GE AVIATION

CORPORATE DISRUPTION THROUGH UTILIZATION OF ADDITIVE MANUFACTURING IN THE NPI CYCLE AND THE RESULTING IMPACT ON GE AVIATION'S BUSINESS MODEL

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GE Aviation, a subsidiary of General Electric, is a worldwide leader in the manufacture of aviation gas turbine engines. The company's position as the forerunner in the use of additive manufacturing (commonly known as 3D printing) continues its strong innovation-driven tradition. GE Aviation views additive manufacturing (AM) as key to maintaining its leadership in the extremely competitive aviation gas turbine market. Although to date GE Aviation has utilized AM for the production of two flight-ready components, it has not formally investigated possible benefits of AM over the engine design process from conception to production. In particular, GE Aviation is interested in how AM could impact the new product introduction (NPI) cycle for a new production gas turbine engine. Therefore, the Tauber team was brought in to identify and quantify the potential benefits of incorporating AM into this process.

To identify the strategic importance of AM to both the NPI cycle and GE Aviation's larger business model, the team met with experts in many areas of the business including engineering, manufacturing, finance, and sales and conducted interviews with 100 individuals in over 75 meetings. To quantify the time and cost savings that could result from utilizing AM, the team focused on its application to reduce or eliminate bottlenecks in the NPI process. The Tauber team found that GE Aviation has the potential to shorten the overall NPI cycle, currently on the order of five years, by 27 weeks or 10.4%. This also results in cost savings of 10.4% over a typical turbofan NPI cycle. The team then proposed a technology development road map that would allow these benefits to be realized through the development of three increasingly capable AM machines over the next eight years. Furthermore, in order to demonstrate additional benefits of implementing AM, the team investigated the increased profits that could be realized due to performance improvements resulting from AM. The team discovered that the incorporation of AM can conservatively yield up to 130% in yearly profit for a next generation helicopter engine. Next, the team identified ways in which GE Aviation could restructure both its design teams and the greater organization to further realize the benefits of AM. Finally, the team qualitatively examined the process by which parts are additively manufactured, finding that GE Aviation can realize time savings, and therefore cost savings, by immediately categorizing parts for prototype or production. This would streamline the AM process and eliminate the inefficient CAD rework that occurs today.

The Tauber team recommended that GE Aviation continue to actively pursue AM technology, showing that its implementation could save GE Aviation 10.4% of the total time and cost for a typical new turbofan NPI cycle and result in an increased profit of up to 130% per year for a small turboshaft engine.