training simulators except for the data package.

(2) The data package used must be:

(a) Comprised of the engineering predictions derived from the helicopter design, development, or certification process;

(b) Based on acceptable aeronautical principles with proven success history and valid outcomes for aerodynamics, engine operations, avionics operations, flight control applications, or ground handling;

(c) Verified with existing flight-test data; and

(d) Applicable to the configuration of a production helicopter, as opposed to a flight-test helicopter.

(3) Where engineering simulator data are used as part of a QTG, an essential match must exist between the training simulator and the validation data.

(4) Training flight simulator(s) using these baseline and modified simulation models must be qualified to at least internationally recognized standards, such as contained in the ICAO Document 9625, the ''Manual of Criteria for the Qualification of Flight Simulators.''

END QPS REQUIREMENT

10. [RESERVED]

11. VALIDATION TEST TOLERANCES

BEGIN INFORMATION

a. Non-Flight-Test Tolerances. If engineering simulator data or other non-flight-test data are used as an allowable form of reference validation data for the objective tests listed in Table C2A of this attachment, the data provider must supply a well-documented mathematical model and testing procedure that enables a replication of the engineering simulation results within 20% of the corresponding flight test tolerances.

b. Background

(1) The tolerances listed in Table C2A of this attachment are designed to measure the quality of the match using flight-test data as a reference.

(2) Good engineering judgment should be applied to all tolerances in any test. A test is failed when the results fall outside of the prescribed tolerance(s).

(3) Engineering simulator data are acceptable because the same simulation models used to produce the reference data are also used to test the flight training simulator (i.e., the two sets of results should be ''essentially'' similar).

(4) The results from the two sources may differ for the following reasons:

(a) Hardware (avionics units and flight controls);

(b) Iteration rates;

(c) Execution order;

(d) Integration methods;

(e) Processor architecture;

(f) Digital drift, including:

(i) Interpolation methods;

(ii) Data handling differences;

(iii) Auto-test trim tolerances.

(5) The tolerance limit between the reference data and the flight simulator results is generally 20% of the corresponding ''flight-test'' tolerances. However, there may be cases where the simulator models used are of higher fidelity, or the manner in which they are cascaded in the integrated testing loop have the effect of a higher fidelity, than those supplied by the data provider. Under these circumstances, it is possible that an error greater than 20% may be generated. An error greater than 20% may be acceptable if the simulator sponsor can provide an adequate explanation.

(6) Guidelines are needed for the application of tolerances to engineering-simulator-generated validation data because:

(a) Flight-test data are often not available due to sound technical reasons;

(b) Alternative technical solutions are being advanced; and

(c) The costs are high.

12. VALIDATION DATA ROADMAP

a. Helicopter manufacturers or other data suppliers should supply a validation data roadmap (VDR) document as part of the data package. A VDR document contains guidance material from the helicopter validation data supplier recommending the best possible sources of data to be used as validation data in the QTG. A VDR is of special value when requesting interim qualification, qualification of simulators for helicopters certificated prior to 1992, and qualification of alternate engine or avionics fits. A sponsor seeking to have a device qualified in accordance with the standards contained in this QPS appendix should submit a VDR to the NSPM as early as possible in the planning stages. The NSPM is the final authority to approve the data to be used as validation material for the QTG. The NSPM and the Joint Aviation Authorities' Synthetic Training Devices Advisory Board have committed to maintain a list of agreed VDRs.

b. The VDR should identify (in matrix format) sources of data for all required tests. It should also provide guidance regarding the validity of these data for a specific engine type, thrust rating configuration, and the revision levels of all avionics affecting helicopter handling qualities and performance. The VDR should include rationale or explanation in cases where data or parameters are missing, engineering simulation data are to be used, flight test methods require explanation, or where there is any deviation from