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Subcommittee on HUD and Independent

Agencies of the Senate Committee

on Appropriations

United States Senate

Statement by:

Robert A. Frosch

99th Congress

TESTIMONY OF ROBERT A. FROSCH
BEFORE THE
SUBCOMMITTEE ON HUD AND INDEPENDENT AGENCIES
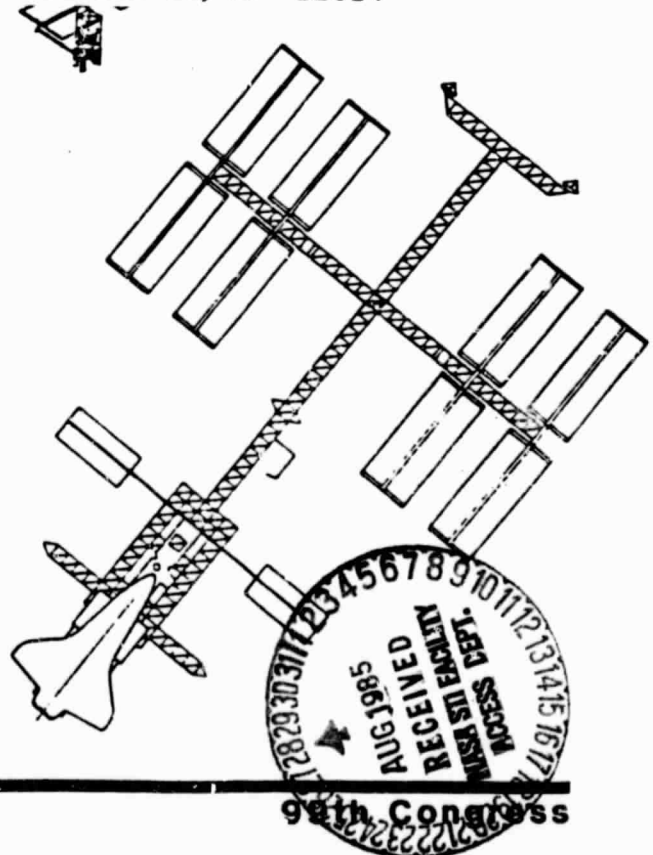OF THE
SENATE COMMITTEE ON APPROPRIATIONS
MARCH 14, 1985

Mr. Chairman, members of the Subcommittee:

It is a pleasure to appear before you today to testify on the work of the Automation and Robotics Panel. As you know, this Panel was arranged by Agreement between NASA and the Congress as part of the activities supporting the establishment of NASA Policy on Automation and Robotics for the Space Station. This Panel was established by the California Space Institute of the University of California under a NASA Grant. Professor James R. Arnold, Director of the California Space Institute, Dr. Charles A. Rosen of machine Intelligence, Inc., and I, acted as a steering committee for the Panel. Dr. David R. Criswell of the California Space Institute organized the Panel and was Senior Technical Advisor. The Panel brought together experts from industry, universities, national laboratories, other government agencies, and NASA to perform an independent study of how NASA could use automation and robotics in the Space Station in ways that would be most useful to carrying out the mission of the station, and that would lead to useful benefits to the U.S. economy and industry on the ground.

The Steering Committee helped in guiding the choice and recruitment of Panel members by providing its views to the Panel. Professor Arnold and Dr. Rosen participated in the meetings of the Panel, and we also consulted with each other and with Dr. Criswell throughout the work. We read and commented on various drafts of the report.

The Panel did a tremendous amount of work in a relatively short time, covering the possible uses of automation and robotics in the station. In the discussions the Panel specifically includes in 'Automation and Robotics' those technologies called artificial intelligence or machine intelligence. The Panel considered how to design the station for the best use of all these emerging technological advances, and how to assure a growth capability for use of these technologies in the station. It studied the technological

advancements that should be aimed at for the greatest benefits to the station and to terrestrial industry. It also considered, drew conclusions and made recommendations with regard to their views of the technology directions for which NASA should take lead responsibility, those on which NASA support should apply leverage, and those which NASA can exploit. It tried to plan for the deliberate advancement of these technologies in both their space and terrestrial applications.

Some specific funding estimates are made in the report. The Panel also makes recommendations on the management requirements and structures that it feels are needed for success.

In the short time appropriate for this testimony I will not try to outline the contents of the Panel report, but will only make my own general comments on the report and its various aspects.

While the development of the detailed plans for, and building, of the Space Station, and the future development of the technologies of automation and robotics, will no doubt result in changes that adjust the appropriateness of many aspects and details of the report, I believe the recommendations are realistic and supportable, keeping in mind that they deal with the application of rapidly changing technologies from the next few years into the next twenty-five years and beyond. The funding levels discussed are well scaled to the place of these technologies in the Space Station and to the scale of effort that will be necessary to create the Station; they would be manageable within the scale of NASA budgets necessary to accommodate the Station development. The organizational recommendations are based on sound principles, and can be accommodated in a reasonable way within the NASA organization.

If the technical recommendations are followed, the infusion of NASA money, objectives and interest into the development of automation and robotic technology should have an important effect in enriching the directions that technology takes, and in pushing new ideas and possibilities required by the Space Station application. These new directions, because they are in areas of considerable difficulty and complexity, will lead to new knowledge, new technology, and new application ideas which will make important contributions to the development of terrestrially useful and important applications of the whole field. The effect may not be most important in specifically identifiable devices and gadgets, but rather will be in new directions and ideas which will have important effects and payoff. The program recommended

will have good connections between the NASA Automation and Robotics Program, possible industrial contributors and users, and the academic community. These connections can ensure a continuous flow of benefits resulting from the work into industry from the beginning of the program. With the establishment of an interested community of contributors to and participants in the program, and interested potential users of results, many aspects of the transfer of the resulting technology into terrestrial use may be essentially automatic.

At the very beginning of the program NASA may be more a user and exploiter of the technology, but as the program matures, the agency will become a major participant, and in many aspects of the technology can become a leader.

The work of the Panel, even before its report is formally issued, has been important because it brought together a community of NASA and non-NASA participants to consider the problems of the applications of automation and robotics to the Space Station. This has stimulated the thinking of the members and has established the beginning of a community of interest between the NASA Space Station team and the automation and robotics community. The NASA group has been working with and listening to the Panel, and has begun to build these ideas and recommendations into its thinking. The work is well begun, and the mandate of the Congress expressed PL 98-371 of the 98th Congress is being carried out. The use of automation and robotics in the planning of the Space Station has begun, and will continue as the Station is designed and built, and throughout its continuing life. The desired effects of the stimulation of this important technological area will follow from this initiative.

Mr. Chairman, thank you for this opportunity to express my views to the Committee. I will be happy to try to answer questions.