MITRE

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Subject: Special Technical Letter: NAICM Opening-Day Runway Configuration: Important Concerns and Considerations

Dear Lic. Núñez:

As an independent aeronautical advisor serving Mexico, MITRE is interested in the mid- and long-term success of the Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM). Therefore, following your request for the preparation of a document describing MITRE's concerns regarding NAICM's opening-day runway configuration plan (Phase 1), a MITRE engineering team has constantly worked in the preparation of this paper. As always, MITRE has copied all principal project stakeholders that may have an interest in the subject.

MITRE's team is unanimously concerned about plans to construct "runway 2" before "runway 1" (see Figure 1 below for runway numbers), as that event will jeopardize in all likelihood subsequent construction of runway 1. This would occur due to unjustified noise fears resulting from existing operations at NAICM, even though noise would fall within customarily acceptable levels. The recent outcry in some Mexico City neighborhoods, given a relatively minor change of trajectories to the current airport, would be a comparatively minor event.

The permanent absence of runway 1 will affect very sharply everything that Mexican aviation authorities and MITRE have worked for relating to the construction of a long-standing airport for the 21st Century, due to capacity reduction and unbalanced traffic next to the all-important initial Terminal. It is a risk that would go against best-practices in airport runway phasing, at a time when Mexico is on time to do things correctly.

MITRE's rationale is described below, a rationale that has been explained on numerous occasions to government officials and stakeholders from the start, ever since 2009. Please consider that when the Terminal was initially planned (by the present

administration) on the eastern side of the airport, you had identical concerns about the risk of never building runway 6 and creating an unbalanced situation.

MITRE's experience all over the world has shown that practically no politician can sustain the outcry of people opposing construction of a new runway at an *existing* airport. We have seen this happening in Latin America, Europe, and Asia. Therefore, with no particular interest, except that of helping Mexico's authorities in good faith, it is important for MITRE to state its position.

It is important to emphasize that including runway 1 in Phase 1 does not delay completion of construction of the main Terminal as early as possible (it may even facilitate it) nor postpone the date of opening the airport for operations after 2020.

The objective of this document is to provide you with supporting information so that you may fully understand the potential risks, outcomes, and impact on NAICM operations if runway 1 is not constructed for the above-noted reasons. As a result, you may be able to appropriately discuss this important matter with your team at Grupo Aeroportuario de la Ciudad de México (GACM) and other stakeholders.

People may feel that Mexico is somehow different and runway 1 will be constructed without opposition after runway 2. Perhaps, but because our team doubts it, MITRE feels an obligation to express its concerns so the Mexican authorities are fully aware of important risks that should be considered before any final decisions are made.

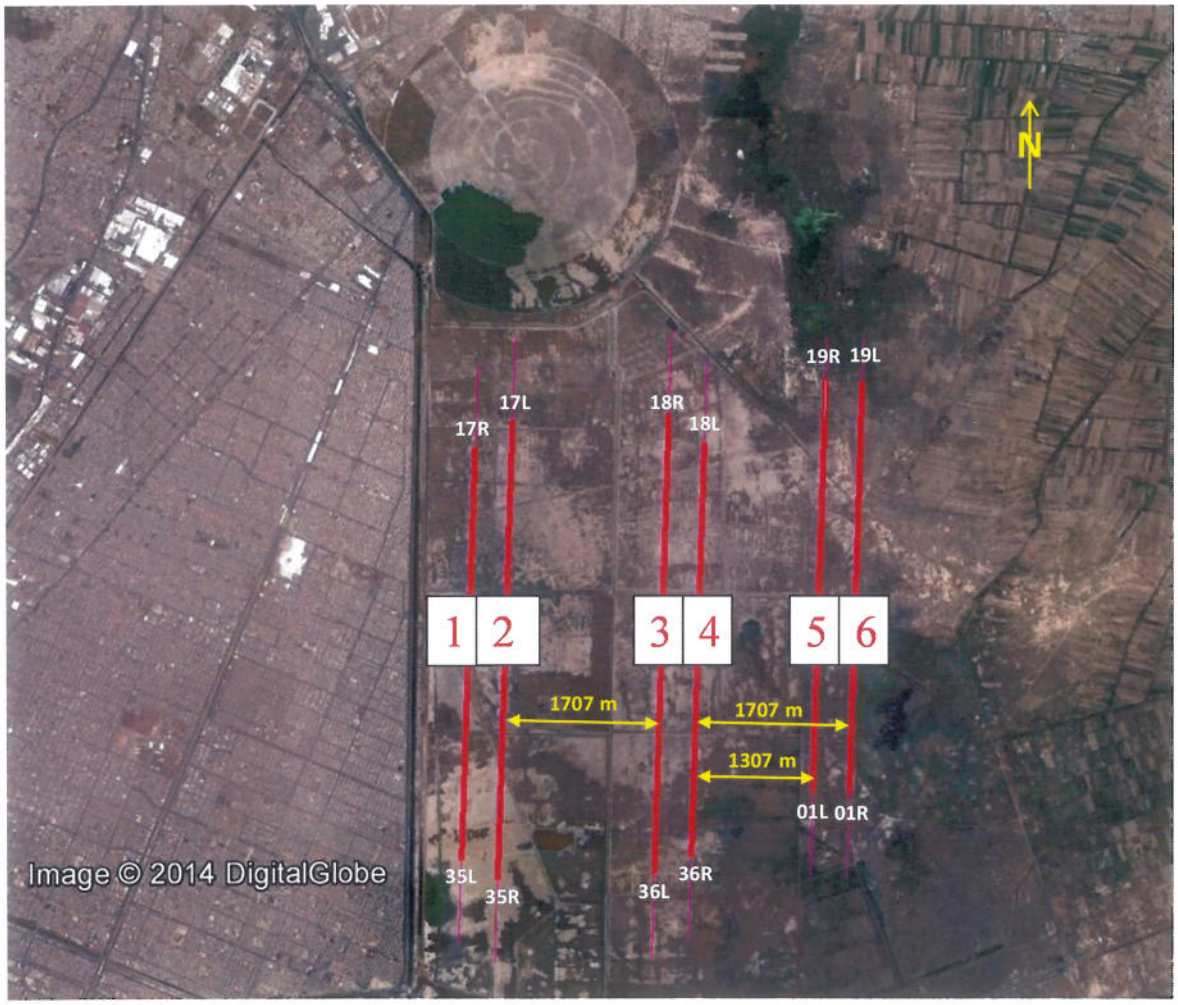
Importance of Noise Considerations in Airport Planning

The current Anteproyecto Ejecutivo, dated 1 September 2014 (hereafter referred to as the Pre-Master Plan), specifies that the NAICM opening-day runway configuration would include runway 2 rather than runway 1. MITRE, however, has recommended for years that NAICM's opening-day runway configuration include the outermost runways (i.e., runways 1 and 6) to ensure and protect the ability of the airport to achieve its ultimate six-runway configuration. Accordingly, MITRE organized several internal meetings attended by some of our most senior technical experts to provide the information contained in this document and assist you in deciding the opening-day runway configuration, by explaining to you the problems the airport will face in the future if runway 1 is never constructed.

The experience and knowledge that MITRE has gained through numerous years of support to the United States Federal Aviation Administration (U.S. FAA) and other Civil Aviation Authorities (CAAs) around the world has provided us with a unique perspective on a large variety of airport development and expansion projects, including both their problems and successes.

One overriding phenomenon that is repeatedly seen in airport expansion projects is the ability of community resistance to stop completion of ambitious airport projects. Examples of airport expansion projects in which community resistance has limited the construction of runways or its operational use include Frankfurt, Munich, Amsterdam, Milan Malpensa, Florence, Barcelona, Málaga, Paris Charles de Gaulle, Dallas-Ft. Worth, Tokyo Haneda, and Buenos Aires, among many more. In recent years, at Mumbai, in

India, community resistance kept the airport from adding a new runway at the existing site, forcing the development of an airport at a new location.



Source Imagery: Google Earth Pro

Figure 1. NAICM Six-Runway Configuration (Showing Notional Runway Designations)

Although airports often construct inner runways first (i.e., those adjacent to the Terminal building or other key facilities), and subsequently construct the outer runways, this is done, without taking unnecessary risks, when expansion is not problematic because there is a wide distance between the airport boundary and populated areas.

NAICM is in a different situation. Although the land to construct runway 1 has been acquired, the factor that could complicate and prevent the construction of that runway is the well-established, densely populated urban area to the west of the site. It is quite possible that operations on runway 2, if it is constructed first, will cause some complaints, since people living in that urban area are not used to aircraft noise. The level of complains

if runway 1 is constructed first will be similar, as unacceptable noise levels should not penetrate populated areas in any significant manner.

MITRE's noise analyses, using advanced modeling (MITRE document F500-L12-016, dated 3 July 2012) show that subsequent construction of runway 2 would actually *decrease* noise exposure in the populated areas next to runway 1, even with increased operations. This is because aircraft departures that would have been initially using runway 1 would move to runway 2, upon the latter runway opening (initially runway 1 would operate both departures and arrivals). In other words, noise will shift to the east, away from the urban area if runway 2 opens after runway 1!!

In contrast, if runway 2 were to be constructed first, when runway 1 is opened, the perception of increased noise will be very apparent to the population because arrival noise would shift towards the populated area (as runway 1 would be used for arrivals alone and runway 2 would be used for departures alone, only after both runways open for service). Thus, the perception of additional noise due to a new runway being constructed closer to the urban area too late will likely create social protests. This is the main reason, once again based on MITRE's experience, why runway 1 may never be constructed if it is not part of the opening-day runway configuration.

The following sections describe important concerns, considerations, and potential operational implications that NAICM could experience if current plans continue. Although MITRE understands that constructing runway 1 before runway 2 may have a short-term cost impact, this must be urgently weighed against the mid- and long-term risk of the airport never achieving its ultimate six-runway configuration, and rather be constrained to just a five-runway airport potentially having important operational inefficiencies and limitations.

Capacity

If runway 1 is never constructed, NAICM would be limited to a five-runway configuration resulting in a loss in the maximum achievable capacity of the airport. In such situation, whenever runway 2 must be closed for any reason (maintenance, incidents, etc.), a significant loss of capacity would be experienced.

The ultimate six-runway configuration at NAICM has three pairs of closely-spaced parallel runways. One advantage of such a design is that if any one runway is closed, whether scheduled or unscheduled, the airport can still run triple arrival streams and triple departure streams. *Not having runway 1 means that if runway 2 must be closed, the airport will be forced to operate with only dual arrival streams and dual departure streams.* Balanced (i.e., 50% arrivals and 50% departures) hourly capacity would decrease, resulting in a capacity loss of approximately 25%. This would cause significant delays, especially during periods of peak demand. Nevertheless, with all six runways present, *if any one runway closed*, the airport would still operate with triple arrivals and departures, and the capacity loss would be very limited.

Surface Movement Efficiency

The operation of the airport in any phase of construction should include consideration of aircraft movement efficiency, the associated reduction of taxi delay, and the enhancement of safety through reduced runway crossing requirements. The airport development phasing plan described in the Pre-Master Plan includes the addition of a second passenger terminal, aircraft maintenance, and air cargo facilities in the eastern part of the airport. These new facilities have fewer gate and hardstand positions than the comparable main western Terminal complex facilities. Therefore, the assumption can be made that aircraft would, whenever possible, be assigned to a runway based on the location of the airline's Terminal facilities, which will most likely be, for many years, the western facilities. This type of operation helps to minimize cross-field taxiing and runway crossings.

In a scenario in which runway 1 is not constructed, the available runway capacity will be shifted to the eastern side of the main Terminal complex even though both sides of the Terminal may have the same gate capacity. Additionally, in order to accommodate peak demand, aircraft from the main Terminal complex may have to cross runways 3 and 4 in order to use runways 5 and 6. While the Pre-Master Plan includes the addition of end-around taxiways around runways 3 and 4, these end-around taxiways will not support "free flow" taxiing during runway operations (i.e., they would be restricted) and they may not adequately solve the runway crossing issue. Alternatively, aircraft could use all the runways adjacent to their Terminal complex if runways 1 and 2 are available. In sum, if air traffic controllers cannot dynamically assign aircraft to runways adjacent to their destination terminals, the potential need for cross-field taxiing, runway crossings, and taxiing delay would increase.

In addition to the recommendation to construct an opening-day runway configuration with runways 1, 3, and 6, MITRE recommends that during Phase 2 runway 2 be constructed instead of runway 4 (as the Pre-Master Plan recommends). Note that if runway 4 is constructed, aircraft using runway 6 will have to cross two runways to access the terminal area. In contrast, if runway 2 is constructed instead, no aircraft will have to cross more than one runway to get to or from the main Terminal. This alternative yields the same airfield capacity in this phase, but results in a *more efficient and safe operation.*

Airfield Construction

Current airfield development plans require performing soil replacement/site preparation work incrementally at the time new construction is required. This represents a deferral of costs that might actually increase total cost later.

The preparation of the NAICM site will need to include special conveyance methods and routes for a large quantity of soil movement and preparation. Examples of special conveyance methods and routes include the use of new, dedicated roads, rail lines, and/or conveyor belt systems. Given the complexity of the soil movement and preparation process, the Mexican authorities may want to consider advancing at least some of this work, including matters such as site grading and drainage for the entire airport site (or

much of it) during the first phase of airport development. This type of work would then not impact future runway development phasing and other airport construction projects. Importantly, this should not delay the key goal of completing the main Terminal as early as possible.

In addition, the taxiway network providing access to runways 1 and 2 has a significant impact on runway development phasing. While the taxiway network depicted in the Pre-Master Plan appears notional, the final placement of taxiways is an important consideration when assessing runway phasing matters. It is important that runway development phasing is planned in a manner as not to require the closure of existing runways so that the airport can operate at maximum capacity constantly, even as new construction progresses.

For the scenario in which runway 2 is developed before runway 1, during construction of runway 1 (assuming that the public allows such construction), runway 2 will need to be closed in order to construct the segments of the taxiway network connected to the western side of runway 2. Similarly, some of the navigational aids (NAVAIDS) associated with runway 2 may need to be taken out of service during construction of the taxiway network on the western side of runway 2 due to construction equipment being located within critical and/or sensitive areas (areas that need to be carefully watched to allow electronic signals to be freely transmitted). On the other hand, construction of runway 2 after runway 1 would not require the closure of runway 1 or its NAVAIDS as long as prior grading and placement of connector taxiways and other infrastructure across the runway 2 corridor maintain taxiway access during runway 2 construction.

Closing Remarks

MITRE strongly recommends that the first three NAICM runways to be opened are runways 1, 3, and 6. Constructing the outer runways (1 and 6) will help protect the ability of the airport to achieve its ultimate six-runway configuration. On the basis of many years of experience, MITRE is convinced that if runway 1 is not built initially it may likely never be built, primarily due to noise complaints that may prove to be politically impossible to overcome. Thus, the envisioned six-runway airport would be curtailed to an airport with only five runways, with its longevity significantly reduced.

Additionally, the impact of not being able to construct runway 1 would lead to an inefficient and unbalanced runway configuration that would have only one runway adjacent west of its main Terminal building, instead of two runways. Furthermore, NAICM would experience a significant loss of capacity when runway 2 is closed for maintenance or other reasons.

The assertion that constructing runway 2 after runway 1 is more complicated needs to be balanced against a strong possibility of NAICM ending up with one fewer runway and with a less efficient runway configuration. It is worth recalling that when the Secretaría de Comunicaciones y Transportes momentarily considered a Terminal building on the airport's eastern side, there was a concern that runway 6 would never be built and render an unbalanced Terminal. Not building runway 1 initially is just as bad an idea as not building runway 6.

Finally, even if runway 1 were one day constructed, MITRE observes that in a scenario in which runway 2 is constructed before runway 1, runway 2 will need to be closed in order to construct the segments of the taxiway network connected to the western side of runway 2 and associated navigational aids will need to be taken out of service.

Mexico is not different than the many countries where airport projects have been stopped or significantly reduced due to social protests. Mexico City's traffic is increasing rapidly. Consequently, many of the issues described in this paper will surface before the 2020s are over.

MITRE hopes that the varied information contained in this document assists you to appropriately discuss this important matter with your group and other stakeholders. MITRE understands very well the issues that concern those who want to start with runway 2. However, this is a one-in-a-century opportunity for Mexico City. Hence our team believes that best practices and minimal risks should be the order of the day.

Please do not hesitate to contact me if you need any clarification or any other assistance. This includes, of course, if you need to, having a face-to-face presentation on this important matter, as some of the important operational issues presented in this paper are somewhat complex.

Sincerely,

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Via e-mail
Dr. Bernardo Lisker
International Director

cc – Alphabetically:
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