control the helicopter dynamics, particularly in the presence of external disturbances. The motion system should meet basic objective performance criteria, and be subjectively tuned at the pilot's seat position to represent the linear and angular accelerations of the helicopter during a prescribed minimum set of maneuvers and conditions. The response of the motion cueing system should be repeatable.

(2) The Motion System tests in Section 3 of Table C2A are intended to qualify the FFS motion cueing system from a mechanical performance standpoint. Additionally, the list of motion effects provides a representative sample of dynamic conditions that should be present in the flight simulator. An additional list of representative, training-critical maneuvers, selected from Section 1, (Performance tests) and Section 2, (Handling Qualities tests) in Table C2A, that should be recorded during initial qualification (but without tolerance) to indicate the flight simulator motion cueing performance signature have been identified (reference Section 3.e). These tests are intended to help improve the overall standard of FFS motion cueing.

b. Motion System Checks. The intent of test 3a, Frequency Response, test 3b, Leg Balance, and test 3c, Turn-Around Check, as described in the Table of Objective Tests, is to demonstrate the performance of the motion system hardware, and to check the integrity of the motion set-up with regard to calibration and wear. These tests are independent of the motion cueing software and should be considered robotic tests.

c. Motion System Repeatability. The intent of this test is to ensure that the motion system software and motion system hardware have not degraded or changed over time. This diagnostic test should be completed during continuing qualification checks in lieu of the robotic tests. This will allow an improved ability to determine changes in the software or determine degradation in the hardware. The following information delineates the methodology that should be used for this test.

(1) Input: The inputs should be such that rotational accelerations, rotational rates, and linear accelerations are inserted before the transfer from helicopter center of gravity to pilot reference point with a minimum amplitude of 5 deg/sec/sec, 10 deg/sec and 0.3 g, respectively, to provide adequate analysis of the output.

(2) Recommended output:

(a) Actual platform linear accelerations; the output will comprise accelerations due to both the linear and rotational motion acceleration;

(b) Motion actuators position.

d. Motion Cueing Performance Signature.

(1) Background. The intent of this test is to provide quantitative time history records of motion system response to a selected set of automated QTG maneuvers during initial qualification. It is not intended to be a comparison of the motion platform accelerations against the flight test recorded accelerations (i.e., not to be compared against helicopter cueing). If there is a modification to the initially qualified motion software or motion hardware (e.g., motion washout filter, simulator payload change greater than 10%) then a new baseline may need to be established.

(2) Test Selection. The conditions identified in Section 3.e. in Table C2A are those maneuvers where motion cueing is the most discernible. They are general tests applicable to all types of helicopters and should be completed for motion cueing performance signature at any time acceptable to the NSPM prior to or during the initial qualification evaluation, and the results included in the MQTG.

(3) Priority. Motion system should be designed with the intent of placing greater importance on those maneuvers that directly influence pilot perception and control of the helicopter motions. For the maneuvers identified in section 3.e. in Table C2A, the flight simulator motion cueing system should have a high tilt co-ordination gain, high rotational gain, and high correlation with respect to the helicopter simulation model.

(4) Data Recording. The minimum list of parameters provided should allow for the determination of the flight simulator's motion cueing performance signature for the initial qualification evaluation. The following parameters are recommended as being acceptable to perform such a function:

(a) Flight model acceleration and rotational rate commands at the pilot reference point;

(b) Motion actuators position;

(c) Actual platform position;

(d) Actual platform acceleration at pilot reference point.

e. Motion Vibrations.

(1) Presentation of results. The characteristic motion vibrations may be used to verify that the flight simulator can reproduce the frequency content of the helicopter when flown in specific conditions. The test results should be presented as a Power Spectral Density (PSD) plot with frequencies on the horizontal axis and amplitude on the vertical axis. The helicopter data and flight simulator data should be presented in the same format with the same scaling. The algorithms used for generating the flight simulator data should be the same as those used for the helicopter data. If they are not the same then the algorithms used for the flight simulator data should be proven to be sufficiently comparable. As a minimum the results along the dominant axes should be presented and a rationale for not presenting the other axes should be provided.

(2) Interpretation of results. The overall trend of the PSD plot should be considered