KEYNOTE ADDRESS

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Good Morning - Both General Ward and Colonel Brooke asked me to convey their regrets for not being here due to the press of business.

I would like to welcome you to this, the second Spacecraft Charging Technology Conference. I am enthusiastic about this conference because I feel this is the best way to insure a maximum exchange of results. As you can see, we have an excellent turnout - about 150 attendees. There are representatives from U.S. industries and universities, from the European Space Agency and, quite naturally, since this is a joint DOD/NASA Technology Program, we have NASA as well as Army, Navy and Air Force participants.

This is the second conference. The first was a smashing success. There were over 225 attendees and 60 papers. From all indications, this conference will also be a success.

Technology involving spacecraft charging is one of the many interdependent research areas in aeronautics and astronautics that are coordinated by the AFSC/NASA Space Research and Technology Review Group. These interdependent technology programs have resulted from our awareness that many technical problems are common to both agencies and, also, from the fact that we both share budgetary constraints.

NASA and DOD strive to identify these common technical problems and then assign agency responsibility for providing the required technology. If one agency has the technical lead in an area, then we assign to it responsibility for developing the technology for both agencies. In some cases, an agency has cancelled its program and transferred funds to the responsible agency. Where both agencies have desired to maintain programs, the programs have been jointly managed and the technical responsibility has been clearly established.

The concept of interdependency has taken hold, and benefits are beginning to accrue. Interdependency allows us to stretch our limited research and development dollars, to reduce or eliminate duplication, and to maximize the technology return per dollar invested.

Spacecraft charging is a 5 year program between Air Force Systems Command and NASA's Office of Aeronautics and Space Technology. A steering committee incorporates NASA and DOD requirements into the investigation. The ultimate objective of the program is to protect our satellites from the harmful effects of high voltage arc-discharges. This objective is met by develop-

ing design criteria and test methods. Each element of the program is assigned to either NASA or the Air Force with well defined accountability. Contractual and in-house efforts are working on this program. Program success requires everyone involved to execute their portion successfully. Technology elements include development of analytical programs to define the environment and model the spacecraft interaction with this environment. There are experimental programs to develop ground facilities to simulate the environment, to determine the response of spacecraft materials to this environment, and to develop new or modified materials.

The spacecraft charging at high altitudes or "SCATHA" satellite managed by the SAMSO STP office will be used to define the environment, to measure charging and discharging characteristics of materials, to provide data for calibration of the analytical models, and to measure satellite contamination. The electrical potential of SCATHA will be actively controlled using an electron and ion beam system.

I see significant progress in the program and I will mention just a few of the accomplishments.

All SCATHA instrumentation has been delivered and integrated. Systems level testing is finished and launch is scheduled for early next year.

A rocket flight showed that electron and ion beams can control vehicle potential. Measurements on the ATS-5 and 6 satellites show the plasma neutralizer can control the surface potential over the spacecraft.

A baseline "Military Standard" for spacecraft charging has been written including a specification of the environment.

A "Design Guidelines Monograph" details techniques to minimize satellite charging.

Silica-fabric thermal control coatings have been developed for use in satellite charging control. Transparent conductive coatings for controlling charging on thermal blankets, on second surface mirrors, and on solar cell covers are now available.

A model of the internal charge buildup within insulators is operating and environmental simulation facilities are characterizing the charging of insulators.

The NASA Charging Analyzer Computer Program is being used to compute satellite voltage distributions.

In addition to these accomplishments, new programs have been initiated. One deals with investigating the effects of a systems generated electromagnetic pulse on an electrically charged satellite. Another investigates the charge buildup on a satellite, which occurs after a high altitude detonation, and the charge breakdown processes.

In conclusion, spacecraft charging is a successful cooperative effort. Your efforts have produced results that, today, are essential to the design of reliable and survivable space systems. As we move into the next era of space technology in which satellites will grow in size, power, complexity, and cost, you again will be called upon to develop the required technology to insure success.

We have a full agenda - so I don't want to take any more of your time. Again -- I welcome you to this - the second Spacecraft Charging Technology Conference.

Thank you.