TEXAS CENTER FOR APPLIED TECHNOLOGY
TEXAS A&M ENGINEERING EXPERIMENT STATION

Blade Erosion Protection Techniques

Helicopter rotor blade and propeller blade erosion is caused by both water and sand impacting the blade. Most of the erosion, however, is caused by sand and takes place during landing and take-off. Sand particles are impacting the metal or polymer strips currently used to protect against erosion, and in a relatively short time the impacts wear away the protective strips. The resulting accelerated wear of the blade material significantly reduces the service life of the rotor blades. Although various solutions have been proposed and tried, nothing has been found to date that adequately addresses the problem. In addition, the only means available to the Army for determining whether a coating is viable is expensive and time-consuming flight testing.

At the request of the Joint Council on Aging Aircraft (JCAA) TCAT was asked to investigate the feasibility of developing a mathematical model that would provide a means of evaluating the relative performance of coatings within a family of polymers—specifically those available as alternative erosion-resistant coatings for H-60 rotor blades.

Drawing on their experience with the analysis of erosion mechanisms, Texas A&M Engineering researchers and TCAT collaborated on the analysis of erosion mechanics and development of software and hardware interfaces. The model utilized as input the coating specifications, flight environment, impact particle size, shape, and hardness. The project focused on determining the sand erosion mechanisms and developing an analytical model of the erosion process for 3M's 8663 coating. The erosion model was based on the localization of plastic deformation and took into account the shear energy during oblique impact. Existing data from testing 3M's 8663 and other similar polymer coatings was used as the basis for generating the model. Additional data on the 3M's 8663 coating was generated to validate and adjust the analytical model.

TEXAS CENTER FOR APPLIED TECHNOLOGY

There are many problems that require the careful and proper integration of applied technologies to find solutions. The Texas Center for Applied Technology (TCAT) was created to focus on these specific problems and to develop effective and efficient solutions. TCAT's core competency is the innovative application of existing technologies and advanced research to solve complex real-world problems.

TCAT's primary objective is to apply and test technologies to address targeted problems and engage basic research as required. TCAT has employees in a variety of locations with the ability to perform research that cuts across multiple technologies, disciplines, and cultures. The Center's employees are knowledgeable regarding customers' requirements and are ready to respond effectively to provide the best value for the customers' needs including expertise in technology insertion, technology assessments, and test and evaluation.

TCAT is part of the Texas A&M Engineering Experiment Station (TEES), a member of The Texas A&M University System. The A&M System is one of the largest and most comprehensive systems of higher education in the United States. Through a statewide network of eleven university campuses, seven state agencies, and a comprehensive health science center, the A&M System educates more than 120,000 students on its university campuses, conducts more than $780 million in research, and reaches another 22 million people through service each year. TEES is an engineering research agency for the state of Texas and conducts over $147 million in research annually. Because of the Center's position within the Texas A&M Engineering program, TCAT's expertise can easily be extended by rounding out its team with world class faculty researchers, as appropriate. TCAT is in an excellent position for collaboration not only with The Texas A&M University System components and their customers but with other universities, institutions, centers, and industry.

TCAT'S CORE COMPETENCIES

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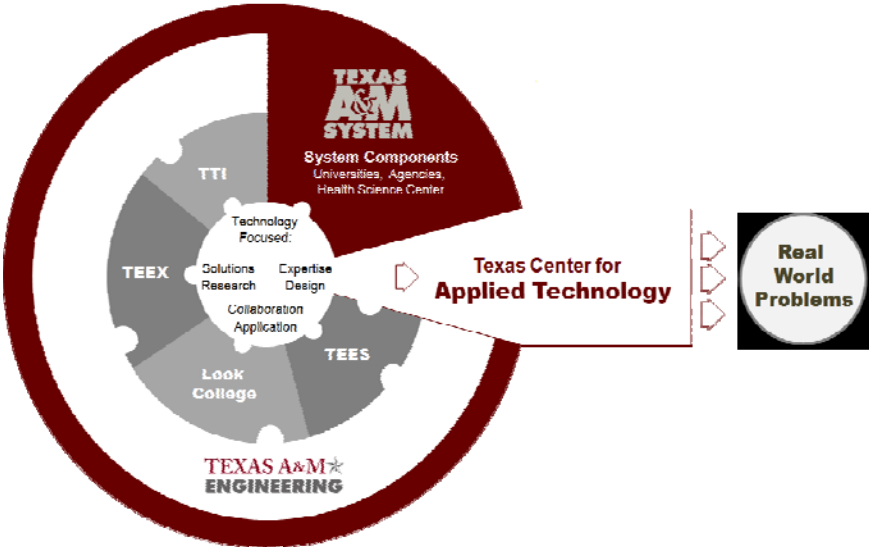
TEXAS A&M ENGINEERING

Texas A&M Engineering consists of the Dwight Look College of Engineering, and three engineering agencies, including TEES: Texas A&M Transportation Institute (TTI) conducts research and professional education in all modes of transportation. The Texas A&M Engineering Extension Service (TEEX) works to develop a highly skilled and educated workforce and enhances public safety through training, continuing education, and technical assistance.



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