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AEROSPACE STANDARD

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PILOT VISIBILITY FROM THE FLIGHT DECK DESIGN OBJECTIVES FOR COMMERCIAL TRANSPORT AIRCRAFT

1. INTRODUCTION

The purpose of this standard is to assure that new transport type aircraft will provide adequate visibility from the flight deck.

A thorough evaluation of the flight deck visibility angles existing in transport aircraft produced up to 1963 was made by SAE Committee S-7, whose members represent a good cross section of operations personnel of the airlines, manufacturers, and general aviation aircraft operators. A philosophy has been generated and is applied throughout the specifications in this document which takes into account the 1963 evaluation of visibility provisions in existing transport aircraft. In addition, it encompasses the visibility objectives for supersonic transport aircraft including consideration for variable geometry nose requirements. The philosophy is that the minimum visibility provisions must permit the pilot to see that which needs to be seen and is useful during any phase of the aircraft's operation, block to block, with complete consideration of its geometric features, operating attitudes, altitudes, and speeds. Good visibility in this philosophy is also that which affords an unobstructed view of the flight instruments at the same time that it provides this external vision from the same eye position.

In consideration of the Supersonic Transport (SST), the following paragraphs 2 through 10 shall apply to all aircraft, including the SST, while operating at all subsonic speeds up to at least Mach 0.90. Paragraph 11 applies to the SST while operating at transonic and supersonic speeds. Effective with this revision, the design objectives in this document which deal with transonic and supersonic portions of the flight operational spectra, are to be classified as Aerospace Recommended Practice (ARP). The remainder, which treat the subsonic operations, will continue as an Aerospace Standard. The latter shall apply to both subsonic and supersonic aircraft while operating subsonically.

2. The cockpit windows shall provide the following view angles measured from a horizontal plane through the design flight eye position (as defined in ARP 268D) and from a vertical plane through this point and parallel to the longitudinal axis while the aircraft is in level flight at maximum cruise subsonic speed, the azimuth angles have been compensated for head rotation.
 - 2.1 20 deg forward and up between 20 deg left and 10 deg right allowed to diminish to 15 deg up at 30 deg right, this area unbroken.
 - 2.2 15 deg forward and down between 20 deg left and 10 deg right allowed to diminish to 10 deg down at 30 deg right, this area unbroken.
 - 2.3 35 deg above the horizon between 85 deg and 95 deg left, this area unbroken.
 - 2.4 30 deg below the horizon between 85 deg and 95 deg left, this area unbroken.
 - 2.5 20 deg up and 15 deg down from the horizon 135 deg left.

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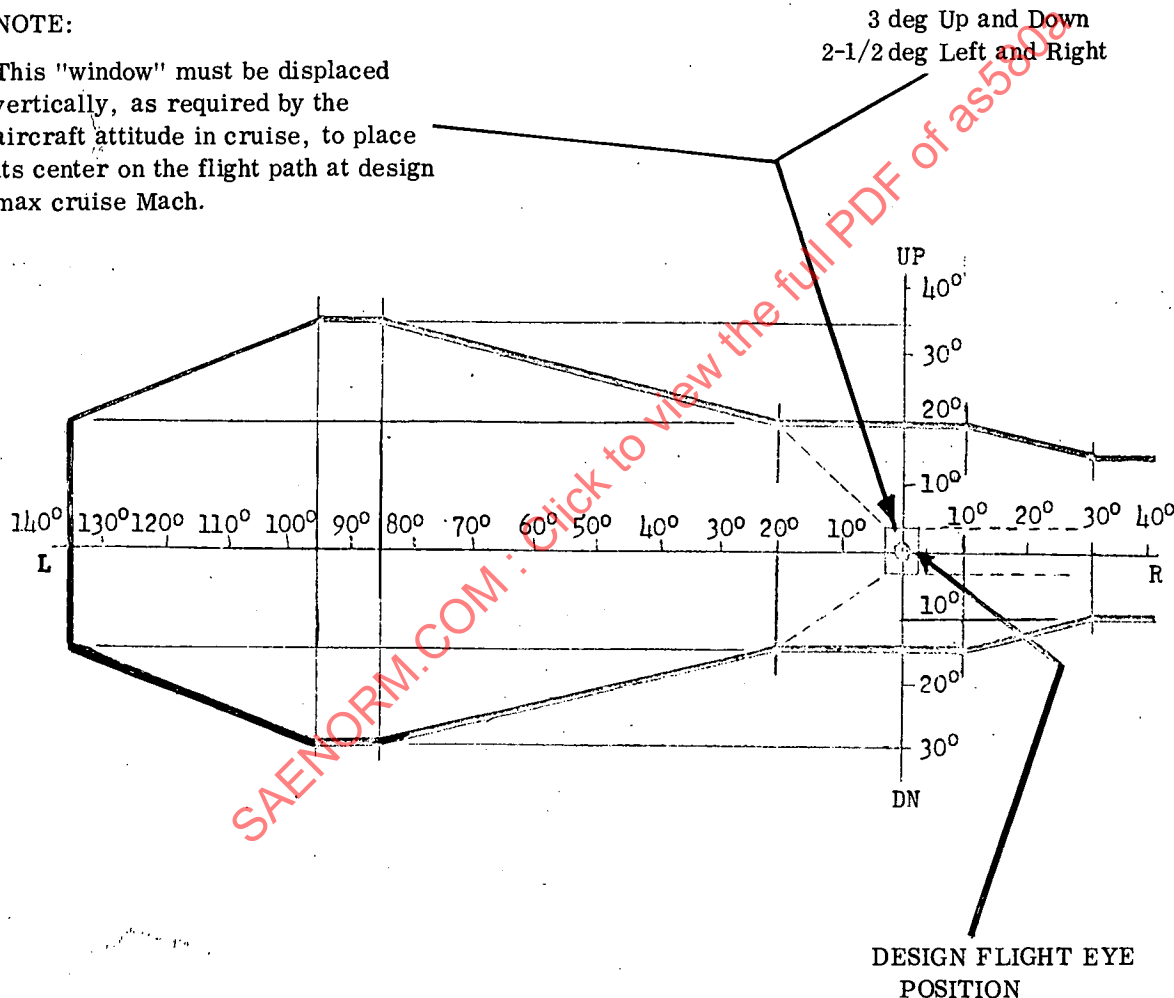
3. Obstruction to vision shall be avoided in the areas indicated by paragraphs 2.1, 2.2, 2.3, and 2.4. Beyond 20 deg left, the angles in paragraphs 2.1 and 2.2 should remain constant or increase progressively until they reach the reference angles in paragraphs 2.3 and 2.4 at 85 degrees. Beyond 95 deg left, the angles may diminish gradually to the angles shown in paragraph 2.5. Beyond 30 deg right to the center line of the aircraft, the angles above and below eye level may diminish due to the increased distance between the eye position and the windshield, but the windshield dimensions established at 30 deg right should be retained. The entire area described above and shown in Fig. 1 shall be free of horizontal obstructions.
4. The above requirements shall be symmetrical about the longitudinal axis of the aircraft.

FIGURE 1

Aerospace recommended practice for
transonic and supersonic visibility:

NOTE:

This "window" must be displaced vertically, as required by the aircraft attitude in cruise, to place its center on the flight path at design max cruise Mach.



5. In addition to the above which shall be considered minimum requirement, the view angle forward and down shall be sufficient to allow the pilot to see a length of approach and/or touch down zone lights which would be covered in three seconds at landing approach speed when the aircraft is:
 - a. On a 2-1/2° glide slope
 - b. At a decision height which places the lowest part of the aircraft at 100 feet above the touch down zone (extended horizontally)
 - c. Yawing to the left to compensate for ten knots cross wind
 - d. Making an approach with 1,200' RVR