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Subject: NAICM Category III Instrument Landing System Acquisition Proposal

Dear Ing. Arellano:

In early January 2015, Lic. Sergio Antonio Pérez Rodríguez of Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM) sent MITRE a document pertaining to the acquisition of a Category (CAT) III Instrument Landing System (ILS) for the Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM). The document, entitled *Anexo Técnico, Adquisición de un Sistema de Aterrizaje por Instrumentos ILS Categoría III para el Nuevo Aeropuerto de la Ciudad de México*, versión Rev. 1.0., includes technical specifications and other requirements for the acquisition and installation of ILS equipment to support future NAICM operations. Lic. Rodríguez provided this document to MITRE for its review and to provide some opinions and recommendations.

Technical specifications, acquisition, and installation of ILS equipment are all areas outside MITRE's area of principal expertise and outside the scope of MITRE's contract in Mexico. Therefore, MITRE is not able to review or provide feedback on many of the technical specifications contained in the above-mentioned acquisition document. Nevertheless, the MITRE team felt it was important to review the document and provide its opinion, where appropriate, on matters pertaining to the unique operational situation at NAICM, as described below. This being the case, MITRE's liability does not extend to any opinions or recommendations provided in this document.

The objective of this document is to inform you of key factors regarding operational needs at NAICM, as well as other planning, coordination, and testing matters for your consideration in completing the acquisition document. MITRE recommends that the following items be carefully considered:

- The NAICM opening-day runway configuration consists of three parallel runways having lengths of 4500 m or 5000 m, appropriately spaced to allow triple independent operations. Due to factors such as challenging terrain, as well as airspace- and procedure-related matters, final approaches at NAICM are very long, exceeding normal limitations of ILS equipment. Therefore, to support future NAICM procedures the following ILS equipment signal coverage is required:

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- The localizer may be required to be flight inspected to a distance of as many as 40 nautical miles (NM) from the runway, at a height of approximately 9000 ft above the transmitter. Note, however, that the SENEAM acquisition document states that the localizer coverage requirement should be 30 NM within +/- 10 degrees of the front course and 17 NM between 10 degrees and 35 degrees of the front course.
- The glideslope may be required to be flight inspected to a distance of 28 NM from the runway, at a height of approximately 9000 ft above the transmitter. Note, however, that the SENEAM acquisition document states that the glideslope coverage requirement should be 30 NM.
- The Distance Measuring Equipment (DME) should be able to meet the operational requirements of the ILS approaches.

As a result of these requirements, ILS equipment is required at NAICM that can provide signals out to the distances mentioned above, and that can support three independent arrival flows (no interference or other issues among ILSs).

- Due to the long final approaches at NAICM, it is important to conduct pre-commissioning flight inspection activities as soon as possible, before runways are constructed, using actual ILS equipment (or equivalent equipment in accordance to experts). This will provide an initial assessment as to whether or not appropriate signal reception can be achieved and confirm, to the extent possible, that other issues such as magnetic effects do not cause problems. Also, the manufacturer of the equipment should be involved in the inspection process, since expertise specific to the equipment would be desirable considering the unique situation at NAICM (i.e., long ILS final approaches). It would be unacceptable to find out after the runways are constructed, that ILS approaches may not be conducted due to equipment signal issues.

- Proposed airport facilities and other airport components can potentially cause signal interference with ILS equipment. Therefore, it is important to ensure that proposed buildings, roads, parking facilities, taxiing/holding aircraft, etc., are located in a manner that do not interfere/degrade ILS equipment signal quality. Therefore, the location of airport facilities and other airfield developments should be closely coordinated with the companies responsible for installing ILS equipment to ensure that facility locations do not cause issues (e.g., electromagnetic affects, reflections, etc.). This also involves conducting appropriate flight inspections, as well as other studies and testing.

- MITRE's weather analysis (based on more than 5 years of detailed information at Texcoco), shows that the occurrence of CAT II or III weather is rare and of short duration at the NAICM site. Furthermore, when such conditions occur, winds are usually calm or favor a north flow operation. In any case, if a

CAT III instrument approach procedure is believed to be required, it is necessary to determine the level of CAT III to be supported, which involves collecting data through a Runway Visual Range (RVR) system. MITRE understands that the installation of an RVR system at the NAICM site is being coordinated at this time by SENEAM. This data collection is also important to understand the level of ancillary equipment required for CAT II or III, such as approach lights, runway lights, etc.

Additionally, it is important to mention that CAT II/III procedure design issues at NAICM need to be addressed due to climb gradients on missed approaches and precipitous terrain. If CAT II/III approach procedures are determined to be necessary, the Dirección General de Aeronáutica Civil (DGAC) may need to conduct an Equivalent-Level-of-Safety (ELS) study to allow for the establishment of CAT II/III approach procedures at NAICM.

Even if CAT II or III ILSs are not required at NAICM, CAT I approaches will be required to all runways. Accordingly, the ILS signal characteristics should be evaluated for CAT I even if a CAT II or III ILS is not required.

Based on the above considerations, MITRE recommends the following:

- Due to the urgency of conducting pre-commissioning flight inspection activities and other testing to provide an initial assessment on signal reception and other issues such as magnetic effects, one set of CAT III ILS equipment should be initially purchased as soon as possible. The advantage of this limited purchase is that if it is determined later on that CAT II/III approaches are not required and/or not feasible due to the above-mentioned issues, the authorities would only have spent funding on one CAT III system rather than six. Yet, all six runway ends should be ILS equipped, as most major airports do when the airport becomes operational.

- Once the new CAT III ILS equipment arrives, conduct pre-commissioning flight inspection activities and other testing of the ILS equipment as soon as possible at the NAICM "greenfield" site to determine with great confidence that the ILS equipment can meet operational signal reception requirements and to examine other technical matters for CAT I, II, or III procedures.

  The ILS equipment (i.e., the one set mentioned in the first bullet) should be installed to evaluate northbound approach operations to one of the opening-day runways. The ILS equipment should then be re-sited to evaluate southbound approach operations to one of the opening-day runways. The runways to be selected should be coordinated with MITRE.

  It is important to mention that the flight inspection activities and other testing at this stage are only intended to identify potential issues or limitations with ILS equipment signals with respect to operational requirements. Final flight

inspection activities and other testing will be required later, once all the runways and buildings are constructed and ILS equipment has been permanently installed.

- If the results of the above-mentioned flight inspection activities and other testing show that the ILS equipment can meet operational signal reception requirements and other technical matters, then SENEAM can purchase additional sets of ILS equipment at the appropriate time for installation at the constructed runways. Also, the need to purchase additional systems can be revisited beforehand. Again, final flight inspection activities and testing will be required for all ILS equipment once permanently installed at the runways.

- The ILS equipment provider should be involved early on and at all appropriate stages of the airport planning and development process so that studies, testing and flight inspection activities can be conducted regarding planned facilities and other airport components. As a result, problems that could affect ILS equipment siting and signal reception can be addressed and resolved early on.

MITRE recommends that the information provided in this document be discussed in more detail with experts in the acquisition and installation of ILS equipment at airports and especially at "greenfield" sites, to ensure that appropriate technical specifications are included in the acquisition document. MITRE also recommends that SENEAM consult directly with an appropriate ILS manufacturer.

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

Sincerely,

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Project Technical Coordinator

cc:
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