CLAIMS

1. A motion simulation apparatus that includes:

a motion platform;

a carrier for carrying a user, the carrier being mounted on the motion platform;

a drive arm, the drive arm having a lower end that is pivotally mounted on a substrate to pivot relative to the substrate with two degrees of freedom of movement and an upper end that is pivotally connected to the motion platform to pivot with respect to the motion platform with two degrees of freedom of movement such that rotation of the drive arm can be imparted to the motion platform; and

two guide arms, each guide arm having a lower end that is pivotally mounted on the substrate to pivot relative to the substrate with three degrees of freedom of movement and an upper end that is pivotally connected to the motion platform to pivot relative to the motion platform with three degrees of freedom of movement, the drive arm, the guide arms and the motion platform defining a dynamic frame that can pivot with respect to the substrate such that a resultant movement of the motion platform can be imparted to the carrier, and the drive arm and the guide arms constraining the range of movement of the motion platform to a curved surface in three-dimensional space.

2. The motion simulation apparatus as claimed in claim 1, in which the drive arm and the guide arms are angled towards each other from the substrate to the motion platform such that longitudinal axes of the arms intersect at a virtual pivot point, with the motion platform interposed between the substrate and said virtual pivot point.

3. The motion simulation apparatus as claimed in claim 2, in which the drive arm is forwardly positioned with respect to the guide arms.

4. The motion simulation apparatus as claimed in claim 3, in which respective planes in which the ends of the arms are located are angularly offset with respect to each other such that pivoting of the dynamic frame causes the drive arm to impart rotation to the motion platform as the drive arm pivots to accommodate the angular offset of the respective planes.

5. The motion simulation apparatus as claimed in claim 1, in which the motion simulation apparatus includes two actuators, each actuator having a linearly fixed end that is pivotally mounted to the substrate to pivot relative to the substrate with at

least two degrees of freedom of rotational movement, and a working end that is pivotally mounted with three degrees of freedom of rotational movement to the carrier, the arms being interposed between the actuators.

6. The motion simulation apparatus as claimed in claim 5, in which the actuators converge towards each other from their fixed ends to their working ends.

7. The motion simulation apparatus as claimed in claim 2, in which the guide arms are of substantially the same length.

8. The motion simulation apparatus as claimed in claim 1, which includes a base assembly, the carrier including a seat assembly arranged above the base assembly, the seat assembly having a seat support and a back support.

9. The motion simulation apparatus as claimed in claim 8, in which the motion platform includes a hub that is fixed to a head region of the back support, the drive arm being in the form of a drive shaft having an operatively upper connector and an operatively lower connector, the upper connector being engaged with a complementary connector of the hub to provide an upper joint that limits movement of the hub relative to the drive shaft to two degrees of freedom of rotational movement and the lower connector being engaged with a complementary connector of the base assembly to provide a lower joint that limits movement of the drive shaft relative to the base assembly to two degrees of rotational movement.

10. The motion simulation apparatus as claimed in claim 9, in which the two guide arms are in the form of two guide struts, each guide strut positioned on a respective side of the drive shaft and having an operatively upper connector and an operatively lower connector, the upper connector being engaged with a complementary connector of the hub to provide an upper joint that permits rotational movement of the hub relative to each guide strut with three degrees of freedom of movement, and each lower connector being engaged with a complementary connector of the base assembly to provide a lower joint that permits rotational movement of the hub relative to each strut relative to the base assembly with three degrees of freedom of movement.

11. The motion simulation apparatus as claimed in claim 10, which includes two linear actuators, the actuators being positioned on respective sides of an operatively vertical plane in which the drive shaft is located when the drive shaft is tilted neither left nor right, each linear actuator interconnecting the base assembly and the seat assembly.

12. The motion simulation apparatus as claimed in claim 10, in which the upper and lower joints of the drive shaft and the guide struts are positioned generally in respective planes to define a dynamic frame that can pivot with respect to the base assembly such that resultant movement of the hub can be imparted to the seat assembly.

13. The motion simulation apparatus as claimed in claim 10, in which a configuration of the base assembly is adjustable to alter a relative angular orientation of the base assembly and the hub such that pivoting of the dynamic frame causes the drive shaft to impart rotation of the hub to simulate yaw.

14. The motion simulation apparatus as claimed in claim 10, in which the upper connector of the drive shaft and the complementary connector of the hub are provided by an upper universal joint and the lower connector of the drive shaft and the complementary connector of the base assembly are provided by a lower universal joint.

15. The motion simulation apparatus as claimed in claim 11, in which each linear actuator is connected, at a fixed end, to the base assembly with a joint that limits relative movement of the linear actuator and the base assembly to at least two degrees of freedom of rotational movement and, at a working end, to the seat assembly with a joint that limits relative movement of the linear actuator and the seat assembly to between two and four degrees of freedom of movement.

16. The motion simulation apparatus as claimed in claim 10, which includes a cockpit floor positioned between the base assembly and the seat assembly.

17. The motion simulation apparatus as claimed in claim 16, in which a joint assembly, that is configured to provide rotational movement with two degrees of freedom of movement, is interposed between the seat support and the cockpit floor

so that the seat assembly can rotate with two degrees of freedom relative to the cockpit floor.

18. The motion simulation apparatus as claimed in claim 17, which includes two control strut assemblies, each control strut assembly interconnecting the drive shaft and the cockpit floor, on respective sides of the cockpit floor, with joints that permit two degrees of freedom of rotational movement and three degrees of freedom of translational movement between the drive shaft and the cockpit floor, so serving to constrain roll of the cockpit floor.

19. The motion simulation apparatus as claimed in claim 18, which includes a connector assembly interposed between the cockpit floor and the base assembly, the connector assembly configured to facilitate pivotal movement of the cockpit relative to the base assembly about an operatively vertical axis positioned forwards of the seat assembly.

20. The motion simulation apparatus as claimed in claim 19, in which the connector assembly includes a pivot arm pivotally connected at one end to the base and at an opposite end to the cockpit floor, forwards of the seat assembly.

21. The motion simulation apparatus as claimed in claim 19, in which the connector assembly includes a linear bearing assembly interposed between the cockpit floor and the base to facilitate fore and aft movement of the cockpit floor relative to the base.