSED.**

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