MITRE

12 January 2015
F500-L15-007

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

Subject: Technical Letter: Summary of Work During the Period 1 October 2014 through 15 January 2015

Dear Lic. Sarabia:

Let me begin by congratulating you on your new position as Director General of Aeropuertos y Servicios Auxiliares (ASA). We at MITRE look forward to working with you in your new role and hope that you are able to visit our laboratories in the near future. MITRE has had an almost uninterrupted relationship with ASA for over 17 years, ever since the initial triple-approach Texcoco project was contemplated in 1996.

I am the technical coordinator of the ASA-MITRE project to assist Mexico's Secretariat of Communications and Transportation (SCT) and the Grupo Aeroportuario de la Ciudad de México (GACM) through ASA. The generic goal of the project is the implementation of aeronautical plans leading to the operation of a new airport for Mexico City, referred to as Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM). Such assistance includes support in a number of critical aeronautical areas associated with the modernization of key national aviation elements of importance to the new airport. For example, MITRE will provide guidance regarding the complex Air Traffic Control (ATC) transition to independent approach and departure operations, not yet performed in Mexico, as well as with the modernization of regulations necessitated by NAICM.

I am going to assume, unless I receive different instructions from you, that Ing. Jorge Nevárez, with whom I have had an excellent relationship, will continue to be my main point of contact at ASA. Thus, I will plan to continue to communicate via telephone and e-mail with him and his designated lieutenant and also continue with the previous practice of copying the Director General, in this case yourself. However, no reply will be expected from you, unless you find it necessary. We would also like to request that Ing. Nevárez continues to copy all e-mail communications to you and our International Director, Dr. Bernardo Lisker.

Finally, Lic. Manuel Ángel Núñez, GACM's Director General, has requested that MITRE continue its engagement with GACM itself, the Dirección General de Aeronáutica

Civil (DGAC), Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM), and other entities, as appropriate. It is MITRE's objective to keep all entities well informed, as appropriate, about MITRE's work throughout. Much of this will require ASA's coordination and intermediation. Lastly, all activities worth of note will continue to be reported through a quarterly Technical Letter to ASA, such as the present letter.

This letter respectfully submits to your attention a summary of the most significant project activities conducted by MITRE during the period 1 October 2014 through 15 January 2015.

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, some of which have been delivered to ASA and other parties throughout the concluding quarter. The documents denominated Enclosures, are described after the list below.

1. Assessment of Tanque Chiconautla and Depósito Chiconautla, dated 23 October 2014 (see MITRE letter F500-L15-001)
2. Automated Weather Observing System (Revised Proposal Review), dated 21 November 2014 (see MITRE letter F500-L15-005)
3. Points of Consideration Concerning the Development of NAICM, dated 27 November 2014 (See MITRE letter F500-L15-002)
4. Enclosure No. 1 to this Technical Letter (F500-L15-007): Weather Analysis for the Nuevo Aeropuerto Internacional de la Ciudad de México Site, dated 12 January 2015
5. Enclosure No. 2 to this Technical Letter (F500-L15-007): Nuevo Aeropuerto Internacional de la Ciudad de México and Cancún Airport Terminal Maneuvering Area Redesign – An Overview of Implementation Planning, dated 12 January 2015
6. Enclosure No. 3 to this Technical Letter (F500-L15-007): Independent Operations at Nuevo Aeropuerto Internacional de la Ciudad de México and Cancún Airport – Air Traffic Control Equipment Requirements and Key Elements to Consider, dated 12 January 2015
7. Enclosure No. 4 to this Technical Letter (F500-L15-007): Cancún Airport – Procedure and Airspace Design Data Request, dated 12 January 2015
8. Enclosure No. 5 to this Technical Letter (F500-L15-007): Photogrammetric, Satellite-Based Survey of the Texcoco Area and Its Surroundings – Final Report, dated 12 January 2015
9. Enclosure No. 6 to this Technical Letter (F500-L15-007): Review of the Pre-Master Plan for Nuevo Aeropuerto Internacional de la Ciudad de México – An Overview, dated 12 January 2015

- **Enclosure No. 1:** ***Weather Analysis for the Nuevo Aeropuerto Internacional de la Ciudad de México Site.*** This report provides a summary of weather conditions at the NAICM site on the basis of over five years of data from an on-site Automated Weather Observing System (AWOS) located at El Caracol. Important information on the potential need for Category (CAT) II/III approaches is included as well.

- **Enclosure No. 2:** ***Nuevo Aeropuerto Internacional de la Ciudad de México and Cancún Airport Terminal Maneuvering Area Redesign – An Overview of Implementation Planning.*** This document highlights the key tasks and projects that must be conducted to turn a conceptual airspace design into reality. This process involves and requires input from experts with diverse backgrounds.

- **Enclosure No. 3:** ***Independent Operations at Nuevo Aeropuerto Internacional de la Ciudad de México and Cancún Airport – Air Traffic Control Equipment Requirements and Key Elements to Consider.*** This document describes the principal requirements for surveillance, display, and communications for conducting dual- and triple-independent operations. It also identifies and describes important airspace and ATC elements to be considered in preparing NAICM and Cancún Airport for conducting these complex operations.

- **Enclosure No. 4:** ***Cancún Airport – Procedure and Airspace Design Data Request.*** This is the guiding document on initial data requirements that are necessary to conduct many of the required tasks associated with preparations for introducing dual independent operations at Cancún Airport.

- **Enclosure No. 5:** ***Photogrammetric, Satellite-Based Survey of the Texcoco Area and Its Surroundings – Final Report.*** MITRE is responsible for the procurement of a satellite-based survey of the Texcoco area and its surroundings to support its own aeronautical work for NAICM. MITRE is pleased to report that the survey has been completed. Additionally, a MITRE team conducted a thorough review of the photogrammetry. The survey is now considered complete and ready for use by MITRE in conducting its NAICM-related aeronautical work.

  This enclosure provides the final documentation regarding the survey work. The report also describes additional work of verification ordered by MITRE and conducted in the field in Mexico City from 1 through 10 December 2014. The objective of the visit was to conduct final obstacle verification work within critical procedure design areas. MITRE assisted in the planning and coordination of this work. Furthermore, procedure design experts from MITRE travelled to Mexico City to accompany the MDA team and make observations.

  MITRE wishes to thank ASA for its support and assistance in facilitating the work.

- **Enclosure No. 6:** ***Review of the Pre-Master Plan for Nuevo Aeropuerto Internacional de la Ciudad de México – An Overview.*** MITRE assembled a large team of experts to thoroughly review the Arup Pre-Master Plan for NAICM. MITRE's review focused primarily on matters that pertain to the aspects of

MITRE's aeronautical work. The objective of the review was to identify differences considered important between MITRE's and Arup's work as well as potential issues and/or questions for consideration by Mexican aviation officials.

Activities

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

- In late September 2014, Dr. Bernard Lisker travelled to Mexico City to meet with Lic. Núñez. The meeting did not take place during the present reporting period and yet is being included here because feedback on the discussions that occurred during that meeting was not provided until after MITRE sent its previous quarterly Technical Letter.

  The objective of this meeting was to discuss urgent project-related matters. The meeting was extremely useful and resulted in the establishment of several action items, most of which are described in the MITRE letter "Points of Consideration Concerning the Development of NAICM" (MITRE letter F500-L15-002), listed above. The letter is described in the following section ("Summaries of Importance").

  Later on, during an International Civil Aviation Organization (ICAO) conference in Montreal in early October, Dr. Lisker communicated the same information described in that letter to then ASA Director General, Cap. Gilberto López Meyer.

- MITRE has been coordinating upcoming work with top former aviation executives that have experience in the area of organizational structures and best practices. The executives will provide SCT and DGAC with lectures and suggestions on lessons-learned based on years of supporting major air navigation service providers and civil aviation authorities. This is very timely as the SCT is moving forward to create a new civil aviation agency in Mexico.

  Specifically, the two former top aviation executives visited MITRE on 9 and 10 October 2014. MITRE plans to discuss with the DGAC the type of support that these individuals will provide.

- Per ASA request, MITRE examined the potential impact to aeronautical operations at NAICM caused by two water storage tanks (one existing and one proposed) in the vicinity of the Chiconautla hill. MITRE sent a document to ASA on 23 October 2014 that provided the results of MITRE's extensive examination. That document (MITRE letter F500-L15-001) is listed above.

- MITRE received from ASA a revised technical proposal dated 23 October 2014 submitted to ASA by Rossbach de México S.A. de C.V. describing the Vaisala AWOS devices being considered for installation at three potential airport sites to be selected in the State of Hidalgo. The MITRE team conducted a detailed review of the technical proposal.

On 12 December 2014, during a MITRE trip to Mexico City summarized in the following section ("Summaries of Importance"), MITRE hand-delivered a document to Ing. Nevárez (MITRE letter F500-L15-005), listed above, that includes comments on the AWOS technical proposal.

- In late October 2014, MITRE received Volume I of Arup's Pre-Master Plan (*Anteproyecto Ejecutivo,* dated 1 September 2014). As the MITRE team noticed during its initial review that additional volumes were referenced in Volume I, MITRE requested from ASA the complete report to conduct a complete and comprehensive review of Arup's Pre-Master Plan. The remaining volumes and material were received by MITRE in late November 2014.

  MITRE assembled a large team of engineers with diverse areas of expertise to conduct a detailed review of Arup's Pre-Master Plan. The Pre-Master Plan consists of a large amount of information contained in several volumes and associated drawings, and required a significant amount of time and effort to review. The MITRE team worked extremely hard to complete the review of the material as soon as possible in order to provide appropriate and helpful feedback. The results of MITRE's review are in Enclosure 6, listed above.

  It is important to mention that Dr. Lisker had a detailed conversation with Ms. Jackie Coburn of Arup in late February 2014. During that conversation, project related matters were discussed in a friendly and professional manner, and it was agreed that Arup would consult with MITRE as Pre-Master Plan work would progress. However, MITRE was not contacted by Arup until November 2014, after the Pre-Master Plan had already been completed. As a result, MITRE was not able to provide any feedback on the Pre-Master Plan until now. Complicating this matter is the fact that Ms. Coburn informed Dr. Lisker that Arup is now working on a Master Plan that is scheduled to be completed in February 2015, which does not allow much time for MITRE's Pre-Master Plan comments to be considered by Arup in its development of the Master Plan.

- In late November 2014, MITRE prepared an extensive document for Lic. Núñez, describing key points of consideration concerning the development of NAICM. That document was prepared in an effort to keep Lic. Núñez, key aviation officials, and other project stakeholders thoroughly informed, to the best of MITRE's ability, about important factors concerning the initial stages, through late 2015/early 2016, regarding the development of NAICM. The document focused on actions that require attention in the near-future, as well as concerns that could potentially become issues. The document is listed above as MITRE letter F500-L15-002.

  It is important to mention that MITRE also provided copies of this document and discussed its contents in detail with Capt. López Meyer of the DGAC, during a meeting with Dr. Lisker in Mexico City on 28 November 2014. This meeting was important because much of MITRE's upcoming work involves the DGAC (e.g., regulatory modernization). Furthermore, the document was discussed by

Dr. Lisker and I with Ing. Nevárez during a meeting in Mexico City in the afternoon of 12 December 2014. Additionally, Dr. Lisker met with Lic. Núñez in Mexico City later that same day to discuss the contents of the document and other important matters. These three meetings just mentioned above are summarized in the following section ("Summaries of Importance").

- On 5 December 2014, a team of MITRE engineers visited Cancún Airport for a full-day of activities. Cancún Airport will serve as a test-bed for future independent operations at NAICM. The objective of MITRE's visit was to hold technical discussions with experts from SENEAM and present briefings regarding the complex ATC transition planning and multiple elements, including equipment requirements that need to be considered in preparing Cancún Airport for independent operations.

  The MITRE team visited the Cancún Airport Air Traffic Control Tower and the Approach Control facility to observe operations and conduct discussions with controllers. A detailed brainstorming session was also conducted regarding independent approach and departure operational concepts at Cancún Airport. The visit was extremely successful and the MITRE team obtained valuable information to support upcoming work pertaining to procedural and airspace design matters.

  On 11 December 2014, a team of MITRE engineers visited Mexico City to meet with SENEAM officials. Two separate meetings were conducted, described in the following section ("Summaries of Importance").

Summaries of Importance

Executive Planning Meeting at SENEAM – On 11 December 2014, Dr. Lisker, Ing. David Barrett, and I met with Ing. Claudio Arellano, Director General of SENEAM, and practically all of his top technical officials to discuss and coordinate important SENEAM-related tasks and activities. During this meeting MITRE presented a detailed overview of the most critical NAICM-related aeronautical items that should be addressed during the 2015-2016 timeframe. The most urgent items discussed during this session were the following:

- Coordination of studies and plans with airlines and other stakeholders
- Flight checks/flight validation activities
  - Note that this requires the acquisition and/or installation of appropriate ILS equipment and, in the case of advanced navigation, the rental of specialized aircraft. MITRE had previously provided information to SENEAM regarding a manufacturer of the type of specialized ILS equipment that is required for conducting the long final approaches envisioned for NAICM and SENEAM had already contacted it.

    During the meeting, Ing. Arellano informed MITRE that it may take between 9 and 12 months to acquire appropriate ILS equipment to

conduct flight checks. Ing. Arellano, however, plans to investigate ways to obtain appropriate equipment sooner.

- Decision by aviation authorities regarding grading (including to what extent) of the hills at Chiconautla and Chimalhuacán
- Final review of instrument procedures and other key aeronautical work, probably during a long-term visit to MITRE by SENEAM procedure designers

While the above-mentioned meeting was underway, two MITRE engineers visited the Mexico Area Control Center (ACC) to observe operations and have discussions with controllers.

Following the initial meeting, two additional MITRE experts joined in (Dr. Vincent Massimini and CTA. Dennis Zondervan) and presented specialized briefings to SENEAM officials. The briefings included many details on the complex ATC transition planning and multiple elements, including equipment requirements that need to be considered in preparing NAICM for independent operations. During the meeting, several technical discussions ensued regarding ATC equipment matters, concerning radars and radar monitors, like the Final Monitor Aid (FMA) display. Enclosure 3, listed above, provides details.

The entire meeting, which lasted about 10 hours, was extremely useful and established the foundation to allow SENEAM and MITRE to work closely together on upcoming aeronautical activities. Ing. Arellano was accommodating in every sense. MITRE also provided SENEAM additional copies of the document entitled Independent Approaches to Two Runways at Cancún (MITRE document F500-L14-022) and Summary of Critical Aeronautical Steps Pertaining to the NAICM Project (MITRE document F500-L14-027), both initially delivered to ASA and SENEAM much earlier in 2014.

Executive Planning Meeting with ASA – On 12 December 2014, Dr. Lisker and I met with Ing. Nevárez in Mexico City for a high-level meeting to discuss upcoming parts of MITRE's work program and other important matters. The following summarizes the key issues discussed during the meeting:

- Administrative Changes:
  - The recent appointment of yourself to Director General of ASA needs to be officially recognized for contractual reasons. Therefore, Ing. Nevárez will provide MITRE with a letter that officially reflects this change.
- Hidalgo Work:
  - Ing. Nevárez confirmed that MITRE's Hidalgo-related work should stop due to the Fuerza Aérea Mexicana's (FAMs) interest in relocating its fixed-wing non-transport aircraft operations to Querétaro Airport. However, Dr. Lisker and I told Ing. Nevárez,

that FAM operations at Querétaro Airport, along with the establishment of Special Use Airspace 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 officials. Since this work is not contained in MITRE's current contract, a modification of the contract will be required. This should be done after detailed discussions with officials from FAM are held to confirm their plans and priorities.

MITRE understands the decision by Mexican aviation officials to stop work at Hidalgo. However, it is important that officials understand the potential risks that stopping Hidalgo work may have on the opening of NAICM if unforeseen issues arise later. In order for NAICM to open, Santa Lucía's runway must be closed and all FAM fixed-wing non-transport operations should be relocated. If a decision is made later to restart Hidalgo work due to unforeseen issues that prevent FAM operations from moving to Querétaro Airport, MITRE's Hidalgo work program would be severely delayed. This is because in order to examine the Hidalgo airport sites, at least one-year of appropriate weather data from an on-site AWOS must be collected. Furthermore, surveys must be ordered and conducted, which can take around one year to complete. Finally, MITRE may not be able to restart its Hidalgo work if it is busy with other scheduled analytical work. As a result, the completion of MITRE's Hidalgo work would be severely delayed, which could ultimately affect the opening of NAICM.

- Coordinates of NAICM Property Boundaries:
  - MITRE requires a drawing (preferably in AutoCAD) showing the definitive boundaries of the full property allocated for the construction of NAICM, utilizing coordinates based on World Geodetic System 1984 (WGS84).

    Ing. Nevárez stated that he will provide the boundary information to MITRE by 15 January 2015.

- Toluca Airport:
  - A discussion regarding plans to expand Toluca Airport was conducted during the meeting with Ing. Nevárez, who stated that there are no definitive plans in the near future to construct a second runway at Toluca Airport. Nevertheless, Ing. Nevárez will provide MITRE with a runway spacing scenario(s) to assist MITRE in making a decision on a potential runway location for Toluca Airport. This will allow preparatory work (e.g., the ordering of a

survey) to be conducted to support analytical work expected to commence in the second half of 2015.

- Bird Mitigation Experiments:
  - A large amount of birds can be found at the water bodies (especially at Lago Nabor Carrillo) near the NAICM site during the winter months. MITRE has been suggesting for several years that bird mitigation experimentation be conducted during the high-bird population periods of the winter months to ensure that a significant number of birds can be discouraged from using areas near the future airport. It is important that these experiments be conducted as soon as possible. Every winter season that is missed is a lost opportunity to conduct mitigation experiments.

    Dr. Lisker and I discussed the need to conduct bird mitigation experiments with Ing. Nevárez who in turn stated that he will look into this matter further. Please keep MITRE informed of plans regarding the experiments.
- Points of Consideration Concerning the Development of NAICM:
  - As previously mentioned, MITRE prepared an extensive document for Lic. Núñez describing key points of consideration concerning the development of NAICM. Dr. Lisker and I reviewed this document thoroughly with Ing. Nevárez.
- Comisión Federal de Electricidad (CFE) Powerlines:
  - During MITRE's December 2014 visit to Cancún Airport, CTA. Bruce Magallón of SENEAM informed MITRE that the proposed CFE powerlines located to the west of the NAICM site and to the north of the NAICM site near El Caracol would be located underground. However, CTA Magallón was not sure if the proposed CFE powerlines that continue towards Teotihuacán would be underground or above ground.

    Ing. Nevárez confirmed that the proposed CFE powerlines located to the west of the NAICM site and to the north of the NAICM site near El Caracol would be located underground. However, he was not sure if the proposed CFE powerlines that continue towards Teotihuacán would also be underground (and how far). MITRE will ask CTA. Magallón about the powerlines that continue towards Teotihuacán. If necessary, MITRE will ask ASA for assistance in this matter.

- On 12 December 2014, Dr. Lisker met with Lic. Núñez to discuss important project matters. During the meeting Dr. Lisker reviewed the document that MITRE prepared describing key points of consideration concerning the

development of NAICM. The following summarizes the main items discussed during the meeting:

- FAM-MITRE Engagement:
  - MITRE requires contact information about top FAM officers to coordinate the re-establishment of discussions at the earliest convenience. This is important as MITRE needs to discuss and coordinate its work with FAM in order to obtain their feedback and to obtain information to support MITRE's analytical work. For example, MITRE agreed to examine (an out of scope activity) the feasibility of new helicopter training areas to be recommended by FAM officials. FAM was to send to MITRE the coordinates of those areas by 25 February 2014, eleven months ago, for MITRE's immediate analysis. MITRE, however, has not received to-date any information.

    In order to re-establish discussions with FAM, Lic. Núñez asked that Ing. Nevárez give MITRE the contact information of a top FAM official who has the authority to coordinate meetings and activities.

- Hidalgo Work
  - Lic. Núñez confirmed that MITRE's Hidalgo-related work should stop due to FAMs interest in relocating its fixed-wing non-transport aircraft operations to Querétaro Airport. Dr. Lisker understood the reasons for this decision and made Lic. Núñez aware of the risks to NAICM-related work if a decision is made later to restart work at Hidalgo due to problems with relocating FAM operations to Querétaro Airport.

- Pre-Master Plan-Related Matters:
  - Lic. Núñez mentioned that Arup's Pre-Master Plan should show that all runways have a width of 60 m.

    Dr. Lisker also mentioned to Lic. Núñez that the Pre-Master Plan shows a different location for runway 5 (as counted from west to east), which is something that MITRE has not analyzed. Regarding this matter, Lic. Núñez said that all runway locations being considered by Arup should be those that were recommended by MITRE in July 2012, including runway 5.

    Finally, Dr. Lisker expressed MITRE's concern regarding constructing runway 2 first instead of runway 1 (as MITRE is afraid runway 1 may never be constructed in the future due to unjustified public protests). Lic. Núñez mentioned that he would talk to

Secretary Gerardo Ruiz Esparza about this matter and requested MITRE's support on this.

- Coordination with Airlines:
  - Lic. Núñez agreed to provide MITRE contact information of airline representatives in order for MITRE to coordinate a meeting. He introduced Dr. Lisker to Lic. Dora Clelia Rodríguez. She will assist MITRE on the airline information once she receives a specific request via e-mail.
- Coordination with Foster + Partners, FR-EE (Fernando Romero Enterprise) and NACO (Netherlands Airport Consultants)
  - Lic. Núñez agreed to provide MITRE with the contact information of Foster + Partners, FR-EE (Fernando Romero Enterprise) and NACO in order for MITRE to coordinate a meeting.

    It is relevant to mention that after the meeting with Lic. Núñez Architect Fernando Romero sent an e-mail to Dr. Lisker to coordinate a visit to MITRE.
- Flight Checks and/or Flight Validation Activities
  - Dr. Lisker informed Lic. Núñez that Ing. Arellano informed MITRE that it may take one year to acquire the appropriate ILS equipment to conduct flight checks. However, Dr. Lisker explained that Ing. Arellano would investigate ways to obtain appropriate equipment sooner.
- Parametric Analysis of Runway Elevations Versus Hill Grading
  - Dr. Lisker offered Lic. Núñez to conduct at MITRE a parametric analysis of runway elevation versus the requirements to grade the hills at Chiconautla and Chimalhuacán. In order to conduct this analysis in a timely manner, however, MITRE will need to delay the start of other NAICM-related work, such as re-checking of instrument procedures on the basis of new photogrammetry. Nevertheless, MITRE understands the importance of conducting the runway elevation analysis and is already progressing on it. MITRE expects to complete the parametric analysis by late January or early February 2015.

    It is important to note that in order to conduct this analysis MITRE requires information on the sink rate of the soil at the NAICM site, which is something that Ing. Nevárez has offered to provide.

- MITRE has been advancing on the development of CAT II/III ILS instrument approach procedures at NAICM and investigating issues associated with establishing those procedures. There are two important analyses regarding the

establishment of CAT II/III instrument approach procedures at NAICM, which are discussed in the following paragraphs:

- Operational need for CAT II/III instrument approach procedures based on weather at the NAICM site
- Procedure-design considerations for CAT II/III instrument approaches

MITRE has examined the operational need for CAT II/III instrument approach procedures. (Refer to Enclosure 1 of this Technical Letter for additional details.) Based on over *five years* of weather data collected from an AWOS located at the NAICM site (from 1 May 2009 through 11 October 2014), MITRE's weather analysis indicates that CAT II/III weather conditions occur a very low percentage of the time. CAT II/III weather conditions occurred 81 days for a total of 111 hours. This is equivalent to approximately 20 hours of CAT II/III weather conditions per year on average. Also, on 29 out of the 81 days, CAT II/III weather conditions lasted only 0.5 hours. Therefore, it appears the actual need for CAT II/III instrument approach procedures is marginal. For example, in December 2013, the month with the most occurrence of poor weather over 24-hour-day periods, a total of 8.5 hours of CAT II/III weather conditions were observed during three days. The hours were distributed as follows:

- 1 December 2013 - 6.5 hours, from 03:00 to 09:30
- 5 December 2013 - 1.5 hours, from 06:00 to 07:30
- 11 December 2013 - 0.5 hours, from 08:00 to 08:30

Additionally, MITRE examined the winds during CAT II/III conditions. The winds were either calm or favored north flow operations approximately 98% of the time during CAT II/III conditions. This would indicate that if CAT II/III capability were deemed necessary, it would only be required for northerly operations.

The Mexican aviation authorities may want to conduct a cost-benefit analysis regarding the establishment of CAT II/III instrument approach procedures at NAICM. Moreover, it is important for MITRE to analyze first Runway Visual Range (RVR) statistics during CAT II/III weather at Texcoco. Fortunately, Ing. Arellano has mentioned the possibility of installing an RVR at the NAICM El Caracol area (the RVR is today located at Toluca Airport).

MITRE's instrument procedure design work for NAICM is based on United States (U.S.) Federal Aviation Administration (FAA) standards, which have been used in Mexico for many years. The U.S. FAA allows CAT II/III instrument approach procedures only when a CAT I instrument approach procedure to the same runway is "unrestricted". Under U.S. FAA definitions, an unrestricted CAT I instrument approach procedure is one that supports CAT I minima of 200 ft Height Above Touchdown (HAT) and the lowest permitted visibility. Additionally, the

unrestricted minima must be achieved without the application of a non-standard Climb Gradient (CG) on the respective missed approach.

As mentioned in MITRE's Technical Letter dated 29 September 2014 (see MITRE letter F500-L14-047), preliminary approach designs indicate that only one of the 12 runway ends at NAICM may have an unrestricted CAT I instrument approach procedure. Therefore, under the U.S. FAA criterion, eleven runway ends would *not be eligible* for CAT II/III instrument approach procedures.

However, and this is important, the causes of the ineligibility are relevant. For eleven runway ends:

- Several runways require non-standard CGs to ensure obstacle clearance on missed approach. When such CGs are applied, the instrument approaches reach their lowest minima.
- Several runways require an adjustment for precipitous terrain, but the precipitous terrain adjustment is minimal (a 12 ft or less increase in HAT).

The above points would be considered disqualifying for CAT II/III instrument approach procedures in the U.S. Nevertheless, the U.S. FAA allows an Equivalent-Level-of-Safety (ELS)[1] argument to allow CAT II/III instrument approach procedures to runways without unrestricted CAT I approach minima.

It is important to note that ICAO procedure design requirements and criteria differ from U.S. standards when it comes to the development of CAT II/III instrument approach procedures. Specifically, there is no requirement for an unrestricted CAT I instrument approach procedure in order to have a CAT II/III instrument approach procedure on the same runway. There are examples of ICAO CAT I instrument approach procedures that have a HAT greater than 200 ft and/or a CG in the missed approach segment, yet still allow for CAT II/III instrument approach procedures to the same runway.[2]

The MITRE team held a series of intense meetings to identify potential methods to properly and safely mitigate the unrestricted CAT I issue so CAT II/III instrument approach procedures could be established at NAICM, assuming that Mexican authorities determine that CAT II/III capability is necessary considering the weather at NAICM. MITRE believes that if all appropriate factors are considered and examined, an ELS could be developed that would allow CAT II/III instrument approach procedures to be published at NAICM despite the presence of a non-standard CG and/or a precipitous-terrain adjustment. MITRE's view is only

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[1] An ELS means a finding that shows that alternative action taken provides a level of safety equal to that provided by the airworthiness standards for which equivalency is being sought.

[2] Tegel Airport in Germany (EDDT) has a CAT I ILS approach procedure with a higher–than-200-ft HAT, but still has a CAT II/III instrument approach procedure to that runway. Hong Kong International Airport (VHHH) has a CAT I ILS instrument approach procedure with a 5% CG that is needed to achieve a 200 ft HAT, but still has a CAT II instrument approach procedure to that runway. The CAT II instrument approach procedure also requires a 5% CG.

advisory and preliminary and the entire matter should be the subject of a thorough review.

- On 19 December 2014, Dr. Lisker and I had a telephone conference call with Ing. Nevárez to discuss and coordinate important project matters as well as information requirements.

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

Sincerely,

Ing. Robert W. Kleinhans
Project Technical Coordinator

6 enclosures and 3 separate documents

cc: Dr. Bernard Lisker

DOCUMENT DISTRIBUTION PLAN

MITRE requests that the documents enclosed with this Technical Letter are distributed as follows. Please request proof of delivery and confirm to MITRE that it took place.

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    - SENEAM: 5 copies
    - DGAC: 2 copies

6. Enclosure No. 3: Independent Operations at Nuevo Aeropuerto Internacional de la Ciudad de México and Cancún Airport – Air Traffic Control Equipment Requirements and Key Elements to Consider, dated 12 January 2015 (MITRE letter F500-L15-007)

    - ASA: 5 copies
    - GACM: 3 copies
    - SENEAM: 5 copies
    - DGAC: 2 copies

7. Enclosure No. 4: Cancún Airport – Procedure and Airspace Design Data Request, dated 12 January 2015 (MITRE letter F500-L15-007)

    - ASA: 5 copies
    - GACM: 3 copies
    - SENEAM: 5 copies

8. Enclosure No. 5: Photogrammetric, Satellite-Based Survey of the Texcoco Area and Its Surroundings – Final Report, dated 12 January 2015 (MITRE letter F500-L15-007)

    - ASA: 5 copies

9. Enclosure No. 6: Review of the Pre-Master Plan for Nuevo Aeropuerto Internacional de la Ciudad de México – An Overview, dated 12 January 2015 (MITRE letter F500-L15-007)

    - ASA: 5 copies
    - GACM: 5 copies
    - SENEAM: 3 copies
    - DGAC: 2 copies