

phenomenologies. The Backgrounds Data Center (BDC), located at the Naval Research Laboratory (NRL), has been designated by the SDIO as the prime archive for data collected by SDIO programs for which substantial backgrounds measurements are planned. The BDC will be the prime archive for MSX data, which will total about 15 TB over three years. Current BDC holdings include data from the VUE, UVPI, UVLIM, FUVCAM, TCE, and CLOUDS programs. Data from IBSS, CIRRI 1A, and MSTI, among others, will be available at the BDC in the near future. The BDC will also archive data from the Clementine mission.

The BDC maintains a Summary Catalog that contains "metadata," that is, information about data, such as when the data were obtained, what the spectral range of the data is, and what region of the Earth or sky was observed. Queries to this catalog result in a listing of all datasets (from all experiments in the Summary Catalog) that satisfy the specified criteria. Thus, the user can identify different experiments that made similar observations and order them from the BDC for analysis. On-site users can use the Science Analysis Facility (SAF) for this purpose.

For some programs, the BDC maintains a Program Catalog, which can classify data in as many ways as desired (rather than just by position, time, and spectral range as in the Summary Catalog). For example, datasets could be tagged with such diverse parameters as solar illumination angle, signal level, or the value of a particular spectral ratio, as long as these quantities can be read from the digital record or calculated from it by the ingest program. All unclassified catalogs and unclassified data will be remotely accessible.

The activities and functionality of the BDC will be described. Information is presented about the BDC facilities, user support capabilities, and hardware and software systems.

N93-28815
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THE ENHANCED-MODE LADAR WIND SENSOR AND ITS APPLICATION IN PLANETARY WIND VELOCITY MEASUREMENTS. D. C. Soreide, R. L. McGann, L. L. Erwin, and D. J. Morris, Boeing Defense and Space Group, Seattle WA 98124, USA.

For several years we have been developing an optical air-speed sensor that has a clear application as a meteorological wind-speed sensor for the Mars landers. This sensor has been developed for airplane use to replace the familiar, pressure-based Pitot probe. Our approach utilizes a new concept in the laser-based optical measurement of air velocity (the Enhanced-Mode Ladar), which allows us to make velocity measurements with significantly lower laser power than conventional methods.

The application of the Enhanced-Mode Ladar to measuring wind speeds in the martian atmosphere has a number of advantages over previously fielded systems. The point at which the measurement is made is approximately 1 m from the lander. This eliminates the problem of flow distortion caused by the lander. Because the ladar uses a small, flush-mounted window in the lander instead of being mounted out in the wind, dust damage and erosion will be dramatically reduced. The calibration of the ladar system is dependent only on the laser wavelength, which is inherently fixed. Our approach does not require the presence of aerosol particles, but the presence of dust in the martian atmosphere is well established. Preliminary calculations indicate that the Enhanced-Mode Ladar will only

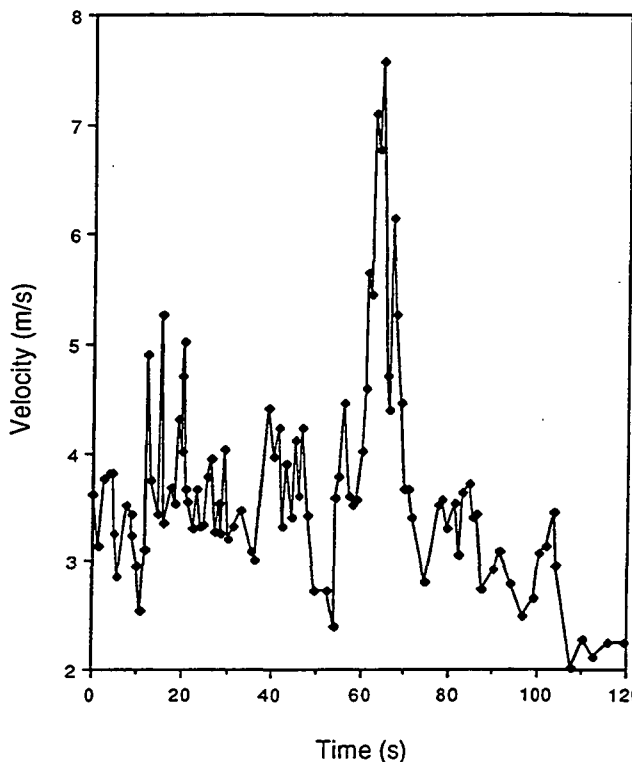


Fig. 1. Wind speed vs. time backscatter coefficient = 4.5E-6.

consume 0.001 Ws per velocity update, not including the power for signal processing. We have developed a brassboard version of the Enhanced-Mode Ladar for airplane applications that we will flight test in early April. This brassboard has been used to measure wind speeds (in Earth's atmosphere) with a backscatter coefficient similar to that on Mars. Results of a single set of measurements are shown in Fig. 1.

N93-28816
552-91 ABS-ONLY 160762 P-2

THE MESUR MISSION. S. W. Squyres, Center for Radio-physics and Space Research, Cornell University, Ithaca NY 14853, USA.

The MESUR mission is the most ambitious mission to Mars planned by NASA for the coming decade. It will place a network of small, robust landers on the martian surface, making a coordinated set of observations for at least one full martian year. The mission addresses two main classes of scientific objectives. The first requires a large number of simultaneous observations from widely distributed sites. These include establishing networks of seismic and meteorological stations that will yield information on the internal structure of the planet and the global circulation of the atmosphere respectively. The second class of objectives requires sampling as much as possible the full diversity of the planet. These include a variety of geochemical measurements, imaging of surface morphology, and measurement of upper atmospheric properties at a range of latitudes, seasons, and times of day.

MESUR presents some major challenges for development of instruments, instrument deployment systems, and onboard data processing techniques. The instrument payload has not yet been selected, but the strawman payload is (1) a three-axis seismometer; (2) a meteorology package that senses pressure, temperature, wind speed and direction, humidity, and sky brightness; (3) an alpha-proton-X-ray spectrometer (APXS); (4) a thermal analysis/evolved gas analysis (TA/EGA) instrument; (5) a descent imager; (6) a panoramic surface imager; (7) an atmospheric structure instrument (ASI) that senses pressure, temperature, and acceleration during descent to the surface; and (8) radio science. Because of the large number of landers to be sent (about 16), all these instruments must be very lightweight. All but the descent imager and the ASI must survive landing loads that may approach 100 g. The meteorology package, seismometer, and surface imager must be able to survive on the surface for at least one martian year. The seismometer requires deployment off the lander body. The panoramic imager and some components of the meteorology package require deployment above the lander body. The APXS must be placed directly against one or more rocks near the lander, prompting consideration of a microrover for deployment of this instrument. The TA/EGA requires a system to acquire, contain, and heat a soil sample. Both the imagers and, especially, the seismometer will be capable of producing large volumes of data, and will require use of sophisticated data compression techniques.

However, instead of one long flight tube it consists of a series of cylindrical electrostatic lenses that confine ions under study along the axis of the flight tube. This results in a short flight tube (i.e., low mass), high mass resolution, and high energy resolution. A laboratory version of this instrument is in routine operation. A schematic diagram of this instrument is shown in Fig. 1.

References: [1] Krishnakumar E. and Srivastava S. K. (1992) *Int. Jour. Mass Spectrom. and Ion Proc.*, 113, 1-12. [2] Srivastava S. K. (1990) U.S. Patent #4,973,840.

PLUTO FAST FLYBY MISSION AND SCIENCE OVERVIEW. A. Stern, Space Science Department, Southwest Research Institute, 6220 Culebra Road, San Antonio TX 78238, USA.

Planning for the Pluto Fast Flyby (PFF) mission centers on the launch of two small (110-160 kg) spacecraft late in the 1990s on fast, 6-8-year trajectories that do not require Jupiter flybys. The cost target of the two-spacecraft PFF mission is \$400 million. Scientific payload definition by NASA's Outer Planets Science Working Group (OPSWG) and JPL design studies for the Pluto flyby spacecraft are now being completed, and the program is in Phase A development. Selection of a set of lightweight, low-power instrument demonstrations is planned for May 1993. According to plan, the completion of Phase A and then detailed Phase B spacecraft and payload design work will occur in FY94. The release of an instrument payload AO, followed by the selection of the flight payload, is also scheduled for FY94. I will describe the scientific rationale for this mission, its scientific objectives, and give an overview of the spacecraft and strawman payload.

A LOW-COST, LIGHTWEIGHT, AND MINIATURIZED TIME-OF-FLIGHT MASS SPECTROMETER (TOFMS). S. K. Srivastava, Jet Propulsion Laboratory, California Institute of Technology, Pasadena CA 91109, USA.

Time-of-flight mass spectrometers (TOFMS) are commonly used for mass analysis and for the measurement of energy distributions of charged particles. For achieving high mass and energy resolution these instruments generally comprise long flight tubes, often as long as a few meters. This necessitates high voltages and a very clean environment. These requirements make them bulky and heavy. We have developed [1] an instrument and calibration techniques [2] that are based on the design principles of TOFMS.

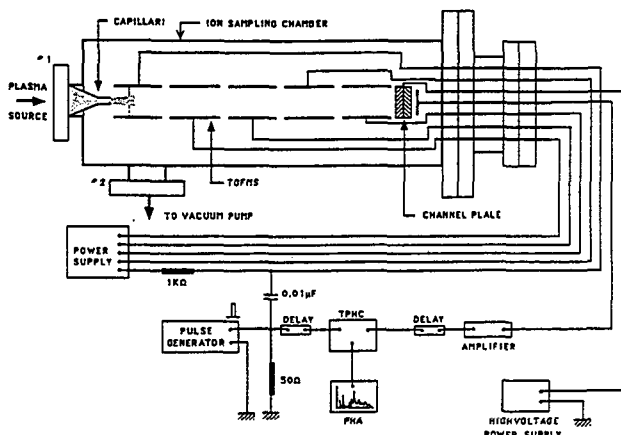


Fig. 1. Schematic diagram of the ion mass sensor.

VENUS INTERIOR STRUCTURE MISSION (VISM): ESTABLISHING A SEISMIC NETWORK ON VENUS. E. R. Stofan¹, R. S. Saunders¹, D. Senske¹, K. Nock¹, D. Tralli¹, P. Lundgren¹, S. Smrekar¹, B. Banerdt¹, W. Kaiser¹, J. Dudenhoefer², B. Goldwater³, A. Schock⁴, and J. Neuman⁵, ¹Jet Propulsion Laboratory, Pasadena CA 91109, USA, ²Lewis Research Center, Cleveland OH, USA, ³Mechanical Technology Inc., Latham NY, USA, ⁴Fairchild Space, Germantown MD, USA, ⁵Martin Marietta, Denver CO, USA.

Introduction: Magellan radar data show the surface of Venus to contain a wide range of geologic features (large volcanos, extensive rift valleys, etc.) [1,2]. Although networks of interconnecting zones of deformation are identified, a system of spreading ridges and subduction zones like those that dominate the tectonic style of the Earth do not appear to be present. In addition, the absence of a mantle low-viscosity zone suggests a strong link between mantle dynamics and the surface [3,4]. As a natural follow-on to the Magellan mission, establishing a network of seismometers on Venus will provide detailed quantitative information on the large-scale interior structure of the planet. When analyzed in conjunction with image, gravity, and topography information, these data will aid in constraining mechanisms that drive surface deformation.

Scientific Objectives: The main objective for establishing a network of seismometers on Venus is to obtain information on both