

GOVERNMENT/INDUSTRY AERONAUTICAL CHARTING FORUM

Instrument Procedures Group (Originally presented at ACF 92-02) HISTORY RECORD

FAA Control # 92-02-105

SUBJECT: Review of Adequacy of TERPS Circling Approach Maneuvering Areas and Circling at Airports With High Heights Above Airports (HAA's)

BACKGROUND/DISCUSSION: The construction of the TERPS standard instrument approach circling maneuvering area is based upon the approach category turning radii assumptions for Categories A through E, as follows: 1.3, 1.5, 1.7, 2.3, and 4.5 nautical miles, respectively. There is no lateral obstacle buffer at the edge of these radii, other than the slight buffer provided at multiple runway airports by the simplistic joining of the tangents of the circles, which are formed, by the radii for each approach category. Thus, a solid granite wall is permitted by the criteria at the edges of the circling maneuvering area. The maneuvering radii are of questionable validity, especially during strong low-level wind conditions. Also, the radii appear to be questionable at high elevation airports because of the significantly higher density altitudes that result at such locations.

RECOMMENDATION: The present circling maneuvering turning radii should be reviewed for their adequacy during strong, adverse low-level winds and with the application of high true airspeeds which result with high density altitudes. An objective and scientific study should be conducted to determine what constitutes reasonable dimensions for the circling maneuvering area under all conditions of low-level winds and density altitudes. The circling maneuvering area should be demonstrated to contain operations to a statistical confidence level of 2 Sigma. A tapered secondary area should be provided around the primary circling maneuvering area that will contain operations to a statistical confidence level of 3 Sigma.

COMMENT: This recommendation affects the United States Standard for Terminal Instrument Procedures (TERPS), FAA Order 8260.3B.

Submitted by: Charles K. Guy

May 13, 1992

AIR LINE PILOTS ASSOCIATION

INITIAL DISCUSSION (Meeting 92-02): Records of the initial discussion and minutes of meetings 93-01 through 94-02 are not available.

MEETING 95-01: International Civil Aviation Organization (ICAO) circling minima is higher than the US in some categories. AFS-420 and AVN-210 has action and will report at the next meeting. **ACTION: AFS-420 and AVN-210.**

MEETING 95-02: Lyle Wink, AFS-422, reported that research is still ongoing for this issue and a finalized report is not available. AFS-422 will report when research is complete. **ACTION: AFS-422.**

MEETING 96-01: Don Pate, AFS-450, presented a status document reflecting FAA study efforts thus far. The next phase is Airspace Simulation and Analysis for TERPS (ASAT) modeling. In order for this effort to be successful and provide realistic data, it is necessary that the parameters used for testing (airspeeds, winds, bank angles, etc.) be agreeable to all. Don requested that the group review the paper and forward recommended parameter changes to him not later than May 17. Revised criteria, if necessary will be on ASAT modeling results. **ACTION: AFS-450.**

MEETING 96-02: Don Pate, AFS-450, provided an update on progress thus far. The ASAT testing was delayed due to other projects, but is now progressing. Don emphasized again that, in order for this effort to be successful and provide realistic data, it is necessary that the parameters used for testing be agreeable to all. No inputs were received from the last meeting. Don provided a listing of factors to be considered and requested the group review the factors and forward recommended parameters to Steve Jackson, AFS-450, as soon as possible. AFS-450 hopes to have the ASAT testing complete prior to the next meeting. **ACTION: AFS-450.**

MEETING 97-01: Don Pate, AFS-450, presented a status document noting FAA study efforts thus far. The ASAT software has been upgraded and the circling model is in final development. As previously noted, industry inputs on circling techniques for various circling maneuvers would aid in completion of the model; however, no industry group has been forthcoming with comments. Tom Young, ALPA, stated that his organization would provide inputs during a scheduled April meeting with AFS-440/450 in Oklahoma City. Don stated that he hopes to have graphic depictions of test results vs. current criteria for presentation at the next meeting. Details of Don's briefing were distributed in a status document. **ACTION: AFS-450.**

MEETING 97-02: Don Pate, AFS-450, reported the study and analysis continues. Proposed criteria development is expected to be complete, and a draft prepared by the spring 98 meeting. Wally Roberts, ALPA, expressed concern over the possibility circling maneuvers would be altogether deleted. He does not consider deletion to be a valid option, and maintains the pilot should determine the option to circle. AFS-450 will continue Aircraft Simulation and TERPS (ASAT) modeling/testing and report the results at the next meeting. **ACTION: AFS-450.**

MEETING 98-01: Steve Jackson, AFS-420, is continuing analysis and computer modeling. Jack Corman, AFS-420, briefed the on-going study and presented examples to the group. Preliminary results and ASAT results indicate that the current criterion requires improvement. New criteria are under development and should be incorporated in the next issuance of TERPS. Jim Terpster, Jeppesen, recommended that test results be presented to ICAO through the OCP. Paul Best, AFS-400, agreed and stated that the criteria would be presented when finalized. **ACTION: AFS-420.**

MEETING 98-02: Howard Swancy, AFS-420, presented a position update paper developed by Steve Jackson, AFS-420. The paper provided the results of ASAT testing and new circling area models. It was briefed that the FAA has received no industry input for the parameters used in the tests, despite repeated requests. Input is necessary at this juncture to preclude developing criteria that everyone will object to when circulated for approval. The group agreed that the parameters used in the tests were acceptable and that criteria development should continue. It is planned that new circling criteria will be published in the next re-write of the TERPS manual. Howard requested that all review the paper thoroughly and forward comments to AFS-420 ASAP. **ACTION: AFS-420.**

MEETING 99-01: Howard Swancy, AFS-420, presented a briefing on new circling criteria for inclusion in TERPS. The new criterion significantly expands the obstacle clearance areas for circling maneuvers and incorporates three altitude stratus. The criteria was developed from extensive Airspace Simulation and Analysis for TERPS (ASAT) test results. A draft copy of the new criteria was handed out to all participants who were asked to review the new criteria and forward comments to Norm LeFevre, AFS-420, ASAP, but not later than May 30, 1999. It is planned to incorporate the new criteria in TERPS, Change 19. **ACTION: All Attendees.**

MEETING 99-02: Howard Swancy, AFS-420, presented a status update paper prepared by Norm LeFevre, AFS-420. A draft copy of new circling criteria was provided to all participants during meeting 99-1. Comments were requested not later than May 30th; however, none were received. The new criteria has been finalized and is planned to be incorporated in TERPS, Change 19, in early 2000. Erik Eliel, USAF/AIS, asked if the FAA has considered an implementation plan for the new criteria that would let pilots know whether or not procedural minima was based on new or old criteria. Howard agreed that the FAA would need an implementation plan that considered both AVN-100 workload and pilot education; however, one has not been developed to date. Randy Kenagy, AOPA, added that AIM information must be updated to reflect the new criterion. The group agreed. AFS-420 is to track publication of TERPS, Change 19 and development of a FAA implementation plan. **ACTION: AFS-420.**

MEETING 00-01: Dave Eckles, AFS-420, presented a status update paper prepared by Norm LeFevre, AFS-420. A draft copy of new circling criteria was handed out to all participants during meeting 99-1. Comments were requested not later than May 30, 1999; however, none were received. The new criteria was subsequently finalized and planned for inclusion in TERPS, Change 19. Implementation is expected to be by attrition; e.g. new SIAP's would incorporate new criteria while current SIAP's would have new criteria applied during periodic reviews or routine amendments for other reasons. However, last minute concerns voiced by AOPA over the parameters used in development of the new criteria will delay the new criteria to TERPS, Change 20. Randy Kenagy, AOPA, stated that the CAT A ASAT modeling indicated only a slight deviance from the current circling protected area, yet the new proposed criteria expands the CAT A&B obstacle protection areas by ½ mile or more. He believes this may significantly raise minimums. Dave indicated that FAA is addressing AOPA's concerns. **ACTION: AFS-420.**

MEETING 00-02: Dave Eckles, AFS-420, presented a status update paper prepared by Steve Jackson, AFS-420. New circling criteria were pulled from TERPS change 19 as a result of AOPA's concerns. It is AFS-420's plan to include the new criteria in Change 20, which will be circulated for formal comment. Randy Kenagy, AOPA, noted that his agency concerns were forwarded via e-mail to AFS-420 on 5/25/00; however, they have received no response. Pre-meeting conversation with Steve indicated that he was expecting further criterion recommendations from AOPA. This apparent miscommunication between AOPA and AFS-420 has resulted in no action taken to mitigate AOPA's concerns. Randy emphasized that the proposed obstacle clearance area for Category (CAT) A aircraft was too large and will result in significant and unnecessary minima increases. Kevin Comstock, ALPA, noted that the new criteria is necessary for CAT BCD aircraft and, in the interests of flight safety, should be processed and implemented without further delay. Bill Hammett, AFS-420 (ISI), recommended that AOPA contact AFS-420 directly regarding their concerns. Bill also noted that all changes to TERPS are formally coordinated with industry and other government agencies prior to publication. Formal comments received must be resolved prior to adoption. Dave Eckles assured Randy that AOPA comments would be staffed.

ACTION: AFS-420.

MEETING 01-01: Dave Eckles, AFS-420, presented a status update paper prepared by Steve Jackson, AFS-420 on the issue. In the paper, Steve, on behalf of AFS-420, has addressed the concerns forwarded by AOPA. It is planned that the new circling criterion will be included in TERPS change 20. As is the norm, this change will be coordinated with industry and other government agencies. **ACTION: AFS-420.**

MEETING 01-02: Norm LeFevre, AFS-420, briefed that new circling criteria was developed as a result of ASAT testing and was originally scheduled to be included in TERPS Change 19. Last minute AOPA concerns over the impact of the new criteria on Category A aircraft have delayed the criteria until Change 20. Norm noted that although AOPA has raised concerns, they have not presented hard data to challenge the AFS-420 analysis of circling airspace requirements. The new circling criteria are scheduled for inclusion in TERPS change 20. Norm requested that AOPA present data supporting smaller than planned circling areas to AFS-420 NLT 1/1/2002 or the proposed new circling areas will be included in TERPS as originally proposed and briefed to the ACF.

ACTION: AFS-420.

MEETING 02-01: Norm LeFevre, AFS-420, briefed that the new circling criteria, proposed for inclusion in TERPS, Change 21, will be initially applied to all airports above 6,000 feet MSL. FAA will then bring the application to sea level. Wally Roberts, ALPA, presented a briefing on the Air China accident at Pusan, Korea (he believes the airport used TERPS circling criteria). Wally's briefing displayed drawings on topographical charts of current TERPS and Pans-Ops criteria as well as the FAA proposed criteria for CATs C and D. The briefing supports that additional airspace should be required for circling maneuvers. Wally, supported by Steve Bergner, NBAA, was critical that the proposed 4500' overshoot area, parallel to the runway, in the new criteria, is too large and should be tapered from the outside turn area toward the runway threshold. Wally, supported by NBAA and Brad Alberts, FPA, also recommended unanimously that the Cat D area be increased to accommodate 180Kts. Wally emphasized that ALPA again recommends that the new

TERPS circling criteria be applied ASAP, especially for CAT C & D aircraft. NBAA and FPA supported this recommendation. Norm agreed to take the message back to AFS-420.

ACTION: AFS-420.

MEETING 02-02: Tom Schneider, AFS-420, briefed the status of this issue as provided by Jack Corman, AFS-420. The new circling areas have been modified to accommodate comments from various industry respondents. The revised criteria were reviewed by the TERPS Working Group (TWG) and approved for inclusion in TERPS change 20. It is planned to have Change 20 in formal coordination this winter; however, the exact timeframe is dependent on priority taskings. Bill Hammett, AFS-420 (ISI), briefed that the overshoot area concerns expressed at the last meeting by ALPA and NBAA were re-evaluated and revised to taper toward the runway. AFS-420 also evaluated the request to expand the Category D area to allow for 180 Knots and this is not considered feasible. Airspeeds and categories are defined in Part 97.3(b). Steve Bergner, NBAA, asked if airspace requirements would be addressed to ensure that the increase in circling area size does not cause procedures to be outside controlled airspace. Tom did not know offhand whether airspace increases have been addressed. Brad Alberts, ALPA, stated that no procedure should be outside controlled airspace. Tom asked if the circling diagram could be removed from the AIM. The consensus, led by Jim Terpstra, Jeppesen, was that the diagram should remain. Aircrews need to know that there are limitations. Discussion as to whether or not charts need to be annotated denoting whether new or old criteria is applied reached no conclusion. Tom also stated that AFS-420 has not taken any action on early criteria implementation for CATs CD. **ACTION: AFS-420.**

MEETING 03-01: Tom Schneider, AFS-420, briefed the status of this issue as provided by Jack Corman, AFS-420. The new circling criteria are still planned for inclusion in TERPS Change 20, which is targeted for coordination in the Fall of 03. Tom also stated that the Manager, AFS-420 will not pursue early criteria implementation for CATs CD. It is preferred that the criteria are circulated for public comment and all categories be implemented simultaneously. **ACTION: AFS-420.**

MEETING 03-02: Bill Hammett, AFS-420 (ISI), briefed that a revision to TERPS Volume 1, paragraph 260, Circling Approach Area, has been prepared for inclusion in Change 20. The change is scheduled to enter formal coordination NLT October 30th, and signature is expected in the first week of January, 2004. AFS-420 will continue to track publication of the new criteria. **ACTION: AFS-420.**

MEETING 04-01: Bill Hammett, AFS-420 (ISI), briefed that the new circling criteria has been pulled from TERPS Change 20 due to questions regarding the validity of the data used in the previous Airspace Simulation and Analysis for TERPS (ASAT) study upon which the new criteria were developed. AFS-420 will forward the request for ASAT re-validation to AFS-440. There was a brief discussion on the variances between PANS-OPS and TERPS. ICAO areas are larger than TERPS to accommodate higher operating speeds by category. Ted Thompson, Jeppesen, noted that after the Air China accident in Korea, his company notes ICAO Pans Ops on the procedure chart to reflect which criteria was used. Randy Kenagy, AOPA, noted that if new criteria were developed, then the new circling dimensions should be depicted in the AIM. It was also asked whether the US would annotate

procedures developed under new criteria. Kevin Jones, Southwest Airlines, stated this should not be necessary, as pilot procedures should not change; rather, criteria should be developed to accommodate operations. Kevin Comstock, ALPA, requested further detail on the reason the new criteria was pulled from Change 20. Bill responded that AOPA had formally objected that the larger areas caused an unnecessary impact on category A and B aircraft. After a short dialog, Kevin stated that if AOPA did not provide specific data to refute the proposed criteria change, then it should go forward as presented and briefed at previous ACF meetings. Kevin re-affirmed the ALPA position that this issue is important and should go forward ASAP, especially for category C and D aircraft operations. Tom agreed to take the comments back to AFS-420. **ACTION: AFS-420 and AFS-440.**

MEETING 04-02: Bill Hammett, AFS-420 (ISI), briefed a status update from Jack Corman, AFS-420, that TERPS change 20 will contain a revised Table 4, Circling Approach Area Radii, with radii values variable according to altitude strata. High altitude airport circling areas will be larger to account for higher true airspeeds. This is an interim step toward establishing a new method for circling area construction in subsequent TERPS changes. Randy Kenagy questioned whether pilot education material would be disseminated so that pilots would know of the larger circling radii. Tom Schneider, AFS-420, explained that this was not planned at present as the intent is not for pilots to change the way they circle; rather, the goal is to ensure that the TERPS circling obstacle evaluation area (OEA) is adequate to encompass current circling maneuvers. Bill also requested industry input on parameters (bank angles, speeds, techniques, etc) to be used in the ASAT study. Randy offered himself as the AOPA focal point to provide input for the study. **ACTION: AFS-420 and AFS-440.**

MEETING 05-01: Tom Schneider, AFS-420 briefed that no action has been taken on this issue since the last meeting due to higher priority taskings. A newly assigned specialist, T.J. Nichols, who has been assigned responsibility for developing conventional TERPS criteria, will work this issue in concert with that project. He has been in training for much of the period since the last meeting. Mr. Nichols assured the Chair, prior to the meeting, that the formal memorandum to AFS-440 requesting the ASAT study on circling obstacle evaluation areas will be forwarded NLT the end of the month. Mark Ingram, ALPA, requested the status of TERPS Change 20. Tom replied that it is targeted for coordination in the August/September timeframe. **ACTION: AFS-420 and AFS-440.**

MEETING 05-02: Tom Schneider, AFS-420, briefed that the Manager of AFS-400 tasked AFS-440, via memorandum dated July 1st, to conduct an analysis of the TERPS circling approach obstacle evaluation areas (OEAs). The memorandum included the Randy Kenagy, AOPA, offer to assist in the Category A and B analysis. A meeting between AFS-420 and 440 was held to review the model used for the past study and the resulting proposed criteria. AFS-440 responded to the study request by stating that the project needs to be assigned a priority and funding. Tom briefed that the circling study has been entered in the new AFS-400 Enterprise Project Management (EPM) software system for tracking. **ACTION: AFS-440.**

MEETING 06-01: Tom Schneider, AFS-420, briefed the proposed AFS-440 ASAT study will not be accomplished due to administrative problems. Rather, AFS-420 has assumed the analysis and standards task for the circling areas. The goal is to retain the current circling area construction methodology, and to provide a formula that determines the appropriate circling radius based on approach category and airport elevation. This work has begun and preliminary calculation routines are being evaluated. A request has gone to the DOD for parameters to use for Category E aircraft. A similar request was forwarded to Randy Kenagy, AOPA, for input for Category A & B. Bill Hammett, AFS-420 (ISI) provided a short briefing on the past history of the issue emphasizing the need for industry input. The proposed criterion, which was planned for TERPS Change 19, but later rescinded, was developed unilaterally by AFS-420 because, despite repeated requests for input from industry groups through the ACF, no parameters for circling maneuvers were received. All attendees were reminded that if they desire to provide input, forward information to Jack Corman, AFS-420. It is hoped that AFS-420 will brief the finalized draft criteria at the next ACF meeting. Lyle Wink, AFS-400, asked whether a request had been made to ICAO for them to assess their parameters. Tom responded that this action may be considered after the FAA criteria have been completed. **ACTION: AFS-420.**

MEETING 06-02: Bill Hammett AFS-420 (ISI) provided a briefing on proposed new TERPS criteria for circling. The briefing and criteria were developed by Jack Corman of the AFS-42 staff, who was unable to attend the meeting. The new criteria adapt the ICAO formula for determining area radius while using maximum U.S. category airspeeds. The criteria assume a 25 degree maximum bank angle, a 25 knot tailwind, and factors in the airport elevation plus an assumed 1000' above airport pattern altitude. This method will continue the traditional TERPS circling obstacle evaluation area (OEA) construction methodology while adding the safety benefit of increasing the area radius to accommodate higher density altitudes. Retention of the traditional construction technique results in a smaller area than the previous draft TERPS proposal for circling OEA construction. Rich Boll, NBAA, asked whether a second evaluation would be accomplished if the first evaluation resulted in a HAA value greater than 1,000'. For example, the CAT C HAA at Aspen, CO is greater than 2300'. Bill responded that the formulae were based on airport elevation plus 1,000' and he would take the NBAA concern back to Jack for consideration. A copy of the briefing slides and the proposed criteria are included here . Additionally, the proposed criteria will be included in a near-future change to TERPS. Early comments are welcome and may be forwarded directly to Jack Corman at jack.corman@faa.gov. **ACTION: AFS-420.**

MEETING 07-01: Bill Hammett AFS-420 (ISI) provided an update, with input from Jack Corman, the AFS-420 lead criteria specialist, on the proposed new TERPS criteria for circling that was briefed at the last meeting is planned to be included in TERPS change 21. It is anticipated that Change 20, which will be limited to a new TERPS Volume 1, Chapter 3, *Takeoff and Landing Minimums*, will enter formal coordination within the next two weeks. Change 21 is planned to include the new circling criteria and radar procedures among other changes. Jack noted that it is against current administrative practices to have two changes in coordination at the same time; therefore, we cannot submit change 21 into internal coordination until Change 20 has cleared. AFS-420 has a work plan that includes conventional TERPS, RNAV, and RNP. That work is prioritized and the prioritization for this year has been #1-RNAV, #2-RNP, and #3-conventional TERPS. AFS-420 has not had the opportunity to fully explore the NBAA recommendation to consider a second evaluation when the initial HAA is greater than 1,000' that was presented at the last meeting due to

workload and staffing limitations. The NBAA request will be evaluated prior to criteria finalization and circulation for formal comment. Further comments on the new criteria are welcome and may be forwarded directly to Jack Corman at jack.corman@faa.gov.

ACTION: AFS-420.

MEETING 07-02: Bill Hammett AFS-420 (ISI) provided an update from Jack Corman, the AFS-420 lead criteria specialist, on the proposed new TERPS criteria for circling that was briefed at meeting 06-02. The new circling criteria will be contained in TERPS change 21 which will tentatively be circulated for coordination in the Dec/Jan time frame. The NBAA recommendation to re-evaluate the circling area when the initial evaluation using the assumed 1000' HAA results in a HAA greater than 1000' has been adopted. Evaluation is ongoing to determine if a maximum HAA value should be established where circling would not be authorized. Further comments on the new criteria are welcome and may be forwarded directly to Jack Corman at jack.corman@faa.gov. **ACTION: AFS-420.**

MEETING 08-01: Bill Hammett, AFS-420 (ISI), provided an update on the proposed new TERPS criteria for circling that was briefed at meeting 06-02 as received from Jack Corman, the AFS-420 lead criteria specialist. The new circling criterion is still planned for TERPS change 21, which is currently in the final editing phase and will be circulated for coordination in the near future. An evaluation to determine if a maximum HAA value should be established where circling would not be authorized will not be accomplished for this change. Further comments on the new criteria are welcome and may be forwarded directly to Jack Corman (see above) or TJ Nichols at thomas.j.nichols@faa.gov. Tom Schneider, AFS-420, emphasized that Change 21 is the number 1 priority for the conventional TERPS criteria specialist. Rich Boll, NBAA, asked if the draft was available. Tom responded that it would be placed on the AFS-420 web site and all notified when the draft entered coordination. AFS-420 will keep the group apprised of progress on criteria coordination. **Item Open – Pending Publication. ACTION: AFS-420.**

MEETING 08-02: Bill Hammett, AFS-420 (ISI), provided an update on the proposed new TERPS criteria for circling that was briefed at meeting 06-02. The new circling criterion has been finalized and is included in TERPS change 21, which is currently undergoing final editing for the formal coordination process. Slight modifications were made to the circling exclusion area to include a splay to provide an overshoot buffer for the turn to final. Additionally, the NBAA recommendation to conduct a second evaluation whenever the resulting HAA is higher than the value used in the formula has been included. The new criterion was provided with the meeting handout material so the attendees may have additional time for review. A copy is also included here  so that those that receive minutes may also have an opportunity to preview the criteria. Additional comments on the new criteria are welcome and may be forwarded directly to TJ Nichols at thomas.j.nichols@faa.gov. John Moore, NACO, asked whether the issue mentioned at the last meeting, regarding determination of a maximum HAA at which circling would not be authorized was resolved. Bill responded no; this was not considered for the current criteria release, but may be considered at a later date depending on comments received.

Item Open – Pending Publication. ACTION: AFS-420.

MEETING 09-01: Bill Hammett, AFS-420 (ISI), briefed that TERPS Change 21, which contains the new circling criteria has completed formal coordination and comments received are being addressed. No negative comments were received regarding the new circling criteria; however, there was a non-concur from the Terminal Service Unit relating to the minimum vectoring altitude criteria that is also included in Change 21 and must be mitigated prior to it being forwarded for signature. Rich Boll, NBAA, asked whether the items under contention could be removed and the rest of the change go-forward. Harry Hodges, AFS-420, responded that such an option will be considered. Dan Diggins, AJT-22, asked what was the MVA non-concur issue. Tom Schneider, AFS-420 responded that it related to the adverse assumption obstacle (AAO) additive. Tom stated he believes the concern has been mitigated; however, the document cannot go forward until the non-concur is lifted by the Terminal Service Unit. **Item Open – Pending Publication. ACTION: AFS-420.**

MEETING 09-02: Bill Hammett, AFS-420 (ISI), briefed that TERPS Change 21, which contains the new circling criteria as briefed at the ACF, was signed and effective on August 27, 2009. AFS-420 and FAA's National Aeronautical Navigation Services, NANS, are currently developing an implementation process that will address the most severely impacted airports first; e.g., high altitude, high HAA, etc. After 17 years on the agenda, Bill recommended this issue be closed. The group concurred. Also see Charting Group issue 09-01-213 regarding charting of revised circling area radii. **Item Closed.**
