

GOVERNMENT/INDUSTRY AERONAUTICAL CHARTING FORUM 03-01

April 30-May 1, 2003

Recommendation Document

Subject: Charting of RNAV Legs Adjacent to Fly-over and Fly-by Waypoints

Background/Discussion: Charts should depict RNAV legs in a clear and concise manner resembling typical aircraft flight paths.

Currently, RNAV legs surrounding fly-by waypoints are charted in a manner similar to “victor” airways and jet routes i.e., RNAV legs near fly-by waypoints are not charted as curved. Legs adjacent to fly-over waypoints are charted in an inconsistent manner; some legs near fly-over waypoints are charted as curved, while others are not.

Realistic charting would aid pilot expectation and detection of errors.

The European Organization for the Safety of Air Navigation publication, *Charting Guidelines for RNAV Procedures* dated May 2002, displays an alternative, more realistic, leg representation on pages 11 and 16 of that document.

Recommendation: Establish a standard that promotes charted legs approximating aircraft flight paths and to a lesser extent, advanced aircraft navigation displays.

Specifically, a charted leg surrounding a fly-over waypoint should intersect the waypoint and emerge in a curved line until proceeding direct to the next waypoint for a subsequent direct-to-fix leg or intersect and join the next path for a subsequent track-to-fix leg. A charted leg surrounding a fly-by waypoint should be indicated by a curved line inside the waypoint joining the tangents of the adjacent paths.

Comments: This recommendation affects IACC specifications.

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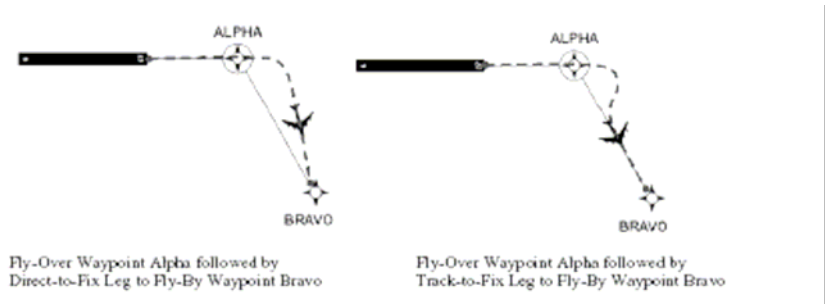
MEETING 03-01: This issue was submitted by Mr. Mark Steinbicker, AFS-410. He recommends that RNAV legs be depicted in a clear and concise manner resembling typical aircraft flight paths. He states “specifically, a charted leg surrounding a fly-over waypoint should intersect the waypoint and emerge in a curved line until proceeding direct to the next waypoint for a subsequent direct-to-fix leg or intersect and join the next path for a subsequent track-to-fix leg. A charted leg surrounding a fly-by waypoint should be indicated by a curved line inside the waypoint joining the tangents of the adjacent paths.” Mr. Jim Terpstra stated that the concept is good but that implementation is more difficult. Mr. Ted Thompson stated that performance characteristics vary by aircraft type as well and that there are chart scale issues. The ACF consensus is that on RNAV procedures where fly-over is designated by the source and the waypoint is followed by a DF leg that the leg be depicted as flown. This ACF consensus only applies to SIDs and STARs. **ACTION:** Mr. John Moore will discuss the ACF consensus on this issue with the IACC and report on the IACC response at the next ACF.

MEETING 03-02: Meeting canceled.

MEETING 04-01: The ACF consensus is that on RNAV procedures where fly-over is designated by the source and the waypoint is followed by a direct-to-fix leg that the leg be depicted as flown. The ACF consensus only applies to SIDs and STARs. Mr. John Moore, AVN-503, reported that he would discuss the ACF consensus and submit a RD at the next MPOC meeting. **ACTION:** NACO AVN-503.

MEETING 04-02: At the 04-01 Aeronautical Charting Forum consensus was reached on this issue and Requirement Document 565 was submitted to the IACC MPOC on June 1, 2004. The requirement document stated that pilots want the intended track of the aircraft depicted on RNAV SIDs and STARs. The intended track would be cartographically rendered based on the type of waypoint, the type of legs into and out of that waypoint and turns required at the waypoint. For instance, if the waypoint were a fly-by waypoint and the legs into and out of the waypoint formed anything other than a straight line, the procedure line would curve prior to the waypoint to intercept the outbound leg. In the same example but with a fly-over waypoint, the outbound procedure line would start at a point 180 degrees from the inbound leg and curve (past the waypoint) to intercept the outbound leg. The procedure track arcs would be indicated with a dashed line, as opposed to the current solid lines, to indicate expected track of an aircraft. Mr. Mike Riley, NGA, stated that DoD Flight Standards non-concurs stating that the current symbology is adequate. Mr. Riley stated that the implied accuracy of the depiction is also an issue for DoD. Mr. Ted Thompson, Jeppesen, agreed stating that the turns on the plainview will not adequately depict the aircraft track due to aircraft performance. The graphical depiction may not depict the ground track. Mr. Ron Canter, NACO, stated that there are one hundred ninety-six RNAV SIDs and twenty-two RNAV STARs that would be affected by this requirement. Mr. Mark Steinbicker, AFS-410, stated that the industry must work towards charting standardization. Mr. Thompson stated that most pilots support this change and Jeppesen is currently working on specifications that will accurately provide this data to its users. Mr. Riley inquired if this was a safety of flight issue. He stated that resources are an issue for DoD and if FAA provides the funding DoD will implement the change. ACF discussion led to the consensus of the ACF that Mr. Mark Steinbicker and Mr. Vincent Chirasello, AFS-410, would submit a revised recommendation document to eliminate the fly-by issue. Recommendation of the ACF is that this issue be applied in the near future. NACO agreed to work towards standardization and provide prototypes of RNAV legs with specific information based on their type at the next ACF. **ACTION:** IACC MPOCs.

MEETING 05-01: Mr. Mark Steinbicker, AFS-410, stated that at the 04-02 Aeronautical Charting Forum consensus was reached to eliminate the fly-by issue and concentrate on the fly-over issue. Mr. Eric Secretan, NACO, provided a brief background on the track types. Mr. Secretan stated that the track types came out of a meeting over three years ago in Oklahoma City. Mr. Carl Moore, AFS-420, originally submitted this issue. Mr. Secretan explained the four track types: Heading – no waypoints shown, ‘hdg’ charted after degrees (i.e., 330 degree hdg), no mileage shown. Direct – waypoint at termination of leg, no course shown, no mileage shown. Course – waypoint at termination of leg, course shown, mileage shown only if first leg upon departure. Track – waypoints at beginning and termination of leg, course shown, mileage shown. NACO provide prototypes depicting the four track types. The Portland Intl Kelyy One Departure prototype is attached to these minutes. Mr. John Moore, NACO, explained the prototype to the ACF participants. Mr. Secretan stated the basic idea is to only provide appropriate information for the leg. Mr. Secretan acknowledged that this does not address the fly-over/fly-by issue. Mr. Steinbicker apologized for not providing the revised recommendation document eliminating the fly-by issue. Mr. Secretan stated that the IACC disagreed with the depiction of the stylized fly-over and comeback type track. However NACO and Jeppesen currently depict this on some charts. Mr. Steinbicker stated that procedure designs are using less and less fly-over waypoints on departures and arrivals. However there are still recognition problems with the fly-over waypoints. The circle around the fly-over points helps with the recognition problem but some type of track depiction going beyond the point would benefit the pilot. Mr. Secretan stated that was the consensus from the last ACF. Fly-by will be shown point-to-point and the fly-over will be a stylized depiction. Mr. Steinbicker stated that currently the chart does not depict what the aircraft will do. The charted paths should be clear, concise, and intuitive as to what the pilot can expect regarding the aircraft flight path as shown in the sample below. **ACTION:** FAA/NACO.



MEETING 05-01: Ms. Valerie Watson, Cartographic Standards, reported that the IACC MPOC is staffing the recommendation document depicting the fly-over waypoint as a stylized line on all procedures. **ACTION:** IACC MPOCs.

MEETING 05-02: Ms. Valerie Watson, Cartographic Standards, reported that the IACC MPOC is staffing the recommendation document depicting the fly-over waypoint as a stylized line on all procedures. **ACTION:** IACC MPOCs.

MEETING 06-01: Lt. Col. Monique Yates, NGA/OMSF, reported that the Department of Defense (DoD) Flip Coordinating Committee (FCC) non-concurred with the proposed IACC RD to graphically depict the flight path for fly-over waypoints as a stylized line on all procedures. Mr. James Spencer, NAVFIG, reported that the Navy non-concurred with the IACC recommendation based on aircraft performance characteristics and the differences in cockpit displays, and moving map displays. The stylized line may not graphically depict the ground

track of the aircraft. The Navy prefers point-to-point straight-line depiction. The Air Force representative stated that they non-concurred for the same reasons. The DoD (Air Force, Navy and Army) unanimously non-concurred. The military response led to extensive discussion by the ACF participants. Mr. Vincent Chirasello, AFS-410, expressed his disappointment stating the fly-by portion of the requirement was eliminated in October 2004 based on the recommendation of the ACF and now we are getting pushback on the fly-over issue. The ACF participants provided several examples of NACG procedures that are currently using the stylized lines. Mr. John Moore, NACG, responded that there are specifications outlining the charting standards and using a stylized line is not currently in our specifications and the procedures in question should be corrected. Mr. Ted Thompson, Jeppesen, commented that there are several other situations where flight tracks are symbolic in nature and do not reflect the true flight tracks such as holding patterns, course reversals, and turn-and-proceed direct-to flight tracks and these are accepted. Mr. Thompson stated that based on user requests, this subject is one of several chart and database compatibility issues being considered by Jeppesen. Regardless of the group's decision, Jeppesen will continue to pursue the issue. Mr. Mark Ingram, ALPA, questioned how many fly-over points are currently in the Jeppesen database. Mr. Thompson responded thousands; the fly-over points will never be eliminated. However, in comparison the percentage of fly-over points are considerably less than fly-by. Mr. Moore inquired if the Military Services would be willing to reconsider their position. Lt. Col. Yates stated that the military would not reconsider their position. Mr. Moore noted that the current specifications are clear and require point-to-point depiction. Mr. Chirasello stressed the importance of charting standardization. Mr. Moore recommended providing DoD examples of problematic charts corrected to show point-to-point depiction for the FCC to review. Lt. Col. Yates commented that perhaps the DoD pilots were not as familiar with the procedures as are the airline pilots. She suggested that ALPA representatives brief the issue at the next FCC meeting. **ACTION:** NACG, Jeppesen, ALPA and NGA/OMS.

MEETING 06-02: Mr. John Moore, NACG, recapped the issue. AFS-410 submitted the issue to standardize the depiction of fly-over waypoints using a stylized line. At the 06-01 ACF, Lt. Col. Monique Yates, NGA/OMSF, reported that the Department of Defense (DoD) Flip Coordinating Committee (FCC) non-concurred with the proposed recommendation to graphically depict the flight path for fly-over waypoints as a stylized line on all procedures. At that meeting, the NACG agreed to provide DoD a PowerPoint presentation depicting problematic procedures. The same procedures were depicted using both stylized lines and point-to-point depiction in two separate examples. Lt. Col. Yates provided the following status report. The FCC is scheduled to meet next week. However, the issue has been discussed at length with the military services. The Navy concurs with the recommendation while the Army and the Air Force non-concur. Two Services carry the FCC vote. Therefore, DoD officially non-concurs with the stylized line recommendation. Additionally, NGA/PVA has issues with the database depiction of stylized lines. Mr. Eric Secretan, NACG reminded the ACF participants that the issue in question is for fly-over waypoints only. The ACF agreed not to use stylized line depiction for fly-by waypoints. DoD stated their position is based on the fact that the lines would be 'stylized' and would not be reflective of true aircraft performance characteristics for different types of aircraft. Lt. Col. Yates stated since DoD non-concurred with the issue it would not be discussed at the next FCC meeting. Mr. Secretan recapped the final ACF position on the issue. Standard depiction of flight tracks will remain as outlined in the IACC Specifications as straight line, point-to-point depiction. Except, when chart clutter is an issue then cartographic judgment will be used. If required, for chart clarity, stylized lines will be used in these instances. The group discussed how these types of flight tracks will be digitally generated once the ESRI (Environmental Systems Research Institute, Inc.) system is in place. The group agreed that until ESRI begins producing the charts, DoD and NACG will continue to use cartographic judgment, depicting

stylized lines when required. Once the charts are produced using the ESRI system only point-to-point straight line depiction will be used. Mr. Secretan commented that ESRI might be able to depict stylized lines with extensive software programming. Mr. Ted Thompson, Jeppesen, commented that this issue is one of several chart and database compatibility issues being considered by Jeppesen. Regardless of the FAA decision, Jeppesen will continue to pursue the issue internally. **CLOSED.**
