Subject: Technical letter: Preliminary Analysis of Obstacle Clearance and Limitation Surfaces over the Southeast Campus

Dear Lic. Lavin:

During MITRE's visit to Mexico City on 15-16 February 2017 to meet with officials from GACM and other stakeholders, MITRE was made aware of plans pertaining to the development of infrastructure (e.g., hangars, buildings, aircraft parking areas, etc.) in the southeast campus (i.e., the area east and southeast of Runway 6) at the Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM). At that time, MITRE was provided with a paper drawing of the southeast campus. On 1 March 2017, MITRE was provided with an AutoCAD drawing, entitled “20170123_WGS84-NAICM_SE Campus.dwg,” in order to get a better understanding of the proposed layout of infrastructure being considered for the southeast campus. Figure 1 shows the content of the above-mentioned AutoCAD drawing.

It is MITRE’s understanding that, to date, the vertical components of all infrastructure on the southeast campus (e.g., building heights) have yet to be determined. To help GACM and other stakeholders in the planning of the infrastructure being considered in the southeast campus, MITRE was asked to analyze appropriate obstacle clearance and limitation surfaces that are located over the southeast campus; thus, providing guidance, from an aeronautical perspective, on the maximum allowable heights of such infrastructure without impacting future operations at NAICM. The purpose of this letter is to present this preliminary guidance.

1 For the purposes of this letter, Runway 6 is used interchangeably with Runway 01R/19L.
For this analysis, MITRE examined obstacle clearance surfaces associated with the development of relevant Instrument Landing System (ILS) Category (CAT) I/II/III approach procedures, Required Navigation Performance Authorization Required (RNP AR) approach procedures, and departures, both conventional and Area Navigation (RNAV), in accordance with United States (U.S.) Federal Aviation Administration (FAA) Standard for Terminal Instrument Procedures. MITRE also examined appropriate parallel approach obstruction assessment surfaces, which are associated with independent ILS approaches. In addition, MITRE examined relevant International Civil Aviation Organization (ICAO) Annex 14 Obstacle Limitation Surfaces (OLS).
The specific surfaces that were considered in this analysis are as follows:

- Runway 01R ILS CAT I/II/III Final Segment of the Approach Procedure
- Runway 01R ILS CAT I Missed Approach Segment of the Approach Procedure
- Runway 01R ILS CAT II/III Missed Approach Segment of the Approach Procedure
- Runway 19L ILS CAT II/III Missed Approach Segment of the Approach Procedure
- Runway 01R CAT I/II/III Parallel Approach Obstruction Assessment Surface 2
- Runway 01R CAT II/III Parallel Approach Obstruction Assessment Surface 4
- Runway 01R RNP AR Final Segment of the Approach Procedure
- Runway 01R RNP AR Missed Approach Segment of the Approach Procedure
- Runway 19L Initial Climb Area (ICA) for Conventional Departures
- Runway 19L ICA for RNAV Departures
- Runway 01R ICAO Annex 14 Approach Surface
- Runway 19L ICAO Annex 14 Takeoff Climb Surface
- Runway 01R ICAO Annex 14 Transitional Surface
- ICAO Annex 14 Inner Horizontal Surface

MITRE assessed each of the individual surfaces listed above and then consolidated the individual surfaces into a single surface\(^2\), which is represented by a set of color-coded areas corresponding to elevations in meters (m) above Mean Sea Level (MSL). See Figure 2. More specifically, these color-coded areas illustrate the most restrictive surface elevations at any given point within the southeast campus. Consideration should be given to these elevations in determining the maximum allowable building and infrastructure heights. Buildings and other infrastructure should be designed to not penetrate these elevations. This will ensure vertical clearance of the above-mentioned obstacle clearance and limitation surfaces. Additionally, it is important that planners consider the heights of aircraft, especially their tail heights, at proposed parking areas within the southeast campus and on adjacent taxiways.

It is not advisable to develop buildings and other infrastructure right up to obstacle clearance/limitation limits. This is because it is more desirable to maintain areas adjacent to and immediately beyond approach and departure ends of runways free of high buildings and other infrastructure. Therefore, it is prudent to design buildings and other infrastructure to elevations as low as possible.

\(^2\) Note: each surface listed is a three-dimensional surface with specific slopes and dimensions. When consolidated, the resulting single surface (also three-dimensional) corresponds to the lowest of the contributing surfaces at each point.
MITRE did not receive information pertaining to the ground elevation of the southeast campus. However, MITRE did consider the proposed runway threshold elevations at NAICM, as provided by GACM, in the development of the obstacle clearance and limitation surfaces. For example, the proposed threshold elevation provided to MITRE for Runway 01R is 2232 m above MSL (Runway 6 elevations were provided by GACM in a letter dated 30 September 2016). An elevation of 2232 m is also the starting surface elevation for the Runway 01R RNP AR Final Segment of the approach procedure and represents the most restrictive elevation over the southeast campus. Figure 3 shows a closer view of the portion of the southeast campus with the most restrictive elevations.
Similarly, there are additional elevation considerations in the northern portion of the southeast campus. These elevations are principally derived from the Runway 01R ILS CAT I Missed Approach Segment of the approach procedure and the Runway 01R ICAO Annex 14 Transitional Surface. Figure 4 shows a closer view of the northern portion of the southeast campus.

Figure 3. Most Restrictive Elevations: Southern Portion of the Southeast Campus
Attached to this letter is an appendix of additional figures which have been included for reference purposes. Figures 5 through 17, show the individual obstacle clearance and limitation surfaces that were considered during MITRE’s analysis of the southeast campus.

MITRE recommends that once proposed building and infrastructure elevations in the southeast campus have been more formally determined, MITRE and Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM) conduct another assessment against appropriate obstacle clearance and limitation surfaces to provide another check.

Due to the importance of the location and elevation of buildings and infrastructure in the southeast campus and their potential long term impact on aircraft operations, MITRE strongly recommends that SENEAM review this document and be involved in the overall decision-making process.
I hope that this information assists GACM and other stakeholders in their ongoing planning efforts. Please do not hesitate to contact me if you need any clarification or assistance.

Sincerely,

Ing. Robert W. Kleinhans
Project Technical Coordinator

cc: Dr. Bernardo Lisker, MITRE
Figure 5. Runway 01R ILS CAT I/II/III Final Segment of the Approach Procedure
Figure 6. Runway 01R ILS CAT I Missed Approach Segment of the Approach Procedure
Figure 7. Runway 01R ILS CAT II/III Missed Approach Segment of the Approach Procedure
Figure 8. Runway 19L ILS CAT II/III Missed Approach Segment of the Approach Procedure
Figure 9. Runway 01R CAT I/II/III Parallel Approach Obstruction Assessment Surface 2
Figure 10. Runway 01R CAT II/III Parallel Approach Obstruction Assessment Surface 4
Figure 11. Runway 01R RNP AR Final Segment of the Approach Procedure
Figure 12. Runway 01R RNP AR Missed Approach Segment of the Approach Procedure
The ICA for conventional departures and RNAV departures for Runway 19L are identical.

Figure 13. Runway 19L ICA for Conventional Departures

3 The ICA for conventional departures and RNAV departures for Runway 19L are identical.
Figure 14. Runway 01R ICAO Annex 14 Approach Surface
Figure 15. Runway 19L ICAO Annex 14 Takeoff Climb Surface
Figure 16. Runway 01R ICAO Annex 14 Transitional Surface
It is important to note that Dirección General de Aeronáutica Civil's Circular Obligatoria, Requisitos para Regular la Construcción, Modificación y Operación de los Aeródromos Civiles states that when constructing the Inner Horizontal surface for an airport, the airport reference elevation should be used. In the case of NAICM, the airport reference elevation has not been established. Therefore, for NAICM, MITRE used 2227 m above MSL as the lowest runway threshold elevation for conservative planning purposes when constructing the Inner Horizontal surface, resulting in an Inner Horizontal surface elevation of 2272.00 m above MSL.

Figure 17. ICAO Annex 14 Inner Horizontal Surface

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4 It is important to note that Dirección General de Aeronáutica Civil’s Circular Obligatoria, Requisitos para Regular la Construcción, Modificación y Operación de los Aeródromos Civiles states that when constructing the Inner Horizontal surface for an airport, the airport reference elevation should be used. In the case of NAICM, the airport reference elevation has not been established. Therefore, for NAICM, MITRE used 2227 m above MSL as the lowest runway threshold elevation for conservative planning purposes when constructing the Inner Horizontal surface, resulting in an Inner Horizontal surface elevation of 2272.00 m above MSL.