WHAT IS CLAIMED IS:

1. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about a first azimuth axis, a second cross-level axis, and a third elevation axis;

a three-axis drive assembly for rotating a vertical support assembly relative to a base assembly about the first azimuth axis, a cross-level driver for pivoting a cross-level frame assembly relative to the vertical support assembly about the second cross-level axis, and an elevation driver for pivoting an elevation frame assembly relative to the cross-level frame assembly about the third elevation axis;

a motion platform assembly affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed on the motion platform assembly for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, and a three-axis gravity accelerometer mounted on the motion platform assembly and configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference, and for controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

2. The antenna system of claim 1, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

3. The antenna system of claim 1, wherein the three-axis gravity accelerometer includes a first two-axis gravity accelerometer mounted on the motion platform assembly and a second gravity accelerometer mounted on the motion platform assembly, the second gravity accelerometer mounted orthogonally to the first gravity accelerometer.

4. The antenna system of claim 3, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

5. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about a first azimuth axis, a second cross-level axis, and a third elevation axis;

a three-axis drive assembly for rotating a vertical support assembly relative to a base assembly about the first azimuth axis, a cross-level driver for pivoting a cross-level frame assembly relative to the vertical support assembly about the second cross-level axis, and an elevation driver for pivoting an elevation frame assembly relative to the cross-level frame assembly about the third elevation axis;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, a motion platform subassembly within the enclosure, three orthogonally mounted angular rate sensors disposed on the motion platform subassembly assembly for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, and a three-axis gravity accelerometer mounted on the motion platform subassembly and configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference, and for controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

6. The antenna system of claim 1, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

7. The antenna system of claim 1, wherein the three-axis gravity accelerometer includes a first two-axis gravity accelerometer mounted on the motion platform assembly and a second gravity accelerometer mounted on the motion

platform assembly, the second gravity accelerometer mounted orthogonally to the first gravity accelerometer.

8. The antenna system of claim 3, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

9. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about three axes, the pedestal including a base assembly dimensioned and configured for mounting to the moving structure, a vertical support assembly rotationally mounted on the base assembly about a first azimuth axis, a cross-level frame assembly pivotally mounted on the vertical support assembly about a second cross-level axis, and an elevation frame assembly supporting the tracking antenna and pivotally mounted on the cross-level frame assembly about a third elevation axis;

a three-axis drive assembly including an azimuth driver for rotating the vertical support assembly relative to the base assembly, a cross-level driver for pivoting the cross-level frame assembly relative to the vertical support assembly, and an elevation driver for pivoting the elevation frame assembly relative to the cross-level frame assembly;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed within the enclosure for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, a first two-axis gravity accelerometer mounted within the enclosure, and a second gravity accelerometer mounted within the enclosure orthogonally to the first gravity accelerometer, wherein the first and second gravity accelerometers are configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said

true-gravity zero reference and controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

10. The antenna system of claim 9, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

11. The antenna system of claim 9, wherein the elevation frame assembly has a rotational range of at least 90°.

12. The antenna system of claim 11, wherein the first and second gravity accelerometers are accurate to within 1° regardless of the angle of the elevation frame assembly.

13. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometer is microelectromechanical system (MEMS) accelerometer.

14. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometers operably connected to the control unit with a non-braided wire harness.

15. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometers has a maximum error of 1° within an operating temperature range of -40°C to +125°C.

16. The antenna system of claim 9, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

17. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about three axes, the pedestal including a base assembly dimensioned and configured for mounting to the moving structure, a vertical support assembly rotatably mounted on the base assembly about a first azimuth axis, a cross-level frame assembly pivotally mounted on the vertical support assembly about a second cross-level axis, and an elevation frame assembly supporting the tracking antenna and pivotally mounted on the cross-level frame assembly about a third elevation axis;

a three-axis drive assembly including an azimuth driver for rotating the vertical support assembly relative to the base assembly, a cross-level driver for pivoting the cross-level frame assembly relative to the vertical support assembly, and an elevation driver for pivoting the elevation frame assembly relative to the cross-level frame assembly;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed within the enclosure for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, a first two-axis gravity accelerometer mounted on a motion platform subassembly within the enclosure, and a second gravity accelerometer mounted on the motion platform subassembly orthogonally to the first gravity accelerometer, wherein the first and second gravity accelerometers are configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference and controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

18. The antenna system of claim 17, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

19. The antenna system of claim 17, wherein the elevation frame assembly has a rotational range of at least 90°.

20. The antenna system of claim 19, wherein the first and second gravity accelerometers are accurate to within 1° regardless of the angle of the elevation frame assembly.

21. The antenna system of claim 17, wherein at least one of the first and second gravity accelerometer is microelectromechanical system (MEMS) accelerometer.

22. The antenna system of claim 17, wherein at least one of the first and second gravity accelerometers operably connected to the control unit with a non-braided wire harness.

23. The antenna system of claim 17, wherein at least one of the first and second gravity accelerometers has a maximum error of 1° within an operating temperature range of -40°C to +125°C.

24. The antenna system of claim 17, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

25. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal including a first azimuth axis, a second cross-level axis, and a third elevation axis;

a three-axis drive assembly for rotating a vertical support assembly relative to a base assembly about the first azimuth axis, a cross-level driver for pivoting a level frame assembly relative to the vertical support assembly about the second cross-level

axis, and an elevation driver for pivoting an elevation frame assembly relative to the level frame assembly about the third elevation axis;

a primary antenna affixed relative to the level frame assembly;

a secondary antenna affixed relative to the level frame assembly; and

a control unit for selecting operation of a selected one of the primary and secondary antennas, determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes, and for controlling the azimuth, cross-level and elevation drivers to position the selected one of the primary and secondary antennas in a desired position for tracking a communications satellite.

26. The antenna system of claim 25, wherein the secondary antenna has a cant of approximately 70-120° relative to the primary antenna.

27. The antenna system of claim 26, wherein the secondary antenna has a cant of approximately 85-105° relative to the primary antenna.

28. The antenna system of claim 25, wherein the secondary antenna has a cant of approximately 70-85 or 105-120° relative to the primary antenna.

29. The antenna system of claim 25, wherein the primary antenna is an offset antenna.

30. The antenna system of claim 29, wherein the primary antenna has a look angle that is approximately 5-20° below the horizontal when the cross-level frame is positioned at 0° relative to the horizontal.

31. The antenna system of claim 25, wherein one of the primary and secondary antennas includes a feed assembly including a remotely adjustable polarizer.

32. The antenna system of claim 31, wherein the remotely adjustable polarizer includes a tubular-body that is rotated by an electric motor disposed on the feed assembly.

33. The antenna system of claim 25, wherein both of the primary and secondary antennas are operably connected to the control unit via a single coax cable.

What is claimed is:

1. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about a first azimuth axis, a second cross-level axis, and a third elevation axis;

a three-axis drive assembly including an azimuth driver for rotating a vertical support assembly relative to a base assembly about the first azimuth axis, a cross-level driver for pivoting a cross-level frame assembly relative to the vertical support assembly about the second cross-level axis, and an elevation driver for pivoting an elevation frame assembly supporting the antenna relative to the cross-level frame assembly about the third elevation axis;

a motion platform assembly affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed on the motion platform assembly for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, and a three-axis gravity accelerometer mounted on the motion platform assembly and configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference, and for controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

2. The antenna system of claim 1, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

3. The antenna system of claim 1, wherein the three-axis gravity accelerometer includes a first two-axis gravity accelerometer mounted on the motion platform assembly and a second gravity accelerometer mounted on the motion platform assembly, the second gravity accelerometer mounted orthogonally to the first gravity accelerometer.

4. The antenna system of claim 3, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

5. The antenna system of claim 3, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

6. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about a first azimuth axis, a second cross-level axis, and a third elevation axis;

a three-axis drive assembly for rotating a vertical support assembly relative to a base assembly about the first azimuth axis, a cross-level driver for pivoting a cross-level frame assembly relative to the vertical support assembly about the second cross-level axis, and an elevation driver for pivoting an elevation frame assembly supporting the antenna relative to the cross-level frame assembly about the third elevation axis;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, a motion platform subassembly within the enclosure, three orthogonally mounted angular rate sensors disposed on the motion platform subassembly assembly for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, and a three-axis gravity accelerometer mounted on the motion platform subassembly and configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference, and for controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

7. The antenna system of claim 1, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

8. The antenna system of claim 1, wherein the three-axis gravity accelerometer includes

a first two-axis gravity accelerometer mounted on the motion platform assembly and a second gravity accelerometer mounted on the motion platform assembly, the second gravity accelerometer mounted orthogonally to the first gravity accelerometer.

9. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about three axes, the pedestal including a base assembly dimensioned and configured for mounting to the moving structure, a vertical support assembly rotationally mounted on the base assembly about a first azimuth axis, a cross-level frame assembly pivotally mounted on the vertical support assembly about a second cross-level axis, and an elevation frame assembly supporting the tracking antenna and pivotally mounted on the cross-level frame assembly about a third elevation axis;

a three-axis drive assembly including an azimuth driver for rotating the vertical support assembly relative to the base assembly, a cross-level driver for pivoting the cross-level frame assembly relative to the vertical support assembly, and an elevation driver for pivoting the elevation frame assembly and the antenna relative to the cross-level frame assembly;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed within the enclosure for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, a first two-axis gravity accelerometer mounted within the enclosure, and a second gravity accelerometer mounted within the enclosure orthogonally to the first gravity accelerometer, wherein the first and second gravity accelerometers are configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference and controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

10. The antenna system of claim 9, wherein the predetermined X, Y, and Z axes are

orthogonal to one another.

11. The antenna system of claim 9, wherein the elevation frame assembly has a rotational range of at least 90°.

12. The antenna system of claim 11, wherein the first and second gravity accelerometers are accurate to within 1° regardless of the angle of the elevation frame assembly.

13. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometer is microelectromechanical system (MEMS) accelerometer.

14. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometers operably connected to the control unit with a non-braided wire harness.

15. The antenna system of claim 9, wherein at least one of the first and second gravity accelerometers has a maximum error of 1° within an operating temperature range of -40 °C to +125 °C.

16. The antenna system of claim 9, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.

17. A rotationally-stabilizing tracking antenna system suitable for mounting on a moving structure, the antenna system comprising:

a three-axis pedestal for supporting an antenna about three axes, the pedestal including a base assembly dimensioned and configured for mounting to the moving structure, a vertical support assembly rotatably mounted on the base assembly about a first azimuth axis, a cross-level frame assembly pivotally mounted on the vertical support assembly about a second cross-level axis, and an elevation frame assembly supporting the tracking antenna and pivotally mounted on the cross-level frame assembly about a third elevation axis;

a three-axis drive assembly including an azimuth driver for rotating the vertical support assembly relative to the base assembly, a cross-level driver for pivoting the cross-

level frame assembly relative to the vertical support assembly, and an elevation driver for pivoting the elevation frame assembly and the antenna relative to the cross-level frame assembly;

a motion platform assembly including an enclosure affixed to and movable with the elevation frame assembly, three orthogonally mounted angular rate sensors disposed within the enclosure for sensing motion about predetermined X, Y and Z axis of the elevation frame assembly, a first two-axis gravity accelerometer mounted on a motion platform subassembly within the enclosure, and a second gravity accelerometer mounted on the motion platform subassembly orthogonally to the first gravity accelerometer, wherein the first and second gravity accelerometers are configured to determine a true-gravity zero reference; and

a control unit for determining the actual position of elevation frame assembly based upon the sensed motion about said predetermined X, Y, and Z axes and said true-gravity zero reference and controlling the azimuth, cross-level and elevation drivers to position the elevation frame assembly in a desired position.

18. The antenna system of claim 17, wherein the predetermined X, Y, and Z axes are orthogonal to one another.

19. The antenna system of claim 17, wherein the elevation frame assembly has a rotational range of at least 90°.

20. The antenna system of claim 19, wherein the first and second gravity accelerometers are accurate to within 1° regardless of the angle of the elevation frame assembly.

21. The antenna system of claim 17, wherein at least one of the first and second gravity accelerometer is microelectromechanical system (MEMS) accelerometer.

22. The antenna system of claim 17, wherein at least one of the first and second gravity accelerometers operably connected to the control unit with a non-braided wire harness.

23. The antenna system of claim 17, wherein at least one of the first and second gravity

accelerometers has a maximum error of 1° within an operating temperature range of -40 °C to +125 °C.

24. The antenna system of claim 17, wherein the second gravity accelerometer is a two-axis gravity accelerometer mounted orthogonally to the first gravity accelerometer.