

OMIC R&D TECHNOLOGY BOARD

CONCEPTUAL ABSTRACT



TITLE: Machining of 3D Printed Ti Parts. [PHASE 2 of M12]

RELATED ROAD-MAPPING DESIGNATION ID#: M39

SUPPORTIVE INDUSTRY: Mitsubishi, Seco, Kennametal, MasterCAM, OSG, Boeing, Sandvik, PH Horn

PROJECT TYPE: General Project

PROBLEM STATEMENT (What Are We Trying to Solve?): With a focus on Aerospace and medical components made of Titanium, this research focuses its investigation on exploring the best performance from Solid Carbide endmill, and drills. Ultimately this research is about building confidence in the use of additively manufactured parts so that they can be deployed as production ready components that meet customer needs.

PROJECT DESCRIPTION: The project scope should cover the guidelines detailed below:

- In partnership with the respective supportive industry, a facsimile Titanium (6Al4V) aerospace and or medical part will be agreed upon. This part will then be built by an agreed upon additive manufacturing process. The AM process must yield a near-net-shape part that would then need semi-finish and finishing operations only. This part can then be subjected to the appropriate post-processing techniques as required.
 - o To qualify as a reasonable semi-finish part, the weight ratio of starting condition to finished part should be close to 2:1
 - o It is reasonable to explore multiple AM techniques to yield an optimal part
- This research will then investigate Solid Carbide endmills to evaluate optimal geometries and coatings for Finish Machining of these 3D printed parts.
- This research will also investigate Solid Carbide Finish Drilling of these 3D printed parts.
 - o The drills are required to be in two lengths: 3XDia, and 5XDia. These optimal diameters will be decided upon in partnership with industry members
- The research conducted on the Solid Carbide Endmills, and Drills, should show the following:
 - o Optimal cutting geometries
 - o Optimal tool substrate and coating materials
 - o Optimal operating parameters
 - o Tool life
 - o Surface finish of machined part
 - o Dimensional accuracy of part
 - o All tests would be repeated 3 times to demonstrate a reliable process

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Identify Related OMIC R&D Resources: Proposing researchers should use their best judgment in deciding on the optimal resources for the research. To further aid in this decision, the OMIC staff has taken the initiative to best identify on-site resources (machines, equipment, and staff) that may relate to the scope of this research. Please recognize that researchers are not limited to these resources.

- Available machines & equipment can be reviewed at:
<https://www.omic.us/explore/facility>
- OMIC Staff or SMEs

PROJECT DELIVERABLES:

- Final report
- Final presentation
- Parts manufactured
- Cutting tools used

SPECIAL NOTE: It should be recognized that this Conceptual Abstract is written based on comments collected during OMIC R&D Road-mapping workshop and based on industries need for applied research. However, researchers as SMEs, are encouraged to lend specific technical feedback to further refine the Project Description and or Project Outcomes. The proposing researcher may do so either directly to OMIC R&D, or in the submitting proposal.

UTILIZATION OF OMIC RESOURCES: Researchers are encouraged to utilize the capital and personnel resources available on the OMIC R&D campus in their proposals. Use of OMIC time and machines should be included in the Proposal funding request. If use of OMIC resources are not identified in a proposal and are requested during, the project sponsor will be responsible for requesting a costed project amendment from the Tech Board.

PROJECT UPDATE EXPECTATIONS: Researchers are required to have monthly update discussion with OMIC R&D to provide a summary update on project status. This is done by way of a user-friendly format known as the OMIC 6-Block update. Typically, these meetings are scheduled on the first Wednesday and Thursday of each month. Secondly, depending on the scope of the project, OMIC R&D's industry Tech Board representatives are often interested in periodic project updates, and even in project participation. Researchers are required to communicate with supportive industry and facilitate communications as required.

PROJECT DURATION: It is OMIC R&D's strong preference that duration of a General Project aligns with the academic calendar cycle (July 2023 to June 2024). It is preferred that the project be

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completed by June 2024. Researchers are encouraged to factor in variables such as contracting, student hiring (if needed), procurement, holidays, and travel. It has been OMIC R&D's experience that a projects useful working duration is typically 9 to 10 months. Researchers are also encouraged to lend feedback, and to adjust the scope of work to best fit this preferred timeframe. Additionally, it is reasonable to even recommend phasing breakdowns to the project. In some unique circumstances, if the project is to take significantly longer than the duration of the academic year, this reasoning should be explicitly explained in the proposal.

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