ABSTRACT

High strength materials designed to operate in extreme conditions are difficult to cut for the same reasons that make them excellent for demanding applications. These materials are called “superalloys”, and are commonly found in aerospace applications. Conventional cutting methods such as milling and turning can expend thousands of dollars’ worth of tools on a single part. Electrochemical Machining (ECM) is a non-contact method of machining that uses controlled anodic dissolution to remove material from a conductive workpiece without mechanical or thermal stress. Material is removed from the workpiece under high pressure aqueous electrolyte (4-10 atmospheres). ECM operations experience no tool wear and material hardness has no effect on the ECM process, making ECM an ideal method for machining exotic materials. Common ECM operations require in-depth design, tailoring a unique tool (cathode) to each part. As many as 20 iterations can be required to create a working cathode. This project serves as a test bed for developing new ECM methods such as the use of non-unique tooling, and for experimentation with different electrolytes.