DEVELOPMENT OF A MATHEMATICAL MODEL FOR PREDICTING
THE PERCENTAGE FATIGUE LIFE INCREASE RESULTING FROM
SHOT PEENED COMPONENTS, PHASE I.

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SHOT PEENING, FATIGUE, FATIGUE LIFE, RESIDUAL STRESS, METAL, ALUMINUM

AC 7075-T6
AC 7075-T73

SHOT PEENING IS USED EXTENSIVELY IN MANY AIRCRAFT STRUCTURAL AND ENGINE APPLICATIONS TO ENHANCE FATIGUE LIFE AND STRESS CORROSION RESISTANCE. RECENT RESEARCH INDICATES THAT HIGH SHOT PEENING INTENSITIES CAN PRODUCE A PHENOMENON CALLED PEENED SURFACE EXTRUSION FOLDS (PSEF) WHICH IS HYPOTHESIZED TO RESULT IN FATIGUE LIFE REDUCTIONS.

IN THIS INVESTIGATION MORE THAN ONE HUNDRED SPECIMENS OF 7075-T6 AND 7075-T73 ALUMINUM MATERIAL WERE MANUFACTURED AND TREATED AT VARIOUS LEVELS OF SHOT PEENING INTENSITY, ALMEN SATURATION LEVEL, AND PEENING BEAD SIZE. SPECIMENS WERE SUBSEQUENTLY FATIGUE TESTED UNDER AXIAL LOADING CONDITIONS. THE LONGEST FATIGUE LIFE WAS OBTAINED AT RELATIVELY LOW ALMEN INTENSITIES WITH THE SMALLEST SIZE GLASS BEAD AT 100-110Z

ALMEN SATURATION. INTENSITY VS FATIGUE LIFE PATTERNS WERE SIMILAR FOR BOTH MATERIALS.

THE OPTIMUM INTENSITY LEVEL WAS SUBSTANTIALLY BELOW THAT SPECIFIED IN MIL-STD-852. SCANNING ELECTRON MICROSCOPY AND METALLOGRAPHY SHOWED INCREASING DEPTH AND QUANTITY OF PSEF AND EMBEDDED GLASS BEAD PARTICLES AT THE SURFACE AS PEENING INTENSITY INCREASED.