

Technology Transfer

by

Kimberly R. Bullock

Langley Aerospace Research Summer Scholar

Rosemary Baize

Mentor

Cheryl Allen

Mentor

**Technology Applications Group
Technology Transfer Team**

ABSTRACT

The development and application of new technologies in the United States has always been important to the economic well being of the country. The National Aeronautics and Space Administration (NASA) has been an important source of these new technologies for almost four decades. Recently, increasing global competition has emphasized the importance of fully utilizing federally funded technologies. Today NASA must meet its mission goals while at the same time, conduct research and development that contributes to securing US economic growth. NASA technologies must be quickly and effectively transferred into commercial products. In order to accomplish this task, NASA has formulated a new way of doing business with the private sector. Emphasis is placed on forming mutually beneficial partnerships between NASA and US Industry. New standards have been set in response to the process that increase effectiveness, efficiency, and timely customer response.

This summer I have identified potential markets for two NASA inventions: including the Radially Focused Eddy Current Sensor for Characterization of Flaws in Metallic Tubing and the Radiographic Moiré. I have also worked to establish a cooperative program with TAG, private industry, and a university known as the TAG/Industry/Academia Program.

Technology Transfer

The development and application of new technologies in the United States has always been important to the economic well being of the country. The National Aeronautics and Space Administration (NASA) has been an important source of these new technologies for almost four decades. Recently, increasing global competition has emphasized the importance of fully utilizing federally funded technologies. Today NASA must meet its mission goals while at the same time, conduct research and development that contributes to securing US economic growth. NASA technologies must be quickly and effectively transferred into commercial products. In order to accomplish this task, NASA has formulated a new way of doing business with the private sector. Emphasis is placed on forming mutually beneficial partnerships between NASA and US Industry. New standards have been set in response to the process that increase effectiveness, efficiency, and timely customer response.

The Technology Applications Group (TAG) at Langley Research Center has developed a process to effectively transfer NASA-developed technologies and expertise to the private sector. This summer I worked under the mentorship of Rosemary Baize and Cheryl Allen, both of whom are part of the Medical/Instrument/Sensors/Environment and Energy (MISEE) team of TAG. I have had several tasks throughout the ten week period and I have worked with many people in TAG.

My first task was to search for a potential market for a patented invention that was developed in the Non-Destructive Evaluation (NDE) Sciences Branch. NDE technologies are used to remotely inspect an object without having to destroy the subject. I started off by obtaining a list of NASA researchers from Ms. Baize. I then utilized the LaRC patent office by getting a list of all patents and invention disclosures by each researcher. After reviewing the list, we were able to narrow it down to a shorter list of inventions that may be used for some type of NDE. I then pulled each patent/invention disclosure file and read through each one. I divided the files up into different types of NDE. The categories were eddy current/electromagnetic flaw detector, ultrasound, x-ray, and acoustic emission. I then decided that I was most interested in pursuing an invention that could inspect pipelines in a non-destructive manner.

The oil refinery industry uses thousands of miles of steel and stainless steel pipelines. The weld joints between them are 3 to 4 inches thick and are wrapped with an aluminum layer. Corrosive materials that flow through the pipes in time cause the pipes to rupture due to wall thinning. The oil leak can cause extreme environmental damage and it can also cause the company to lose money. Since access to the welded joints is often limited, a device is needed that can remotely inspect weldments and critical pressure vessel joints in the pipes. The problem is that many current methods have high sensitivity to small changes in the conductivity and permeability of the test piece which is known to vary at the weldments.

I chose a patented eddy current invention by Buzz Wincheski called Radially Focused Eddy Current Sensor for Characterization of Flaws in Metallic Tubing. This invention is a modification of the already patented NASA invention called the "Simpson Probe" and it helps to alleviate the high sensitivity of current eddy current methods. This modified probe can be placed into a tube to detect longitudinal fatigue cracks and flaws. The probe then induces eddy currents into the tube walls. The magnetic flux is such that in the absence of damage, there is no link between the coil so no signal is produced. If there is a flaw, the induced eddy currents in the tube walls are forced to flow around the flaw. The magnetic field associated with the currents links the pickup coil and an emf is generated across the pickup coil leads. The induced voltage indicates the presence of a flaw.

After thoroughly reading the invention disclosure to understand the invention, I proceeded to search for commercial partners that might be interested in licensing the

technology. Thanks to a report from the Research Triangle Institute, I was able to obtain a list of Market Share Estimates for Manufactures of Eddy Current Testing Equipment. Upon locating a company, we came to the realization that the invention had only been disclosed and that it wouldn't be filed with the US Patent and Trademark Office until mid-September. We were unable to begin working with a commercial partner on this particular invention because the case had not been filed and we were concerned about protecting NASA's intellectual property.

Since I was unable to complete the process for the eddy current, I moved on to another category of NDE. This time I chose x-ray inspection. The "Radiographic Moiré" was invented by LaRC researcher Eric Madaras. Originally, this invention was designed to remotely detect stresses and strains in the free wall of space shuttle tires. The radiographic moiré or X-ray moiré is accomplished by attaching a fine grid of radio opaque lines to the surface of the area to be inspected. The pattern can also be embedded within the material or the pattern already existing in the material may be used. X-rays are passed through the test specimen and detected on photographic film. The compilation of the two sets of lines produces the moiré effect which is used to locate strains in a particular area. In this case the area would be the cords and belts in radial tires.

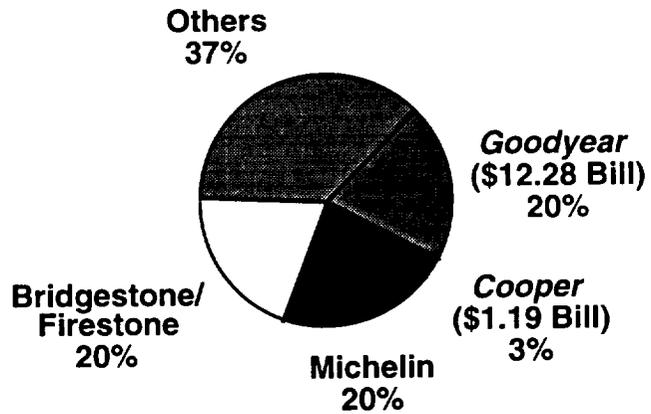
We felt this invention could be of great use to the commercial tire and retread industry. I familiarized myself with CD-ROM in the library to access business directories. I obtained a list of only American tire companies since the patent does not have foreign protection. I also made contacts with the International Tire Association and the American Retreader's Association. These two associations helped me to get an idea of what tire companies controlled the new tire and retread market in the US for manufacturing. (see Fig. 1-A, 1-B) Rosemary, Cheryl, and I then met with Eric Madaras, the inventor, to discuss our plan with him and to get some feed back from him. The meeting went very well and Mr. Madaras was interested in finding some commercial use for the technology. Also to better understand how retreads are manufactured, we took a plant tour of Bandag, Inc. in Newport News, VA. The trip was beneficial in that we were able to see the current methods used in detecting flaws in tires and how those flaws are repaired. Interestingly, several x-ray manufacturing companies submitted request about the new technology rather than tire companies. I believe this may have been because tire companies are looking for technologies they can buy off the market rather than potential license agreements. Hopefully, one of the x-ray companies will be interested in forming a partnership with NASA to further develop the radiographic moiré.

My second major tasks this summer has been to develop a TAG, industry, and university cooperative program. Bob Yang in the Technology Applications Group has developed the TAG/Industry/Academia Exchange Program. (see Fig. 2) Since government funding for many programs is in decline, this new program would solicit funds from private industry to be donated to the university for further development of a NASA technology. Cooperation between NASA, academia, and the private sector will help to better solve market needs. Together TAG and North Carolina A&T State University are searching for the appropriate industry partners. Once this is accomplished, the University will be able to make contact with NASA researchers and facilities through the Virtual Tech Transfer Center or Picture Tel. Students and faculty will have the funding to develop the product for the interested commercial partner who will in turn have their need or want satisfied. The long-term outlook of this process is to have a Commercialization Opportunity Program (COOPR) that will allow universities to compete for the chance to further develop a technology.

Some other minor tasks I have completed this summer include answering information requests on thermographics and heat flux microsensors. I have also pursued my interest in patent law by working with members of the LaRC patent counsel team.

Figure 1-A

Tire Industry



American Companies Italicized

Figure 1-B

Retread Industry

(All American Companies)

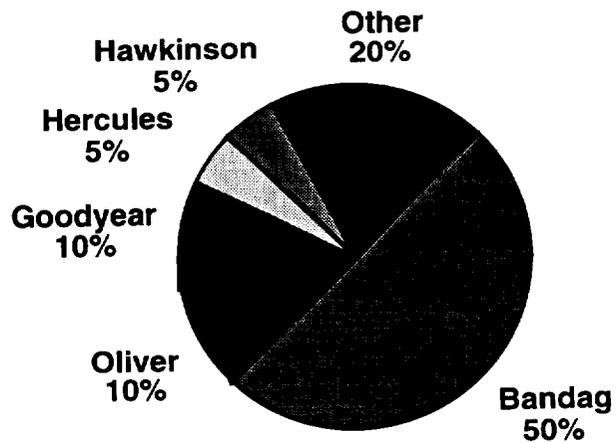


Figure 2

TAG / Industry / Academia Exchange Program

