CLAIMS

1. An integrated probe suitable for performing cathodic protection voltage readings and ultrasonic testing thickness measurements at an underwater surface substantially simultaneously, comprising:

a probe carrier having an electrically conductive portion disposed at a front surface of the probe carrier for conducting voltage when performing cathodic protection voltage readings at the underwater surface, in which the front surface of the probe carrier defines a cavity centrally therein;

one or more magnets embedded within the probe carrier;

a flux concentrator embedded within the probe carrier, supported by the one or more magnets, and adjacent to the electrically conductive portion;

a flexible membrane seated in the cavity of the probe carrier;

a sleeve housing;

an ultrasonic probe having a transducer crystal, the ultrasonic probe being partially disposed within the sleeve housing and extending through the probe carrier to be adjacent to the flexible membrane, the flexible membrane being arranged about the transducer crystal; and

a spring coupled to a free end of the sleeve housing and configured to provide two degrees of freedom to the probe carrier in response to a force imparted when the probe carrier contacts the underwater surface.

2. An integrated probe system according to Claim 1, in which the electrically conductive portion comprises one or more legs each having one or more electrically conductive tips extending away from the front surface of the probe carrier and arranged equidistant from one another about the cavity.

3. An integrated probe system according to Claim 1, in which the electrically conductive portion comprises a serrated rim.

4. An integrated probe system according to Claim 1, in which the flux concentrator is a ring-shaped layer of magnetically conductive material.

5. An integrated probe system according to Claim 1, in which the flux concentrator comprises one or more magnetically conductive rods embedded within the probe carrier.

6. An integrated probe system according to Claim 1, in which the flux concentrator is made of iron.

7. An integrated probe system according to Claim 1, in which the sleeve housing is a hollow, cylindrically-shaped tube.

8. An integrated probe system according to Claim 1, further comprising a couplant disposed within a gap between the flexible membrane and the transducer crystal.

9. An integrated probe suitable for performing cathodic protection voltage readings and ultrasonic testing thickness measurements at an underwater surface substantially simultaneously, comprising:

an outer gimbal shaped as a hollow ring and having one or more coupling points disposed at the inner surface of the outer gimbal;

an inner gimbal coupled to the outer gimbal at the one or more coupling points, the inner gimbal having an electrically conductive portion disposed at a front surface of the inner gimbal for conducting voltage when performing cathodic protection voltage readings at the underwater surface, in which the front surface of the inner gimbal defines a cavity centrally therein;

one or more magnets embedded within the inner gimbal;

a flux concentrator embedded within the inner gimbal, supported by the one or more magnets, and adjacent to the electrically conductive portion;

a flexible membrane seated in the cavity of the inner gimbal;

an ultrasonic probe having a transducer crystal, the ultrasonic probe being partially disposed within and extending through the inner gimbal to be adjacent to the flexible membrane, the flexible membrane being arranged about the transducer crystal; and

in which the outer gimbal and the inner gimbal are coupled such that the inner gimbal has one or more degrees of freedom of movement.

10. An integrated probe system according to Claim 9, in which the electrically conductive portion comprises one or more legs each having one or more electrically conductive tips

extending away from the front surface of the inner gimbal and arranged equidistant from one another about the cavity.

11. An integrated probe system according to Claim 9, in which the electrically conductive portion comprises a serrated rim.

12. An integrated probe system according to Claim 9, in which the flux concentrator is a ring-shaped layer of magnetically conductive material.

13. An integrated probe system according to Claim 9, in which the flux concentrator comprises one or more magnetically conductive rods embedded within the inner gimbal.

14. An integrated probe system according to Claim 9, in which the flux concentrator is made of iron.

15. An integrated probe system according to Claim 9, further comprising a couplant disposed within a gap between the flexible membrane and the transducer crystal.

16. An integrated probe system according to Claim 9, further comprising a modular frame couplable to an outer surface of the outer gimbal.

17. An integrated probe system according to Claim 9, in which the inner gimbal is sized and shaped to define one or more ingresses.

18. An integrated probe system according to Claim 17, in which at least one of the one or more legs passes through the one or more ingresses to couple to the outer gimbal.