Air Force Materials and Manufacturing Alumni Association (AFMMAA) Newsletter

Third Edition — Winter 2004

President's Corner

Now that the year of the Centennial of Flight has been celebrated, it is only fitting that we review the origin of the Materials Directorate and its predecessor organizations that have played a critical role in making aerospace technology what it is today. The Wright Brothers themselves were constantly aware of the importance of materials behavior under the severe stresses present during flight conditions. From the very early days of the Materials Section in 1919 with studies of wood and textiles to today's investigations of high temperature metals and nonmetals as well as the emerging field of nanotechnology, the Materials Directorate has been at the forefront of aerospace technology. Literally thousands of individuals have produced materials innovations at every stage of advancement of flight. The Materials Directorate has a proud heritage; we look forward to the next one hundred years as those who follow in our footsteps at the Directorate make even more contributions to the age of aircraft and space technology.

Phil Bouchard

ML Historical Review

Starting with the Wright Brothers, materials have played a vital role in the development of aviation. Early engineers at McCook Field responsible for the oversight of the production of World War I airplanes recognized the importance of materials. Those engineers who encountered materials problems did the necessary materials research themselves. An organization that played a primary role in upgrading materials for aircraft use was the Specification Branch. With the recognition of the need for a focal point for materials research and development, a nucleus of personnel with comprehensive materials knowledge was acquired in 1918 but it was early in 1919 before a Materials Section was organized and began to function. Personnel were transferred to Dayton from Washington, DC and Pittsburgh to form the nucleus of the new Materials Section.

By the end of 1919, forty four individuals were employed in the Section. The Section was organized into several branches: Liaison, Chemical, Physical Testing, Metallurgical, Wood, Textile, and Rubber.

The Liaison Branch cooperated with other Sections of McCook Field showing where the Materials Section could be of service. The Chemical Branch analyzed steels, brasses, bronzes, aluminum alloys, dopes, paints, varnishes, enamels, shellacs, oils, rubber, gasoline and other organic and inorganic compounds. Research was underway in areas such as reclaiming lubricating oil, pigmentation for camouflage, corrosion of metallic aircraft parts, the use of new metals, protective coatings for metallic parts, and fire proofing fabric.

The Metallurgical Branch investigated armor plate and brazing. It also did metallographic investigations of brasses, bronzes, and aluminum. The Physical Testing Branch performed static test in tension, compression and bending. Impact test, hardness tests, and stress tests were performed.

The Textile Branch under the leadership of Lt. C.J. Cleary dealt with issues related to textiles used in aeronautical applications including balloon and airplane fabric as well as parachute fabrics. The Wood Branch investigated plain woods as well as laminated structures. Spruce, Douglas fir, oak, mahogany, walnut, and birch lumber were researched.

Because there was such a significant use of wood in the airplane construction, a large effort was established in wood research. Due to shortage of plain woods for airplane lumber, laminated wood structures were introduced. This introduced additional problems such as the method of construction of laminated stock and the use and development of various types of glue. Optimum kiln drying, grain orientation, and durability of glues were areas of investigation.

In 1919, metals became an area of interest. Investigations were undertaken on components such as wheels, crankshafts, engine bearings, metal propellers, landing gear components and numerous other items.

Over the next ten years, the Materials Section remained a stable organization and started to define its mission in the aeronautical world. In 1922, the Textile and Rubber Branches merged. A Camouflage Branch was started to disguise airplanes and field markers. A Planning Branch was established to maintain records and perform necessary administrative functions.

Noteworthy accomplishments of the 1920's included the development of carburized armor plate, aluminum alloys and magnesium with unique casting and mechanical properties. Another notable achievement was the evolution of 4100 series of chromium-molybdenum steels. An alumnus of the Materials Section joined the research department of ALCOA and developed aluminum skins for aircraft.

As early as 1926, non-destructive evaluation was a key element of aeronautical materials research at the Materials Section. X-rays were investigated for the identification of internal defects. Flaw detection in cast and wrought metals were introduced. Radiography was also applied to welded joints and for examining aluminum alloy billets being used for propeller blades.

In 1924, President Calvin Coolidge accepted a gift of 4,527 acres from the Dayton Air Service Committee that was composed of businessmen from the local Dayton area interested in aeronautical research. The area adjacent to Huffman Dam was designated Wright Field. In 1927, the renamed Materials Branch moved into Buildings 16 and 46.

During the 1930's, the Building 16 basement was dug out by hand as a WPA Depression Era project. The floor was reinforced with steel girders and a concrete floor was poured. A portion of the Materials Branch moved into the basement in 1939.

During the 1930s, research continued in many areas. Areas included: heat treated steel tubing, bullet holes in metal propeller blades, helical landing gear springs. An area of major interest was the effects of low temperatures caused by high altitude flying. A cold room was installed in the Materials Branch which could simulate minus 50 degrees Fahrenheit. Tensile, impact, and fatigue properties were measured. Instrument lubricants and fluids for hydraulically actuated control mechanisms were evaluated at sub-zero temperatures. Spot welding was introduced into aircraft production in 1933. Research was conducted on welding equipment, corrosion resistance, soundness of the weld, and strength properties. Other areas of research included protective coatings of aircraft skins, laminated non-shattering glass, corrosion and heat resistant alloys, use of synthetic nylon for parachutes.

In 1939, the name of the organization was changed to the Materials Laboratory. In that year, more emphasis was placed on in-house research and three PhDs were hired. In succeeding years, more attention was directed at maintaining the highest level of technical competence in all phases of materials research. In 1939, the Laboratory had a visit from Charles Lindberg and Orville Wright. Both expressed much interest in materials research.

1940 and 1941 witnessed rapid growth of the Materials Laboratory. The ranks grew from 40 to over 100 individuals. The Laboratory reorganized into a variety of Units including: Chemical, Metallurgical, Physics, Structures & Mechanical Test, Textile & Rubber, Welding, and Special Test.

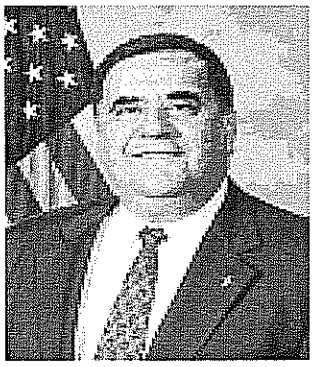
World War II brought new demands on the Materials Laboratory. The expansion in aircraft production and associated items brought new increased responsibilities. These included providing technical assistance to industry in speeding up production and maintaining quality. The Laboratory conducted over 2,000 investigations related to equipment failures. This activity gave Materials Laboratory personnel first hand knowledge of materials shortcomings. Analysis also was done of German and Japanese parts to determine quality and types of materials.

A significant amount of effort was expended during World War II on the development of substitute aircraft materials, particularly replacements for critical or strategic materials. Thiokol and Neoprene were produced at new production facilities to replace natural rubber. Nylon was optimized for applications in parachutes, tire cords and glider tow ropes. Magnesium was used as a replacement for aluminum in many aircraft applications. In 1942, work was initiated on plastics, glass fiber reinforced materials and metal to metal adhesives. Throughout the War, there was always a shortage of critical materials thus there was never a shortage of materials problems.

In the summer of 1944, the Materials Laboratory moved to a facility that had been redesigned to meet its needs. This building was subdivided according to the Materials Laboratory branch structure and each organization had its own equipment and office layout. Building 32 had some shortcomings but it was a vast improvement over Building 16 for laboratory use. By August 1945, the Materials Laboratory had grown to 214 individuals.

The post World War II story will be continued in the Spring Newsletter. References: Genesis: Materials Central, James J. Niehaus, Dec 1962; Dr. Charles E. Browning Presentation, 2003 Materials and Manufacturing Directorate (ML) Roadmap Review, July 2003.

Vince Russo Retires



Vince Russo retired 3 Sep 03 after over 40 years of government service. His initial assignment in the Air Force Materials Laboratory was as a Second Lieutenant. After converting to Civil Service, Vince had positions within ML as a Branch Chief, Division Chief, and Director. His most recent position was that of the Executive Director of the Aeronautical Systems Center.

ML Individual 2003 Accomplishments

Dr. Edmund Moore was recognized with an award for special achievement by the 17th Annual Black Engineer of the Year Awards Conference.

Dr. Loon-Seng Tan was recognized by the Affiliate Societies Council of Dayton as an Outstanding Engineer and Scientist.

Mayra Martinez was selected by the Hispanic Engineer & Information Technology magazine as one of the "Power Hitters in Business & Technology."

Dr. Charles E. Browning received a Presidential Rank Award, the Meritorious Executive Rank Award from the Secretary of the Air Force.

The American Society of Nondestructive Testing (ASNT) selected Dr. Claudia Kropas-Hughes as a Fellow.

Dr. Lee Semiatin received a Lifetime Achievement Award from the Thermec International Conference on Processing & Manufacturing of Advanced Materials

Dr James Grote and Dr Gail Brown were recognized as Fellows of the International Society of Optical Engineering.

Dr. John Maguire was selected for the J. Keith Brimacombe Award during the Intelligent Processing and Manufacturing of Materials Converence.

Losses From The ML Family

We regret to report the following passing from the ML Family during 2003:

Thomas R. Ferguson (LGen, USAF, Retired), January 28, 2003 at the age of 67.

Phillip A. House, February 27, 2003 at the age of 73.

Theodore ("Ted") J. Reinhart, August 10, 2003 at the age of 72.

If you know of others, and would care to share their names, please let us know.

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AFMMAA MERIT SCHOLARSHIP AWARDS FOR 2003

The Association Chief Scientists Scholarship was awarded to Michael Grant. He will be studying at Purdue University in Aerospace Engineering. At Alter High School, Michael was a scholar athlete, National Honor Society member and active in numerous civic volunteer organizations. He is a co-op student at NASA's Johnson Space Flight Center and intends to be an astronaut one day.

The Alumni Association Scholarship was awarded to Dan Peterson. He will be attending the University of Cincinnati's five year Mechanical Engineering program. At Fairmont High School, he was a National Honor Society member, scholar athlete, musician and active in various church and community service organizations. He plans to pursue a graduate degree upon completion of his bachelor's degree.

Both the number and quality of the applications to the 2003 Scholarship Program bodes well for the future of the program (if not daunting to the selection committee – John Williamson, Don Schmidt, Bill Woody, Larry Bidwell, and Jim Mattice). The Association greatly appreciates the committee's dedication to the efforts to select the "best and the brightest" of alumni offspring for this recognition.

WHERE IS YOUR AFMMAA MEMBERSHIP CARD?

Do you still have your membership card? If you were a single year member, please look at the bottom of the card and see if there is an expiration date. If the expiration date reads 6/30/02 your dues are due for the current year. The annual dues are $10.00, or a Lifetime Membership is available for $150.00. If your dues lapse for one year your membership will become inactive. Our records indicate there are still 17 members who have not paid their 2002-2003 membership dues. We don't want to lose a valuable resource to the Association – YOU!

Please give serious consideration to joining us. Enclosed is a form that can be returned to become an active member.