PARC Member F2F Summary
March 15-16, 2006

15 March

Roadmap Update - Shahidi
An update on the status of the update to the Roadmap for Performance-based Navigation was given. The original deadline of Jan. 31st was not met due to the extremely large number of comments received. A new schedule was presented, with a final publication date of July 31st. The US is having discussions with ICAO now on where to draw the line between RNP and RNP SAAAR approaches. Capabilities like RF legs, DA' in a turn and other advanced features are the topics of discussion.

Frank Alexander questioned why an RNP .3 procedure had to be a SID or STAR, and it was stated that was an issue that was currently being discussed.

There is an Infrastructure Roadmap currently being developed by the Navigation Services Directorate (ATO-W) that will be published about the same time as the RNP road map. This road map will cover the navigation infrastructure and how many ground based navaids are required to support performance based operations in the NAS. ATO-W is ensuring that the two road maps are properly coordinated.

When discussing the Far Term (2016-2025) features, Frank Alexander had concerns with the goal of "delegation of separation tasks using CDTI (cockpit display of traffic information)". It was suggested that this be removed.

It was stated that both the military and Eurocontrol are concerned with the effect of mandates on their operations in the NAS. More participation from the military was suggested, but their participation in the JPDO may already be enough.

ACTION ITEM: John McGraw and Jeff Williams will determine how to coordinate the use of mandates with the US military.

RNP 0.3 Approaches – McGraw
A briefing was given on FAA recommendations for implementation of performance based approaches. The intent of this recommendation is to match the TSO GPS box performance to be consistent with RNP.
Our recent discussions on approaches has led to the following. All approaches currently are performed by systems that have a level of on-board monitoring and alerting. The agreed to definitions of RNAV is no on board monitoring and alerting. This implies there are no public RNAV approaches and that all performance based approaches can be designated RNP. These fall into two types, RNP 0.3 and RNP SAAAR. Any unique requirements can be met with a special procedure. To implement the RNP 0.3 approaches, the existing criteria in 8260.48 and .51 could be merged to define RNP approach obstacle clearance criteria. Since monitoring and alerting is the key component in the approach, the FAA recommended that the DO

236 containment integrity be used as the basis for RNP. This requirement states the box/single system must alert if the risk of being outside a 2XRNP area is higher than 10^{-5}. Since the integrity alert is at 2XRNP and an RNP alert is not required, the pilot must be given room for extraction. The addition of a secondary obstacle clearance surface (OCS) of 1XRNP would provide this extraction area. A discussion ensued on the predicted effect of secondary areas. Mike Cramer presented some analysis of the Final Approach Segment (FAS) at over 5,000 runway ends. The affect on DA with the 1XRNP secondary area was minimal. This 2+1XRNP OCS is under discussion with ICAO and is consistent with current PANS-OPS. Note: systems with indications of actual performance and if in dual configurations could provide a higher level of integrity and would not necessarily require the extra lateral area. Additionally, PANS-OPS criteria being re-evaluated to determine what level of buffer area might be required.

The advantages of defining RNP approaches and the OCS in this manner are to make these approaches available to a larger population of users and simplify implementation. If advanced, complex performance-based capabilities are added to RNP, procedure production becomes more difficult and time consuming and will reduce the numbers the FAA can produce each year. Some observations were made that the RNAV WG members were not totally in synch with the definitions of RNAV, RNP, and RNP SAAAR that the PARC has recommended to the FAA. Because of this, some of the recommendations are going to be delayed until the members can get their arms around these definitions.

There was some general agreement that the RNAV Approach WG should be renamed the RNP Approach WG. In addition, John McGraw asked that the group respond to the two FAA recommendations within two weeks (end of March):

1. There are no public RNAV approach requirements, only RNP 0.3 and RNP SAAAR.
2. The OCS for RNP approaches will be 2XRNP with a 1XRNP secondary surface for extraction,

There was some discussion on the use of RF legs on public RNP approaches. It was stated that airports in the mountains could benefit greatly from an RF leg during the approach and even in the FAS. The disadvantage of adding this advanced capability to RNP is the increased procedure development complexity and the potential requirement for some sort of SAAAR approval less onerous than that currently defined by AC 90-101.

The RF leg decision was assigned to the RNP Approach WG for resolution.

xLS - DeCleene

Bruce DeCleene presented a recommendation that in the performance-based NAS, where there are no system specific aircraft requirements; there still will be approaches that are system specific. For example, ILS, MLS, and GLS approaches require those

avionics on board. By GLS, Bruce means GBAS. However, no matter which avionics are used, the approach is flown exactly the same. In addition to this, the obstacle clearance surfaces (OCS) have been harmonized where each uses a trapezoidal OCS. In addition to ILS, MLS, and GLS, LPV approaches also use the same trapezoidal OCS. However, since its inception, the LPV approach has been advertised as performance based, meaning its use is not restricted to a specific system. Bruce recommended that all of these approaches be placed in a category titled xLS approaches. The advantage of doing this is in efficiencies gained through common OCS, common survey requirements, and common Part 77 requirements. If this were agreed to, then in the performance based NAS we would have RNP 0.3, RNP SAAAR, and xLS approach procedures.

A lengthy discussion was held that covered:

- The statement by Boeing that ILS total system performance in modern aircraft integration is linear, not angular. However, when you are looking at the signal in space, the error is greater the further you are from the transmitter. This is the classic definition of angular.
- GLS is a linear system and should not have its performance restricted with angular criteria. Current cockpit displays and annunciations may need to be changed if GLS falls into this xLS category. In the future, GLS may also provide guided missed approach.
- Since LPV is currently based on the use of WAAS, it may make sense to make LPV a system specific procedure as well. However, this would restrict future technologies from taking advantage of the LPV minima.

It was stated that there was a need for an Action Team to be formed to review the xLS recommendation. This action team will be assigned to the Critical Decision WG (CDWG).

Action Item: The CDWG will develop a ToR to define all issues involved creating an xLS category of approach. Action is needed quickly for inputs to the RNP Roadmap.

Critical Decisions Priorities, RNAV/RNP/xLS Definitions- Nakamura/Davis

A briefing was given on activities and recommendations of the Critical Decisions Working Group (CDWG).

The CDWG recommended that the PARC approve the approach recommendations presented in John McGraw's RNP 0.3 and Bruce DeCleene's xLS briefings above (reference CDWG PARC Mar 06 Brief – Work Program.ppt). The CDWG recommendation for public RNP approach performance values of 1, 1, 0.3, 1 (Initial, Intermediate, Final, Missed Approach) using LNAV and LNAV with Baro-VNAV capabilities. RNP SAAAR recommendation is for scalable performance values as low as RNP 0.1 with capabilities that include RF legs in any segment, LNAV/VNAV with VEB and LNAV with SBAS/GBAS vertical. The items from these recommendations that remain open for discussion are:

- Accepting the recommendation that there is no need for public RNAV approach.
- Accepting the recommendation that public RNP have 1, 1, 0.3, 1 Performance parameters
- Accepting the recommendation that public RNP OCS surfaces include a 1XRNP secondary area.
- Some members want RF Leg capability to be included in the public RNP approach.

As stated above, the first three bullets are an action item assigned to the RNP WG with an answer desired by the end of March.

During the discussion of runway transitions for STARS it was stated that tailoring of databases and charts could give the same benefit to aircraft that otherwise wouldn't have this capability. There are a large number of aircraft without the capability that could emulate a type 3 STAR with a tailored database.

Action item: The Arrival and Departure Working Group needs to review the CDWG briefing (reference CDWG PARC Mar 06 Brief – Work Program.ppt pg 10 and 11) and provide a recommendation to PARC.

During the discussion of decommissioning NAVAIDS it was stated that the Navigation Services Directorate does not refer to this task as decommissioning. That implies certain specific tasks are accomplished. They are referring to the task of reducing the numbers of NAVAIDS maintained by the FAA as disinvesting. As part of the discussion the question was raised regarding the ability to record the number of instrument approaches flown to determine how much a particular NAVAID is used. One way to accomplish this is to record the types of approaches flown. However, this does not take into account the times during VMC when an approach is flown for familiarization or currency. It was not clear what records are kept by the facility that might be referenced to gather this data. It was stated that the NEWG needed to be aware of this issue to determine if data collection is possible. During the discussion, it was stated that some of the NAVAID disinvesting accomplished to date has been without input from users. Jeff Williams agreed to start a dialog with the NEWG to ensure user needs are considered during the identification process. Roger Walls stated the ATMAC is keeping NAVAID decommissioning on their agenda. The PARC decided to not provide a formal recommendation either to ATMAC or to the FAA (reference CDWG PARC Mar 06 Brief – Work Program.ppt pg 12).

AC90-100 Action Team - Alexander

The team met March 13 and has completed review of draft 7. Work began reviewing draft 8. On slide 4 of the presentation it was noted that when discussing En Route the value is half the RNAV value.

It was requested that a discussion group be formed for Pilot Standards. Randy Kenagy was requested to participate.

A review of the schedule still has the AT recommendation going to the PARC in the June/July time frame. In looking at the future dates when all order, AC, and charting change dates are aligned, it appeared that a reasonable implementation date for AC 90-100A will be February, 2007.

Communications Working Group Roadmap - Oldach/Kraft

An update was given on the work of the Communications Working Group. Over 300 comments were received and reviewed. Comment resolution is in work and final coordination of resolution needs to be completed. The target date for completion of the Data Link Roadmap is the end of April or early May with a formal PARC recommendation to the FAA to ensue. The Flight Plan Study Group has completed their first review of designators.

RNAV Working Group - Burns

The RNP Approach WG has had several telcons to discuss the 16 critical items presented by John McGraw at the November F2F. The FAA asked for six items to be clarified. Of those six, the WG decided to withdraw one item: enable continuous turn using multiple fly-by fixes (simulate RF leg). They also decided to withdraw an item that was to be included in a future update of the TERPS criteria: allow linear widths no larger than existing criteria. The WG clarified the item: enable RF legs on public criteria. They feel that the benefit of RF legs is large enough to add this advanced capability in RNP non-SAAAR approaches. A new item was added for consideration: criteria should be developed to allow one waypoint inside the FAF. Of the six items needing clarification, four remain: 1) allow 3.77^{o} descent angle for all categories on vertically guided approaches; 2)provide a method for temperature correction for non-compensating systems; 3) allow missed approach gradients > 200 feet/nautical mile; 4) enable a multiple segmented vertical angle final approach. Estimated time for completion of these clarifications is July 2006.

Navigation Data Switchover - Speir

The issue was raised that international harmonization was needed, however due to different time zones and busy airports this seems impossible. Ken Speir was tasked with forming a Working Group and determining what the ToRs should be for the group by the next meeting.

ADS-B - Zelechoski

Pat Zelechoski has been identified as the AVS Program Manager for the ADS-B effort. He has been busy getting his arms around the program, determining the budget and laying out what needs to be done. This will require the development of a RSP (Required Surveillance Performance) Road Map. ADS-B provides surveillance to air traffic control, cockpit advisory services and cockpit operational service. JRC Milestone 2A was held in September 2005. Milestone 2B is scheduled for June 2006. The Concept of Operations (CONOPS) developed in 1995 is currently the only document available. An updated CONOPS is due out soon. There was concern stated about the equipage required and what benefits would be gained by the air

carriers. ADS-B equipment today is based on DO260A and are GPS based. Plans for the future are for the ADS-B specification to be a performance based operation and therefore not system specific. ATMAC had received a similar briefing on ADS-B but did not understand that a new cockpit display would be required. It was stated that the PARC and the ATMAC need to coordinate their efforts closely. The intent is to publish a NPRM that requires a 7-10 year mandatory equipage time. Coordination of the technical specifications is currently in work in six RTCA workgroups.

16 March

JPDO/NGATS, and PARC - Arbuckle

Doug Arbuckle updated the PARC on the JPDO efforts. The JPDO considers the PARC work critical to NGATS. However, they want the transition to a performance-based NAS to occur quicker than currently planned. That transition is obviously driven by the available budget. The NGATS will be composed of Network enabled information access (communications and surveillance) and broad area precision navigation, both supporting shared situational awareness. The two primary aspects of this transition to NGATS are: 1) technology innovation and development and 2) policy change and cultural acceptance. NASA has a good handle on what needs to be done to innovate. JPDO is depending on PARC for the policy change and cultural acceptance. JPDO has defined two terms they feel are important to understand. Performance-based operations are really the concepts and requirements for aircraft capabilities. Performance-based services are how you apply the concepts to day-to-day efforts. There was some discussion on the metrics to be used for consumer purposes. JPDO has been thinking that curb-to-curb defines the "trip" for the consumer. AVS is thinking more gate-to-gate. JPDO has some concept-of-use documents they will make available to PARC members for their review and use.

Several items during the briefing were clarified and/or discussed including:

- environmental performance is intended to be noise and emissions
- super density operations will be the last capability addressed due to wake vortex prediction and performance complexity
- Controlled Descent Arrival (CDA) activities are going on independently of performance –based operations considerations. There appear to be different views and definitions of what CDA is. These activities need to be coordinated with ATMAC and with PARC.
- For CDA, one must really consider more than the OEP airports (top 35 airports in the country). For example, a CDA into JFK, EWR or LGA will not do much good if the other area airports in NY City are not part of the procedure. For CDA what really needs to be considered are the "metroplexes" around the OEP airports.

Doug presented the FY08 budget guidance that has been given to the government organizations who participate in the JPDO. This is intended to be a stimulant for dialogue. Draft goals are:

Performance-based services:

a. Publish the anticipated Required Navigation Performance (RNP) that will be required as a function of time and airspace to achieve the needed National Airspace System (NAS) capacity and efficiency in an affordable manner [FAA, DoD, DHS*]
b. Publish the anticipated Required Communications Performance (RCP) that will be required as a function of time and airspace to achieve the needed NAS capacity and efficiency [FAA, DoD, DHS*]
c. Implement RNP/RNAV routes to/from all OEP airports, including Continuous Descent Approach procedures where appropriate [FAA]
d. Quantify the Required Surveillance Performance (RSP) for today's operations, coordinate with ICAO, and utilize RSP as the basis for applying separation procedures [FAA, DoD, DHS*]
e. Redefine procedural surveillance standards and airspace in terms of performance requirements instead of technologies [FAA, DoD, DHS*]

Broad Area Based Navigation:
a. Establish satellite navigation as the primary means of navigation throughout the NAS [FAA, DoD]
b. Determine the secondary navigation system(s) that is (are) acceptable for operations in the NAS [FAA, DoD, DHS].
c. Upon completion of a. and b. above, establish the schedule for ground-based navigation aids identified for decommissioning [FAA, DoD, DHS]

Equivalent Visual Operations:

a. Certify and implement procedures for use of Cockpit Display of Traffic Information (CDTI) during non-visual operations [FAA, DoD, NASA, DHS*]
b. Implement procedures for aircraft taxi in low-visibility conditions using CDTI and airport surface navigation information [FAA, DoD, NASA, DHS*]
    i. Generate requirements
    ii. Survey airport surface features

Doug summarized by saying the JPDO felt there needed to be a RNP/RCP/RSP framework within 10 years to enable the envisioned NGATS in 25 years. The definition of "framework" was discussed. People stated that aircraft manufacturing timelines lasted many years for a model and that once purchase an in operation could have a life span of 20 – 30 years. So if the equipage is not defined before 10 years, the NGATS vision will not be able to be realized within 25 years. Doug stated he would be more definitive on what they meant by a "framework" to help with the discussions in the future. The JPDO will have their Roadmap out for comment this summer and encouraged all the PARC members to review it and provide comments.

RNP Program Office Status - Williams
Jeff Williams gave an update of the FAA's RNP implementation program. One item the FAA needs as we start developing RNP approaches is for PARC to identify the list of airports, similar to the tier 1, 2, 3 list for RNP SAAAR, where RNP approaches

are desired. In addition, Jeff requested that Industry do what they can to ensure their representatives to other forums support the decisions made in the PARC. Jeff is presenting the consensus decision and has received some questions on why the FAA is doing certain things and not others. Jeff stated that 3rd party development has been discussed within the FAA and the effort to analyze the possibility has been ratcheted up. Both ATO and AVS have been tasked to review what policy and process changes need to occur to institute 3rd party development. Once that review is complete, and a decision is made on its feasibility, the next steps will be addressed.
Counting RNP SAAAR Approaches, RNAV Q and T routes, RNAV SIDS and STARS, and RPAT procedures, the FAA implemented 89 new performance-based procedures in FY05. Plans for FY06 and 07 call for about 160 of these procedures to be implemented each year. As an example of the FAA's responsiveness, the South Florida airway reconfiguration was completed in four months, start to finish. This took a tremendous amount of resources. Hassan stated that the current industry coordination version of the RNP Road Map had a goal of having all RNAV SIDS and STARS at the top 50 airports by the end of 2010. He asked if that time line can be met. That remains to be seen. Procedure development times are drastically improving (28% shorter in FY05, almost 50% shorter by FY07) but environmental issues are the greatest challenge. Jeff is trying to show the procedures in the pipeline on the web site so people can keep track of where thongs are going. He is using the prioritization given to him by the PARC. The PARC needs to ensure that is still the priority they desire.

Action Item: Jeff Williams will provide the web site for the ongoing procedure development.
Action item: PARC review the list of 75 airports to confirm the RNP SAAAR implementation priority.

Jeff discussed the implementation of RNP procedures outside the US. During a meeting, a review of one country's implementation indicated they were using a combination of PANSOPS, RNP SAAAR and other criteria to establish an RNP approach. ATO and AFS-400 have been working with this country to help them get started properly. RAA stated that their members did not want funding to go towards development of procedures outside the U.S. Jeff stated that the only resources devoted to work outside the U.S. have been to develop a framework.
Jeff gave his thanks to industry for the RNAV SIDS/STARS implementation at DFW. There has been a problem with multiple transitions on departures. Some pilots are not flying the waypoints and are going straight to the fix. Pilots are indicating the waypoints have been dropped from the FMC. Real time troubleshooting is underway to determine what is happening and the cause. Of the 89 errors at ATL, 1/3 of them have been caused by the wrong data base being applied.

Jeff highlighted potential PARC activities as follows:
a. DME Requirements (Mid/Far Term)
    - Prioritize terminal area locations and en route requirements
b. Emphasize RCP as it applies to ATC and FMS uplinks (4D)

c. Define training requirements
    - Flight crew
d. Future Systems
    - RTA (4D)
    - Vertical RNP
    - Bank Angles

Human Factors WG Update - Abbott/Kerns

Kathy covered the success at ATL of the additional verifications that have caught 11 errors where the wrong departure runway was identified. Nine were entry errors and two were other issues. That gives an average of 1-2 errors per week. Kathy asked if this error rate was acceptable. The general response was that even though it is a very small percentage, it was unacceptable. The HF WG will have a meeting March 21-22 to discuss further.

A discussion was held regarding the wording of the altimeter setting paragraph in AC 90-101. It was questioned how much of this was a Human Factors issue, and what aspects of this the Human Factors Working Group should focus on. The HF issues dealt with the timing of the setting between the IAF and FAF and the associated crew workload that exists during that time to prepare for landing. There were questions raised on the Approach via terminology in the Airbus and on RF legs where a big arc is part of the procedure. RAs are occurring at Palm Springs in this situation and if you get off the RF leg, the aircraft can not reengage the procedure.

The PARC/CAST flight deck automation WG will commence meeting in April.

RPAT Activity - Porter

It was questioned whether the intent was to leave the autopilot coupled during an S-turn maneuver. This was stated to be an open issue.

Wake vortex was discussed, with ALPA stating that wake vortex was not an issue as long as the heavy did not lead.

The draft RPAT Operations Order proposed for inclusion into AC 90-101 is scheduled to be complete by June ’06. The group was tasked with providing a full schedule to the PARC. Airline participation will be required.

Harmonization Activities

ICAO RNP SORSG - Williams/DeCleene/Nakamura

All required representative organizations were said to be participating.

ICAO OCP - Nakamura

Development of the ICAO Procedure Design Manual for RNP has begun. Aircraft categories and speed modules will be different. A completion date of the 3rd quarter of ’06 was given.

ICAO NSP – DeCleene

The ICAO document on RNAV and RNP Operations is being updated. DME/DME and RNP flight inspection will be rolled into the ICAO guidance. There has been some dialogue between Canada and France on Baro-VNAV performance. They have not been satisfied with its performance. The question was dismissed form the NSP because it was not in the NSP area of responsibility.

Work has begun on guidance to use GLS to support low visibility operations down to Cat III, with a completion date scheduled for the end of '07.

LPV operations down to 200' does not match with ICAO Annex 10 due to VAL limits and will need to be changed.

There are no plans for an LNAV/VNAV minima line based on Baro-VNAV.

RTCA ATMAC R&P WG - Wall/Speir

Roger Wall took an action to send the ATMAC minutes to the PARC for greater coordination between the two groups. A list of what the ATMAC is working on will be sent to the PARC.

It was questioned what the real mandates are that the ATMAC is coming down with, and who the AGILE IPT members were. Kathy Abbot was stated as being a member, so it was suggested that she continue her participation but possibly in a more formal role.

Eurocontrol TERA - Kraft

Eurocontrol is working on an Implementation Concept. They are working on mandates to draft implementation rules which would require equipage. The comment period on the document closes on March 27th. There is a meeting scheduled at the FAA to review the document. Tom Kraft was tasked with forwarding the documents to review for posting to the PARC KSN site for PARC Members to review.

FASDAWG Status - Demosthenes

A review of FASDAWG issues that would be discussed in the upcoming FASDAWG F2F meeting was given. Simulator capabilities were said to be the most serious issue, and a request was made to the PARC for a simulator subject matter expert to participate in the FASDAWG discussions on this issue. Ted estimates he is 70% complete and expects to meet the June 30 deadline for providing a recommendation the FAA.

Mapping N8000.287/300 to AC90-101 and 8260.52 - Cramer

The comment matrix with hyperlinks was presented.

It was stated that the new criteria is confusing to procedure designers. We must work with AVN until electronic TERPs are implemented.

When Order 8260.52 was written, industry indicated the maximum command bank angle was 30°. It has since been determined that the maximum angle for some Boeing aircraft is 25°. Therefore, the maximum design bank angle must be lowered from 25° to 20° to preserve the 5° bank angle authority for course correction. Changes to .52 will be worked with the original .52 group.