INTELLIGENT SENSOR PROTECTION SYSTEM FORMALLY KNOWN AS THE ARCTIC AUTONOMOUS RADIOMETER SYSTEM

Dr. Peter J. Stein
Mr. Armen Bahlavouni
Scientific Solutions, Inc.
18 Clinton Drive
Hollis, NH 03049-6576
pstein@mv.mv.com
Voice: (603) 880-3784 Fax: (603) 598-1803
Award No. N00014-95-C-0406

LONG TERM GOALS

To develop a system for protecting sensitive meteorological type sensors for long term, unmanned, low power deployments in harsh environments such as the Arctic.

OBJECTIVES

Heat balance studies of the Arctic require long term radiometric measurements. This includes the prediction of thermal ice stresses, and the resulting ice cracking and underwater ambient noise. However, making unmanned radiometric measurements in the Arctic is very difficult because of frost, freezing rain, and snow accumulation on the glass radiometer dome. Current methods for keeping radiometers clean, such as a ventilation fan, are too power consumptive for long-term deployments. They are also ineffective in heavy frost conditions, freezing rain, or heavy snow. The Arctic Radiometer System was a Phase I SBIR awarded to SSI to develop a housing system for keeping radiometers clean under Arctic conditions. A prototype system was design, built, and tested with very promising results. The success of this prototype, along with the realization that the approach could be used for a wide variety of sensors in a wide variety of harsh environments led to a Phase II effort. Under the Phase II, the project was renamed to the Intelligent Sensor Protection System (ISPS) to indicate its wider application. The objectives of the Phase II effort were to develop and test an advanced prototype of the ISPS Arctic version and design an ISPS marine version.

APPROACH

The advanced prototype of the Arctic version of the ISPS is shown in Figure 1. The radiometer is housed in a sphere which is mounted at the top of a cylindrical housing. The sphere rotates about its axis via a computer controlled motor. In its normally closed position the radiometer faces downward inside the housing. On a preprogrammed schedule, say once per hour, the radiometer is rotated to its upward position for a measurement. During rotation any ice or snow accumulation is scraped off the sphere. For this purpose the sphere is anodized with a teflon impregnated coating such that it is very slippery. The computer also turns on a ventilation fan to help keep the radiometer clear only when deployed. Usually the radiometer is exposed for only about 60 seconds. After rotating it back inside, a light or heat source, depending on the type

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 1997		**00-00-1997 to 00-00-1997**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Intelligent Sensor Protection System Formally Known as the Arctic Autonomous Radiometer System	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Scientific Solutions, Inc,18 Clinton Drive,Holis,NH,03049**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**3**	

of radiometer, is turned on and a calibrated measurement is made. If it is determined that the sensor is corrupted, forced hot air is blown up over the radiometer dome. In this fashion any ice or snow is melted. For the marine version, the cleaning mechanism might be a fresh water spray. An underwater version is also in development in which the dome would rotate through a bromine bath on a programmed cycle to clean off biologics.

ACCOMPLISHMENTS

Eight of the advanced prototypes of the Arctic versions are being deployed as part of the Office of Naval Research/National Science Foundations (ONR/NSF) Surface Heat Budget of the Arctic (SHEBA) program. The deployment at SHEBA will be the first time remote, unmanned, long-term radiometric measurements have been made under Arctic conditions.

IMPACT FOR SCIENCE/ SYSTEMS APPLICATIONS

The Arctic version will be invaluable to global warming studies. The marine version will allow for enhanced deployments on Navy ships with improved data sets. The underwater version will allow for underwater optical measurements to be made on moorings for a much longer period of time. Presently, these deployments only yield useful data for a couple of months after which the sensors become severely fouled.

TRANSITIONS

This SBIR is currently being transitioned to Phase III. ONR is supporting fabrication of one of the underwater versions. There is promise of support for fabrication and testing of a marine version.

RELATED PROJECTS

The radiometer data being acquired at SHEBA is being taken along with underwater ambient noise and ice stress data. These data sets will be used to better understand thermally induced fracturing and underwater ambient noise in the Arctic.

PUBLICATIONS

"Intelligent Sensor Protection System for Polar and Marine Environments", (with P.J. Stein and D.W. Andersen), presented at the ISOPE-97 Honolulu Proceedings, Honolulu, HI, USA, May, 1997.

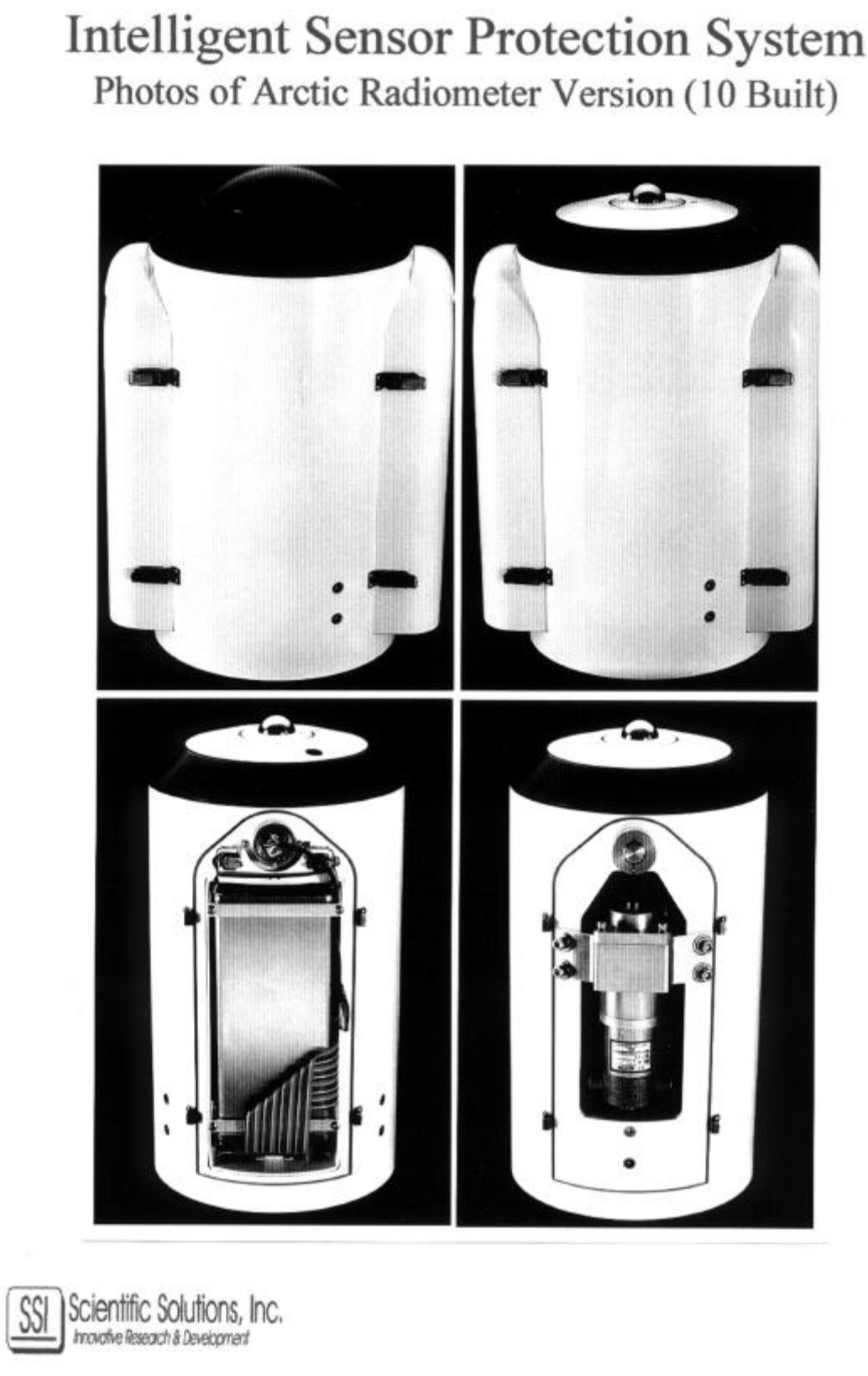

Figure 1. The advanced ISPS prototype.