OMIC R&D TECHNOLOGY BOARD
CONCEPTUAL ABSTRACT

TITLE: **Finish Machining of Inconel 718 Parts Made with AM**

RELATED ROAD-MAPPING DESIGNATION ID#: **M49**

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

PROJECT TYPE: General Project

PROBLEM STATEMENT (What Are We Trying to Solve?): With a focus on Aerospace components made of Inconel 718, 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: This project carries with it a very specific focus as outlined below:

- In partnership with the respective supportive industry, a facsimile Inconel 718 aerospace 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 (using endmills, and drills). This part can then be subjected to the appropriate post-processing techniques as required.
    - To qualify as a reasonable semi-finish part, the weight ratio of starting condition to finished part should be close to 2:1.
    - 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.
    - The drills are required to be in two lengths: 3XDia. 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:
    - Optimal cutting geometries
    - Optimal tool substrate and coating materials
    - Optimal operating parameters
    - Tool life
    - Surface finish of machined part
    - Dimensional accuracy of part
    - All tests would be repeated 3 times to demonstrate a reliable process

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.

- Machines and equipment at OMIC can be reviewed at: ***https://www.omic.us/explore/facility***
- OMIC Staff or SMEs

PROJECT DELIVERABLES:

- Final report
- Final presentation
- All built parts
- 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.

ADDITIONAL COMMITMENTS TO FACTOR: Researchers may be asked to present their final project at an OMIC R&D biennial Technology Exchange Symposium. This symposium is an in-person event, held at the OMIC R&D campus in Scappoose Oregon. The Symposium is held in April, and researchers should factor in their availability when bidding on projects.

Researchers may be invited to participate in OMIC R&D's marketing efforts that showcase the working history of the project.

PROJECT DURATION: Its OMIC R&D's strong preference that duration of a General Project aligns with the academic calendar cycle (July 2024 to June 2025). It is preferred that the project be completed by June 2025. 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 project's useful working duration is typically 9 to 10 months. Researchers are also encouraged to give 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.

CONTACTS AT OMIC R&D:

Urmaze Naterwalla
Director of Research Operations
Urmaze.Naterwalla@oit.edu

Craig Campbell
Executive Director
Craig.Campbell@oit.edu

Jen Kammerman
Research Administrative Manager
Jen.Kammerman@oit.edu