

Lic. Alfonso Sarabia de la Garza
Director General
Aeropuertos y Servicios Auxiliares (ASA)
Avenida 602, Número 161
15620 México, D.F.
México

Subject: Technical Letter: Summary of Work During the Period 1 April 2016 through 30 June 2016

Dear Lic. Sarabia:

This letter respectfully submits to your attention a summary of the most significant MITRE project activities conducted during the period 1 April 2016 through 30 June 2016.

Reports

At the outset, before proceeding with a full description of activities, please find below a list of the documents that we are including along with this Technical Letter.

1. Enclosure No. 1 to this Technical Letter (F500-L16-039): Minimum Vectoring Altitude Charts for NAICM and Toluca – Preliminary Results, dated 30 June 2016.
2. Enclosure No. 2 to this Technical Letter (F500-L16-039): Nuevo Aeropuerto Internacional de la Ciudad de México Preliminary Airspace Redesign – Informal Working Notes on Departure Procedures, dated 30 June 2016.
3. Enclosure No. 3 to this Technical Letter (F500-L16-039): DRAFT Regulatory Modernization to Support the Nuevo Aeropuerto Internacional de la Ciudad de México – Initial Considerations, dated 30 June 2016.
4. Enclosure No. 4 to this Technical Letter (F500-L16-039): Dual Independent Test-Bed Operations at Cancún – Initial Concept of Operations, Letters of Agreement, and Standard Operating Procedures in Support of Human-In-The-Loop Simulations, dated 30 June 2016.
5. Enclosure No. 5 to this Technical Letter (F500-L16-039): Photogrammetric, Satellite-Based Survey of Toluca Airport and Its Surroundings – Field Validation, Verification and Ground Truth Visit Report, dated 30 June 2016.

6. Enclosure No. 6 to this Technical Letter (F500-L16-039): Photogrammetric, Satellite-Based Survey of Toluca Airport and Its Surroundings – Final Quality Control Visit Report, dated 30 June 2016.

The documents designated as Enclosures, are described below:

- **Enclosure No. 1: Minimum Vectoring Altitude Charts for NAICM and Toluca – Preliminary Results.** This document presents and discusses the preliminary Minimum Vectoring Altitude Charts (MVACs) to support operations at Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM) and Toluca Airport. The MVACs described in this document are based on work conducted during a joint meeting between Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM) and MITRE engineers during a one-week airspace design workshop held in Mexico City from 29 February 2016 through 4 March 2016.
- **Enclosure No. 2: Nuevo Aeropuerto Internacional de la Ciudad de México Preliminary Airspace Redesign – Informal Working Notes on Departure Procedures.** This document provides a record of both SENEAM’s original conceptual airspace departure route design (developed in early February 2016) and modifications to those routes resulting from SENEAM-MITRE airspace design workshops and follow-on teleconferences.
- **Enclosure No. 3: DRAFT Regulatory Modernization to Support the Nuevo Aeropuerto Internacional de la Ciudad de México – Initial Considerations.** This document describes potential regulations that may be required in order to operate dual independent operations at Cancún and triple independent operations at NAICM for consideration by SENEAM and other authorities, and for further discussion with MITRE.
- **Enclosure No. 4: Dual Independent Test-Bed Operations at Cancún – Initial Concept of Operations, Letters of Agreement, and Standard Operating Procedures in Support of Human-In-The-Loop Simulations.** MITRE has been working with SENEAM on planning matters in preparation for upcoming Human-In-The-Loop (HITL) simulations to evaluate the airspace design for the Cancún/Cozumel Terminal Control (Maneuvering) Area (TMA) in support of dual independent test-bed operations. The intent of this document is to provide a starting point for the development of necessary material to aid the HITL simulation participants in understanding how dual independent operations are conducted.
- **Enclosure No. 5: Photogrammetric, Satellite-Based Survey of Toluca Airport and Its Surroundings – Field Validation, Verification and Ground Truth Visit Report.** MITRE is responsible for the procurement of a satellite-based photogrammetric survey of Toluca Airport and its surroundings. A team of survey experts from MDA Geospatial Services Inc. (MDA) visited Toluca from 29 March 2016 through 22 April 2016 to perform validation, verification and ground truth work.

The objective of the visit was to validate and measure any feature greater than 60 m Above Ground Level (AGL) present within survey Area B and to collect validation points randomly situated throughout the various project survey areas. The information collected will be used to ensure that all items are collected to survey specifications and that heights derived from stereoscopic satellite imagery are accurate. MITRE pre-coordinated the visit details and its objectives. This enclosure describes that work.

- **Enclosure No. 6: Photogrammetric, Satellite-Based Survey of Toluca Airport and Its Surroundings – Final Quality Control Visit Report.** A team of survey experts from MDA, along with a MITRE procedure design expert, travelled to Toluca from 9 through 13 May 2016 to conduct field verification work in support of the Toluca survey. The objective of the Quality Control visit was to conduct obstacle verification work within critical procedure design areas. The field verification activity was a component of the quality control process for the entire project. MITRE assisted in the planning and coordination of this work. This enclosure describes that work.

MITRE wishes to thank ASA for its support and assistance in facilitating the above-mentioned Toluca survey activities.

Activities

The following list describes activities conducted by MITRE during this reporting period:

- In order to assist Mexico's Secretaría de Comunicaciones y Transportes (SCT), as well as other aviation authorities and stakeholders in the planning of the NAICM project, the MITRE team spent a significant amount of time updating a document provided as part of a previous MITRE Technical Letter (see Enclosure 1 to Technical Letter F500-L16-013, dated 14 January 2016) that lists several key items that are pending which should be addressed.

Regarding this activity, in June 2016 MITRE received through ASA documents from Grupo Aeroportuario de la Ciudad de México (GACM) that provided feedback on the status of several pending items. The MITRE team is now in the process of reviewing that information and re-updating the above mentioned document to reflect the current status of the pending items.

- As reported in MITRE's previous Technical Letter, a large team of MITRE engineers visited Mexico City from 29 February 2016 through 4 March 2016 to conduct an intense one-week airspace design workshop with SENEAM. During this workshop, the SENEAM and MITRE teams advanced on the development of MVACs to support operations at both NAICM and Toluca Airport.

During this quarter, the MITRE team spent a significant amount of time examining the development of the MVACs in more detail. Refer to Enclosure 1 of this

Technical Letter for details on the preliminary MVACs. As new or updated data becomes available, the MVACs will be revisited for possible modifications.

- The MITRE team spent a significant amount of time preparing an 83-page document that provides a record of NAICM departure routes that have been considered as part of previous airspace design workshops and follow-on teleconferences with SENEAM. Refer to Enclosure 2 of this Technical Letter for details.

The document provides details on both Area Navigation (RNAV) and conventional departure routes for NAICM, including waypoint coordinates, route illustrations, and important notes. As a result, both SENEAM and MITRE will be able to keep track of departure procedures considerations, which is essential for such a large and complex airspace redesign project.

- MITRE is supporting the Mexican aviation authorities in identifying key regulatory guidance and authorization processes that are currently missing or appear incomplete that are required to operate NAICM. During this quarter, the MITRE team conducted several lengthy brainstorming sessions, research activities, and discussions to identify areas in which regulations may be missing or incomplete. The team also examined documents both from Mexico's aviation authorities as well as from the United States (U.S.) Federal Aviation Administration and other organizations for regulations of relevance to NAICM.

This time-consuming work resulted in the development of an initial list of regulatory items for consideration by the Dirección General de Aeronáutica Civil (DGAC) and SENEAM for further discussion with MITRE. Many of the items are also needed to appropriately operate dual independent test-bed operations at Cancún. Refer to Enclosure 3 of this Technical Letter for details on the initial list of regulatory matters.

- The MITRE team completed the preparation of an initial Concept of Operations document to inform the Cancún HITL participants of what to expect when dual independent test-bed operations at Cancún commence. The document also includes draft Standard Operating Procedures (SOPs) and Letters of Agreement (LOAs) to support the upcoming HITLs. Refer to Enclosure 4 of this Technical Letter for details.

This information will be further discussed with SENEAM and modified as necessary as work leading towards the HITLs advances. The recent trip by MITRE HITL laboratory and simulation experts to the Mérida Area Control Center (ACC) and Cancún Approach Control facilities, described farther below, supported the development of this document.

- The MDA satellite-based photogrammetric survey team visited Toluca on two separate occasions. The first visit was conducted from 29 March 2016 through 22 April 2016 (close to 4-weeks) to perform validation, verification, and ground

truth work. The second visit was conducted from 9 through 13 May 2016 to perform quality control work. A MITRE engineer accompanied the MDA team during the second visit in order to act as an observer and liaison to provide feedback to MITRE project leaders on the status and outcome of the trip. MITRE assisted in the planning and coordination of the details of both visits. Refer to Enclosures 5 and 6 of this Technical Letter for details on the above-mentioned trips.

As a result, the final draft of the survey was sent to MITRE in June. The MITRE team is currently in the process of conducting a thorough review of the survey data and associated imagery.

- MITRE assembled a large team of engineers with expertise in various areas to thoroughly review Volume I of the Arup Master Plan for NAICM (dated 14 September 2015), which MITRE received on 5 April 2016. It is important to note, however, that MITRE is still waiting on information regarding additional Master Plan-related material, such as Volumes 2 through 4 and all other associated files (appendices, AutoCAD drawings, etc.). This information is required for MITRE to conduct a complete and thorough review of the overall Master Plan so that feedback can be provided to GACM and other stakeholders.
- A large team of MITRE engineers visited the Mérida ACC and Cancún Approach Control facilities in May 2016 to conduct observations of operations, gather data, and conduct discussions with controllers and other officials in preparation for upcoming HITL simulations. The goal of the visits was for MITRE's HITL laboratory and simulation experts to obtain a better understanding of operational procedures and systems in use at the facilities to support the HITL simulations. CTA Augusto Gómez also accompanied the MITRE team and assisted in coordinating matters on-site.
 - On 17 May 2016, the MITRE team visited the Mérida ACC. The team met with officials and controllers to discuss current operations as well as the potential impact of future operations (dual independent operations at Cancún) on Mérida's current procedures. The team spent several hours observing operations, which allowed the team to obtain a better understanding of Air Traffic Control (ATC) system functions that are typically used, as well as working position configurations and settings, peripheral hardware in use, common tasks, and communications and coordination matters. Operational procedures, such as the delivery of aircraft to the Cancún TMA, receipt of aircraft from the Cancún TMA, and coordination with other ACCs, including non-domestic facilities (e.g., Houston and Miami Centers) were discussed.
 - On 18 May 2016, the MITRE team visited the Cancún TMA and Air Traffic Control Tower (ATCT). The team spent several hours observing operations during a typical mid-morning rush (peak) arrival and departure period, and observed sector-level tasks and procedures for normal

operations. This allowed the MITRE team to obtain a better understanding of ATC functionality and usage, similar to the information gathered during the visit to the Mérida ACC. Discussions with several SENEAM officials were also conducted. The MITRE team then visited the Cancún ATCT to observe operations and discuss positions and roles, and gather other information on important matters such as aircraft surface movement which may become an issue at Cancún as demand increases.

The visits to Mérida and Cancún were very successful and productive. The MITRE HITL team has been reviewing the information that was gathered and is starting to advance on HITL preparations.

- On 3 June 2016, the MITRE team received information from SENEAM on its Mexico ACC Performance-Based Navigation (PBN) enroute design. The MITRE team spent a significant amount of time reviewing enroute design information in order to provide feedback to SENEAM. Other operational data was also received and it is being reviewed to determine its appropriateness for use by MITRE in its tools to assist SENEAM in its enroute airspace redesign efforts.

It is important to mention that the above-mentioned SENEAM-prepared Mexico ACC PBN enroute design introduced important changes to the SENEAM-MITRE Mexico TMA airspace design, including arrival and departure routes, that were jointly created through airspace design workshops conducted during the previous quarter. The MITRE team discussed the impact of these changes on the TMA airspace design, as well as potential operational issues with SENEAM during a lengthy teleconference. The SENEAM team is currently reviewing and considering MITRE's feedback. Once SENEAM completes its review, SENEAM and MITRE will discuss how best to proceed with modifying, as necessary, the TMA airspace design and associated arrival and departure routes.

- The MITRE team continues to coordinate closely with SENEAM on various matters pertaining to Cancún and NAICM work. For example, MITRE reviewed several SENEAM airspace design proposals for both Cancún and NAICM, and provided detailed feedback and suggestions for their consideration. As mentioned above, several important teleconferences with SENEAM have occurred this quarter, which have allowed for key items to be discussed.
- As per previous conversations with Undersecretary of Transportation, Lic. Yuriria Mascott and SENEAM, a procedure design tool (utilizing U.S. standards) should be acquired to facilitate SENEAM's review of MITRE's procedural work. This will also allow SENEAM and MITRE to work efficiently together on procedure design matters.

MITRE has been conducting discussions with the provider of an appropriate procedure design tool that is being considered for acquisition by MITRE itself. During these discussions, MITRE requested the provider that an evaluation license of that software be provided to SENEAM. After numerous, lengthy, and intense

discussions, the software provider agreed to offer SENEAM an 18-month evaluation license at no cost. This was, as MITRE sees it, a major accomplishment that will not only save time to SENEAM but contribute in the modernization of procedure design in Mexico.

MITRE discussed the offer with SENEAM and accepted it. SENEAM is now in the process of acquiring an appropriate laptop computer to run the software. MITRE expects that SENEAM will receive the software in the late July/early August timeframe. As a result, SENEAM and MITRE will be able to conduct procedure design work efficiently and in a collaborative manner using the same software tool. Following the 18-month evaluation and use period, SENEAM needs to make a decision about purchasing the software tool.

- During the 20 November 2015 visit to MITRE by Lic. Mascott and other officials, the topic of the second parallel runway at Toluca Airport was discussed. MITRE expressed its opinion to the officials that Toluca should be planned and protected for long-term growth, even if a second runway is not needed in the near future, and that to do so it is critical to ensure that operations at Toluca, both current and future, do not create capacity-limiting effects on operations at NAICM due to airspace conflicts.

As a result, all the officials present in the meeting, including Lic. Mascott, Ing. Kobeh, and Lic. Sarabia, agreed that a second parallel runway at Toluca should be considered in MITRE's work. Therefore, as mentioned in MITRE's January and March 2016 Technical Letters to ASA, a **formal written authorization from ASA that re-instates MITRE's analysis of a second parallel runway at Toluca into its scope of work has been requested. It is important that MITRE receives authorization as soon as possible as the entire Toluca work is now delayed (both runways need to be analyzed simultaneously). This is already starting to impact other NAICM-related airspace and procedure design work.**

Additionally, as mentioned in MITRE's January and March 2016 Technical Letters to ASA, **MITRE requires feedback from aviation authorities on the preferred location of the second parallel runway for Toluca for analysis by MITRE. However, and this is important, as runway spacing standards keep changing, this decision should be made in coordination with MITRE.**

If at least the first of the two requests mentioned above is received by 15 July 2016, MITRE will be able to avoid further delays by working harder. Following that date, however, the team reserved to complete that endeavor will need to be dispersed

- Under Task 8 of the ASA-MITRE contract, MITRE is to assist aviation authorities with examining problems relating to airport expandability in Mexico so that they learn how the NAICM experience applies to other work in Mexico. More specifically, MITRE will work on a sample runway-related solution regarding

expandability of a critical airport to be selected by the Mexican authorities, after consultation with MITRE. This task was to commence in 2015 with the selection by the Mexican authorities of the airport to be studied. Following the selection of the airport to be studied, an Automated Weather Observing System (AWOS) will be installed by SCT/ASA, if needed. A satellite-based photogrammetric survey (for which MITRE is responsible) will also be required.

MITRE received a letter from ASA (see Oficio ASA/C/03236/2016, dated 13 May 2016), which offered options for MITRE's consideration on how to address the selection of an airport. Based on the information and considerations described in that letter, MITRE preferred the option of discussing the matter directly with the DGAC. Therefore, MITRE will contact the DGAC to discuss the selection of an airport for MITRE to analyze.

- Contractual Matters
 - **Hidalgo-Related Work** – Per ASA information, MITRE's Hidalgo-related work was stopped due to Fuerza Aérea Mexicana (FAM) interest in relocating its fixed-wing non-transport aircraft operations to Querétaro Airport. However, MITRE informed through Technical Letter F500-L15-007, dated 12 January 2015, that FAM operations at Querétaro Airport, along with the establishment of Special Use Airspace (SUA) to support those operations, must be thoroughly examined to ensure that they are feasible and, more importantly, that they do not interfere with future operations at NAICM. Such investigation must be conducted in close coordination with FAM and SENEAM officials.

Since this work is not contained in MITRE's current contract, a modification of the contract will be required. MITRE received a letter from ASA (see Oficio ASA/C/121/2016, dated 23 March 2016) that contained ASA's proposal to amend the contract by replacing remaining Hidalgo-related work with work pertaining to the examination of relocating FAM fixed-wing non-transport operations to Querétaro Airport.

In May, MITRE submitted a letter to ASA suggesting that detailed discussions with officials from FAM on the specific work to be conducted for Querétaro Airport be conducted in the autumn 2016 timeframe once the NAICM airspace design reaches an appropriate stage (see MITRE document F500-L16-034). This is because MITRE feels the discussions will help to avoid confusion and facilitate dialogs with FAM officials that will allow for the identification and establishment of an appropriate scope of work for Querétaro Airport. At that time, it is going to be best to formally modify the contract.

- **Assignment to GACM** – On 17 June 2016, MITRE received via e-mail from ASA a document (Oficio/ASA/A/2016, dated 15 June 2016) requesting consent from MITRE to assign the ASA-MITRE contract to

GACM. Afterwards, on 21 June 2016, MITRE received via e-mail from ASA two documents, in English and Spanish (Oficio.-ASA/C/00313/2016, dated 21 June 2016; both versions have the same document number), which also stated that the ASA-MITRE agreement is to be assigned to GACM. The 21 June 2016 documents, however, indicated that certain obligations and rights of ASA would be suspended as of that date (i.e., when MITRE received the documents). This meant that ASA would not accept MITRE's 1 July deliverable and invoice package, to cite but one example.

MITRE's legal opinion is that this is an inappropriate process for MITRE, especially given its timing: that is, when a major deliverable and invoice package was being prepared for submittal to ASA. As a result, MITRE managers and contract officials have spent a significant amount of time dealing with this matter in order to ensure the assignment to GACM is conducted in an appropriate manner for all parties (i.e., ASA, GACM, and MITRE).

In the end, ASA agreed to accept and process MITRE's 1 July invoice on time and distribute the quarterly deliverables, as in the past. The legal areas of both ASA and MITRE are dealing with this matter at the time of this writing.

Note that due to the above-mentioned assignment, the Hidalgo and Toluca contractual matters may need to be addressed by GACM, unless before the assignment process ends, ASA reinstates the second-runway process to avoid a delay in MITRE's Toluca and airspace redesign work. This is due to the fact that without ASA's re-authorization, the team reserved to perform this task would need to be dispersed after 15 July 2016.

Please do not hesitate to contact me if you need any clarification or assistance.

Sincerely,



Ing. Robert W. Kleinhans
Project Technical Coordinator

Included with this letter:

Six Enclosures

cc: Dr. Bernardo Lisker
Ing. Jorge Nevárez

This two-page return receipt (*acuse de recibo*) is to be scanned (both pages) and e-mailed to Ing. R. Kleinhans

1 JULY 2016 TECHNICAL LETTER DISTRIBUTION

MITRE requests that the documents enclosed with this Technical Letter are distributed as follows.

1. Enclosure No. 1 to this Technical Letter (F500-L16-039): Minimum Vectoring Altitude Charts for NAICM and Toluca – Preliminary Results, dated 30 June 2016.
 - ASA: 5 copies
 - GACM: 5 copies
 - SENEAM: 5 copies
 - DGAC: 5 copies

2. Enclosure No. 2 to this Technical Letter (F500-L16-039): Nuevo Aeropuerto Internacional de la Ciudad de México Preliminary Airspace Redesign – Informal Working Notes on Departure Procedures, dated 30 June 2016.
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 - SENEAM: 5 copies
 - DGAC: 5 copies

The distribution of the six, above-mentioned documents, was completed.



Ing. Jorge Nevárez Jacobo

Date

July, 8th, 2016