



# I WAS THERE!

*Bill Dirkes*

As a young 2nd Lieutenant, I was assigned to the Materials Laboratory at Wright Field. My initial assignments were for the evaluation of structural adhesives, those newly developed adhesives for bonding metals together. I was sent to the University of Illinois to get a master's degree in mechanical engineering. Most of my courses were in the mechanics of materials, vibration analysis, and related topics that were of particular interest to the Air Force.

Later, I was put in charge of the branch of the laboratory that developed non-metallic structural materials: reinforced plastics, sandwich construction, transparent cockpit enclosures, and, of course, metal adhesives. Then I was promoted to chief materials engineer in the Engineering Division of the Aeronautical Systems Division. During an extensive review of newly emerging technical opportunities during Forecast '75, conducted in 1963, the upgrading of reinforced plastics with the replacement of glass fibers with boron fibers was identified as an opportunity for a significant technical breakthrough. Glass reinforced plastics had excellent strength characteristics, but a low modulus of elasticity. They were not stiff enough.

That is why reinforced plastic parts were frequently formed into sandwich panels, which increased the rigidity. If boron fiber reinforced plastics could be developed successfully, with greater rigidity than glass fibers, it meant that the weight of aircraft should be reduced by 25 percent or more. This stiffer reinforced plastic material could be used to replace aluminum.

The director of the Materials Laboratory asked me to return to the laboratory to lead the planning for the development of boron composites. I accepted the assignment, and with a team of a half dozen carefully selected engineers and scientists, over the course of four months, we developed a 12-year plan that would cost 211 million dollars. As I was finishing the plan, I realized the flaws: boron cost \$10/pound, and finishing it into suitable fibers and the forming of plastic composites would result in a material that would probably cost over \$100/pound; even more important was the thickness of the boron fibers. The fibers were formed by depositing vaporized boron on a tungsten filament. The resulting filaments were far too rigid to be useful in the fabrication of complex aircraft parts; and, finally, the thicker fibers reduced the surface area in contact

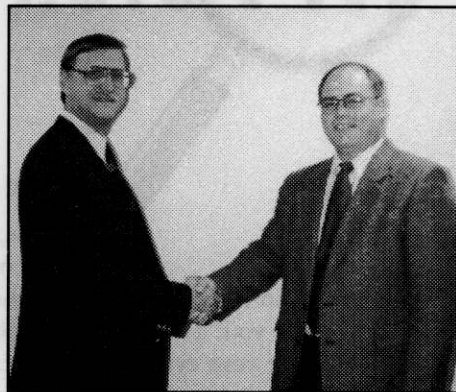
with plastic resin, which would result in a lesser ability to transmit stresses from one fiber to another.

I went to the head of the Non-metallic Materials Division and presented the facts. I showed him the development plans and encouraged him to conduct studies on the graphitization of other fibers, such as polyester nylon and orlon. These fibers were made about a hundredth the size of the boron fibers. And, if they could be successfully graphitized, they had the potential to develop an even greater modulus of elasticity than boron. Also, I knew that it would take several years to get approval of the development plan and get funding, so I felt that there would be time to develop a graphitization process. At that time, the development plan for boron fiber reinforced plastics could be switched over to graphite fiber, and the plan could become successful.

The development plan was submitted, and the development of organic fiber graphitization was started. The successful development of graphite reinforced plastics led not only to the development of lighter, more maneuverable aircraft but also the possibility of "stealth" aircraft; and, of course, graphite golf club shafts.

## Dodson-Stilson Inc. Expands into the Dayton-Miami Valley Region

Dodson-Stilson Inc. (DSI), one of Ohio's largest architectural/engineering and environmental firms, has opened an office in Dayton. The office is located at 211 South Main Street in Fidelity Plaza, Suite 1120. DSI has previously established itself with clients in the Miami Valley, providing services to the Montgomery County Engineer, Germantown and Middletown. DSI's new office in Dayton will complement its existing offices in Columbus, Cleveland, Cuyahoga Falls, and Cincinnati. "We are encouraged by the growth potential in the Dayton-Miami Valley region," said DSI's president Jim Siebert, who added "That is why we are excited about making an investment in this community."



*Jim Siebert, left, and Paul Pfennig*

Siebert added that Paul W. Pfennig, P.S. has been named manager of the new office. "His experience with the Dayton-

Miami Valley region will be a tremendous asset not only to DSI, but to the clients in that region." A graduate of the University of Cincinnati, Pfennig brings 25 years of extensive experience in the field of civil engineering. "I look forward to cultivating relationships with the people and businesses in this community," Pfennig said.

DSI, a full-service, multi-disciplinary organization of engineers, architects, scientists, surveyors, and planners, provides consultant services to public and private-sector clients in the Midwest including Ohio, Indiana, and Michigan.

DSI will be hosting an open house on December 10 from 4 to 7 p.m. at their new facility in Dayton.