Enclosure 4
(Ref. Technical Letter F500-L15-007)

MITRE

Center for Advanced
Aviation System Development

Cancún Airport

Procedure and Airspace
Design Data Request

The data described herein are requested by Friday 6 February 2015. Electronic transmission is preferred and should be e-mailed to rkleinha@mitre.org (Ing. Robert W. Kleinhaus, Project Leader). If e-mail is not possible for particular items, the information should be sent via FedEx. Please include with the delivery a Table of Contents that references in a clear manner the various parts of this request. Likewise, please describe in detail any differences, if any, between the request and what is being delivered, as well as the original source of each item.

Please contact Ing. Kleinhaus no later than Friday 23 January 2015 if there are any issues or concerns with providing the requested data on time, as MITRE needs to allocate staff in a most efficient manner.

Prepared for

Aeropuertos y Servicios Auxiliares

January 2015
1. Introduction

As part of MITRE’s support of Mexico’s Aeropuertos y Servicios Auxiliares (ASA), MITRE needs to request information required to conduct detailed analyses pertaining to the implementation of dual independent arrival and departure operations at Cancún International Airport (MMUN). The data being requested herein are particularly important in the analysis of Air Traffic Control (ATC) procedures and routes within the Cancún/Cozumel Terminal Maneuvering Areas (TMAs) and the Mérida enroute airspace.

The data requirements described in this document are necessary to complete many of the required tasks associated with preparations for introducing independent arrival and departure operations. Furthermore, many of the tasks are interrelated and, therefore, delays to one task may create a cumulative effect that could impact follow-up tasks. Additional data request documents will be submitted, as necessary, at the appropriate time later on in the project.

The data described herein are requested by Friday 6 February 2015. Please see the note concerning other deadlines on the front cover of this document.

All inquiries concerning this data request should be addressed to Ing. Robert W. Klein hans, Project Leader, at rkleinha@mitre.org explaining in detail, and in English, the inquiry in question. The above Internet address should also be the one utilized for the transmission of data. In case Ing. Klein hans is out of town or if the inquiry must be in Spanish or it requires further contractual interpretation, questions can be addressed to Dr. Bernard Lisker at bernard@mitre.org or, if data needs to be shipped (please via FedEx), send it to the following address:

Ing. Robert W. Klein hans
The MITRE Corporation
7515 Colshire Drive
McLean, VA 22102-7539
U.S.A.

2. Data Request

This section lists and, if necessary, describes the data required to conduct the tasks pertaining to the aeronautical analysis of implementing dual independent arrival and departure operations at MMUN. The list should not be construed as being all-inclusive, as additional information will be requested throughout the project. Figures, tables, and information of a mainly numerical nature can be sent to MITRE in Spanish. Other data, particularly lengthy conceptual texts, are required in English. If in doubt, or if such information is lengthy, please consult MITRE before spending time in translating the information.

To the extent possible, the information should be sent in electronic format (e.g., Excel, Word, AutoCAD, etc.). While paper format is acceptable, it should be a last option. In the case of AutoCAD, where appropriate, three-dimensional (3D) values (that is, x, y, and z-values) should be provided (e.g., building elevations). In the case of elevations, these should be provided in meters above Mean Sea Level (MSL). All maps, boundaries, runway thresholds, and in general, all coordinates that are to be provided to MITRE should be based on the Universal Transverse
Mercator (UTM)/World Geodetic System 1984 (WGS 84) coordinate system. If for any reason any data sent to MITRE does not use WGS 84, it should be clearly specified what coordinate system is being used. In the case of AutoCAD drawings, please specify both the coordinate system and projection used.

It is important to note that MITRE plans to use as a primary source of information the most recent version (as of the date of this document) of Mexico’s Aeronautical Information Publication (AIP). This is the official, publicly available civil aviation authority publication of Mexico regarding principal aeronautical data. Therefore, MITRE cannot take responsibility for errors, discrepancies, or inconsistencies thereof.

ALL THE INFORMATION REQUESTED THROUGHOUT THE REST OF THIS DOCUMENT SHOULD TAKE INTO ACCOUNT THE CONSIDERATIONS MENTIONED ABOVE.

Airport Layout Plans, Imagery, Obstacles, and Similar Information

The following is a list of information concerning airport layout plans, imagery, obstacles and similar information that are being requested:

1. Current layout of MMUN, including airport property lines, runways, taxiways, aprons, buildings, the location of navigational aids, auxiliary aeronautical equipment and other important airport components. Include coordinates and threshold elevations of the existing runways.

2. Proposed improvements to the current layout of MMUN (e.g., new aprons, aircraft parking stands and/or gates, taxiways, terminal buildings, etc.)

3. Existing aerial and/or satellite imagery (the most current available) of MMUN and its surroundings, if available. The images should preferably be in color and should be geo-registered (e.g., Geo-TIFF files) for insertion into AutoCAD.

4. Existing survey information for MMUN, including such information as runways, taxiways, aprons, buildings, and contour lines. Information on the elevation of buildings (especially the Air Traffic Control Tower), structures, and other prominent natural and/or man-made items should also be provided.

5. List of relevant man-made obstacles around MMUN. This man-made obstacle information will be used by MITRE to develop preliminary dual independent instrument approach and departure procedures. Figure A-1 in Appendix A to this document provides information to assist in collecting relevant man-made obstacles around MMUN.

Data on man-made obstacles collected and provided to MITRE should include the following:

- A description of the man-made obstacle
- Latitude and longitude (Degree:Minutes:Seconds:Decimal Seconds [DD:MM:SS.SS]) of the obstacle in WGS 84 coordinate system format. If the obstacle is a building please include this information along with all corners of the building, if possible.
- Elevation of the obstacle in meters MSL. If the obstacle is a building, please include the elevation in meters MSL at each corner of the obstruction, if possible.

- Associated surveyed horizontal and vertical accuracy, if known

6. International Civil Aviation Organization (ICAO) Aerodrome Operating Charts, or equivalent, Types A, B and C for MMUN. These types of charts contain obstacle data that may prove useful in the analysis of instrument procedures.

7. Readily available Geographic Information System (GIS) data for MMUN and its surroundings. These data should encompass an area within a 40-NM radius around MMUN. The preferred format is Environmental System Research Institute (ESRI) Shapefiles.

8. Location of areas that MITRE should consider as noise sensitive (i.e., that aircraft routes should avoid). The noise sensitive areas should be depicted on a map.

9. Location of other areas that aircraft routes should avoid, such as historical, tourist, and archeological sites. These areas should be depicted on a map.

**Operational Data**

The following is a list of information concerning operational data that are being requested:

1. One week (i.e., seven consecutive days) of detailed daily operations data for all traffic within the Mérida enroute airspace that includes both overflights and traffic originating from or arriving at the following airports:
   - MMUN
   - Cozumel International Airport (MMCZ)
   - Mérida International Airport (MMMD)
   - Campeche International Airport (MMCP)
   - Isla Mujeres General Airport (MMIM)
   - Tulum Naval Air Station (MMTU)
   - Chichén Itza International Airport (MMCT)

The operations data should indicate whether the flight was Visual Flight Rules (VFR) commercial, VFR general aviation, Instrument Flight Rules (IFR) commercial or IFR general aviation. If there are seasonal fluctuations at other times during the year, separate days should be provided for MMUN, MMCZ, MMMD and Mérida enroute airspace overflights and be representative of the seasonal traffic fluctuations.

The week selected should be considered a relatively high-volume peak week in 2014 that would represent at least 90% of the highest traffic volume. These days need to be free of unusual events that would drive the traffic volume up, such as major sporting events. As
this task is centered on operations at MMUN, the data should include a high-volume week in which MMUN is using the Runway 12 direction.

In addition, provide the same information for a week of relatively high-volume in 2014 for all traffic within the Mérida enroute airspace that includes both overflight traffic originating from or arriving at all the airports listed above, but when MMUN is using the Runway 30 direction.

If any of the following information is difficult to obtain, contact MITRE to determine which elements are absolutely essential. Operations data should be provided in Excel and include the following elements (see Figure B-1 in Appendix B to this document for the preferred format):

- Date
- Type of operation (arrival, departure, or overflight)
- Registration ("tail number")
- Associated runway for either the departure or arrival at the above-mentioned airports
- The entire ICAO flight plan data for all traffic traversing the Mérida enroute airspace or any aircraft using the above-mentioned airports that includes at a minimum:
  - Airline name, airline code, and flight number (if not a commercial operation, indicate whether it is general aviation, military, or governmental) or the flight callsign
  - Aircraft type (model and sub-model, for example, Boeing 737-200)
  - Indication of Area Navigation (RNAV) equipment designator
  - Filed true air speed
  - Actual arrival and departure date and time (indicate whether the time is local or Coordinated Universal Time [UTC]), or scheduled arrival and departure date and time (indicate whether the time is local or UTC) if actual is not available
  - Filed altitude
  - Origination airport
  - Standard Instrument Departure (SID) for departures from any of the above-mentioned airports
  - Destination airport
  - Standard Terminal Arrival Routes (STARs) for arrivals to any of the above-mentioned airports
  - Filed or actual route of flight through the Mexico Flight Information Region (FIR). Be sure to indicate whether the data is filed or actual.
o Time stamp and altitude at each waypoint or navigational aid in the route of flight

2. Radar track data with sufficient information to be able to cross reference the aircraft identifier with a particular radar track for MMUN, MMCZ, MMMD, MMCP, MMIM, MMTU and MMCT, as well as traffic traversing through airspace under the control of Mérida enroute airspace. Additional information should show at a minimum:

- Aircraft position data - format needs to include either:
  - Known origin (usually the location of the radar antenna) in latitude/longitude and then displacement coordinates, in Cartesian (x,y) format from the known origin
  OR
  - Latitude/longitude of each aircraft position

- Altitude of each aircraft position (Mode C)

- Time data for each position, at least to the nearest second

- Callsign

- Point of origin and destination information for each particular radar track

The radar data should be processed to the point of providing the location information either in latitude/longitude or Cartesian (x,y) coordinates. See Table B-1 in Appendix B to this document for the preferred radar data format.

3. Information on future traffic growth statistics, specifically percentage increases, for each of the airports mentioned above, including overflight traffic in Mérida enroute airspace for a ten-year period, if possible

Facility Documents

The following is a list of information concerning ATC facility documents that are being requested:

1. Letter of Agreements (LOAs) between the following facilities:

- Mérida ACC and the airports of MMUN, MMCZ, MMMD, MMCP, MMIM, MMTU, MMCT and Cancún/Cozumel Terminal Control
- Mérida ACC and Cancún/Cozumel Terminal Control and any military facilities
- Mérida ACC and Cancún/Cozumel Terminal Control and surrounding adjacent ATC facilities, including those in neighboring countries
- Cancún/Cozumel Terminal Control and MMUN and MMCZ towers
2. Standard Operating Procedures (SOPs) within Cancún/Cozumel Terminal Control, MMMD Terminal Control, MMUN Tower and Mérida ACC. For each facility/sector the information should include:

- A description of the sector including altitudes and coordinates
- The sector’s basic functions (i.e., merging, crossing, sequencing traffic and responsibilities)
- Type of traffic handled (arrivals, departures, and/or overflights)
- General description of the sector traffic flows
- Altitude, speed, and/or route restrictions that the sector is required to meet
- Location of and procedures for holding
- Hand off procedures between the following:
  - Mérida ACC and Cancún/Cozumel Terminal Control
  - Mérida ACC and airport control towers
  - Mérida ACC and adjacent TMAs, Terminal Controls or approach controls and other ACC facilities
  - Cancún/Cozumel Terminal Control and MMUN and MMCZ airport tower
  - Cancún/Cozumel Terminal Control and adjacent Terminal Controls or approach controls and other ACC facilities

Airport/Airspace Boundaries and Maps

The following is a list of information concerning airport and airspace boundaries and maps that are being requested:

1. Airspace boundaries consisting of latitude/longitude coordinates and floor and ceiling altitudes of the following:

- The surrounding ACCs/FIRs
- Each sector inside the Mérida ACC (including any shelves and sector/position numbers)
- Each sector inside the Cancún/Cozumel Terminal Control (including approach control sectors) for each direction in which the airport operates (including any shelves and sector/position numbers)
- Airport tower airspace boundaries
- External boundaries of any Special Use Airspaces (SUAs) both official and unofficial (i.e. military restricted areas, including name identifier and vertical limits)
2. Radar and radio coverage charts. Specify any known problems/issues affecting radar/radio coverage including those in the Mérida enroute airspace, Cancún/Cozumel TMA or any tower airspace at any of the airports in the Mérida enroute airspace. Indicate the sectors or parts of sectors where there is any known problems or issues.

3. Navigational Aid (NAVAID) service limitations and magnetic variation for NAVAIDs within 60 NM of MMUN and MMCZ

**Future Airspace and/or Route Plans**

The following is a list of information concerning future airspace and/or route development plans that are being requested:

1. Future known plans for the Mérida enroute route structure (AutoCAD diagrams showing the current and future route structure are preferred), including all coordinates for any proposed airways or new NAVAIDs, waypoints, additional entry/exit points for Cancún/Cozumel TMA or Mérida enroute airspace or other significant data

2. Proposed new routes/airways/procedures, including RNAV or Required Navigation Performance (RNP) procedures, to include those defined in the Caribbean/South American (CARSAM) Air Navigation Plan (ANP)
Appendix A

Figure A-1 below provides information to assist in searching for relevant man-made obstacles around MMUN.

Description of Man-Made Obstacle Collection Area

- The man-made obstacle collection area is based on a 2% sloping surface that starts from the inner box and extends outward to the outer box. Coordinates of the inner and outer boxes are shown in the bottom right corner of this figure.
- The starting elevation of the sloping surface at the inner box is 5 m MSL. The elevation of the sloping surface at the outer box is 145 m MSL.
- Concentric squares are provided every 1000 m, which represents a 20 m rise in slope elevation, to aid in the identification of man-made obstacles.
- Any obstacles that penetrate the 2% sloping surface should be identified. The latitude and longitude of the obstacle, as well as its elevation in meters MSL, should be provided.
- Beyond the outer box, identify any obstacles that have an elevation of 145 m MSL or higher to a distance of 40 NM, as measured from the MMUN Airport Reference Point (21°02'33.87"N / 86°52'23.52"W).

Source: Google Earth

Figure A-1. Man-Made Obstacle Collection Area Around MMUN

Coordinates of Inner and Outer Boxes (based on World Geodetic System 1984)

Inner box:
- A: 21°02'40.24"N / 86°53'32.28"W
- B: 21°03'26.80"N / 86°52'59.22"W
- C: 21°02'21.48"N / 86°51'14.85"W
- D: 21°01'34.93"N / 86°51'47.91"W

Outer box:
- E: 21°01'36.97"N / 86°59'08.58"W
- F: 21°08'42.54"N / 86°54'06.56"W
- G: 21°03'24.52"N / 86°45'38.45"W
- H: 20°56'19.16"N / 86°50'40.71"W
Appendix B

Figure B-1 below shows a sample of the operations data MITRE requires. (Note that the data sample is fictitious.) These data should be provided electronically in Microsoft Excel.

Table B-1 shows a sample of radar data, as presented in Excel. If possible the data should be given in ASCII format.

A sample of radar data sent in advance of the above dataset would be useful to allow MITRE to check and, if necessary, set up any tailored automatic adaptation and/or conversions of the radar data into a form that can be readily used by MITRE’s airspace design tools.