

Guest Editor's Introduction

Harry K. Charles, Jr.

The Laboratory's Technical Services Department (TSD) has a long tradition of supplying quality services and products to its customers—the members of the entire APL staff. TSD activities range from building electronic hardware, which can be traced back to the VT fuze when the Laboratory first began operation, to maintaining the buildings and landscaping the grounds. Other key activities include running the Laboratory's central publications, reproduction, and visual communications operations; managing the R. E. Gibson Library; and overseeing all major construction and renovation activities.

Every day and everywhere, APL staff come in contact with TSD personnel, their services, and the products of their efforts. For example, TSD manages APL utility (electric and gas) acquisition and payment. Our power engineers are responsible for electrical distribution within the APL compound, just as our electricians are responsible for connecting equipment to the APL power system. TSD service personnel clean the buildings and maintain the restrooms. Our artists, illustrators, and editors develop most of the Laboratory's marketing and promotion literature, as well as complete proposal packages and the *Johns Hopkins APL Technical Digest*. The R. E. Gibson Library has a valuable reference collection and provides access to all government documents and many electronic information services. The engineering, design, and fabrication (EDF) operation produces an extensive array of electronic, electromechanical, and mechanical hardware, ranging from ingestible pills to entire Earth satellites.

APL has over 1.65 million square feet of floor space under roof, and it is TSD's job to maintain and enhance these facilities, thus ensuring safety for their occupants and a comfortable working environment. With 27 major buildings (each with an area larger than 10,000 square feet) and 90 secondary buildings on APL's 365-acre campus, this is a daunting but very important and rewarding operation.

This brief summary is only a thumbnail sketch of the services and products delivered to the Laboratory by TSD on a daily basis. The theme articles in this issue of the *Technical Digest* provide greater detail, beginning with an overview from Department Head Robert Fletcher. The remaining articles are divided into three primary segments: (1) the EDF activity, (2) information and computing services and resources, and (3) the physical plant.

As already noted, TSD has its roots in the very beginnings of the Laboratory. This illustrative history and the consolidation of all technical resources into a single, unified service delivery department are described in detail in Fletcher's opening article. The survey also provides a glimpse into TSD's future and what we might expect in the way of new technical services, both in scope and method of delivery.

In the next series of articles about the EDF, Charles and Weiner present a comprehensive overview of EDF's activities, including many of its products and services. In today's world, all aspects of design, fabrication, and testing must be integrated and carefully coordinated to achieve a quality hardware product, while keeping within the constraints of customer budget and schedule. The EDF has been actively working on many aspects of concurrent engineering to improve product flow while maintaining the high-quality hardware standards that have built APL's reputation over the past 58 years. The Charles and Weiner article describes some of the EDF's integrated design and fabrication approaches and illustrates key aspects of new capabilities and service products.

The EDF has modern facility and equipment resources for the development and fabrication of electronic hardware and systems. Most of this capability is housed in the Steven Muller Center for Advanced Technology (Bldg. 13) and is described in the article by Hider et al. on TSD's Electronic Services. Key to these services is the use of computer-aided engineering (CAE) tools, which provide engineers in TSD and the rest of APL with powerful methods for the design, layout, simulation, and testing of their electronic circuits and systems. The EDF has made an extensive commitment to the development of design automation activities focused on the delivery of high-quality CAE services. Our efforts include managing a state-of-the-art engineering design network; structuring, building, and maintaining an electronic parts library system for APL-wide use; and supporting advanced engineering tools such as analog, digital, and mixed-mode simulation and VHDL (an advanced language for the design of high-speed electronic systems). Once designs are captured in electronic format, CAE tools turn them into board layouts, machine tool paths, and materials and test information needed to fabricate and assemble the resultant product.

Hider et al. trace the transfer of the electronic output from the CAE tools to modern processing machines (e.g., photoplotters and board routing and drilling machines). The EDF maintains modern board and substrate fabrication facilities, including certified lines for polyimide multilayer printed wiring boards, as well as flex and rigid flex structures. Assembly operations range from wire bonding and flip chipping to conventional surface mount solder reflow technology.

On the mechanical side, Wilson et al. provide an overview of the product flow from mechanical CAE using Pro/Engineer to the use of sophisticated numerically controlled machine tools. New sources such as electrical discharge machining and rapid prototyping are highlighted, along with the latest advances in conventional machining. Composite materials have begun to play a major role in APL products. The articles by Wilson et al. and Rooney et al. feature several aspects of our composite development activities. Key to the use of composites and our other accomplishments in the mechanical fabrication arena is the proper selection of materials and knowledge of their processes. Rooney et al. highlight the EDF's materials development, testing, and analysis activity. Our materials activities supply support in chemical analysis, metallurgical engineering, mechanical properties determination, and materials engineering.

The next series of articles focuses on TSD's information and computer resources. Gresehover et al. describe modern information retrieval for APL staff and trace the evolution of the library from the conventional facility housing stacks of books to the modern digital library that is accessible from every staff member's workstation. The article deals with issues associated with electronic information retrieval, as well as the future of this rapidly changing arena.

Pullin et al. address other forms of technical information and communications provided by TSD. Operating APL's central publication, printing, audiovisual, and reproduction services, TSD provides significant support to Laboratory programs in these areas. Items produced include award winning proposals, videos, and, of course, the *Technical Digest*. The article describes recent improvements made in these areas, future trends in publication, and the use of electronic media to convey the Laboratory's technical information.

The next two articles, by Ahlbrand and Moore et al., focus on TSD computer resources and databases. Ahlbrand traces TSD desktop support and the philosophy behind a three-tiered architecture that relies on both Departmental and APL-wide resources to provide the needed expertise to support TSD's network of desktop computers and engineering workstations. Moore et al. describe important TSD databases and software, which not only support our extensive computer network but also provide extensive information to our customers. Examples include a product data management system, which controls engineering drawing configuration and keeps track of all change requests and notices; work tracking software, which allows the EDF to follow hardware development projects (status, estimates to complete, etc.); and similar tracking software for plant services work requests and facility maintenance projects.

The final article, by Hagler et al., details the evolution of APL's physical plant. It traces the history of

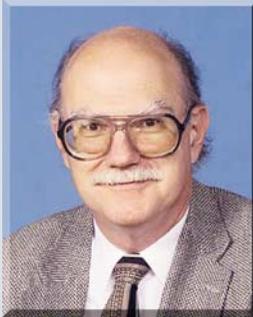
site development at the Howard County campus and offers a glimpse into the hidden resources necessary to provide a safe, healthful, and comfortable workplace for every APL employee. The APL physical plant is a major operation requiring many tens of people to clean, maintain, repair, and build anew the myriad buildings and physical resources necessary to allow the Laboratory staff to serve their customers and the nation. Hagler and Loesch give many behind-the-scenes details on current operations, as well as a look at the future evolution of the APL campus.

The staff of TSD must be recognized as the key element in achieving the many accomplishments outlined in this *Digest* issue. Their hard work, dedication, and imagination yield the extensive array of technical

services that support the Laboratory infrastructure from hardware development, through information gathering and publication, to the operation of the physical plant. TSD's workforce is highly skilled, responsive, and dedicated to providing quality services to its customers, the people of APL.

The goal of this issue of the *Technical Digest* is to clearly convey to the reader that TSD (1) offers a wide range of technical services to the APL staff, (2) is evolving and tailoring these services to meet the future needs of the Laboratory, (3) is staffed by service professionals who are highly skilled and eager to serve the APL community, and (4) offers the skills, services, and products that are a key element of the APL infrastructure, helping to ensure the success of the Laboratory.

THE AUTHOR



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