

MITRE

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**Subject: Technical Letter: Summary of Work During the Period
1 July Through 30 September 2011**

Dear Lic. González Weeks:

This letter respectfully submits to your attention a summary of the most recent project activities conducted by MITRE.

Visit by Officials from ASA, SEMARNAT, and CONAGUA to MITRE

On 28 July, officials from SEMARNAT (led by Subsecretary Lic. Mauricio Limón), CONAGUA (led by its Director, Ing. José Luis Luege), and ASA (led by Ing. Jorge Nevarez, representing ASA's Director-General), and other officials, visited MITRE for a number of presentations, discussions, and laboratory demonstrations regarding the SCT-MITRE project. Their visit to MITRE was extremely useful and the feedback obtained regarding hydrological needs in the Mexico City area, and particularly Texcoco, was invaluable. The officials from SEMARNAT and CONAGUA were made aware of the bird hazard concerns pertaining to the development of a new airport in the Texcoco area.

During this very useful encounter, MITRE was informed by CONAGUA that it may be possible to dry all bodies of water located north of the "Autopista Peñón Texcoco". In order to do this, however, additional reservoirs will likely be needed south of the highway, a large deep drainage tunnel may need to be added, and additional water treatment plants will need to be constructed to meet the water regulation needs of the Mexico City area, in particular Texcoco. All of these hydrology projects will need to be part of the airport project to make it a reality.

CONAGUA also informed MITRE that additional land parcels have been acquired (or are in the process of being acquired) along the northeastern federal boundary lines originally provided to MITRE by SCT. As a result, MITRE was informed that it may be possible to shift the eastern-most pair of runways farther to the north, across the above-mentioned boundary. This would increase the distance of the eastern-most pair of runways from Lago Nabor Carrillo to 3 km, which meets the United States Federal Aviation Administration (FAA) recommendation for separation between runways and wildlife attractants (e.g., water bodies, such as Lago Nabor Carrillo). Only a small amount of land (considered somewhat politically sensitive) would still need to be acquired for this to happen.

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This news prompted MITRE to conduct an exploratory analysis of a new runway configuration, at no cost to SCT, to determine if it appears to be aeronautically feasible. Initial findings appear promising. To move from an exploratory to a conclusive stage, MITRE requested authorization from the DGAC to conduct more detailed aeronautical analyses of this new runway configuration, again at no additional cost to SCT. This additional analysis is complex and will push forward deliverables not connected to the determination of ultimate feasibility of Texcoco, such as the final airspace analysis and parts of Tasks 10, 11, and 12. A statement to this affect was provided by MITRE and you provided authorization to proceed, via email, on 21 September.

It is important to mention that significant bird mitigation efforts will still be required south of the highway. This is because, despite the 3 km separation, a significant amount of birds would still be located south of the highway. Therefore, it is important that bird mitigation experiments start as soon as possible and are conducted throughout airport construction to determine the extent of success of the mitigation measures. The degree to which additional water bodies may need to be dried is directly connected to the success of the mitigation experiments mentioned above.

Visit by Official from DGAC to MITRE

Ing. Agustín Cano visited MITRE on 4 August for a full day of briefings and demonstrations. The objective of his visit was to familiarize him with the SCT-MITRE project and make him fully aware of the status of all key activities. Urgent issues that need to be resolved and critical support that MITRE needs in order to advance its work were also discussed. The agenda included a visit to MITRE's Air Traffic Management (ATM) Laboratory for several flight demonstrations, which included the Mexico City area. The visit was extremely successful and useful. Ing. Cano was also made aware of the information provided to MITRE by the CONAGUA officials, both in terms of hydrological solutions as well as land acquisition.

Important Texcoco-Related Assumptions

During the above-mentioned visit by Ing. Cano to MITRE, several key assumptions that should be made which affect MITRE's Texcoco-related work were discussed. MITRE cannot continue its work without making those assumptions. It was agreed that to prevent additional delays project work will continue unless SCT formally asks MITRE not to utilize the assumptions shown below, many of which have been communicated to SCT in previous technical letters.

The most important assumptions being utilized by MITRE to determine the feasibility of operating a large airport at Texcoco are shown below. Note that only one of them, still under investigation by SENEAM (long finals) can become a project *showstopper* or at the very least a factor that would send MITRE back to the drawing board.

- Santa Lucía Military Base

Santa Lucía Military Base will need to be relocated before the new airport opens (i.e., this gives perhaps another 8-10 years to prepare) to prevent it from becoming a project *showstopper*. Its existence along with a new airport at Texcoco would create a highly complex airspace environment (with all the safety issues that come with that) and would adversely impact runway capacity, thus reducing the overall benefit of the Texcoco Airport. MITRE has analyzed this matter in great detail along with SENEAM, reaching a joint conclusion that the base should be relocated. Additionally, it is extremely important to state that no new airports should be planned in the area (e.g., a Pachuca airport) until such time that a full airspace redesign for the Valley of Mexico has been completed and tested.

- Hydrology and birds (see CONAGUA Visit to MITRE section) are assumed not to become an issue.

- Minimum Vectoring Altitude Chart (MVAC)

An appropriate MVAC to support operations at a future Texcoco airport and at Toluca airport was developed by MITRE as part of Task 10 and was then examined by SENEAM. The design assumed that radar coverage (SENEAM provided MITRE with this information) and radar software systems can be configured appropriately to meet operational needs. While this is the domain of SENEAM, MITRE *does not see this as a showstopper*.

- Long Finals

MITRE's procedure design work indicates that high terrain may require final approach paths for Texcoco that are relatively long (sometimes referred to as "long finals"). The main concern regarding long finals is that they may extend well beyond the normal operating range of Instrument Landing System (ILS) signals. MITRE will assume that long finals will not be an issue for Texcoco.

Queries by MITRE indicate that other airports with long finals are able to receive appropriate ILS signals. Nevertheless, as each airport situation is unique MITRE recommends that this matter be further examined by SENEAM to obtain more confidence that signals at Texcoco can be received by aircraft. MITRE has provided SENEAM with the necessary information to investigate this potential issue which if left unresolved, *can be a showstopper*.

- Climb Gradients

Climb gradients on missed approach and departure procedures need to be approved by the DGAC (this has already been approved by the FAA; Ing. Cano was given a copy of the Order). The airlines should be consulted. SENEAM has communicated to MITRE that this should not be an issue.

- **Nearby Hills**

Nearby hills to the north and south of the Texcoco site penetrate the International Civil Aviation Organization (ICAO) Annex 14 Obstacle Limitation Surfaces. MITRE assumes that the hills will be graded as necessary (and the antennas located on its peak removed) and/or a waiver will be issued by the DGAC (SENEAM has communicated to MITRE that this should not be an issue).

It is important to note, however, that shifting the eastern-most pair of runways farther to the north (as described above in this document) causes the hill to the north to penetrate United States TERPS procedure design obstacle clearance surfaces. Therefore, in this case the height of the northern hill must be substantially reduced appropriately (and the antennas located on its peak removed). While this is costly, *it is not seen as a showstopper*.

The following three analyses cannot be categorized as “assumptions” nor can be said that they need to be completed before a declaration of airport feasibility. However, these analyses cannot be completed before all runway configuration matters are conclusively resolved. These are important analyses in their own right as they help determine the ultimate capabilities and impact of the airport.

- **Airspace Design**

The airspace can be designed in a manner that can support the maximum achievable capacity of a six-runway configuration at Texcoco conducting triple independent approaches and departures. This should not be an issue and MITRE will support SENEAM in its development.

- **Noise Analyses**

The Texcoco area permits, as no other area in the Valley of Mexico, the construction of a large airport causing minor overall noise impact in the vicinity. Noise analyses will help the authorities plan land use and establish a timeline into the future.

- **Engine-out Procedures**

These procedures need to be developed by airlines to avoid obstacles in the event of an engine-out situation at Texcoco, which can affect maximum allowable takeoff weights and, as a result, payload and range capabilities of aircraft. It is assumed that there will be no issues in the development of engine-out procedures.

Visit by MITRE Engineers to Bird Strike Conference

In order to better advise SCT, two MITRE engineers traveled in September to a major bird hazard conference in Ontario, Canada. This four-day conference provided valuable information on the latest developments regarding wildlife hazard reduction, recently

released ICAO wildlife control and reduction manuals, bird strike analyses, and pilot perspectives on bird strike concerns.

Task 10-Related Analyses

As you know, Task 10 activities are intended to enhance navigation in Mexico and to examine plans for the development of an airport in the Riviera Maya area in Quintana Roo state. In doing so, the MITRE Task 10 team is providing support in the three areas described below.

MVACs

MITRE's airspace and procedure design experts reassessed the Texcoco/Toluca MVAC sector altitudes based on radar and radio coverage analyses conducted by SENEAM. In early August 2011 during a trip to Mexico (described further below), MITRE discussed the results of the revised MVAC and radar and radio coverage analysis with an official from SENEAM. Appropriate changes to the Texcoco/Toluca MVAC were also covered.

MITRE then submitted a document to SENEAM in mid-August (see Enclosure 1 to this letter) containing important information regarding the MVAC so that they could conduct a thorough review. The document contains information on the preliminary Texcoco/Toluca MVAC, including its sector labels and associated altitude, information on how sector altitudes were determined, and a complete description of each sector, including coordinates. SENEAM has since reviewed the MVAC and provided comments, which have been addressed by MITRE.

It is important to note that the Texcoco/Toluca MVAC was designed based on a single sensor radar mode of operation (i.e., based on the Toluca radar and a theoretical location for the future Texcoco radar). This concept was agreed to by SENEAM.

Riviera Maya Interoperability

This work focuses on the airspace interoperability of a new airport in the Riviera Maya area and the airports in Cozumel and Cancún. MITRE engineers have advanced on the development of potential airspace concepts to determine if any conflicts may arise in the future. For example, four airspace concepts consisting of three airports (Cancún, Cozumel, and a new airport at Riviera Maya) have been refined to coincide with future routes being examined over the Gulf of Mexico. Both conventional and Area Navigation (RNAV) are being considered. Initial runway capacity analyses for Riviera Maya have also been conducted based on two future scenarios: single-runway and dual-runway operations.

Task 11-Related Analyses

Task 11 consists of analyses conducted by MITRE to assist the DGAC in the development of plans intended to protect and preserve the land and airspace around key airports in Mexico. In mid-July, a team of six (6) MITRE engineers traveled to Mexico to visit the airports at Tijuana, Guadalajara, and San José del Cabo. Ings. Agustín Cano

and José Gil helped coordinate the trip and participated in the Tijuana and Guadalajara visits. CTA. Sergio Chávez of SENEAM also provided assistance and accompanied the MITRE team to facilitate visits to air traffic control facilities. MITRE appreciates the excellent support provided by DGAC and SENEAM, including the personnel located at each airport.

During this trip, MITRE engineers visited the Radar Control Centers and Air Traffic Control Towers at each airport. The team also met with airport operations and management personnel to discuss the current situation at each airport to gain a better understanding of issues and constraints. A tour of each airfield was also conducted.

As all three of the above-mentioned airports are operated by Grupo Aeroportuario del Pacífico (GAP), the MITRE team thought it would be useful to provide a high-level overview of MITRE's work to GAP officials. Therefore, while in Guadalajara MITRE visited the headquarters of GAP and provided a presentation to its Commercial Director.

Since returning from Mexico, the MITRE team has continued to examine potential new runway locations where applicable. Existing procedures and flight tracks are being examined in more detail, including advanced navigation concepts for long-term planning. Initial assessments of ICAO Annex 14 Obstacle Limitation Surfaces are also being conducted.

Next Steps

Given the 21 September DGAC authorization to analyze a new runway configuration, MITRE engineers will focus over the next quarter on completing an aeronautical analysis to establish a feasible runway configuration for Texcoco. In the meantime, MITRE hopes that SENEAM, on the basis of feedback provided by MITRE, resolves the fundamental issue of long-final feasibility. At the same time, another engineering group at MITRE will perform a runway saturation analysis to assess matters of runway phasing and longevity. Finally, the MITRE team will prepare an executive-level briefing and laboratory demonstration to present project results to-date.

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

Sincerely,



Ing. Robert W. Kleinhans
Project Leader

Enclosure

cc: Lic. Felipe Duarte, SCT
Ing. Agustín Cano, SCT
Dr. Bernardo Lisker, MITRE