

AERONAUTICAL CHARTING FORUM
Instrument Procedures Group
April 27, 2010

History Record

FAA Control # 10-01-294

Subject: RNP AR Intermediate Segment Length and ATC Intervention

Background/Discussion: ATC is increasing the use of direct-to-the-IF to either ***expedite*** the IAP, or because of ***intervention*** for spacing, sequencing, etc. The limit imposed on ATC is a 90 degree course change at the IF, thus the presumption for procedure design purposes is a 90-degree course change fly-by at the IF. In most RNAV IAPs, the width and the length of the intermediate segment is sufficient to accommodate a 90-degree course change fly-by of the IF (DTA and recovery to centerline). But, where there is one, or more intermediate segment step-down fixes then the distance between the IF and the first segment step-down may be insufficient to accommodate DTA and recovery to centerline.

Much more significant, though, is the issue of the intermediate segment length and width in RNP SAAAR IAPs. The RNP SAAAR criteria specify a standard intermediate segment with of 2 miles, centerline to edge (2 X 1.0 RNP), and a minimum segment length predicated only on the magnitude of course change (if any) at the IF. This is the pertinent criterion from FAAO 8260.52:

RNP SEGMENT LENGTH. Design segments with sufficient length to accommodate the required descent as close to the OPTIMUM gradient as possible and DTA (see paragraph 1.13) where turns are required. Minimum straight segment (any segment) length is 2×RNP (+DTA as appropriate for fly-by turn constructions). Paragraph 2.8 applies where RNP changes occur (RNP value changes 1 RNP prior to fix). The maximum initial segment length (total of all sub segments) is 50 NM.

If there is no course change at the RNP SAAAR IF the intermediate segment minimum length could be very short, and not nearly able to accommodate an ATC-imposed significant course change at the IF. Further, where obstacles or other critical conditions dictate, the RNP SAAAR intermediate segment width could be as little as 2 X 0.10 RNP (2/10 of 1 nautical mile). (Ref: FAAO 8260.52, Table 1-1)

This issue was presented to the PARC by NBAA and supported by the RNP SAAAR charting working group. The PARC steering committee subsequently supported the issue and requested that NBAA bring it before the ACF-IPG as the proper medium for discussion and resolution of the criteria issues.

Finally, the ACF-IPG has determined in Issue 96-01-166, "Determining Descent Point of Fly-by Waypoints" that descent at the bisector of the fly-by is acceptable. Because of the constraints of RNP containment area widths, descent at the bi-sector is ***not*** acceptable in RNP SAAAR IAPs except where designed into the procedure; i.e., course change at charted TF-to-TF segments.

Recommendations: The length of the RNP SAAAR intermediate segment must be sufficient to accommodate a “worst case” ATC-directed course change of 90 degrees, which length must include DTA for a 90-degree course change, recovery of Performance Based Navigation (PNB) and recovery of the vertical profile and stabilized flight prior to the final approach segment. Because ATO is currently proposing to provide direct-to-the-IF clearances in both radar and non-radar environments, the design criteria presumption must be a non-radar environment.

Where an RNP SAAAR IAP has multiple intermediate segments, one of these intermediate segments must be a TF leg aligned with the final approach segment (or at least the first portion of the final approach segment) and must be of sufficient length to accommodate the issue set forth in this issue paper. The other intermediate segments in a multiple intermediate segment RNP SAAAR IAP may be of any length; however, ATC needs to be and trained to provide direct-to clearances only to the straight segment IF.

Order 8260.52 criteria needs to be changed to provide criteria to resolve the issue presented in this issue paper. ATO needs to provide training to controllers on which IF is the appropriate IF for direct-to clearances in multiple intermediate segment RNP SAAAR IAPs.

Further, Order 8260.54A criteria needs to be reviewed to determine whether intermediate segment criteria is sufficient to accommodate ATC-directed 90-degree course changes at the IF, particularly where the procedure itself does not have 90-degree course changes at the IF designed into an RNAV IAP. Distance to intermediate segment step-down fixes must also be considered in RNAV IAP design criteria.

Comments: This issue affects FAA Orders 8260.52 and 8260.54A. It also affects present and pending ATC directive material for direct-to-the IF clearances.

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Initial Discussion - Meeting 10-01: New issue introduced by Rich Boll, on behalf of NBAA. ATC is increasing the use of direct-to-the-IF clearances to either expedite the approach or because of ATC required intervention due to traffic sequencing. Current guidance allows up to a 90 degree intercept at the IF for RNAV IAPs. However, NBAA is concerned that applying the 90 degree intercept on RNP SAAAR may compromise obstruction clearance and flyability for RNP approaches with shortened intermediate segments and reduced procedure design widths for obstacle containment. This issue was previously presented to the PARC by NBAA and is supported by the PARC RNP SAAAR charting working group. The PARC steering committee subsequently supported the issue and requested that NBAA bring it before the ACF-IPG as the proper medium for discussion and resolution of the criteria issues. NBAA is recommending that criteria in Orders 8260.52 and 8260.54A be reviewed to ascertain whether intermediate segment length requirements are sufficient for ATC directed 90 degree direct-to clearances. Tom Schneider, AFS-420, briefed the following update as received from Jack Corman, AFS-420's lead RNAV criteria specialist,

who performed a preliminary review of the issue : "Unless the entire Intermediate Segment altitude is at or above the MVA, we cannot guarantee obstacle protection for turns in excess of approximately 60 degrees unless the evaluation area is expanded. Work has started on determining the magnitude of expansion required. When draft criteria is written, it will enter the US-IFPP approach working group coordination process. Expect signed revised criteria in 60-90 days if standard coordination is required." Brad Rush, AJW-372, showed several examples of approaches where allowance for a 90 degree turn at the IF will require increased intermediate segment lengths. Tom stated the issue would be forwarded to the US-IFPP for consideration. **ACTION: AFS-420 (US-IFPP)**

Meeting 10-02: Tom Schneider, AFS-420, briefed the following from Jack Corman, the AFS-420 TERPS RNAV criteria specialist:

"The October 2, 2009 memorandum on RNAV segment length identifies design length limitations in Order 8260.54A. Order 8260.52 contains RNP SAAAR segment length limitations. Both Orders are subject to the "up to 90 degree intercept clearance" authority assumed in 7110.65. However, the Order 7110.65 ATC allowance of clearance direct to join an RNAV approach procedure at fixes following the IAF at intercept angles up to 90 degrees may result in a turn that the designed segment length was not intended to accommodate. In these instances, air traffic will assure obstacle clearance is not compromised through use of radar and other mechanisms. AFS-420 discussed this with ATC at length and they satisfied our concerns when the segment RNP value was 1.0 or greater. If < 1.0, amendment action or statement of ATC accepting obstacle clearance responsibility is required.

The AFS concerns were centered on 2 problems: 1) Inadequate segment length to accommodate the turn, and 2) Descent into unevaluated airspace.

1. Radar monitoring is required. Controllers are trained to take action when they observe gross deviations from prescribed paths. This training and expected reaction is inherent to the radar controller discipline. The controller would intervene to maintain altitudes at or above MVA and provide vectors back toward the course or re-sequence the aircraft. Although Flight Standards may and does provide input, controller responsibilities and the ATC discipline is under the purview of the ATO through Order 7110.65. All changes go through a SMS process with Flight Standards representation to assure safety

2. These are direct clearance to the IF or fixes between the IF and PFAF. The segment width is +/- 2 NM. Turn radius should be in the vicinity of 2.5 to 3.5 NM (example airport at 4000, aircraft at 6000). At a 90 degree turn, the DTA is equal to turn radius. If descent commences at the bisector, and the turn radius was as large as 4 miles, descent out of the intermediate minimum altitude would occur at or just slightly before crossing the segment boundary. The MVA ROC is 1000, intermediate segment ROC is 500. If the area was expanded to evaluate the turn, at least 500 feet ROC would exist. The probability of obstacle conflict is very, very low.

For RNP values <1.0, segment half width would decrease, but the DTA stays the same. We are not yet comfortable with allowing the operation with less than a 2 NM half-width without expanding the OEA and evaluating the area."

Gary Fiske, AJT-28, stated that ATC will radar monitor all "direct to" clearances; however, they do not care what RNP value is designed in the procedure. The MVA altitude at the IF where the turn commences provides 1,000 feet of ROC, twice the intermediate segment requirement of 500 feet. Tom stated this represents a disagreement between ATC and AFS that the US-IFPP must address. **ACTION: AFS-420 (US-IFPP)**

Meeting 11-01: Tom Schneider, AFS-420, briefed the following update as received from Jack Corman, the AFS-420 lead RNAV criteria writer: The following is the US-IFPP's latest proposal, but no one has authorized us to go forward and issue a NOTICE detailing the evaluation. "Where (if) ATC assumes obstacle clearance responsibility with radar monitoring until the aircraft is established on the inbound course, there is no objection. Without ATC accepting obstacle clearance responsibility until the aircraft is established on course, RNP values <1.0 must be successfully evaluated prior to "direct-to" clearance application." Tom noted that at the last meeting the Terminal Service Unit representative (Gary Fiske, AJT-28) stated that "ATC will radar monitor all "direct to" clearances; however, they do not care what RNP value is designed in the procedure. He asserted that the MVA altitude at the IF where the turn commences provides 1,000 feet of ROC, twice the intermediate segment requirement of 500 feet." This represents a disagreement between ATC and AFS that the US-IFPP must address. The Executive Director of the US-IFPP will keep the ACF-IPG apprised of the issue status. **ACTION: AFS-420 (US-IFPP)**

Meeting 11-02: Tom Schneider, AFS-420, briefed the following update as received from John Bordy, AFS-420 (ISI), the specialist assisting in addressing the ATC response as endorsed by Jack Corman, the AFS-420 lead RNAV criteria writer: "The latest iteration of the draft Document Change Proposal (DCP) to Order 7110.65, paragraph 4-8-1 requires ATC to radar monitor any "direct-to" application associated with a clearance for an RNAV (RNP) approach. This requirement will be valid for all RNAV (RNP) approaches, without regard to the RNP value of the segment associated with the fix used for the "direct-to" clearance. AFS-420 is satisfied with the language of the DCP and recommends closure of this item". Terry Pearsall, AJT-28 briefed that the Safety Risk Management Decision (SRMD) was uncontested. The group consensus was to leave the issue open until the change is published in JO 7110.65. AJT-24 will track the DCP change until published. **ACTION: AJT-24.**

Editor's Note: Recommendation title changed to "**RNP AR**" vice "**RNP SAAAR**" to reflect current FAA procedure naming.

MEETING 12-01: Gary Fiske, representing AJT-2A3, stated that the DCP for FAA Order JO 7110.65U, paragraph 4-8-1, has been completed and is awaiting publication. The group

consensus was to leave the issue open until published. AJT-2A3 to track the DCP change until published. **ACTION: AJT-2A3.**

MEETING 12-02: Gary Fiske, representing AJT 2A3, had been tracking this issue, but was unable to attend this meeting. Paul Eure, AJE-31, stated that the DCP for FAA Order JO 7110.65U, paragraph 4-8-1, has been completed and is awaiting March publication. He added that they are attempting to publish the change sooner via a NOTICE, hopefully in the January timeframe. Gary McMullin, SWA, stated that he would like a copy of the final to comment on. He added that the 6-NM requirement prior to joining an RF leg is unacceptable and will cause problems with use of RNP. Gary added that he had communicated these concerns to Gary Fiske, then representing AJT-2A3, about a year ago. Paul agreed to provide Gary McMullin a copy of the final DCP and forward his concerns to Gary Fisk's replacement. AJT-2A3 will continue to track the DCP change. **ACTION: AJT-2A3.**

***Editor's Note:** The secretary was advised that publication of the change to Order JO 7110.65 has been slipped to August 2013; however, implementation via NOTICE is still planned for early 2013.*

MEETING 13-01: Mark Washam, AJT 2A3 (HSI, Contract Support), reported that the Document Change Proposal (DCP) for FAA Order JO 7110.65, paragraph 4-8-1 has been completed and the changes will be implemented via Notice on June 13, 2013. Gary McMullin, Southwest Airlines, stated that the 3 and 6 NM straight segment requirements will create more of a problem than currently exists and Southwest is actively in conversation with FAA to lift this limitation. Gary emphasized that it needs to be researched further, prior to implementation. Jim Arrighi, AJV-14, responded that the need for 90 degree intercept has been analyzed using radar data and very few examples have been observed. He added that the DCP contains many other beneficial items that ATC needs to implement; therefore, the plan is to proceed with implementation on June 13. Mark Steinbicker, AFS-470, affirmed that the Notice is progressing forward and that Air Traffic has developed the necessary training package to support the 3/6 NM requirement. Mark added that additional efforts will be required to review and re-evaluate the effect on 300 existing RNAV RNP procedures that are working satisfactorily. While the plan is to go forward, a second look at procedure design will occur. Mark agreed there needs to be additional vetting of the operational need of a 90 degree intercept focusing on what we can actually do vs. what is required. Bob Lamond, NBAA, agreed that the FAA should not pull the plug on the DCP. Gary agreed the DCP should go forward, but without the 3/6 NM limitation. He recommends retaining the existing language to allow controllers to clear aircraft direct to the IF at 90 degrees or less. This resulted in a lively exchange between Gary and Mark regarding which procedures had been evaluated for a 90 degree intercept and the evaluation methods used. Gary emphasized that procedures were evaluated after Boise and determined to be designed correctly. He added that he has coordinated with the Manager of AFS-400 and it was agreed at a meeting in Oklahoma City to build procedures based on the current guidance of 90 degrees to the IF. Gary added that he confirmed this with Brad Rush, AJV-3B. Mark disagreed, saying that Brad had confirmed that some procedures had been designed with 90 degrees to the IF and some had not. Gary Powell, AFS-401, intervened stating there may be a disconnect between TERPS criteria and FAA Order JO 7110.65 and this needs to

be resolved in Order 8260.58. Gary McMullin responded that it appears that the FAA is creating criteria via an ATO NOTICE and this is not how criteria should be written. Mark questioned the operational necessity of the 90 degree intercept. Gary McMullin responded that it is used frequently at O'Hare and other high density locations. It was questioned why the FAA is going forward with the change when there is so much user concern. After much conversation, Mark agreed to form an ad hoc work group to look further into the issue and asked Tom Schneider, AFS-420, to obtain a list of interested persons. The following attendees signed up to participate:

Mark Steinbicker, AFS-470
Neal Covington, AeroNav Data, Inc.
Josh Fenwick, AeroNav Data, Inc.
Gary McMullin, Southwest Airlines
David Newton

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Two IOUs are open: 1) AFS-470 to lead an ad hoc work group to further assess the issue and report; and, 2) AJT-2A3 continue tracking changes to FAA Order JO 7110.65, paragraph 4-8-1. **ACTION: AJT-2A3 and AFS-470.**

MEETING 13-02: Kel Christianson, AFS-470, briefed this item has been taken up by the PARC, and they are actively working the issue; however, there is no update to quote. Gary Fiske, AJV-8, advised the ad hoc work group was supposed to meet on Oct 7, but that meeting was cancelled and has not yet been rescheduled. Gary added that there will be Document Change Proposals (DCPs) developed to support PARC recommendations. Gary also briefed that the DCP for FAA Order JO 7110.65, paragraph 4-8-1 has been completed and the change was implemented via NOTICE on June 13, 2013. AFS-470 will continue to monitor PARC actions and report back. **ACTION: AFS-470.**

MEETING 14-01: Mark Steinbicker, AFS-470, briefed this is an extension of some work being done with Order JO 7110.65, para 4-8-1. There are some concerns about a couple of aspects and the PARC is working to allow 90 degree turn-ons to an IF & IAF. The PARC formed an action team and is making progress on identifying Authorization Required (AR) procedures that need to be scrubbed using a harmonized method to allow the turns (i.e., which procedures are OK and which need application of a speed constraint). The general change of strategy is that most, if not all, of these procedures will have a speed constraint associated with those fixes. If a speed change is required, expect a NOTAM of some type. He is also encouraging outreach from the data base providers to ensure higher confidence. Gary Fiske, AJV-8, is working the DCP which is ready for the coordination process. Mark said procedure design criteria will be in Order 8260.58, around summer of 2015.

Status: AFS-470 to monitor PARC actions and report back next ACF. **Item Open (AFS-470).**

MEETING 14-02: Kel Christianson, AFS-470, briefed ([View](#)) that the PARC has completed work on this topic and the report on vectors to RNP final was published on August 22, 2014. Gary Fiske, AJV-8, added that FAA Order JO 7110.65 has already been changed to account for 90 degree turns. He stated that the subject has been expanded into a paragraph 4-8-1 change on parameters for turns onto an RF leg, which is due to be published January 8, 2015. Tom Schneider, AFS-420, advised that changes to FAA Order 8260.58 will appear in the "A" revision. Rick Dunham, AFS-420, added the change will address design criteria for these types of procedures, will be aligned with other changes, and that speed concerns (design constraints) remain. Planned publication for Order 8260.58A is July 2015.

Status: AFS-420 will report on changes to FAA Order 8260.58A. **Item Open: AFS-420**

MEETING 15-01: Tom Schneider, AFS-420, briefed ([View](#)) showing new language for the draft Order 8260.58A, adding that TJ Nichols, AFS-420, is lead on the Order. The AIM paragraph 4-8-1 issue is already taken care of. Gary Fiske, AJV-82, said language in Order JO 7110.65 does not allow vectoring to an RF leg. Rick Dunham, AFS-420, advised that the last piece of the puzzle is Order 8260.58A language.

Status: Item open pending guidance in Order 8260.58A. **Item Open: AFS-420**

MEETING 15-02: Tom Schneider, AFS-420, said guidance is in the draft FAA Order 8260.58A. The order is still being worked; there is nothing more to report at this time, and the issue will remain open to ensure no objections are received to the language changes during the coordination process.

Status: Track status of guidance getting published in FAA Order 8260.58A. **Item Open: AFS-420.**

MEETING 16-01: Tom Schneider (AFS-420) briefed that Gary Petty (AFS-420) said Order 8260.58A has been published and includes the new language. ([View](#)) NBAA concurs with closing item.

Status: **Item closed.**