

Workshop Discussion of the Proposed Revision from an Analytical Concepts and Methods Viewpoint

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The discussion opened by acknowledging that the proposed revision of the Levels of Flying Qualities had already produced disagreement. The group decided, therefore, to consider other revisions first.

Longitudinal static stability (3.2.1.1)

There was both support for and opposition to the proposed allowance of Level 3 instability. The requirement was noted to allow an unstable airframe but not require it, that would remain a design option. The discussion then centered on the proposed value for time to double amplitude. The consensus was that 6 secs is adequate, even conservative, if the pilot is tightly controlling the aircraft without side tasks. For Flight Phases such as cruise, however, (or "night IFR glideslope intercept") it was felt that 6 secs is too short when the pilot may be occupied with side tasks such as radio transmission, navigation, etc.

The judgment was to reassess the proposed Level 3 requirement - possibly as a function of Flight Phase and airplane Class. There were also requests to clarify the intent of the proposed: "In no event shall there be more than one unstable mode of motion."

Higher order dynamic systems (3.2.2.1.3)

This subject also generated much discussion but no consensus. There was a general feeling that the frequency domain has meaning to designers, while time domain envelope criteria are not discriminating (in particular they would not screen out high frequency effects). Discussion on the equivalent system approach, per se, raised a variety of points:

- 1) all modal requirements should be equivalent

- 2) it is appealing to have all the parameters related, as in the proposed revision
- 3) there is a high (supersonic) speed problem with pitch attitude tracking
- 4) other transfer functions need to be considered
- 5) should the phugoid be included with the short period?
- 6) specify what is really desired rather than requirements on modal parameters.

The discussion was lively but the only consensus was that more work is required.

Lateral-directional requirements (3.3)

Hodgkinson of McAir again advocated the use of equivalent parameters for all the modal requirements. Specific comments were

- 1) the required Level 1 damping ratios are too low; since this is frequently provided by augmentation increasing the requirement should not be a major problem
- 2) the required $\zeta\omega$ values are too stringent for large aircraft because of the low frequencies involved
- 3) a new requirement was proposed - "There shall be no objectionable coupling between pitch motions and the Dutch roll mode.

There was, moreover, even stronger unanimity that the lateral-directional requirements need improvement.

Roll control requirements (3.4)

Again, there was a suggestion to specify requirements on response to pilot input rather than modal requirements. As part of this discussion, guidance was requested in measuring roll mode time constant for highly augmented airplanes. The proposed revisions were accepted with the discussion concentrating on rudder-pedal-induced rolls (3.3.4.5). The consensus seemed to be that the requirement should be retained in a form to preclude adverse rudder-pedal-induced rolls.

Failure transients (3.5.5.1)

From the discussions of this section, the consensus was that the allowed excursions are very stringent. A strong majority suggested that the numerical requirements could be deleted in favor of the qualitative requirement in 3.5.5 (a lone voice from ASD dissented).

Transfer to alternate control modes (3.5.6.1)

In contrast to the preceding section, the allowed transfer transients were felt to be both appropriate and valid. In terms of clarification, it was felt that this requirement should not apply to switching off an augmentation system in training for failure states.

Contrails