What is claimed is:

1. An aerostatic or hydrostatic bearing seal assembly comprising:

a rotatable shaft with a runner coupled to the rotatable shaft;

a housing located concentric to the shaft and defining a cavity, the housing being coupled to an annular seal body via a first O-ring seal, the seal body including a conductive passage for communicating pressurized fluid to a labyrinth which distributes the pressurized fluid to a porous media positioned between the runner and the seal body, the pressurized fluid creating an annular air film between the rotatable shaft and seal body.

2. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein a second O-ring seal couples the rotatable shaft to the runner.

3. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the porous media is selected from a group of graphite, carbon, silicon carbide, Tungsten carbide, alumina, and combinations thereof.

4. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein an adapter plate is positioned between the housing and the seal body, and a third O-ring is positioned between the adapter plate and the seal body.

5. An aerostatic or hydrostatic bearing seal assembly comprising:

a rotatable shaft with a runner coupled to the rotatable shaft;

a housing located concentric to the shaft that defines a cavity,

an adapter plate coupled on one side to the housing via a first O-ring seal and coupled on an opposite side to a seal body via a second O-ring seal,

the seal body including a first and second ring each including porous media having an annular opposed air bearing face,

a spacer located concentric to a runner separates the first and second ring,

wherein the first and second ring each include a conductive passage for directing fluid to the porous media, the spacer includes a drain in communication with a space defined between the rings and the runner, and the fluid creates an annular air film between the rotatable shaft and the seal body.

6. The aerostatic or hydrostatic bearing seal assembly of claim 5, wherein a third O-ring seal couples the rotatable shaft to the runner.

7. The aerostatic or hydrostatic bearing seal assembly of claim 5, wherein the porous media is selected from a group of graphite, carbon, silicon carbide, Tungsten carbide, alumina, and combinations thereof.

8. The aerostatic or hydrostatic bearing seal assembly of claim 5, wherein an adapter plate is positioned between the housing and the seal body, and a third O-ring is positioned between the adapter plate and the seal body.

9. An aerostatic or hydrostatic bearing seal assembly comprising:

a rotatable shaft, and

a housing located concentric to the shaft which defines a cavity, the housing is coupled to an adapter block via a first O-ring seal, the adapter block is arranged concentric to a cylindrical seal and is coupled with the cylindrical seal via a second O-ring seal, the adapter block and the cylindrical seal include conductive passages for communicating pressurized fluid to a porous material located between the cylindrical seal and the shaft, the pressurized fluid enters an air gap located between the porous material and the shaft to create an annular seal.

10. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein a retainer element is located on a low pressure side of the adapter block and clearance is provided between the retainer and the shaft.

11. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the adapter block includes a hole and epoxy is inserted through the hole and between a cylindrical gap defined between the adapter block and the cylindrical seal.

12. A blade runner air bearing seal assembly comprising:

a rotatable shaft with a blade runner coupled to the rotatable shaft; and

a housing located concentric to the shaft and defining a cavity, the housing being coupled to an annular seal body via a first O-ring seal, the seal body including a conductive passage for communicating pressurized fluid to a labyrinth which distributes the pressurized fluid to a porous media positioned between the blade runner and the seal body, the pressurized fluid creating an annular air film between the rotatable shaft and seal body.

13. The blade runner air bearing seal assembly of claim 12, wherein a second O-ring seal couples the rotatable shaft to the blade runner.

14. The blade runner air bearing seal assembly of claim 12, wherein the shaft includes a shoulder and the blade runner abuts the shoulder.

15. The blade runner air bearing seal assembly of claim 12, wherein blade runner is between 0.1 and 1.0 mm thick.

16. A multi-blade runner air bearing seal assembly comprising:

a rotatable shaft with a plurality of blade runners coupled to the shaft via a shoulder on the shaft and a first bolt, the plurality of blade runners are separated from each other via spacing rings;

a stator with a plurality of porous bearing seals coupled to the stator via a second bolt, the plurality of porous bearing seals are separated from each other via precision spacers;

a first clearance is defined between an inside diameter of the bearing seals and an outside diameter of the shaft, and a second clearance is defined between an outside diameter of the blade runners and an inside diameter of the stator; and

passageways are provided in the stator that communicate with respective holes in the plurality of bearing seals, pressurized fluid flows from the passageways to a circumferential groove arranged adjacent to the stator, the pressurized fluid also flows through the plurality of bearing seals through respective holes to spaces between the plurality of bearing seals and the plurality of blade runners.

17. The multi-blade runner air bearing seal assembly of claim 16, wherein the precision spacers are approximately the same size as the blade runners.

18. The multi-blade runner air bearing seal assembly of claim 1, wherein the precision spacers are less than 10 μm thicker than the blade runners.

19. A spherical runner bearing seal assembly comprising:

a rotatable shaft with a spherical runner coupled to the shaft via two O-ring seals, the spherical runner including an outer diameter that mates to a complementarily shaped porous restrictive element, a housing supports the porous restrictive element and includes a passageway for feeding pressurized fluid through the passageway and a labyrinth, a gap between the housing and spherical runner allows the pressurized fluid to create an air film between the porous restrictive element and the outer diameter of the spherical runner, and a vent located between the two O-ring seals in the housing prevents pressure buildup of the pressurized fluid.

20. A spherical runner bearing seal assembly comprising:

a rotatable shaft arranged within a stationary housing with two thrust collars, a yoke is suspended between opposed faces of the thrust collars, the stationary housing includes an input port for pressurized fluid and the thrust collars include secondary ports for the pressurized fluid, the input port communicating with a first passageway in the yoke and feeding into a second passageway in a spherical runner, the secondary ports communicating with chambers and porous media arranged adjacent to the spherical runner, the pressurized fluid flows from the input port and secondary ports to a gap between the spherical runner and the shaft creating an air film for the pressurized fluid.

21. A spherical runner bearing seal assembly comprising:

a rotatable shaft arranged within a stationary housing with two thrust collars, a yoke is suspended between opposed faces of the thrust collars, the stationary housing includes an input port for pressurized fluid and the yoke includes secondary ports for the pressurized fluid, the input port communicating with a first passageway in the yoke and feeding into a second passageway in a spherical runner, the secondary ports communicating with chambers and porous media arranged adjacent to the spherical runner, the pressurized fluid flows from the input port and secondary ports to a gap between the spherical runner and the shaft to create an air film.

22. A spherical runner bearing seal assembly comprising:

a rotatable shaft arranged within a stationary housing with two thrust collars, a yoke suspended between opposed faces of the thrust collars, the thrust collars each include input ports for pressurized fluid and the stationary housing includes an exhaust port for the pressurized fluid, the input ports communicate with a respective chamber and porous media to direct the pressurized fluid into a bore in the yoke, the yoke includes a fitting and tube for directly

communicating with a gap between the rotatable shaft and a spherical runner, additional porous media is provided in an area between the yoke and the spherical runner for allowing the pressurized fluid to flow from the input ports to the gap between the rotatable shaft and the spherical to create an air film.

23. A hydrodynamic bearing seal assembly comprising:

a rotatable shaft with a runner coupled to the rotatable shaft;

a housing located concentric to the shaft and defining a cavity, the housing being coupled to an annular seal body via a first O-ring seal;

the seal body including a conductive passage for communicating pressurized fluid to a labyrinth which distributes the pressurized fluid to a porous media positioned between the runner and the seal body and the pressurized fluid exerts a force on a face of the porous media; and

an element provides a opposing force to the pressurized fluid force, such that the face of the porous media and a face of the runner are completely unloaded and zero contact pressure exists between the porous media face and the runner face.

24. A aerostatic or hydrostatic bearing seal assembly comprising:

a rotatable shaft;

a housing located concentric to the rotatable shaft, the housing including:

a cavity, and

axial air bearings located at each end the cavity, the air bearings supporting the rotatable shaft on an air film between the rotatable shaft and sealing a gas inside the cavity.

What is claimed is:

1. An aerostatic or hydrostatic bearing seal assembly comprising:
a rotatable shaft with a runner coupled to the rotatable shaft;
a housing located concentric to the shaft and defining a cavity;
an annular seal body coupled to the housing;
a primary ring coupled to the annular seal, the primary ring including a porous media positioned over a plenum and a port connected to the plenum, the seal body includes a conductive passage for communicating pressurized fluid to the plenum through the port of the primary ring, the plenum and the porous media distributes the pressurized fluid between the runner and the primary ring to create an annular film between the runner and the porous media, and wherein an axial compliance is provided for the primary ring using a compliant mount.

2. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein a 0-ring seal couples the rotatable shaft to the runner.

3. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the porous media is selected from a group of graphite, carbon, silicon carbide, Tungsten carbide, alumina, and combinations thereof.

4. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein an adapter plate is positioned between the housing and the seal body, and a 0-ring is positioned between the adapter plate and the seal body.

5. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the porous media is a sintered material.

6. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the plenum has a conductance that is at least 9 times that of a free flow through the porous media.

7. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the pressurized fluid is one of gas, liquid, or steam.

8. The aerostatic or hydrostatic bearing seal assembly of claim 1, wherein the runner has a curved surface.

9. An aerostatic or hydrostatic bearing seal assembly comprising:
a first opposing surface that is a runner coupled to a rotatable shaft;
a second opposing surface that is a porous media;
housing located concentric to the shaft and defining a cavity;
an annular seal body coupled to the housing;
the annular seal body including a plurality of plenums arranged concentrically about the shaft, each plenum having a port, and the porous media positioned over the plurality of plenums; and
the seal body including a conductive passage for communicating pressurized fluid to the plurality of plenums through the ports, the plurality of plenums and the porous media distributing the pressurized fluid between the runner and the seal body to create an annular film between the runner and the porous media.

10. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein a 0-ring seal couples the rotatable shaft to the runner.

11. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the porous media is selected from a group of graphite, carbon, silicon carbide, Tungsten carbide, alumina, and combinations thereof.

12. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the porous media is a sintered material.

13. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein each plenum of the plurality of plenums has a conductance that is at least 9 times that of a free flow through the porous media.

14. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the pressurized fluid is one of gas, liquid, or steam.

15. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the porous media and the plurality of plenums are configured to not deform under pressure differentials between each side of the porous restriction.

16. The aerostatic or hydrostatic bearing seal assembly of claim 9, wherein the runner has a curved surface.