

CALLBACK

From NASA's Aviation Safety Reporting System



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Observations on RNAV (RNP) Approaches



The RNAV Required Navigation Performance (RNP) approach is fundamental to Performance Based Navigation (PBN) in the FAA's NextGen effort to modernize air transportation. Both complex and challenging, RNAV (RNP) approaches require discipline and teamwork to accomplish. ASRS has received reports describing problems that crews have experienced during execution.

Often, these problems may be classified into one of several types that are usually operationally linked. An untimely approach clearance may leave little time for flight crews to accomplish additional tasks required by an RNAV (RNP) approach. Expectation bias can result in track and altitude deviations. Prior route segments either inserted or omitted in the Flight Management Computer (FMC) coupled with a revised arrival or approach clearance could result in the FMC being programmed with a route that differs from the revised clearance. Finally, errors linking arrival and approach segments in the FMC are common, owing to distractions, communication problems, or procedural discipline.

This month, *CALLBACK* shares two reports that examine problems experienced during RNAV (RNP) approach operations. Lessons may be inferred, but implied with certainty is the close teamwork between Controller and pilots required to execute a successful RNAV (RNP) approach.

Rushing to Expedite

A late approach clearance, expectation bias, and other factors resulted in surprise and a track error while this B737-800 flight crew was conducting RNAV (RNP) operations.

From the Captain's report:

■ *We were descending into Denver via the JAGGR3 RNAV with QWIKE at 210 knots and at 11,000 feet MSL (approximately 6,000 feet AGL). The ATIS had multiple approaches listed to possibly expect, making setting up the approach impossible. The First Officer (FO), Pilot Monitoring (PM), even queried Denver Center if they had any idea what approach we could expect, and they did not. Given the VMC conditions, we expected vectors off the STAR to the ILS RWY 17R. The ATIS did say RNAV approaches could also be assigned, but given the conditions, the weather,*

and my having not flown into Denver in over ten years, I expected vectors to the ILS, not an RNAV (RNP) with a Radius to Fix (RF) leg.

We had been cleared direct to CLPTN and told to keep our speed at 270 knots until told otherwise. At some point we were slowed. As I recall, it was just prior to OPREE, which is 6,000 to 7,000 feet AGL, that we were switched to Approach. When we checked in, the Controller informed us that we were cleared for the RNAV (RNP) Z RWY 17R. I was surprised that they were using that type of approach.... Normally, a Receiver Autonomous Integrity Monitoring (RAIM) prediction is required. I made the comment to the FO that I need to make sure we were even legal for an RNP approach, having not had a RAIM....

I called up the plate on my iPad. This approach has several items that need to be procedurally checked. It has an RF leg, the RNP requirement, and the RF leg speed and [way] points. VOR updating needs to be turned off on page 2 of the NAV STATUS page on the FMC. A lot of heads down time [is needed] to prep for that approach.

As I looked that up, the approach was loaded into the box, all the time quickly approaching QWIKE, which is an Intermediate Fix (IF) on the approach. We were trying to get down, set the approach up, and check...legalities, and all below 10,000 feet AGL. It was very busy, to say the least, and we both missed the route discontinuity in the box from QWIKE to STAAM. As we hit STAAM, we noticed the plane continuing straight ahead and not on the RF leg. I tried to heading-select us around to the leg without success. At this time, the Controller asked us if we were descending on the approach and then told us we were a mile north. The Controller then canceled our approach clearance, gave us a vector, and... cleared us for the ILS approach. At no time was there a TCAS alert of any kind, nor did we come close to any other aircraft. We landed uneventfully, and were told to call TRACON....

I talked to a supervisor, and we discussed the event.... On our part, verifying that the box is correct is paramount. I should have declined the approach and requested the ILS. It would help the crew if more lead time were given if an RNAV (RNP) approach specifically is going to [be] assigned, so that all the proper steps on our part can be accomplished. More specificity on the ATIS to which approach is being

used could allow proper preparation by the pilots. [The ATC Supervisor] said they have been told it is easier for pilots to switch from an ILS approach to an RNAV (RNP) approach procedurally. I told him that is incorrect, and it is not the type of approach that should be given last minute. ... Feeling rushed and crammed to get this approach loaded...and [checking] all the RF points and RNP values loaded us up where we went from the green...into the red comfort zone... very quickly.

There are lots of great learning points for everyone in this event. ... I am reviewing my methodology for future events similar to this. ... There are a lot of steps involved in setting up this approach. We missed the route discontinuity. ... We learned an old lesson again: Check and recheck, and go around if need be.

From the First Officer's report:

■ The ATIS for Denver was winds from the north at 9 knots and landing 17R. If my memory is correct, it said ILS 17R. There was no mention of any other approaches being offered. ...

ATC cleared us for the RNAV (RNP) Z RWY 17R. ... As the PM, I went heads down to load the approach, and as I loaded it, I saw the arc show up as...expected...on the navigation display. ... We were both trying to play catch up on reviewing the approach and briefing what we expected on the approach. We failed to review the legs of the approach in the FMC. We did not notice the discontinuity at QWIK. ...

ATC issued a late approach clearance for an RNAV (RNP). We spent time ensuring we were legal to fly the RNAV (RNP) approach. ... If we had time to review the legs on the approach, we would have noticed the discontinuity. ... Put the appropriate approach and runway on the ATIS. As soon as a flight checks in with Approach, they should give [the crew] the expected approach.

Assumptions Over Austin

Assumptions combined with uncertain procedures and clearance to confuse this A320 Captain, resulting in track and altitude deviations on an RNAV (RNP) Z approach.

■ I programmed the ILS RWY 17L to Austin at the gate. On receiving ATIS, visual approaches with RNAV approaches on request were in use. I briefed and talked with the FO about the approach and decided to setup for the RNAV (RNP) Z RWY 17L. We were on the WLEEE4 RNAV arrival. Center started us down late behind a 737 descending for Austin. We were given, "Descend via." ... We were right behind the 737 at 4 miles. ...

The FO checked [in] on the Approach frequency, "[Callsign] with you at 4,000, request RNAV (RNP) 17L," and I don't recall [the FO] acknowledging the approach, but I do remember ATC giving us a speed and/or altitude change to 2,500 feet, I believe. I saw the 737 break away to the north and assumed he was going to 17R. It was then I realized, "Did [ATC] clear us for the RNAV (RNP) Z?" I directed the FO to verify as we were approaching XWING intersection, which was the IF. The FO waited to get a word in but made contact, and we still had the RNAV (RNP) Z curved approach...in the FMS. ATC confirmed, "No, you must fly the arrival. XWING is still a point on the RNAV arrival."

As we descended through 3,100 [feet], ATC directed us to turn north and climb back to 3,300 feet. ... Radio discussion began about what we were cleared for, and I heard a momentary TCAS TA to my left. According to Approach, it was a 737 on arrival. I [disconnected] the autopilot and started the turn north as I noticed the airspeed decreasing. ... My belief was that the airplane was slowing to [published] speed over the fix on the RNAV (RNP). I manually disengaged all auto settings and hand-flew the airplane.

I was startled by all of this sensory overload. The wrong approach, a TA, a turn right, and getting slow without any input, but I managed to get control of the airspeed as we leveled at 3,300 feet. The Controller turned us left to a 260 heading...and cleared us for a visual once clear of traffic. ... Almost established on inbound course of 175, we were lased from the right side. ... We landed without further incident.

We had assumption bias for the RNAV (RNP) 17L, because it seems airports are now advertising RNAV approaches, which are more work intensive. The ILSs are on but never talked about. This...NextGen throughput...forces us into bad setups like this instead of a vector to final approach to engage an ILS. ... We should have verified, confirmed, and triple checked that what we had in the Multipurpose Control Display Unit (MCDU) was what we were cleared for. ... This RNAV approach has a sneaky tie-in that does not have a discontinuity in the path, so I was just thinking, ... "This is where we need to be."

The RNAV STAR shares a common fix that is almost directly over the final approach. At XWING, you either turn left and descend to the runway, or you turn right (north)...for an eventual vector to final. If someone else makes the same mistake we made, it is just too close to the final, and it puts all parties in a bad spot for loss of separation. That should be redesigned.

I have learned a valuable lesson. Do not assume you are cleared for anything, and verify if you are unsure.

ASRS Alerts Issued in February 2020	
Subject of Alert	No. of Alerts
Aircraft or Aircraft Equipment	3
Airport Facility or Procedure	4
ATC Equipment or Procedure	6
TOTAL	13

483
 A Monthly Safety
 Newsletter from
 The NASA
 Aviation Safety
 Reporting System
 P.O. Box 189
 Moffett Field, CA
 94035-0189
<https://asrs.arc.nasa.gov>

February 2020 Report Intake	
Air Carrier/Air Taxi Pilots	5,037
General Aviation Pilots	1,300
Flight Attendants	777
Controllers	429
Military/Other	300
Mechanics	237
Dispatchers	143
TOTAL	8,223