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NASA TECH BRIEF



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Study of Hydrogen Slush-Hydrogen Gel Utilization

The study of hydrogen slush-hydrogen gel utilization constitutes the first formal investigation of subcooled liquid and slush hydrogen fuels for space vehicle applications. Results of this study program are reported in two volumes. The first volume contains the physical and thermal property data for hydrogen used in the study plus complete property data from the triple point to the critical point. In the second volume, details of the technical effort are presented including parametric analysis of effects on vehicle systems and applications of subcooled hydrogen to three study vehicles.

Because it was determined that insufficient data were available on hydrogen gels, it was decided to concentrate the study effort on triple-point hydrogen. In phase 1, all available property data on subcooled (including slush) and gelled hydrogen were compiled for later use in phases 2 and 3. In phase 2, effects of using triple-point hydrogen were investigated on vehicle subsystem designs in parametric fashion. These effects were then evaluated for each of the affected vehicle subsystems prior to the phase 3 vehicle application studies.

In conducting phase 1 it was found that all of the fundamental physical and thermal properties of hydrogen needed to properly perform phases 2 and 3 were available in the literature. It was further found that additional data in the form of triple-point hydrogen flow characteristics will be required to conduct detail design of flight subsystems.

Note:

A complete report of the findings of this study is contained in Lockheed Missiles and Space Company report K-11-67-1, volumes I and II, available from:
Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10413

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: C. W. Keller
of Lockheed Missiles and Space Company
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Marshall Space Flight Center
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Category 02



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NASA Tech Briefs are intended to provide a concise and accurate summary of the results of research and development projects conducted by NASA and its participating agencies. The information is presented in a form that is easily understood by a wide range of interested parties.

Development of a High-Speed Data Acquisition System

The development of a high-speed data acquisition system for use in the study of the aerodynamic characteristics of a winged body in a supersonic flow field. The system is designed to acquire and store data at a rate of 100,000 samples per second. The data is then processed and displayed on a computer terminal. The system is capable of operating in a real-time mode, allowing the user to monitor the data as it is acquired. The system is also capable of storing data for later analysis. The data is stored on a magnetic disk, which can be accessed at any time. The system is designed to be flexible and adaptable to a wide range of applications. It is capable of acquiring data from a variety of sensors and can be configured to acquire data from a single sensor or from multiple sensors. The system is also capable of acquiring data from a variety of sources, including analog and digital signals. The system is designed to be easy to use and to integrate with existing systems. It is capable of operating on a variety of computer systems and can be configured to operate on a specific system. The system is designed to be reliable and to provide accurate data. It is capable of operating in a wide range of environments and can be configured to operate in a specific environment. The system is designed to be cost-effective and to provide a high level of performance. It is capable of operating at a high speed and can be configured to operate at a specific speed. The system is designed to be easy to maintain and to provide a high level of service. It is capable of operating in a wide range of conditions and can be configured to operate in a specific condition. The system is designed to be flexible and adaptable to a wide range of applications. It is capable of acquiring data from a variety of sensors and can be configured to acquire data from a single sensor or from multiple sensors. The system is also capable of acquiring data from a variety of sources, including analog and digital signals. The system is designed to be easy to use and to integrate with existing systems. It is capable of operating on a variety of computer systems and can be configured to operate on a specific system. The system is designed to be reliable and to provide accurate data. It is capable of operating in a wide range of environments and can be configured to operate in a specific environment. The system is designed to be cost-effective and to provide a high level of performance. It is capable of operating at a high speed and can be configured to operate at a specific speed. The system is designed to be easy to maintain and to provide a high level of service. It is capable of operating in a wide range of conditions and can be configured to operate in a specific condition.