F500-L16-044

MITRE

Center for Advanced
Aviation System Development

Nuevo Aeropuerto Internacional de la Ciudad de México
Preliminary Airspace Redesign

Informal Working Notes:
NAICM Area Navigation and Conventional Standard Terminal Arrival Routes

Prepared for

Servicios a la Navegación en el Espacio Aéreo Mexicano

September 2016

Introduction

The MITRE Corporation (MITRE) is assisting Aeropuertos y Servicios Auxiliares (ASA) and the aviation authorities of Mexico with the implementation of a new airport, referred to in this document as Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM), to replace the current Aeropuerto Internacional de la Ciudad de México. The proposed runway layout of NAICM will allow for dual- and triple-independent arrival and departure operations.

MITRE has been working closely with Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM) in developing an airspace design for the new Mexico City Terminal Maneuvering Area (TMA) to support NAICM. SENEAM and MITRE conducted an airspace design workshop from 29 February 2016 through 4 March 2016 to assist SENEAM in the airspace redesign of the new Mexico TMA to support NAICM. Following that workshop, modifications to the airspace design occurred. The main modification to the airspace design consisted of changes to the location of the entry and exit points on the new Mexico City TMA boundary related to the Mexico Area Control Center (ACC) Performance-Based Navigation enroute design being developed by SENEAM.

Both SENEAM and MITRE agreed that in order to properly address the above-mentioned modifications and to allow for the development of detailed procedures to move forward, another airspace design workshop was required. Therefore, a large team of MITRE engineers visited Mexico City for two days on 1 and 2 August 2016 to work with SENEAM on the refinement of the routes for the new Mexico City TMA. The workshop was instrumental in advancing the airspace design to an appropriate level that will now allow additional work to commence.

This document, along with its associated appendix, is intended to provide a record of both the SENEAM-MITRE late February/early March 2016 airspace design, as well as the modifications resulting from the above-mentioned airspace design workshop held in early August 2016. These route definitions will provide information to SENEAM on the agreed upon NAICM Area Navigation (RNAV) and conventional Standard Terminal Arrival Route (STAR) definitions (e.g., waypoint names and latitude/longitude coordinates based on World Geodetic System 1984) to allow SENEAM to conduct detailed STAR procedure design work. As a result, SENEAM can determine if potential procedure design issues affect the routes.

The RNAV and conventional STARs for NAICM, refined during the early August 2016 airspace design workshop, are presented in the appendix to this document. The names of the STAR definitions contain the airport landing direction, the expected runway and the TMA entry fix. Note that the opening-day runway configuration will consist of three runways. The three opening-day runways are identified as runway 2, 3, and 6[1]. Also, the STARs are intended to be "open transition" type STARs, which end at a point that allows the controller to vector aircraft to the final approach. Therefore, the final approach is not shown in the appendix figures.

Figures A-1 through A-16 provide information on the RNAV STARs. The RNAV STARs (developed in late February/early March 2016) are shown along with the RNAV STAR modifications that were developed during the early August 2016 airspace design workshop. The RNAV STAR definitions and latitude and longitude waypoint coordinates pertaining to the

[1] Ultimately, NAICM will have six parallel runways. For simplicity, the runways are identified as runways 1 through 6 as counted from west to east.

routes developed during the late February/early March 2016 airspace design workshop are contained in the table on the left. The RNAV STAR definitions and latitude and longitude waypoint coordinates, as well as the segment or leg type and turn types (described below) pertaining to the routes developed during the early August 2016 airspace design workshop are contained in the table on the right. The graphic underneath the two tables shows a visualization of both of the routes. The late February/early March 2016 routes are shown in a solid blue line while the early August 2016 routes are shown in dashed blue line. The coordinates of the waypoints that changed from the airspace design from the late February/early March 2016 RNAV STAR definitions are highlighted in the tables on the right in green.

There are numerous leg types that can be used when designing procedures. However, in the United States, for general procedure design typically only a few leg types are used. The leg types used in the NAICM airspace design developed in early August 2016 are Initial Fix (IF), Direct to Fix (DF), Track to Fix (TF), Course to Fix (CF), Heading to Altitude (VA), Heading to Intercept (VI) and Course from a Fix to Manual Termination (FM). The turn types shown in the procedure definitions in the appendix are Fly By (FB) or Fly Over (FO), which dictates the point at which the aircraft will start the turn. With a FB turn type, the aircraft will turn inside of the route lines and go by the waypoint, while with a FO turn type the aircraft will not start its turn until the aircraft has passed the waypoint resulting in a turn that is outside of the route lines.

For the route definitions from the early August 2016 workshop, MITRE included for the STAR all downwind waypoints that are used in both the Land South and Land North configuration. This is in preparation for the next part of the design process, which involves procedurally separating the arrivals from the departures. As SENEAM and MITRE work through that process, some, all or none of these waypoints may be used and the appropriate addition or removal of waypoints will take place at that time.

The modification of the new Mexico City TMA boundary entry and exit points also affected the conventional STAR definitions that were developed during the late February/early March 2016 airspace design workshop. Therefore, the conventional STARs were modified during the early August 2016 airspace design workshop. The conventional STAR route information is provided in Figures A-17 through A-20. The concept of the conventional STARs remains the same as what was considered during the late February/early March 2016 workshop, where non-RNAV equipped aircraft would follow a procedure which takes the aircraft direct to the NAICM Very High Frequency (VHF) Omnidirectional Range (VOR). Once the aircraft enters the new Mexico City TMA they can expect radar vectors from the procedure for sequencing to the assigned runway. The conventional STAR is the same for both operational directions. The difference is how the controller would vector the aircraft to the approach procedure for each runway.

Appendix

NAICM RNAV and Conventional STAR Definitions

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NW1_Land_South_R2
Airport: NAICM
Flight Type: ARR

	Degrees, Minutes, Seconds (DMS)	
Point	Latitude	Longitude
ICM_WP001	N20° 13' 46.72"	W099° 44' 21.28"
ICM_WP041	N20° 03' 04.05"	W099° 06' 40.32"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NW1_Land_South_R2 (FR017)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR017	IF		N20° 06' 19.34"	W099° 51' 11.85"
ICM_WP041	TF	FO	N20° 03' 04.05"	W099° 06' 40.32"
ICM_WP041	FM		N20° 03' 04.05"	W099° 06' 40.32"

Figure A-1 displays the late February/early March 2016 design in solid blue beginning at ICM_WP001 along with the early August 2016 design in dashed blue beginning at FR017. Both routes terminate at ICM_WP041 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 2 (17L) but aircraft can be vectored to any of the parallel runways.

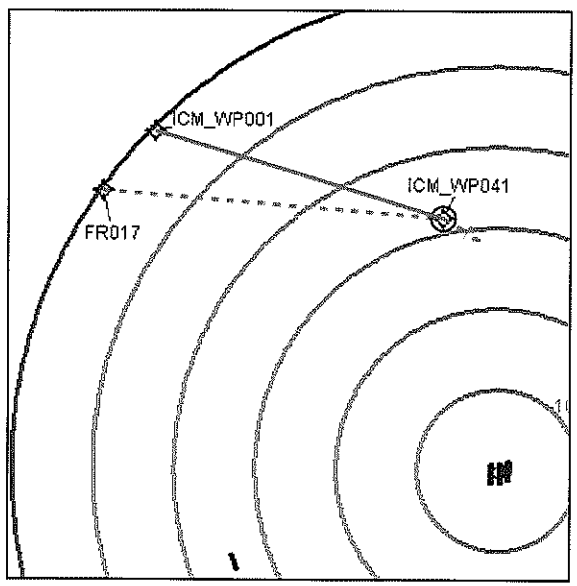

Figure A-1. <u>NAICM RNAV STAR Runway 2 Land South</u> (NAICM_STAR_NW1_Land_South_R2 [FR017])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NW2_Land_South_R3
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP002	N20° 21' 26.79"	W099° 34' 30.88"
ICM_WP042	N20° 11' 33.99"	W098° 57' 48.19"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NW2_Land_South_R3 (FR018)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR018	IF		N20° 20' 26.42"	W099° 36' 22.31"
ICM_WP072	TF	FO	N20° 13' 14.22"	W099° 02' 48.99"
ICM_WP072	FM		N20° 13' 14.22"	W099° 02' 48.99"

Figure A-2 displays the late February/early March 2016 design in solid blue beginning at ICM_WP002 along with the early August 2016 design in dashed blue beginning at FR018. The late February/early March 2016 route terminated at ICM_WP042, which was placed on an extension of the final approach course (FAC) for Runway 3 (18R). The new proposed route terminates with an FM leg at ICM_WP072, which is positioned approximately 5 NM from the FAC. It is expected that this route will primarily feed Runway 3 (18R), but aircraft can be vectored to any of the parallel runways.

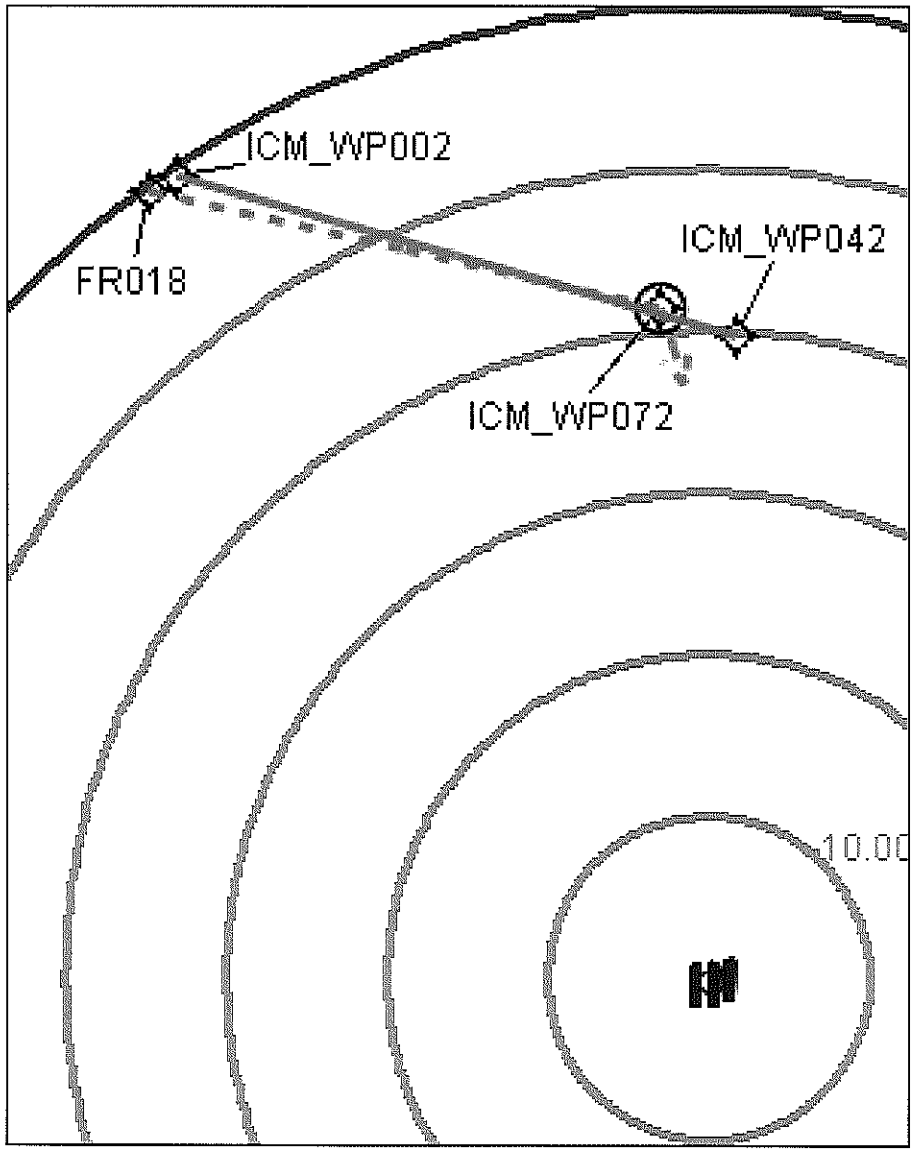

Figure A-2. <u>NAICM RNAV STAR Runway 3 Land South</u> (NAICM_STAR_NW2_Land_South_R3 [FR018])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NE2_Land_South_R3
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP003	N20° 21' 26.20"	W098° 23' 50.88"
ICM_WP042	N20° 11' 33.99"	W098° 57' 48.19"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NE1_Land_South_R3 (FR004)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR004	IF		N20° 20' 26.42"	W098° 22' 13.11"
ICM_WP071	TF	FO	N20° 12' 54.17"	W098° 52' 40.72"
ICM_WP071	FM		N20° 12' 54.17"	W098° 52' 40.72"

Figure A-3 displays the late February/early March 2016 design in solid blue beginning at ICM_WP003 along with the early August 2016 design in dashed blue beginning at FR004. The late February/early March 2016 route terminated at ICM_WP042, which was placed on an extension of the FAC for Runway 3 (18R). The new proposed route terminates in an FM leg at ICM_WP071, which is positioned approximately 5 NM from the FAC. It is expected that this route will primarily feed Runway 3 (18R), but aircraft can be vectored to any of the parallel runways.

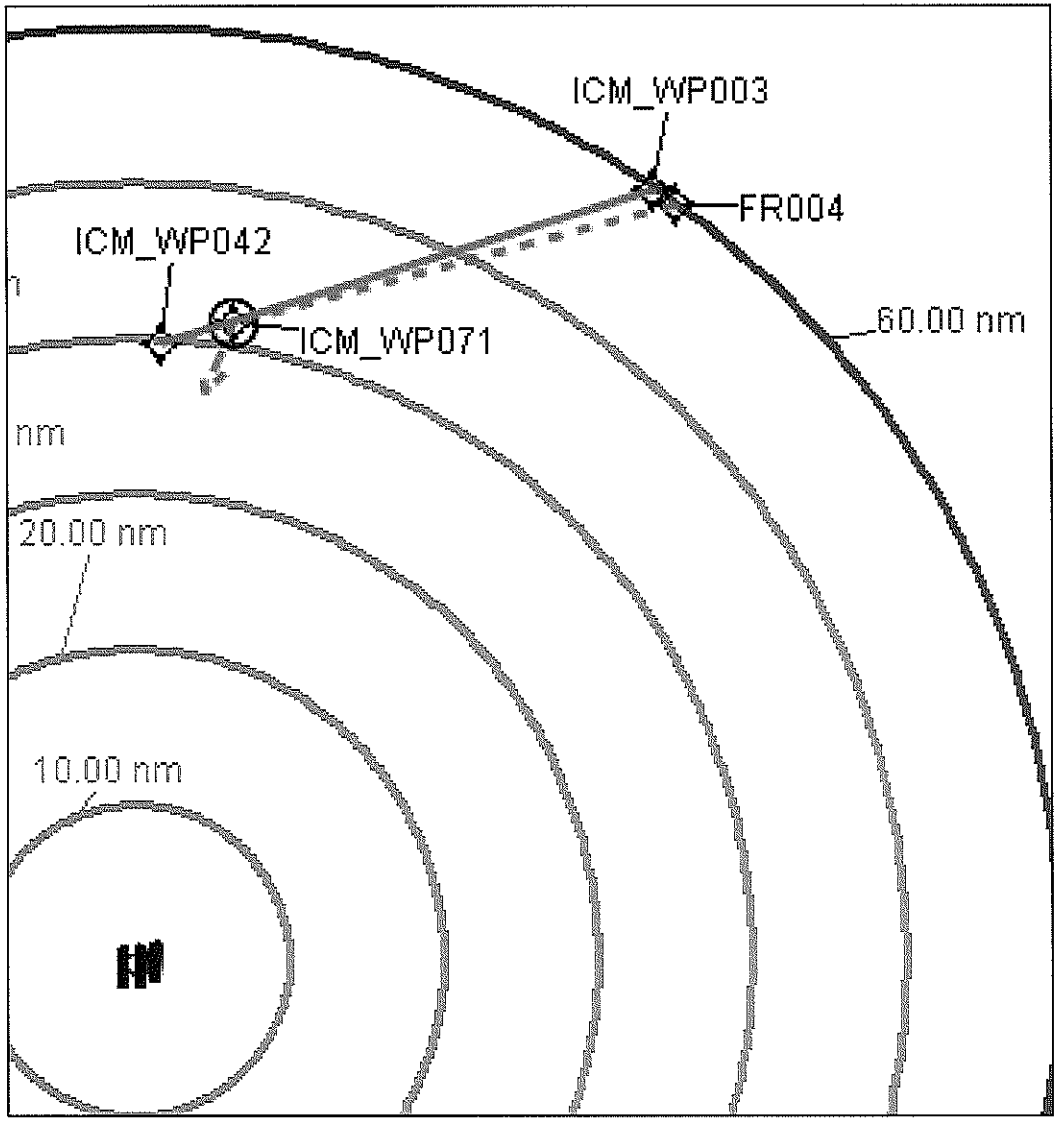

Figure A-3. <u>NAICM RNAV STAR Runway 3 Land South</u> (NAICM_STAR_NE1_Land_South_R3 [FR004])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NE1_Land_South_R6
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP004	N20° 13' 45.90"	W098° 14' 00.56"
ICM_WP040	N20° 02' 29.83"	W098° 49' 24.06"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NE2_Land_South_R6 (FR005)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR005	IF		N20° 06' 19.34"	W098° 07' 23.57"
ICM_WP040	TF	FO	N20° 02' 29.83"	W098° 49' 24.06"
ICM_WP040	FM		N20° 02' 29.83"	W098° 49' 24.06"

Figure A-4 displays the late February/early March 2016 design in solid blue beginning at ICM_WP004 along with the early August 2016 design in dashed blue beginning at FR005. Both routes terminate at ICM_WP040 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 6 (19L), but aircraft can be vectored to any of the parallel runways.

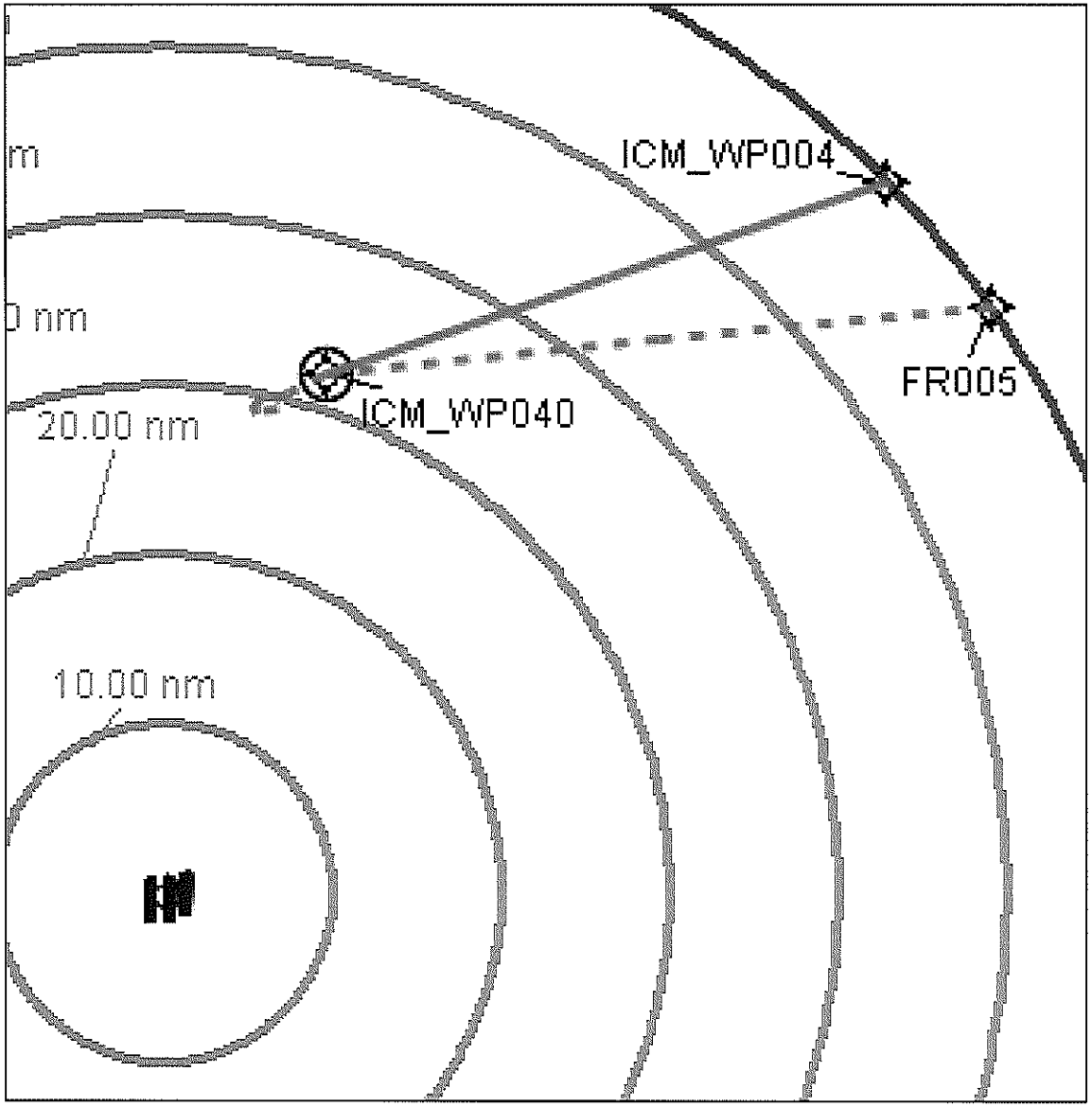

Figure A-4. <u>NAICM RNAV STAR Runway 6 Land South</u> (NAICM_STAR_NE2_Land_South_R6 [FR005])

Route: NAICM_STAR_SE1_Land_South_R6 (FR009)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR009	IF		N18° 56' 22.55"	W098° 07' 45.83"
ICM_WP069	TF	FB	N19° 17' 29.22"	W098° 36' 47.58"
ICM_WP070	TF	FB	N19° 27' 37.25"	W098° 50' 48.53"
ICM_WP014	TF	FB	N19° 40' 57.29"	W098° 50' 18.32"
ICM_WP065	TF	FB	N19° 45' 58.20"	W098° 50' 06.92"
ICM_WP038	TF	FO	N19° 57' 29.12"	W098° 49' 40.74"
ICM_WP038	FM		N19° 57' 29.12"	W098° 49' 40.74"

Figure A-5 shows a new proposed route with no previous versions so only one table is presented above. Figure A-5 below displays the early August 2016 routing in dashed blue beginning at FR009. The route is designed to remain at least 3 NM from restricted airspace MMP-159 before turning north on a downwind leg at ICM_WP070. The route terminates at ICM_WP038 in an FM leg. It is expected that this route will primarily feed Runway 6 (19L), but aircraft can be vectored to any of the parallel runways.

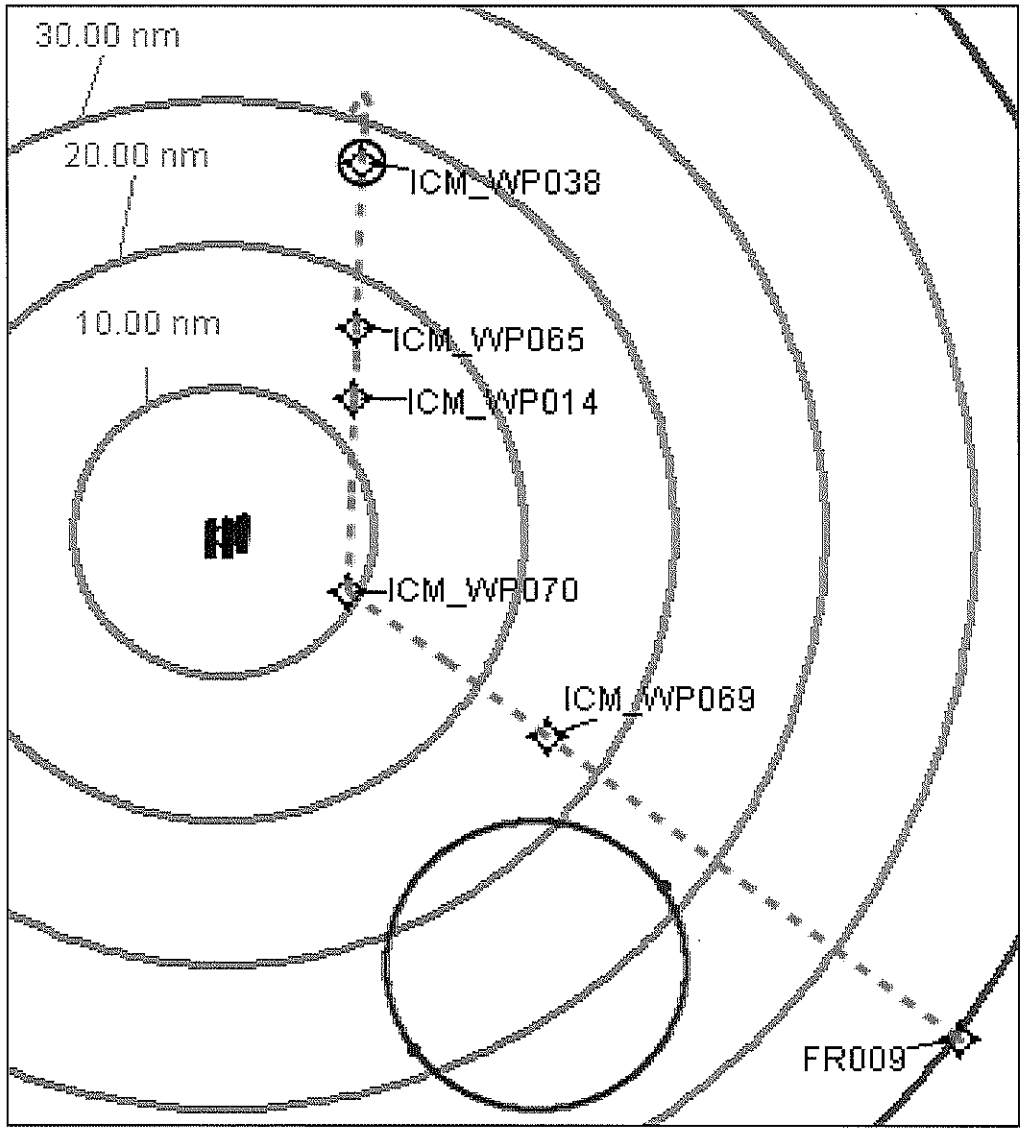

Figure A-5. <u>NAICM RNAV STAR Runway 6 Land South</u> (NAICM_STAR_SE1_Land_South_R6 [FR009])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_SE_Land_South_R6
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP005	N18° 41' 24.16"	W098° 23' 45.24"
ICM_WP024	N18° 52' 25.33"	W098° 52' 07.92"
ICM_WP038	N19° 57' 29.12"	W098° 49' 40.74"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SE2_Land_South_R6 (FR010)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR010	IF		N18° 42' 22.61"	W098° 22' 35.37"
ICM_WP024	TF	FB	N18° 52' 25.33"	W098° 52' 07.92"
ICM_WP063	TF	FB	N19° 08' 09.29"	W098° 51' 32.51"
ICM_WP070	TF	FB	N19° 27' 37.25"	W098° 50' 48.53"
ICM_WP014	TF	FB	N19° 40' 57.29"	W098° 50' 18.32"
ICM_WP065	TF	FB	N19° 45' 58.20"	W098° 50' 06.92"
ICM_WP038	TF	FO	N19° 57' 29.12"	W098° 49' 40.74"
ICM_WP038	FM		N19° 57' 29.12"	W098° 49' 40.74"

Figure A-6 displays the late February/early March 2016 design in solid blue beginning at ICM_WP005 along with the early August 2016 design in dashed blue beginning at FR010. Both routes terminate at ICM_WP038 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 6 (19L), but aircraft can be vectored to any of the parallel runways.

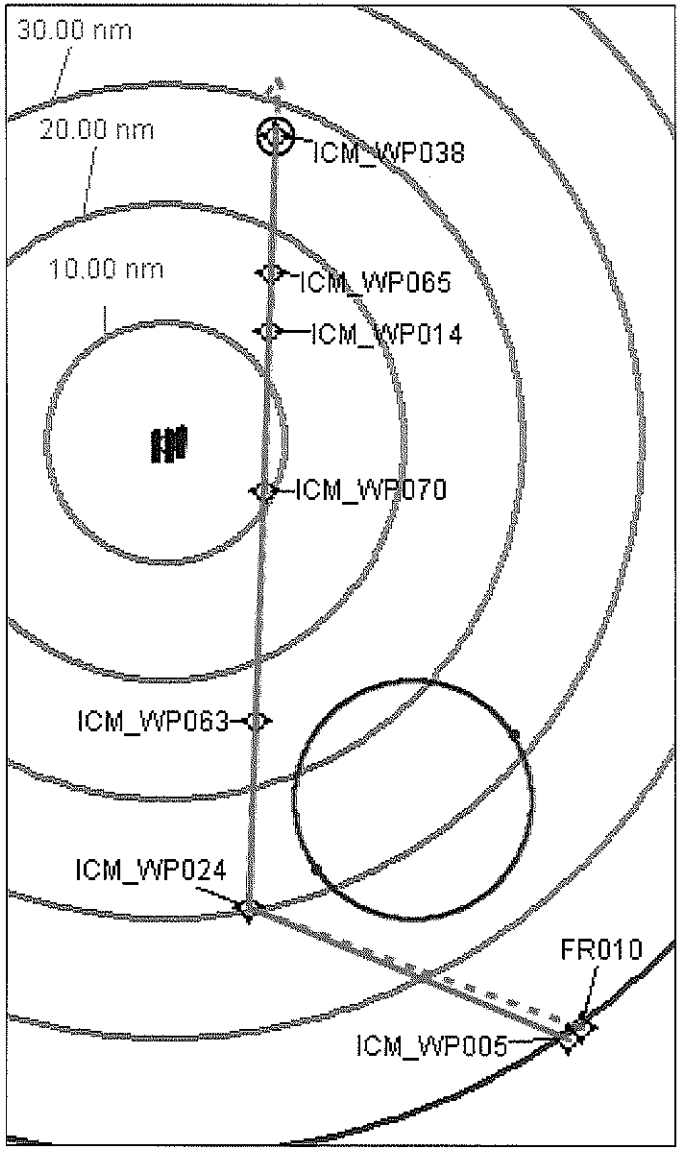

Figure A-6. <u>NAICM RNAV STAR Runway 6 Land South</u> (NAICM_STAR_SE2_Land_South_R6 [FR010])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_SW_Land_South_R2
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP007	N18° 29' 55.05"	W099° 29' 43.81"
ICM_WP026	N19° 21' 18.58"	W099° 08' 16.80"
ICM_WP037	N19° 58' 03.34"	W099° 06' 57.00"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SW1_Land_South_R2 (FR012)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR012	IF		N18° 42' 22.61"	W099° 36' 00.05"
ICM_WP068	TF	FB	N19° 16' 17.31"	W099° 08' 28.16"
ICM_WP045	TF	FB	N19° 40' 34.76"	W099° 07' 35.58"
ICM_WP064	TF	FB	N19° 45' 35.65"	W099° 07' 24.73"
ICM_WP037	TF	FO	N19° 58' 03.34"	W099° 06' 57.00"
ICM_WP037	FM		N19° 58' 03.34"	W099° 06' 57.00"

Figure A-7 displays the late February/early March 2016 design in solid blue beginning at ICM_WP007 along with the early August 2016 design in dashed blue beginning at FR012. Both routes terminate at ICM_WP037 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 2 (17L), but aircraft can be vectored to any of the parallel runways.

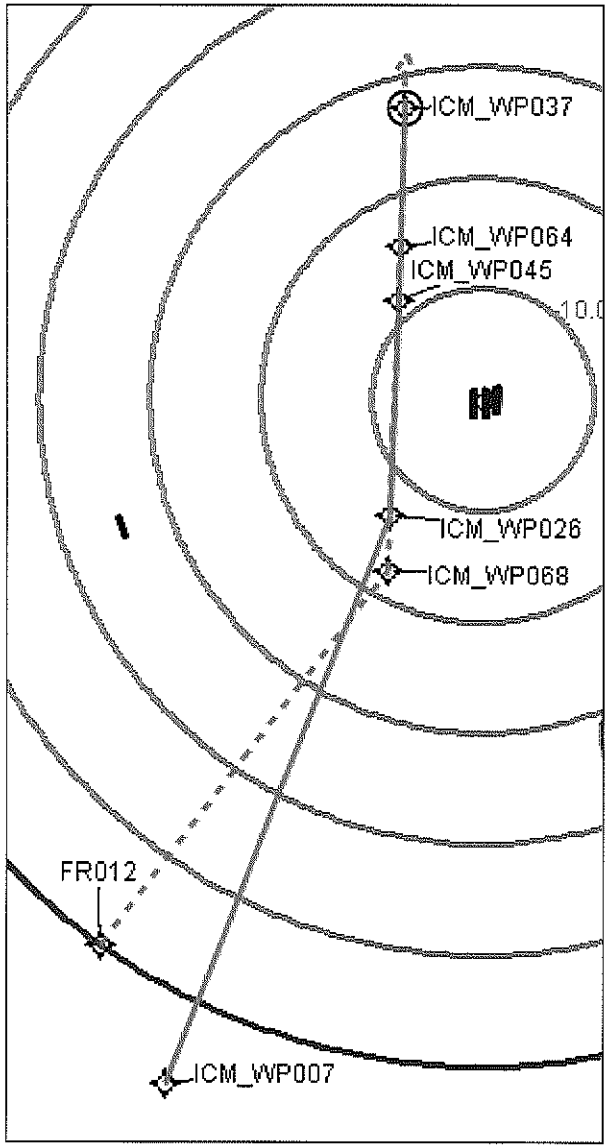

Figure A-7. <u>NAICM RNAV STAR Runway 2 Land South</u> (NAICM_STAR_SW1_Land_South_R2 [FR012])

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SW2_Land_South_R2 (FR013)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR013	IF		N18° 56' 22.55"	W099° 50' 49.59"
ICM_WP026	TF	FB	N19° 21' 18.27"	W099° 08' 17.32"
ICM_WP045	TF	FB	N19° 40' 34.76"	W099° 07' 35.58"
ICM_WP064	TF	FB	N19° 45' 35.65"	W099° 07' 24.73"
ICM_WP037	TF	FO	N19° 58' 03.34"	W099° 06' 57.00"
ICM_WP037	FM		N19° 58' 03.34"	W099° 06' 57.00"

Figure A-8 shows a new proposed route with no previous versions so only one table is presented above. Figure A-8 below displays the early August 2016 routing in dashed blue beginning at FR013. This route terminates at ICM_WP037 in an FM leg. It is expected that this route will primarily feed Runway 2 (17L), but aircraft can be vectored to any of the parallel runways.

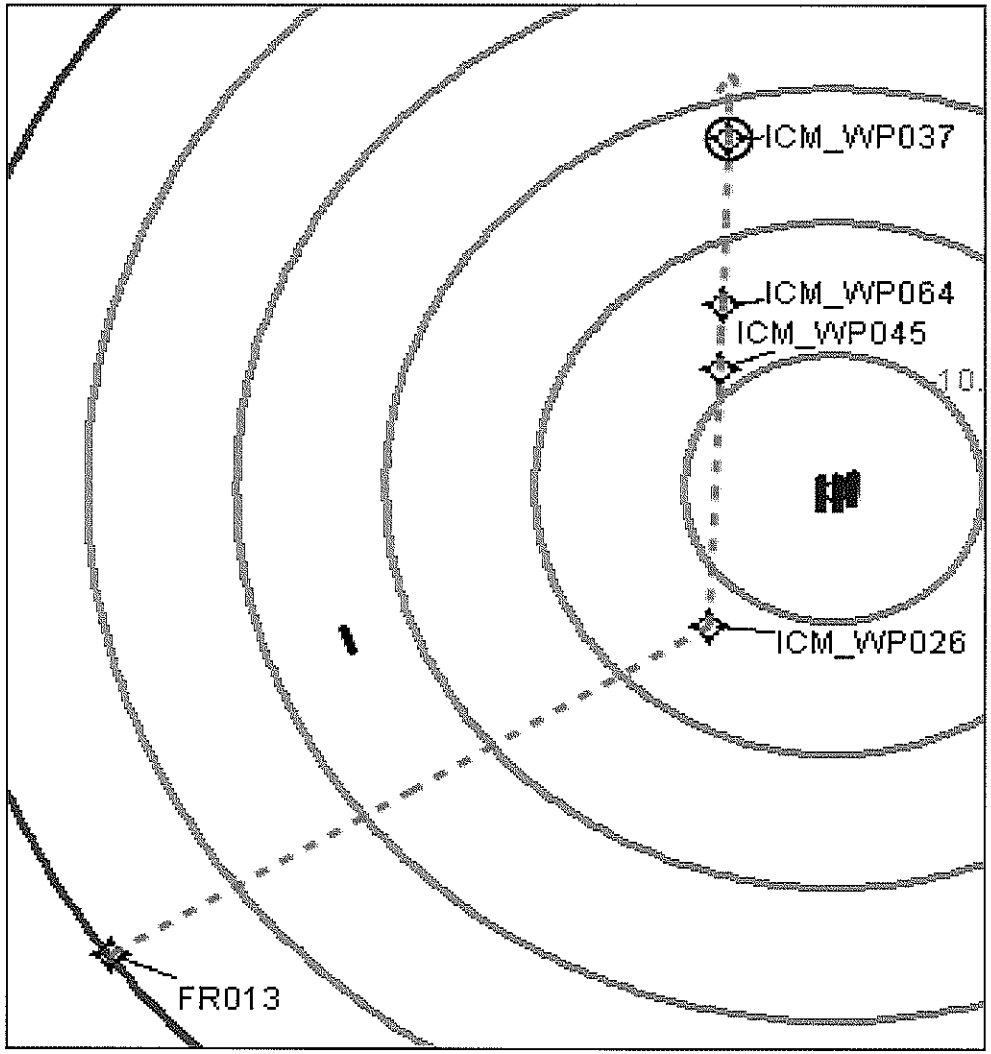

Figure A-8. <u>NAICM RNAV STAR Runway 2 Land South</u> (NAICM_STAR_SW2_Land_South_R2 [FR013])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NW1_Land_North_R2
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP001	N20° 13' 46.72"	W099° 44' 21.28"
ICM_WP045	N19° 40' 34.62"	W099° 07' 35.37"
ICM_WP011	N18° 58' 01.56"	W099° 09' 06.93"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NW1_Land_North_R2 (FR017)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR017	IF		N20° 06' 19.34"	W099° 51' 11.85"
ICM_WP045	TF	FB	N19° 40' 34.76"	W099° 07' 35.58"
ICM_WP026	TF	FB	N19° 21' 18.27"	W099° 08' 17.32"
ICM_WP068	TF	FB	N19° 16' 17.31"	W099° 08' 28.16"
ICM_WP011	TF	FO	N18° 58' 01.56"	W099° 09' 06.93"
ICM_WP011	FM		N18° 58' 01.56"	W099° 09' 06.93"

Figure A-9 displays the late February/early March 2016 design in solid blue beginning at ICM_WP001 along with the early August 2016 design in dashed blue beginning at FR017. Both routes terminate at ICM_WP011 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 2 (35R), but aircraft can be vectored to any of the parallel runways.

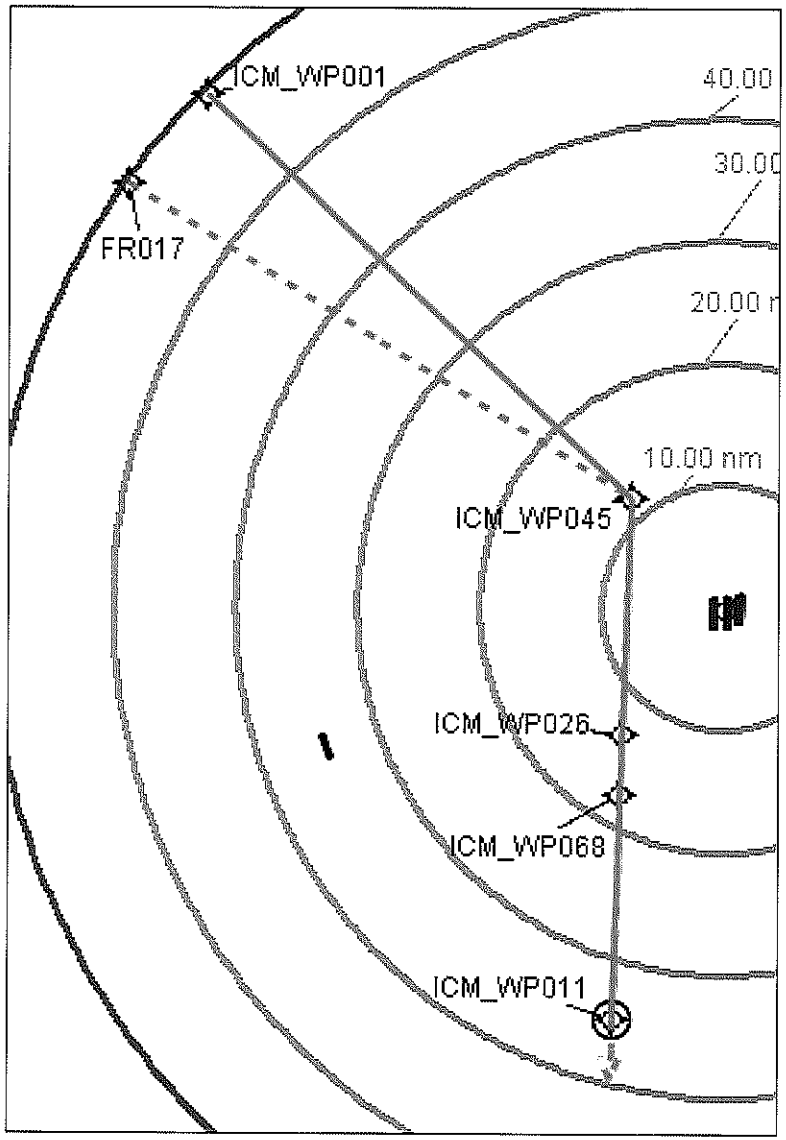

Figure A-9. <u>NAICM RNAV STAR Runway 2 Land North</u> (NAICM_STAR_NW1_Land_North_R2 [FR017])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NW2_Land_North_R2
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP002	N20° 21' 26.79"	W099° 34' 30.88"
ICM_WP021	N20° 01' 08.64"	W099° 13' 00.91"
ICM_WP045	N19° 40' 34.62"	W099° 07' 35.37"
ICM_WP011	N18° 58' 01.56"	W099° 09' 06.93"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NW2_Land_North_R2 (FR018)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR018	IF		N20° 20' 26.42"	W099° 36' 22.31"
ICM_WP064	TF	FB	N19° 45' 35.65"	W099° 07' 24.73"
ICM_WP026	TF	FB	N19° 21' 18.27"	W099° 08' 17.32"
ICM_WP068	TF	FB	N19° 16' 17.31"	W099° 08' 28.16"
ICM_WP011	TF	FO	N18° 58' 01.56"	W099° 09' 06.93"
ICM_WP011	FM		N18° 58' 01.56"	W099° 09' 06.93"

Figure A-10 displays the late February/early March 2016 design in solid blue beginning at ICM_WP002 along with the early August 2016 design in dashed blue beginning at FR018. Both routes terminate at ICM_WP011 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 2 (35R), but aircraft can be vectored to any of the parallel runways.

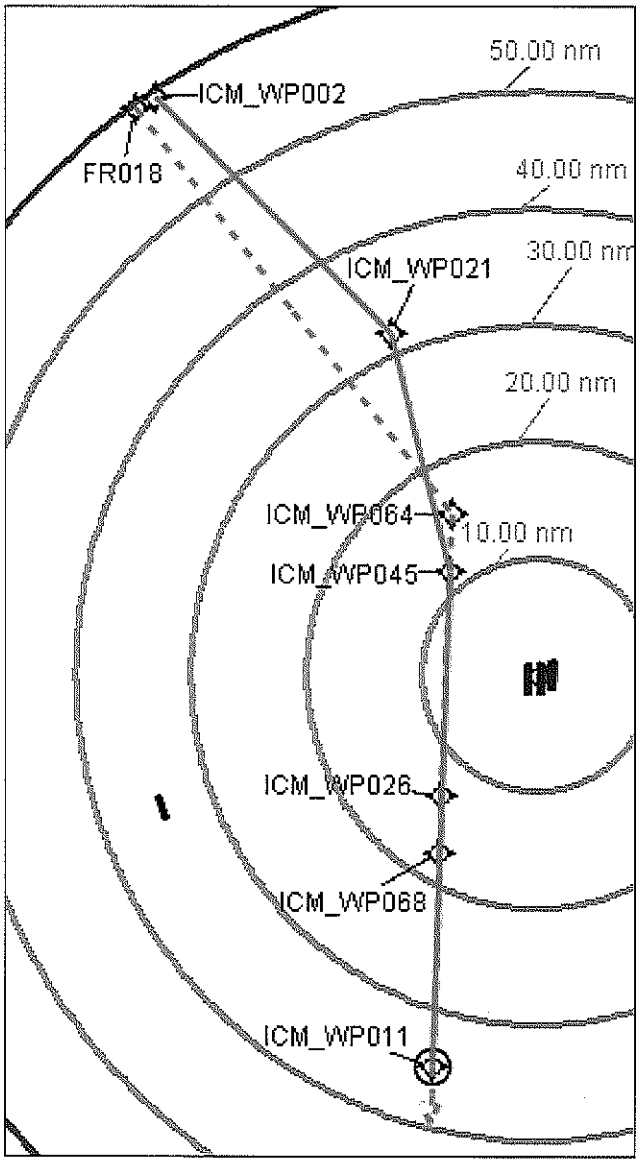

Figure A-10. <u>NAICM RNAV STAR Runway 2 Land North</u> (NAICM_STAR_NW2_Land_North_R2 [FR018])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NE2_Land_North_R6
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP003	N20° 21' 26.20"	W098° 23' 50.88"
ICM_WP022	N20° 00' 06.87"	W098° 43' 11.26"
ICM_WP014	N19° 40' 56.95"	W098° 50' 18.89"
ICM_WP012	N18° 57' 27.33"	W098° 51' 57.12"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NE1_Land_North_R6 (FR004)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR004	IF		N20° 20' 26.42"	W098° 22' 13.11"
ICM_WP065	TF	FB	N19° 45' 58.20"	W098° 50' 06.92"
ICM_WP070	TF	FB	N19° 27' 37.25"	W098° 50' 48.53"
ICM_WP063	TF	FB	N19° 08' 09.29"	W098° 51' 32.51"
ICM_WP012	TF	FO	N18° 57' 27.31"	W098° 51' 56.60"
ICM_WP012	FM		N18° 57' 27.31"	W098° 51' 56.60"

Figure A-11 displays the late February/early March 2016 design in solid blue beginning at ICM_WP003 along with the early August 2016 design in dashed blue beginning at FR004. Both routes terminate at ICM_WP012 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 6 (01R), but aircraft can be vectored to any of the parallel runways.

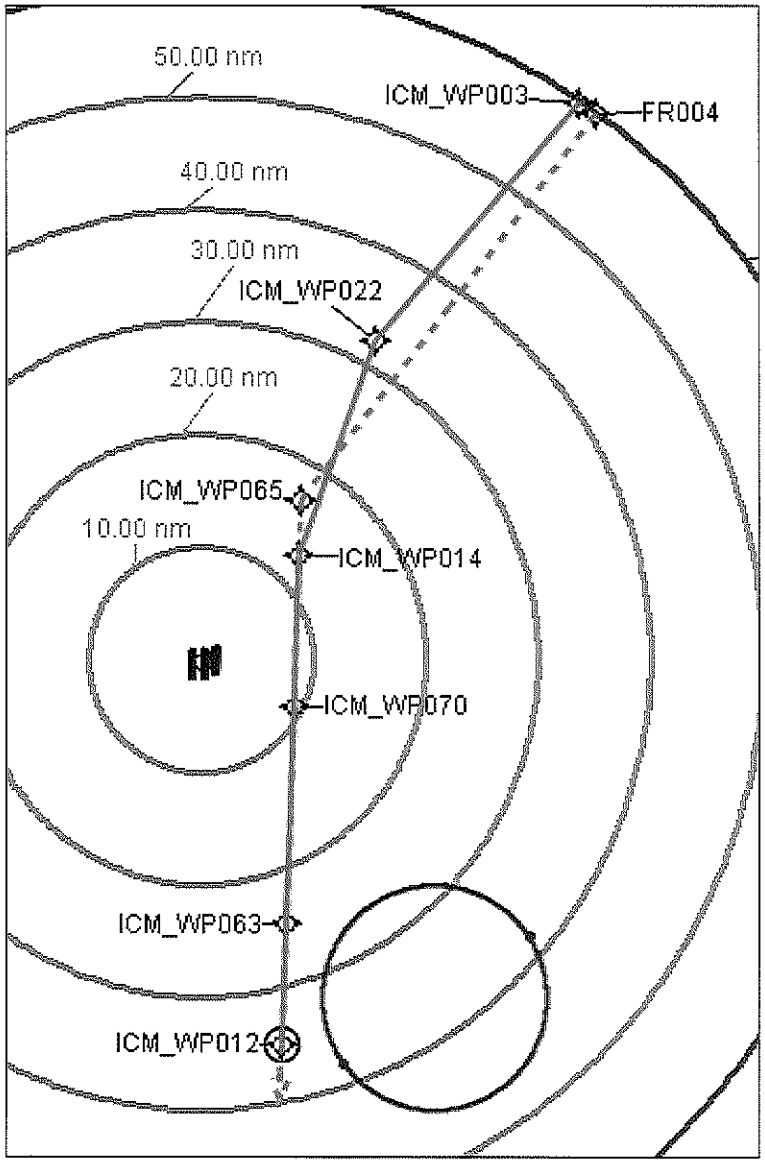

Figure A-11. <u>NAICM RNAV STAR Runway 6 Land North</u> (NAICM_STAR_NE1_Land_North_R6 [FR004])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_NE1_Land_North_R6
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP004	N20° 13' 45.90"	W098° 14' 00.56"
ICM_WP014	N19° 40' 56.95"	W098° 50' 18.89"
ICM_WP012	N18° 57' 27.33"	W098° 51' 57.12"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_NE2_Land_North_R6 (FR005)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR005	IF		N20° 06' 19.34"	W098° 07' 23.57"
ICM_WP014	TF	FB	N19° 40' 57.29"	W098° 50' 18.32"
ICM_WP070	TF	FB	N19° 27' 37.25"	W098° 50' 48.53"
ICM_WP063	TF	FB	N19° 08' 09.29"	W098° 51' 32.51"
ICM_WP012	TF	FO	N18° 57' 27.31"	W098° 51' 56.60"
ICM_WP012	FM		N18° 57' 27.31"	W098° 51' 56.60"

Figure A-12 displays the late February/early March 2016 design in solid blue beginning at ICM_WP004 along with the early August 2016 design in dashed blue beginning at FR005. Both routes terminate at ICM_WP012 with the new proposed route ending in an FM leg. It is expected that this route will primarily feed Runway 6 (01R), but aircraft can be vectored to any of the parallel runways.

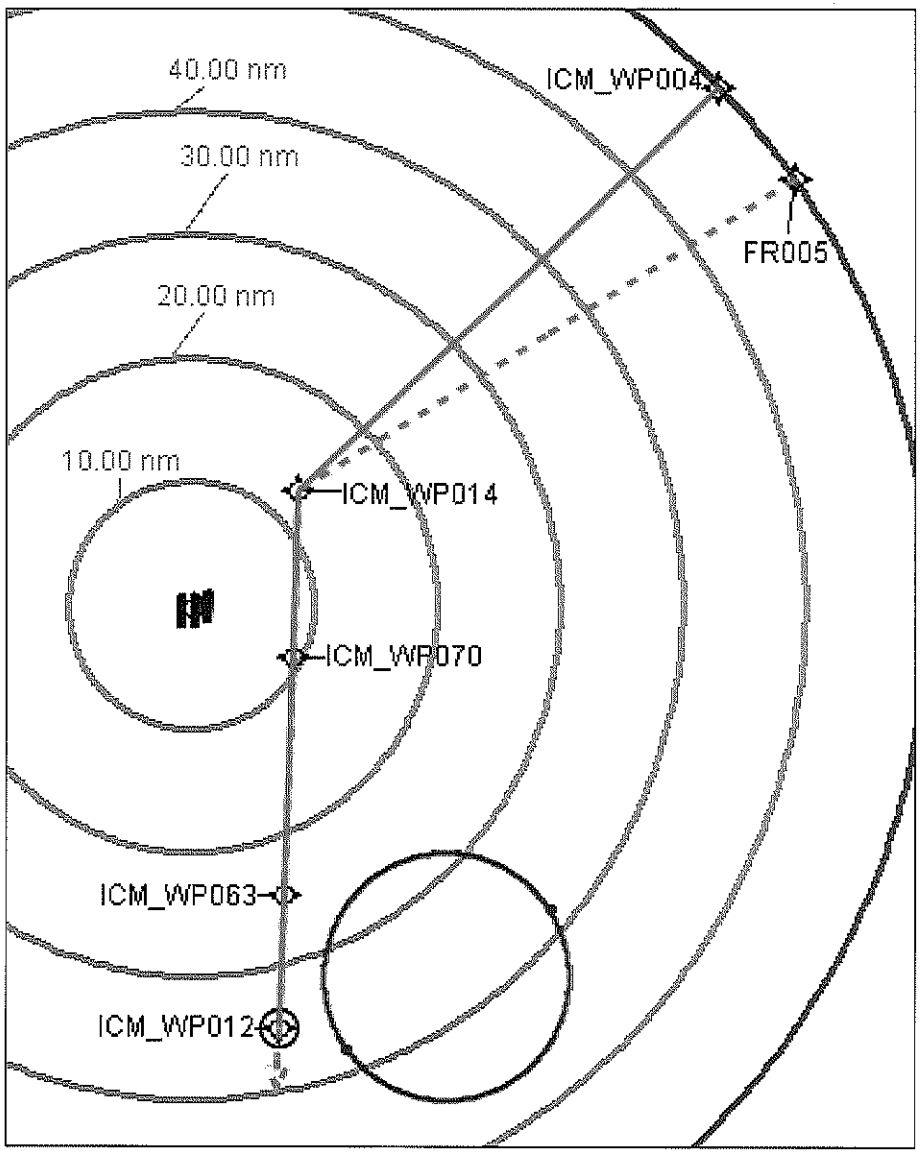

Figure A-12. <u>NAICM RNAV STAR Runway 6 Land North</u> (NAICM_STAR_NE2_Land_North_R6 [FR005])

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SE1_Land_North_R6 (FR009)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR009	IF		N18° 56' 22.55"	W098° 07' 45.83"
ICM_WP069	TF	FB	N19° 17' 29.22"	W098° 36' 47.58"
ICM_WP063	TF	FB	N19° 08' 09.29"	W098° 51' 32.51"
ICM_WP012	TF	FO	N18° 57' 27.31"	W098° 51' 56.60"
ICM_WP012	FM		N18° 57' 27.31"	W098° 51' 56.60"

Figure A-13 shows a new proposed route with no previous versions so only one table is presented above. Figure A-13 below displays the early August 2016 routing in dashed blue beginning at FR009. The route is designed to remain at least 3 NM from restricted airspace MMP-159 before turning south on a downwind leg at ICM_WP063. The route terminates at ICM_WP012 with an FM leg. It is expected that this route will primarily feed Runway 6 (01R), but aircraft can be vectored to any of the parallel runways.

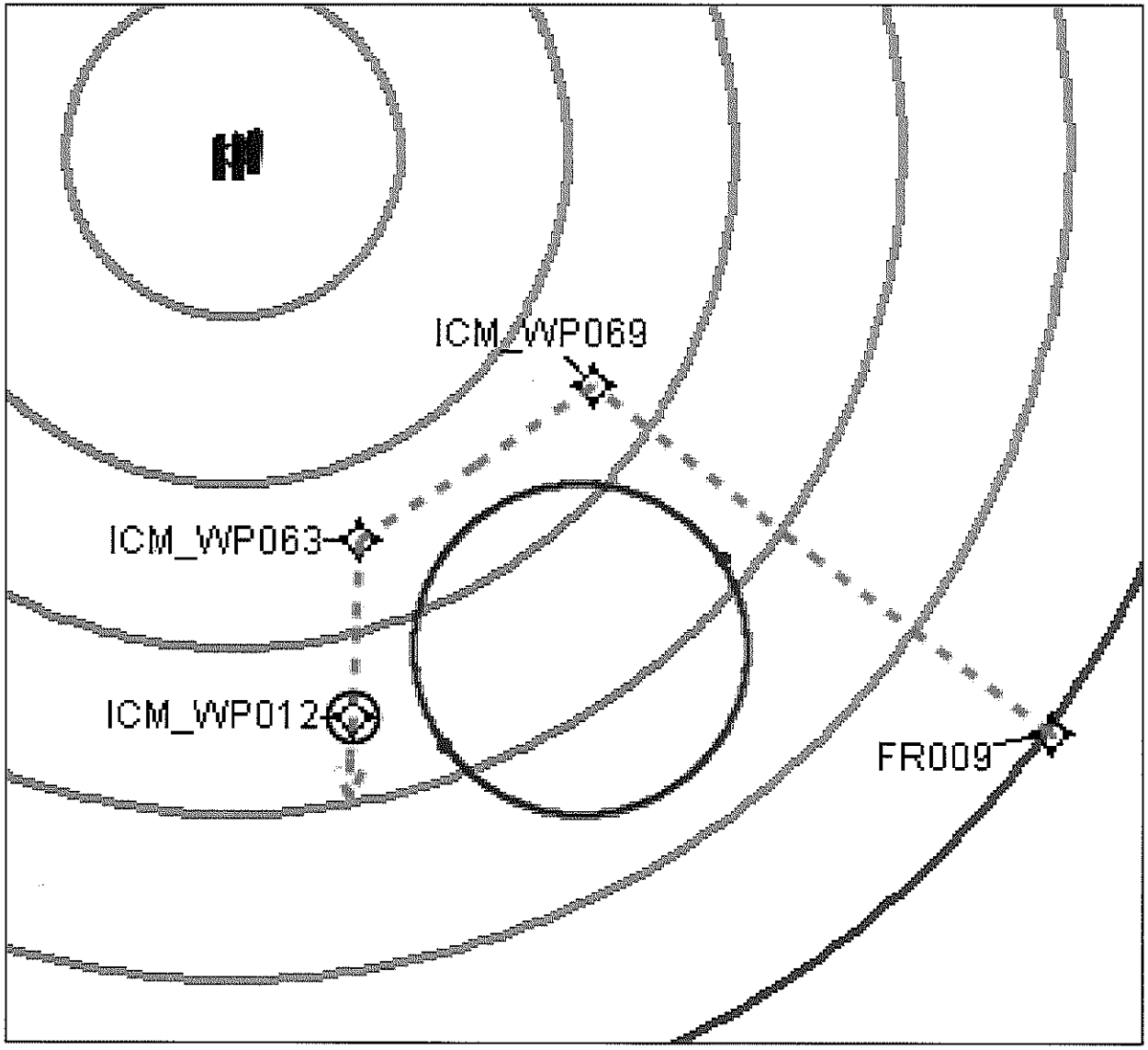

Figure A-13. <u>NAICM RVAV STAR Runway 6 Land North</u> (NAICM_STAR_SE1_Land_North_R6 [FR009])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_SE_Land_North_R3
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP005	N18° 41' 24.16"	W098° 23' 45.24"
ICM_WP008	N18° 53' 43.81"	W099° 00' 40.78"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SE2_Land_North_R3 (FR010)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR010	IF		N18° 42' 22.61"	W098° 22' 35.37"
ICM_WP074	TF	FO	N18° 52' 03.42"	W098° 55' 42.47"
ICM_WP074	FM		N18° 52' 03.42"	W098° 55' 42.47"

Figure A-14 displays the late February/early March 2016 design in solid blue beginning at ICM_WP005 along with the early August 2016 design in dashed blue beginning at FR010. The late February/early March 2016 route terminated at ICM_WP008, which was placed on an extension of the FAC for Runway 3 (36L). The new proposed route terminates in an FM leg at ICM_WP074, which is positioned approximately 5 NM from the FAC. It is expected that this route will primarily feed Runway 3 (36L), but aircraft can be vectored to any of the parallel runways.

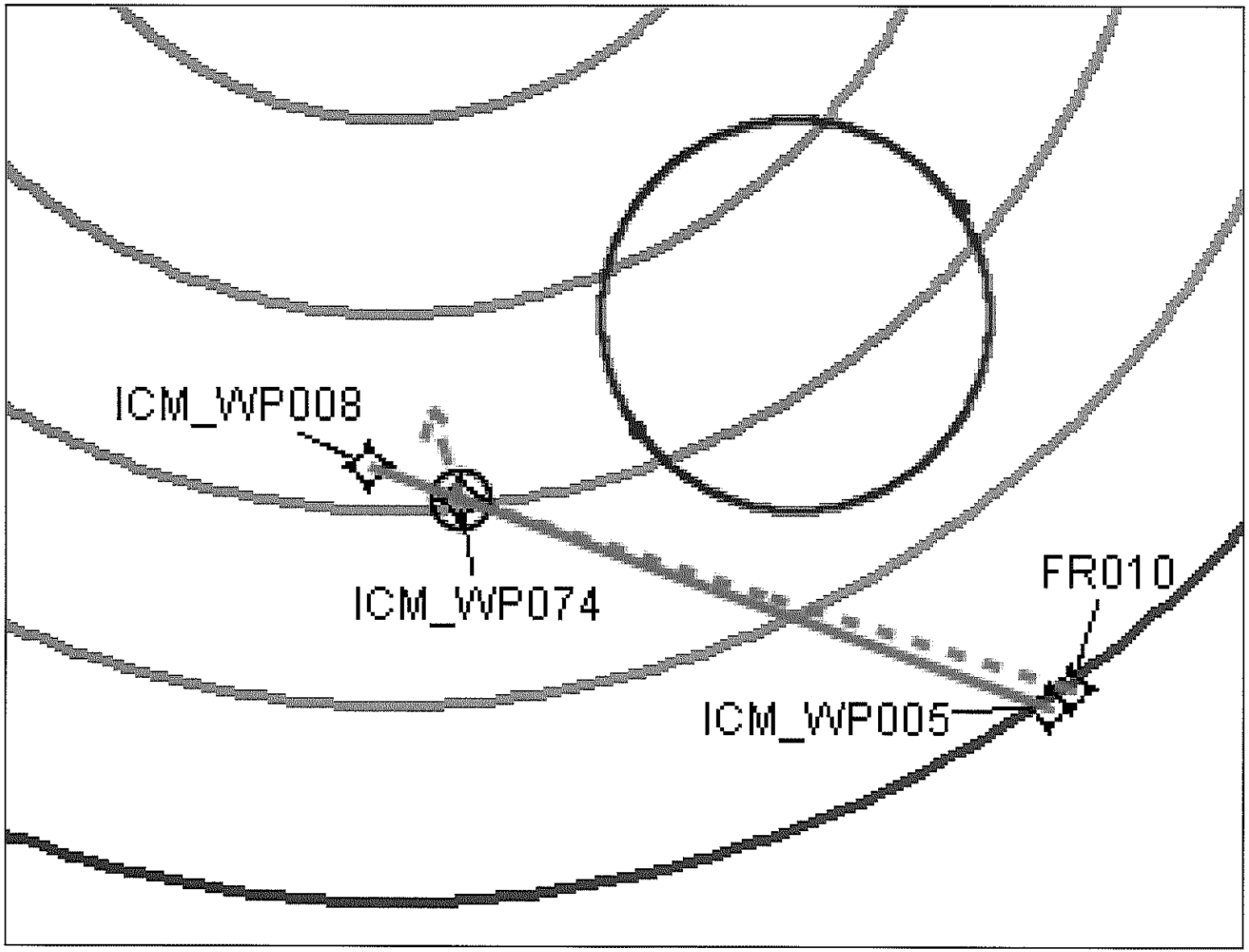

Figure A-14. NAICM RVAV STAR Runway 3 Land North (NAICM_STAR_SE2_Land_North_R3 [FR010])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_STAR_SW_Land_North_R3
Airport: NAICM
Flight Type: ARR

	DMS	
Point	Latitude	Longitude
ICM_WP007	N18° 29' 55.05"	W099° 29' 43.81"
ICM_WP008	N18° 53' 43.81"	W099° 00' 40.78"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SW1_Land_North_R3 (FR012)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR012	IF		N18° 42' 22.61"	W099° 36' 00.05"
ICM_WP073	TF	FO	N18° 52' 23.47"	W099° 05' 45.72"
ICM_WP073	FM		N18° 52' 23.47"	W099° 05' 45.72"

Figure A-15 displays the late February/early March 2016 design in solid blue beginning at ICM_WP007 along with the early August 2016 design in dashed blue beginning at FR012. The late February/early March 2016 route terminated at ICM_WP008, which was placed on an extension of the FAC for Runway 3 (36L). The new proposed route terminates in an FM leg at ICM_WP073, which is positioned approximately 5 NM from the FAC. It is expected that this route will primarily feed Runway 3 (36L), but aircraft can be vectored to any of the parallel runways.

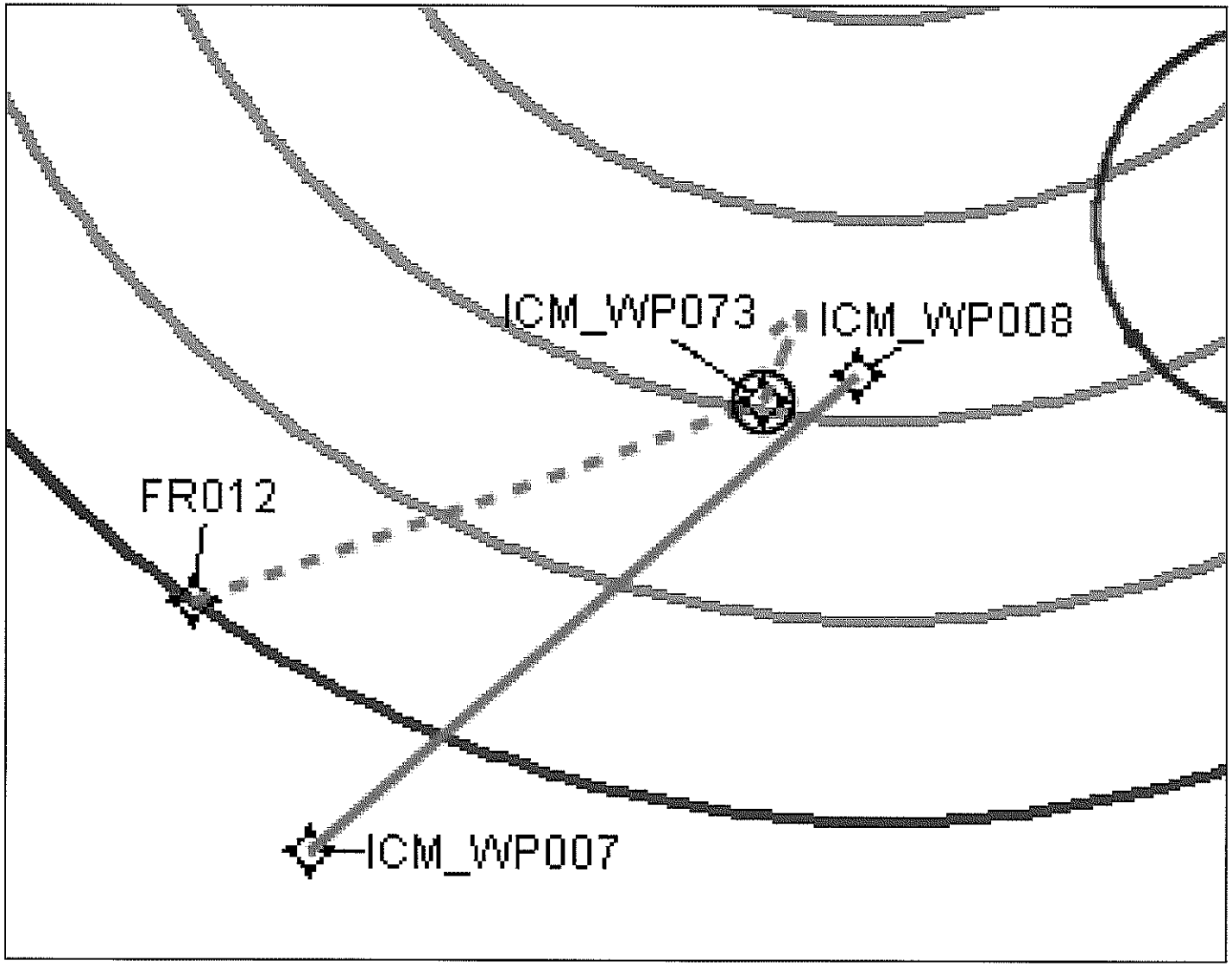

Figure A-15. <u>NAICM RNAV STAR Runway 3 Land North</u> (NAICM_STAR_SW1_Land_North_R3 [FR012])

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_STAR_SW2_Land_North_R2 (FR013)
Airport: NAICM
Flight Type: ARR

			DMS	
Point	Leg Type	Turn Type	Latitude	Longitude
FR013	IF		N18° 56' 22.55"	W099° 50' 49.59"
ICM_WP011	TF	FO	N18° 58' 01.56"	W099° 09' 06.93"
ICM_WP011	FM		N18° 58' 01.56"	W099° 09' 06.93"

Figure A-16 shows a new proposed route with no previous versions so only one table is presented above. Figure A-16 below displays the early August 2016 routing in dashed blue beginning at FR013. This route terminates at ICM_WP011 in an FM leg. It is expected that this route will primarily feed Runway 2 (35R), but aircraft can be vectored to any of the parallel runways.

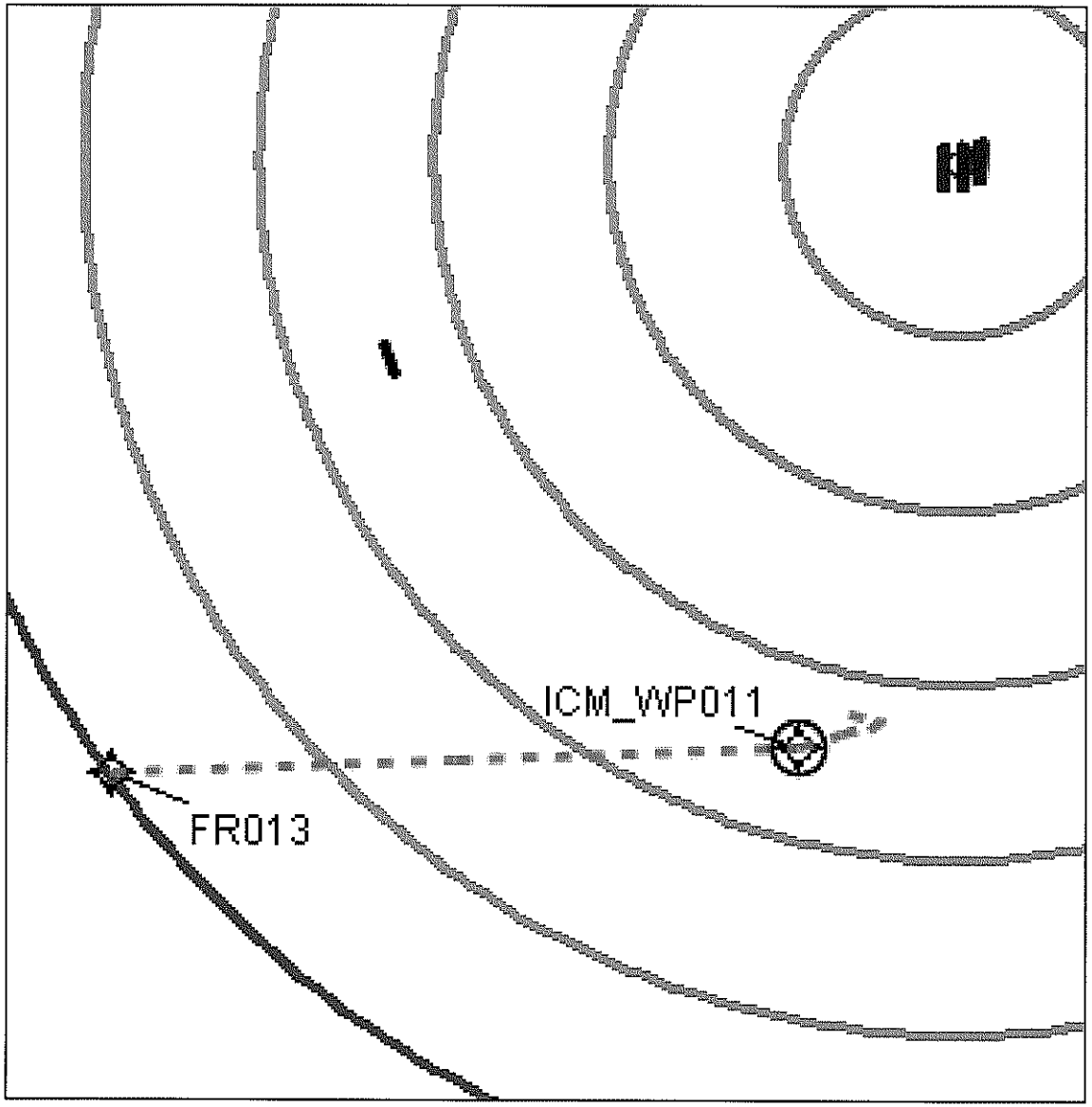

Figure A-16. <u>NAICM RNAV STAR Runway 2 Land North</u> (NAICM_STAR_SW2_Land_North_R2 [FR013])

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_CONV_STAR_NW
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
Queretaro VOR (QET)	N20° 37' 02.85"	W100° 11' 37.06"
CONV_FIX019	N20° 17' 50.85"	W099° 39' 38.33"
NAICM_NEW_VOR	N19° 32' 41.60"	W098° 59' 15.00"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_CONV_STAR_NW
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
QET	N20° 37' 02.85"	W100° 11' 37.06"
FR018	N20° 20' 26.42"	W099° 36' 22.31"
NAICM_NEW_VOR	N19° 32' 54.53"	W098° 59' 09.01"

The late February/early March design positioned the non-RNAV aircraft between the two proposed RNAV STARs. After discussions with SENEAM, it was determined that the conventional routing should be designed over the northern most RNAV arrival fix in the northwest quadrant (FR018). Figure A-17 displays the late February/early March design in solid blue along with the early August 2016 design in dashed blue, both beginning at QET.

Previous Proposal

Fly outbound on the QET R-115 to intercept the NAICM New VOR R-314 inbound at CONV_FIX019.

New Proposal

Fly outbound on the QET R-109 to intercept the NAICM New VOR R-318 inbound at FR018.

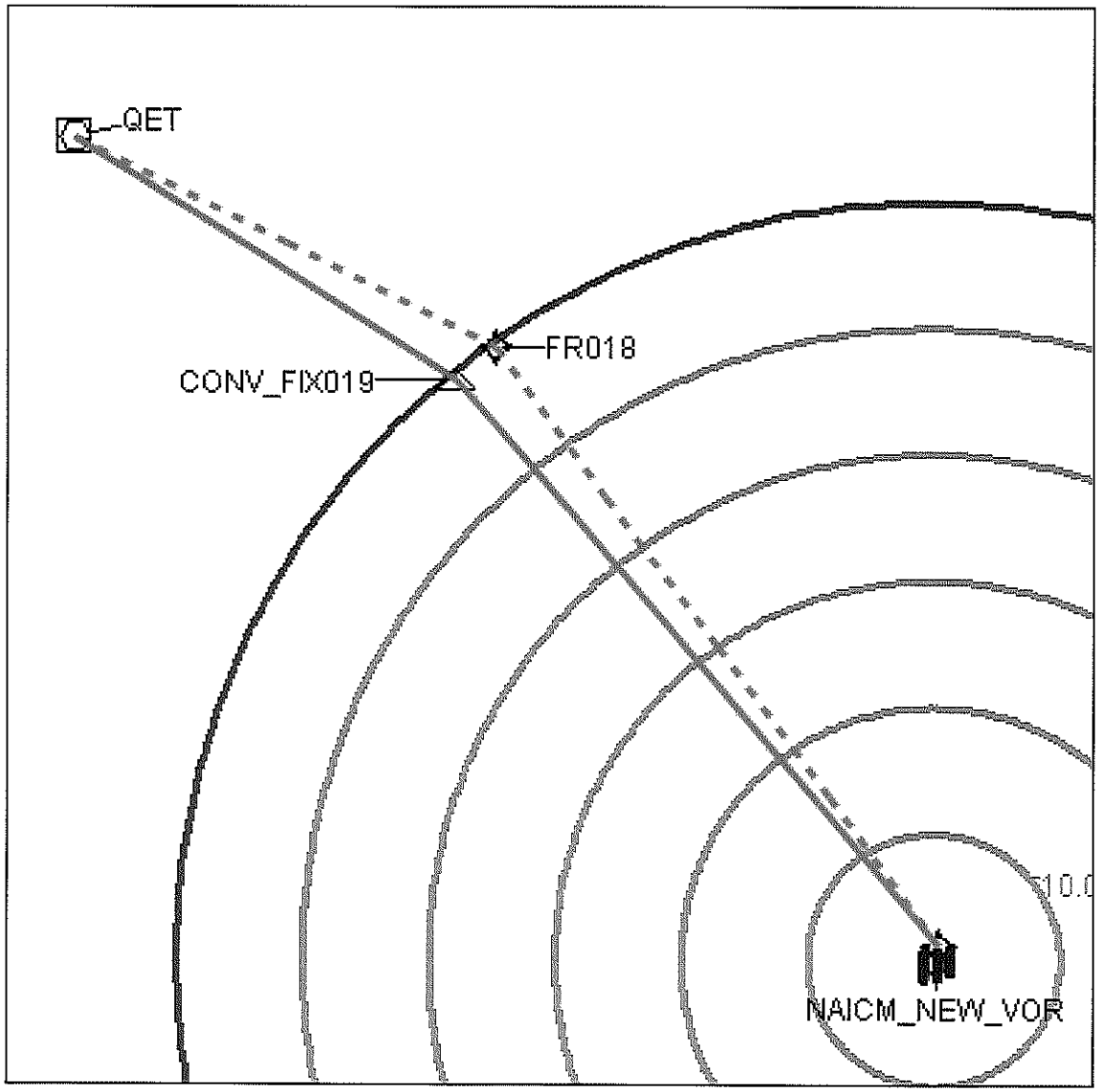

Figure A-17. <u>NAICM Conventional STAR Land North and South</u> (NAICM_CONV_STAR_NW)

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_CONV_STAR_NE
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
Poza Rica VOR (PAZ)	N20° 36' 02.03"	W097° 27' 18.28"
CONV_FIX018	N20° 17' 50.04"	W098° 18' 43.32"
NAICM_NEW_VOR	N19° 32' 41.60"	W098° 59' 15.00"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_CONV_STAR_NE
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
PAZ	N20° 36' 02.03"	W097° 27' 18.28"
FR004	N20° 20' 26.42"	W098° 22' 13.11"
NAICM_NEW_VOR	N19° 32' 54.53"	W098° 59' 09.01"

The late February/early March design positioned the non-RNAV aircraft between the two proposed RNAV STARs. After discussions with SENEAM, it was determined that the conventional routing should be designed over the northern most RNAV arrival fix in the northeast quadrant (FR004). Figure A-18 displays the late February/early March design in solid blue along with the early August 2016 design in dashed blue, both beginning at PAZ.

Previous Proposal

Fly outbound on the PAZ R-245 to intercept the NAICM New VOR R-034 inbound at CONV_FIX018.

New Proposal

Fly outbound on the PAZ R-248 to intercept the NAICM New VOR R-030 inbound at FR004.

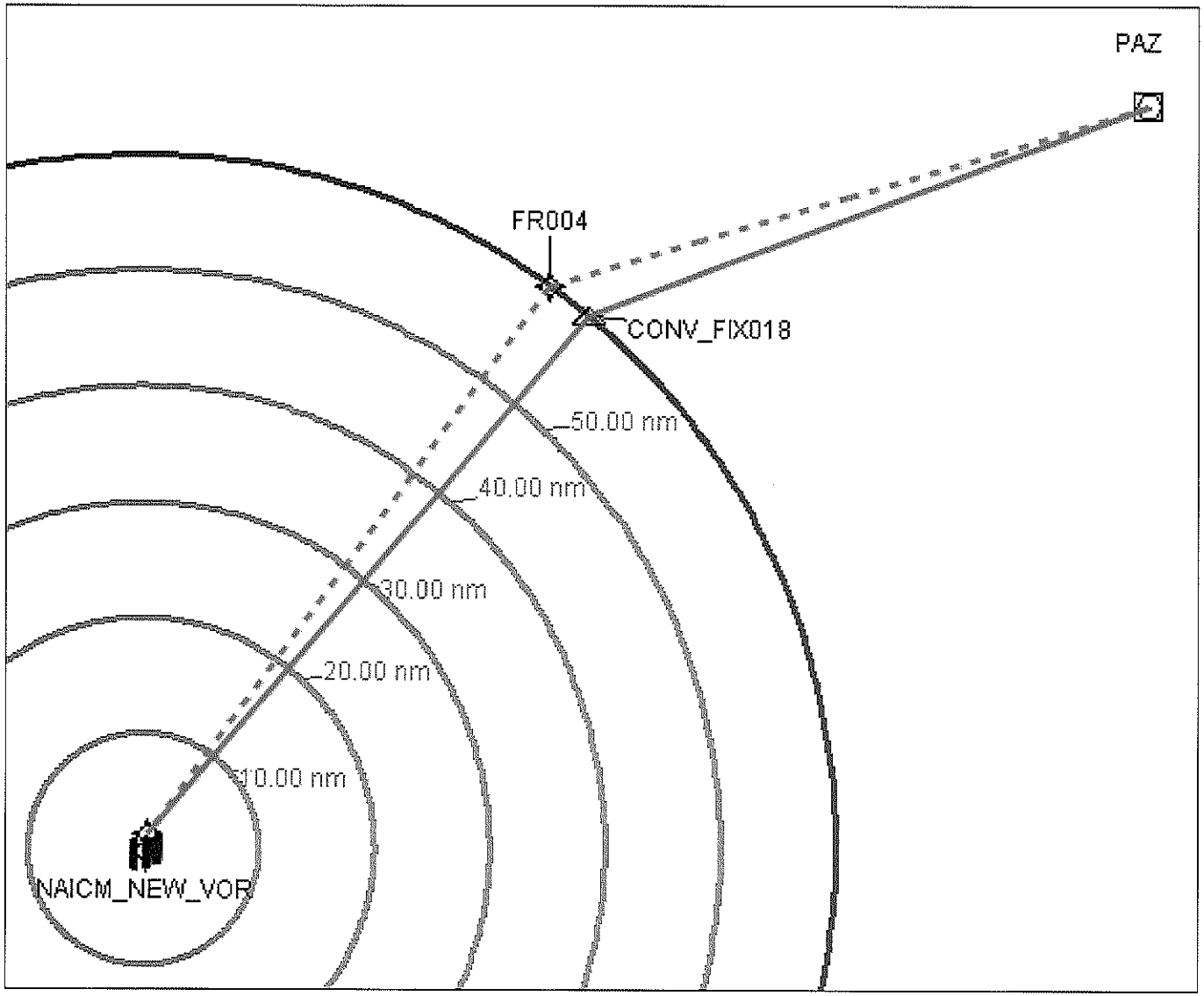

Figure A-18. <u>NAICM Conventional STAR Land North and South</u> (NAICM_CONV_STAR_NE)

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_CONV_STAR_SE
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
CONV_FIX015	N18° 24' 25.71"	W097° 53' 24.19"
CONV_FIX016	N18° 57' 21.55"	W098° 52' 30.81"
NAICM_NEW_VOR	N19° 32' 41.60"	W098° 59' 15.00"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_CONV_STAR_SE
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
Cuautla VOR (CUA)	N18° 47' 07.39"	W098° 54' 02.70"
NAICM_NEW_VOR	N19° 32' 54.53"	W098° 59' 09.01"

The late February/early March design positioned the non-RNAV aircraft in the general area of the proposed RNAV arrival from the southeast. After discussions with SENEAM, it was determined that the conventional routing should begin at CUA. This would allow non-RNAV aircraft to navigate on current airways to CUA before being vectored to NAICM, and also ensures aircraft will remain at least 3 NM from restricted airspace MMP-159. Figure A-19 displays the late February/early March design in solid blue along with the early August 2016 design in dashed blue.

Previous Proposal

Fly inbound on the Toluca VOR (TLC) R-113 beginning at 110 DME (CONV_FIX015) to intercept the NAICM New VOR R-163 inbound at CONV_FIX016.

New Proposal

Fly outbound on the CUA R-347 direct to the NAICM New VOR.

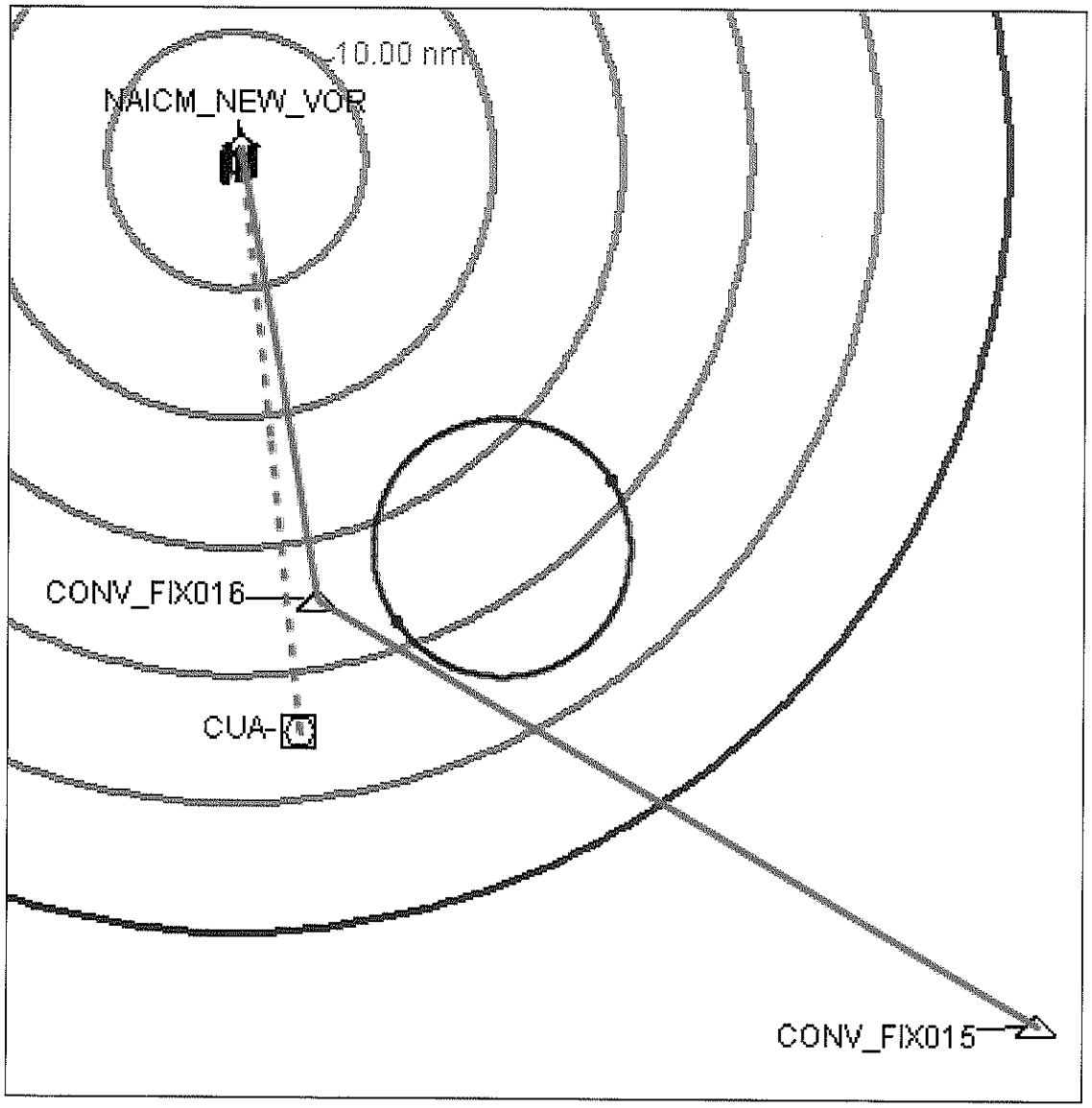

Figure A-19. <u>NAICM Conventional STAR Land North and South</u> (NAICM_CONV_STAR_SE)

SENEAM/MITRE Agreed Routes 04 March 2016

Route: NAICM_CONV_STAR_SW
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
CONV_FIX017	N18° 16' 45.89"	W099° 42' 15.41"
ICM_WP007	N18° 29' 55.05"	W099° 29' 43.81"
NAICM_NEW_VOR	N19° 32' 41.60"	W098° 59' 15.00"

SENEAM/MITRE Agreed Routes 02 August 2016

Route: NAICM_CONV_STAR_SW
Airport: NAICM
Flight Type: Conventional ARR

	DMS	
Point	Latitude	Longitude
Tequesquitengo VOR (TEQ)	N18° 40' 33.90"	W099° 15' 19.13"
NAICM_NEW_VOR	N19° 32' 54.53"	W098° 59' 09.01"

The late February/early March design positioned the non-RNAV aircraft in the general area of the proposed RNAV arrival from the southwest. After discussions with SENEAM, it was determined that the conventional routing should begin at TEQ. This would allow non-RNAV aircraft to navigate on current airways to TEQ before being vectored to NAICM. Figure A-20 displays the late February/early March 2016 design in solid blue along with the early August 2016 design in dashed blue.

Previous Proposal

Fly inbound on the Apan VOR (APN) R-216 beginning at 110 DME (CONV_FIX017) to intercept the NAICM New VOR R-199 inbound at ICM_WP007.

New Proposal

Fly outbound on the TEQ R-054 direct to the NAICM New VOR.

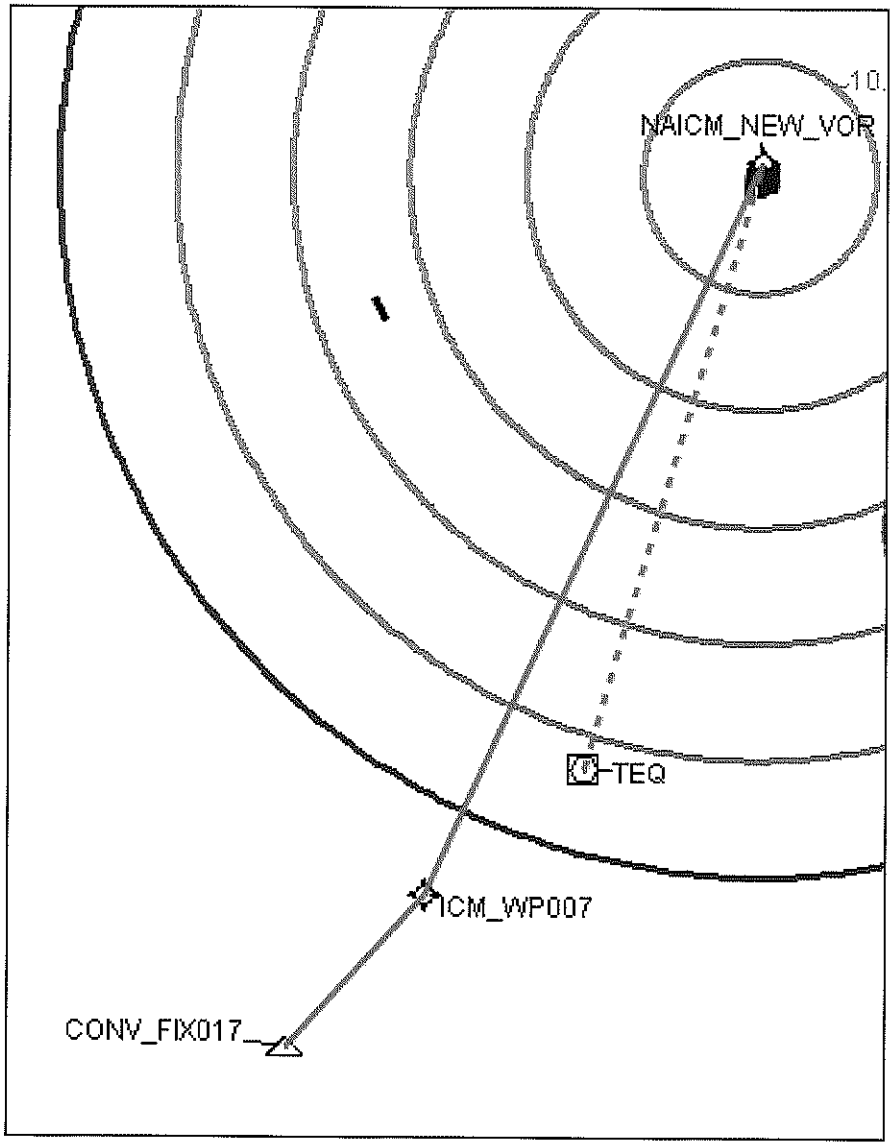

Figure A-20. <u>NAICM Conventional STAR Land North and South</u> (NAICM_CONV_STAR_SW)