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Applied Research Laboratory

Statement A per telecon
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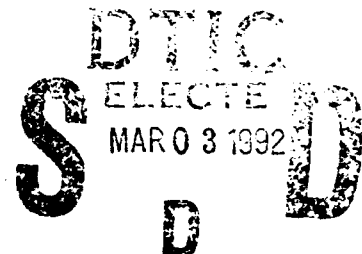
Date: 12 February 1992

NWW 3/2/92

Subject: *Semi-Annual Progress Report on Research Grant N00014-91-J-1608 entitled,
"Particle Image Velocimetry."*

From: S. Deutsch 59

To: Dr. L. P. Purtell, Scientific Officer



Objective

We will develop Particle Image Velocimetry (PIV) as a viable turbulence research tool at the ARL/PSU near-wall flow facility (glycerin tunnel). We will then use the PIV technique to study the influence of controlled disturbances on the fluid structure in the very near wall region and compare these results with those from an ongoing LDA study.

Progress

A PIV system may be conveniently separated into two parts: an image acquisition system and an image interrogation system. The image acquisition system is now operational, while the image acquisition system is still under development.

The image interrogation system, including all hardware and image processing and interrogation software were purchased (internal funds) from Fluid Flow Diagnostics of Tallahassee, Florida. Initially, we had attempted to custom design our own system, but found that the Fluid Flow system was quite close to our design. Their system has been used successfully at, among other A-1 institutions, Yale and the University of Florida. The system consists of a small Helium-Neon laser and the associated optics needed for picture illumination and transformation, an x-y traversing system for accurate slide positioning during interrogation, a CCD camera and an image monitor. The interrogation system optically transforms a laser illuminated image and then uses a Young's fringe pattern based technique to analyze the image and reconstruct the velocity field. We have tied this interrogation system to a Swan 386 microcomputer and established that all the hardware and software functions properly.

Plans

Over the next half year, we shall develop the image acquisition system and begin using the system to acquire data in the glycerin tunnel. We plan to illuminate the flow with an available ruby laser. This laser can be very accurately and reliably double pulsed. Flow images will then be captured using both a Nikon 35mm format and a 6x7 large format camera. The ruby laser is currently being refurbished. The 6x7 camera is on order.

Two graduate students will continue to work with the PIV system. One is modifying and improving the purchased software while the other is testing and developing the overall system.

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