



The Digital Manufacturing Institute

# MxD

## REQUEST FOR QUOTATION

Subtractive CNC Machine Health  
21-36-01

Revision 1.0 Release Date: **May 3<sup>rd</sup>, 2022**

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# TABLE OF CONTENTS

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I.	Record of Change.....	3
II.	Timeline .....	3
III.	Introduction.....	3
IV.	Technical Summary .....	6
	Overview and Background.....	6
	Problem Statement .....	6
	Objectives.....	6
	Technical Requirements .....	7
	1. CNC Sensor Outfit.....	7
	2. Establish Maintenance Dashboard .....	7
	3. Training.....	7
	4. Cybersecurity Considerations and Requirements.....	8
	Scope of Work .....	8
V.	Program Requirements.....	10
	Program Management .....	10
	Project Requirements .....	10
	Reporting .....	10
	Period of Performance Requirements .....	11
	Travel, Facility Access and Insurance Requirements .....	11
	Ownership of Deliverables .....	11
	Funding Requirements.....	12
VI.	Eligibility.....	12
	MxD Membership.....	12
	Notification of Participation by Non-U.S. Citizens.....	13
VII.	Quotation Evaluation.....	13
	Evaluation Process .....	13
	Evaluation Criteria.....	14
VIII.	Project Awards.....	14
	Contract .....	14
	Final Revisions .....	14
	Submission Details .....	14
IX.	References and Acronyms.....	15

## I. RECORD OF CHANGE

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Revision	Date	Sections	Description
1.0	May 3 <sup>rd</sup> , 2022	N/A	Original

## II. TIMELINE

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Deadline for submissions to be received	May 26 <sup>th</sup> , 2022
Follow up clarification meetings as needed	Throughout the submission phase
Feedback to participants	By June 15 <sup>th</sup> , 2022

## III. INTRODUCTION

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MxD: The Digital Manufacturing Institute is where innovative manufacturers go to forge their futures. In partnership with the Department of Defense, MxD (also referred to as the Institute) equips U.S. factories with the digital tools and expertise they need to begin building every part better than the last. MxD's core mission is to transform American manufacturing, by fully integrating the digital thread across the manufacturing enterprise to reduce overall manufacturing costs, stabilize and grow the manufacturing industrial base and improve US competitiveness.

MxD has invested over \$120 million in more than 85 applied research and development projects in areas including design, product development, systems engineering, future factories, agile and resilient supply chains, and cybersecurity.

MxD operates from a nearly 75,000-square-foot innovation center near downtown Chicago. Its future factory floor features some of the most advanced manufacturing equipment in the world, which partners can use for experimentation and training on everything from augmented reality to advanced simulation techniques.

MxD is also the DoD's National Center for Cybersecurity in Manufacturing which focuses on three key areas. First, it uses its factory floor as a demonstration area for existing cybersecurity technology. Second, it works to develop new tools to address very specific pain points for manufacturers. And third, it is working with industry and government to figure out how to get these tools to small and medium-sized manufacturers. All MxD projects must take cybersecurity into consideration.

This RFQ is publicly available on the MxD website at <https://mxdusa.org/projects/>. This public posting represents the official notification of a request to submit the required documents. Amendments to an MxD RFQ may be used to extend due dates, clarify procedural requirements, or modify technical requirements. If an updated RFQ is issued, the previous RFQ will be rescinded. Those interested in responding to this RFQ should carefully monitor the MxD website after an original posting, up to the time of the quotation submission date. Any revisions, amendments or updates will appear in the same section of the website as the original solicitation. It is the responsibility of the respondents to monitor the MxD RFQ updates and ensure that their quotation meets the solicitation requirements.

The Respondent to an RFQ is the non-Federal organization that submits a quotation in response to the RFQ. The Respondent is considered the Prime contractor. Any other companies involved are considered Subcontractors typical of a Prime/Subcontractor relationship. All Subcontractors are subject to flow-down clauses in the Prime contract as required by all government stipulations.

Any questions regarding this solicitation must be provided to [projects@mxdusa.org](mailto:projects@mxdusa.org). The questions will be sent to the appropriate MxD point of contact, and answers will be published on the MxD website, if appropriate.

# **TECHNICAL SUMMARY**



## IV. TECHNICAL SUMMARY

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### OVERVIEW AND BACKGROUND

The overall objective of The Rock Island Arsenal Modernization Program is to assess, develop, pilot, and implement a common set of processes and tools to modernize legacy manufacturing and maintenance facilities using the Joint Manufacturing and Technology Center (JMTC) at Rock Island Arsenal (RIA) as a surrogate. This initiative will help improve U.S. manufacturing and maintenance organizations and the JMTC's ability to manufacture, maintain, repair, and overhaul various ground systems and their associated components in a more efficient, effective, and affordable way.

These projects are considered pilots with the potential for subsequent work expected not only at Rock Island Arsenal but also other Department of Defense (DoD) facilities.

**Subtractive CNC Machine Health (21-36-01)** is one of several projects that comprise this RIA-JMTC modernization program.

### PROBLEM STATEMENT

As part of the Army's Organic Industrial Base (OIB), the Rock Island Arsenal (RIA) Joint Manufacturing and Technology Center (JMTC) exists to maintain unit readiness across the force and give the Army the ability to surge in support of contingencies. To support the facility's ability to provide flexible and responsive warfighter readiness solutions, MxD is implementing a Machine Health Dashboard (MHD). The MHD will collect data from subtractive Computer Numerical Control (CNC) machines in the facility to allow RIA to perform preventative maintenance to improve part quality and reduce machine downtime.

### OBJECTIVES

The objective of this project is to optimize the readiness of equipment used in a high-mix, low-volume, specialized manufacturing setting. This specialized setting prioritizes capability over utilization. It is not unusual for equipment to sit idle for extended periods of time. However, when equipment is needed, it is must to be ready for immediate operation.

The purpose of the MHD is to promote a proactive methodology for RIA to always keep mission critical machinery ready given this challenging environment.

The following sections highlight the minimum requirements proposed by MxD to meet the objectives of the project. However, MxD is open to receiving an expanded proposal with additional inputs if they are relevant to supporting the objectives while meeting budget and time constraints.

To support the key objectives of this project the proposal should try to prioritize the use of Commercial Off the Shelf (COTS) where possible.

Machine health data will include at a minimum:

- Current
- Spindle speed, torque, vibration
- Machine Alerts
- Utilization
- Chamber temperature, humidity
- Coolant level, temperature, concentration

The MHD should also include as inputs:

- Date and type of last maintenance performed
- Date and type of next planned maintenance

## TECHNICAL REQUIREMENTS

### 1. CNC Sensor Outfit

To improve the visibility on the health of critical manufacturing machines in the RIA facility the Contractor will acquire and install sensors on five (5) CNCs. The CNCs will be Mazak bridge mills or similar machines. The CNCs that will be monitored are connected via the Industrial Control Network (ICN), which does not have Internet access. Sensors will be selected with this in mind.

It should be noted that Bluetooth wireless protocol is not permitted in the manufacturing environment. Contractor must propose a wired solution. A wireless solution using Wi-Fi will be considered as an additional option. However, wireless connectivity cannot be proposed as a sole requirement.

- Contractor shall acquire sensors for machine health monitoring where the machines lack the existing capability
- Contractor shall install sensors on up to five (5) CNCs at Rock Island
- Contractor shall aggregate and store data from sensors locally at Rock Island

### 2. Establish Maintenance Dashboard

The contractor will create a MHD to display health of instrumented machines for Rock Island IT and Maintenance personnel. The MHD will include predictive maintenance.

- Contractor shall acquire or otherwise provide software machine health dashboard
- Contractor shall acquire and install a host machine on the ICN where software will reside
- Contractor shall install software on the ICN to host a machine health dashboard
- Contractor shall implement at least one (1) use case of predictive maintenance on each machine
- Machine health dashboard shall operate without connection to the Internet
- Contractor shall acquire and install industrial display monitors to show the dashboard at each machine and at two additional locations in the facility
- All hardware and software needed for machine health dashboard shall be installed locally at Rock Island

### 3. Training

The contractor will conduct training for RIA personnel on the maintenance, use, and updating of the installed systems to support future capability.

- Contractor shall provide training for Rock Island maintenance and operator personnel (users) on the install and maintenance of the sensors
- Contractor shall provide training for Rock Island IT personnel (administrators) on the aggregation and storage of data
- Contractor shall provide training for Rock Island maintenance personnel (users) on using machine health dashboard

- Contractor shall provide training for Rock Island IT personnel (administrators) on maintaining and updating the machine health dashboard for future capability
- Contractor shall supply all user guides and manuals for all implemented hardware and software

#### 4. Cybersecurity Considerations and Requirements.

- Contractor must abide by security requirements outlined in National Institute of Standards and Technology (NIST) 800 SP-53 and NIST 800 SP-82 R2
- Only preapproved hardware and software components are permitted
- There are Security Technical Implementation Guides (STIGs) for the implementation/ configuration of preapproved hardware and software components. The STIGs and approved components can be found here: [STIGs Document Library – DoD Cyber Exchange](#)
- The allowed networking protocols, ports, etc. for both enterprise and Industrial networks can be found here: [Enterprise Connections PPSM – DoD Cyber Exchange](#)
- If no STIG exists for a particular component, please consult: [STIGs Frequently Asked Questions – DoD Cyber Exchange](#)

**A response to this RFQ must have a detailed, itemized breakdown of the minimum requirements outlined above and any additional inputs if they are relevant to supporting the objectives.**

#### SCOPE OF WORK

**Period of Performance:** 3 months

**Estimated start date:** 07/01/2022

The proposal shall include a Gantt chart detailing tasks and milestones required to achieve the project outcome.

A line-item breakdown of costs must be included in the proposal. Costs should be reasonable relative to current market rates and must adhere to any federal government guidelines. Costs that will continue after the end of the PoP, such as software as a service costs, must be noted in the proposal.

All hardware and software installed during the scope of this project are to be tested and demonstrated to MxD and RIA personnel during commissioning.

**Table 1: Technical Deliverables**

Deliverable	Due
System architecture and implementation plans	Month 1
Equipment identification and procurement plan	Month 1
Hardware Bill of Material (BOM)	Month 1
Software BOM	Month 1
User guides and maintenance manuals for all hardware and software installed	Month 1
RIA Implementation	Month 2
RIA Training	Month 3



# **PROGRAM OVERVIEW**



## V. PROGRAM REQUIREMENTS

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### PROGRAM MANAGEMENT

The selected Respondent will be awarded a contract as the Awardee. The Awardee is responsible for managing the project to ensure the team meets all the technical objectives and requirements as contracted based on the quotation. The Awardee will coordinate with the MxD point of contact (POC) for reporting purposes and for coordinating the integration at RIA-JMTC. The MxD POC will monitor technical performance and project costs relative to the associated contract. The Awardee will submit the reports listed below in Table 2 to their MxD POC to fulfill their reporting requirements. These reports will be accessed by the MxD Director of R&D Projects, MxD Director of Engineering, RIA-JMTC, the MxD POC and other authorized staff members in the course of their official duties.

### PROJECT REQUIREMENTS

All proposals must include a requirements verification cross reference matrix (VCRM). VCRM will include how the technical requirements will be verified (Analysis, Inspection, Demonstration, or Test) and when the requirements will be verified.

### REPORTING

The contractor is required to submit a weekly project status report which includes progress towards deliverables, including schedule and budget updates.

The contractor is required to submit a test results report for any performance tests listed above at the completion of testing.

The contractor is required to submit a final project report which summarizes the scope of the project, accomplishments, challenges, and lessons learned. The final report shall also incorporate any/all test reports and a time-based summary of expenditures and milestones completion.

**Table 2: Program deliverables**

<b>Deliverable</b>	<b>Description</b>	<b>Due</b>
<b>Program Review</b>	Summary of progress towards of objectives and deliverables.	Weekly
<b>VCRM</b>	Summary of how all requirements will be verified, when, and by who	30 days after contract award
<b>Technical Documents and Test Reports</b>	Per Technical Deliverables	Per Technical Deliverables
<b>Final Report</b>	Summary of the project to include accomplishments, challenges, and lessons learned	End of PoP
<b>Safety Accident/Incident Report</b>	Participants must report any major accident/incident (including fire) resulting in any one or more of the following situations: one or more fatalities or one or more disabling injuries; damage of Government property exceeding \$10,000; impact to project planning or production schedules or degradation of the safety of equipment under contract. Such report will also identify potential hazards requiring corrective action.	Immediately on Occurrence
<b>Government Required Documentation</b>	Additional reporting based on government contractual requirements.	As Needed

**PERIOD OF PERFORMANCE REQUIREMENTS**

Estimated period of performance is **3 months** from contract award. MxD and RIA-JMTC are flexible on implementation time dependent on objectives quoted. However, there is no increase in funding beyond what was agreed to per contract.

**TRAVEL, FACILITY ACCESS AND INSURANCE REQUIREMENTS**

The RIA-JMTC is located in Rock Island, IL. All travel requirements and associated costs needed for execution of the objectives and deliverables must be included in the quotation. There is no increase in funding should additional travel be required to fulfill the agreed upon requirements. Proposals must include an estimate for required travel to RIA to perform all work as defined above.

Awardee and/or its authorized subcontractor(s) will need to access the RIA-JMTC facility to perform the necessary onsite installation work as outlined in this RFQ. Awardee and / or its authorized subcontractor(s) must meet any terms and conditions for access as set forth by RIA-JMTC.

**OWNERSHIP OF DELIVERABLES AND INTELLECTUAL PROPERTY**

The contract will be a work for hire relationship. It is expected that the solution to meet the objectives will be a commercially available solution. Any existing, background intellectual property (IP) remains the property of the IP owner. Ownership and other rights in new IP produced as a result of the work performed under this contract will be determined at the time of contracting.

## FUNDING REQUIREMENTS

MxD will award a contract type resulting from this RFQ that is most appropriate to the specific procurement and selected Awardee. MxD reserves the right to fund all, some, or none of the quotations received under issued RFQs. Final award amounts will be determined accordingly based on quotations received, subsequent evaluations, and final agreement between MxD and the Awardee.

**Cost share is not required for this contract.** However, cost share is encouraged to support the Institute's mission.

MxD recognizes the difficulty in completing a final, fixed-price quotation without additional information or site visits for certain projects. Therefore, **clearly document and explain all assumptions used to generate the quotation.**

If down selected, the Respondent will have the opportunity to gather additional details and revise the quotation. The Respondent must then submit substantiating documentation for costs (including any cost share). MxD will complete a comprehensive cost analysis (including cost reasonableness and cost realism) prior to contract award.

Neither MxD nor the U.S. Government has any responsibility for costs associated with development, submissions, or pre-award negotiations for this quotation and subsequent contract.

## VI. ELIGIBILITY

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### MxD MEMBERSHIP

This RFQ is open to the public; any organizations regardless of membership status may submit a quotation in response to this RFQ. **Membership in MxD is not required to be awarded a contract as a result of this RFQ.**

If a Respondent or Awardee wishes to promote their affiliation with MxD as a result of this RFQ or subsequent award, MxD membership is required. This can include participation in workshops, social media promotion, and networking with other members. MxD membership does not grant rights to publish association with the project. Publication of association with the project will be subject to terms to be determined at the time of contracting.

Any Respondents who are non-MxD members are encouraged to review the Membership Agreement prior to submission and to direct questions to MxD's Director of Business Development, Tony Papke ([tony.papke@mxdusa.org](mailto:tony.papke@mxdusa.org)). For more information on how to become a MxD Member, please visit the MxD Membership page on our website.

Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to RFQs in any capacity unless they address the following conditions:

- FFRDCs or Government entities may not exclusively respond to this RFQ.
- FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector and must also provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to compete with industry and propose to solicitations utilizing Government funding.

- Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority, as well as, where relevant, contractual authority, establishing their ability to propose to solicitations utilizing government funding.

Government agencies interested in participating in MxD RFQs as a respondent or subcontractor should notify MxD in advance of the RFQ submission. For RFQs utilizing federal funding, special agreements and considerations may need to be implemented to enable participation.

#### **NOTIFICATION OF PARTICIPATION BY NON-U.S. CITIZENS**

Award shall be granted only to U.S. companies, firms, organizations, institutions, or other entities organized or existing under the laws of the United States, its territories, or possessions (as defined in Section 120.15 of International Traffic in Arms Regulations, 22 CFR § 120 et. seq. (“ITAR”)).

**It is a requirement that work related to the Award must be completed in the U.S. by people legally authorized to work in the U.S.** All proposed participation by non-U.S. Citizens must be disclosed to MxD on Attachment 1 Non-U.S. Citizens at least 60 days prior to proposed participation. Written approval of non-U.S. Citizens must be received by the Awardee from MxD prior to commencing work.

## **VII. QUOTATION EVALUATION**

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### **EVALUATION PROCESS**

An MxD Evaluation Board (EB) will review and evaluate each submitted quotation utilizing the evaluation criteria specified in the following section.

The EB may consist of recognized experts from industry and academia and key government stakeholder representatives (when appropriate). MxD representatives, such as the Director of R&D Projects, Director of Engineering, MxD POC, may participate in and lead EB meetings. All members of the EB will need to meet strict standards of personal and organizational conflict of interest. The evaluators may be supported by subject matter experts to review and comment upon the proposed work.

Through its deliberations, the EB will determine “selectability” of each quotation. Selectability determination incorporates average EB judgement of objective compliance, budget availability, and overall perceived value. The EB will identify a list of quotations that are “selectable for negotiation” to the MxD POC. The Director of R&D Projects and the Director of Engineering, with the consultation of MxD POC, will determine which subset of the proposed quotations deemed “selectable for negotiation” will be down selected for negotiations. This determination will take into account the EB’s recommendation, funding availability, alignment with MxD’s mission and strategic goals as well as external stakeholder requirements (when applicable).

## EVALUATION CRITERIA

Each quotation is evaluated by a specific set of criteria. Below are the quotation evaluation criteria for this RFQ:

Quotation Evaluation Criteria
<b>Requirements Compliance</b> <ul style="list-style-type: none"><li>• <i>Quoted solution clearly addresses all mandatory objectives identified in RFQ</i></li><li>• <i>Clear identification of assumptions, risks, and mitigations</i></li><li>• <i>Complete and clear itemization of all requirements</i></li><li>• <i>Program management plan meets requirements in the RFQ</i></li></ul>
<b>Respondent Qualifications</b> <ul style="list-style-type: none"><li>• <i>Respondent and any proposed subcontractors highly qualified to accomplish objectives with clear delineation of roles and responsibilities</i></li><li>• <i>Respondent and any subcontractors have unique capabilities that are directly associated with the target technology</i></li></ul>
<b>Cost Factors</b> <ul style="list-style-type: none"><li>• <i>Quoted costs are reasonable and realistic for the proposed work effort</i></li><li>• <i>Quoted costs are competitive relative to other commercial offerings</i></li><li>• <i>Value is maximized through inclusion of optional cost share and objectives</i></li></ul>

## VIII. PROJECT AWARDS

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### CONTRACT

The award of this contract will be subject to the requirements of the Collaboration Agreement between National Center for Manufacturing Sciences and MxD. All contractual negotiations related to RFQs will be executed by MxD. Funds will be distributed to the Awardee selected through the evaluation/selection process utilizing a contract appropriate to the procurement.

### FINAL REVISIONS

MxD reserves the right to negotiate the cost and scope of the proposed work with a Respondent that has been down selected prior to award. MxD will facilitate the creation of a Statement of Work with the Respondent including technical scope modifications and program management aspects. The Respondent and subcontractors, if any, who intend to pursue selection are required to participate in the revision process prior to award. For example, MxD may request that the organizations revise the quotation to better align to RFQ requirements.

### SUBMISSION DETAILS

Each Respondent must submit their quotation (including Attachment 1) no later than 5:00PM Central Time, **May 26th**, 2022. All submissions must be made electronically to [projects@mxdusa.org](mailto:projects@mxdusa.org). Please include the RFQ designation: "21-36-01 Subtractive CNC Machine Health Quotation <Respondent / Company>" for the file name and in the subject line of the email.

## IX. REFERENCES AND ACRONYMS

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**Table 3: References**

Document Title	Document Number
US Code of Federal Regulation	N/A

**Table 4: Acronyms**

BOM	Bill of Materials
CNC	Computer Numerical Control
COTS	Commercial Off the Shelf
DoD	Department of Defense
EB	Evaluation Board
FFRDC	Federally Funded Research and Development Center
ICN	Industrial Control Network
IP	Intellectual Property
ITAR	International Traffic in Arms Regulations
JMTC	Joint Manufacturing and Technology Center
MHD	Machine Health Dashboard
NIST	National Institute of Standards and Technology
OIB	Organic Industrial Base
PoC	Point of Contact
PoP	Period of Performance
RFQ	Request for Quote
RIA	Rock Island Arsenal
STIG	Security Technical Implementation Guide
VCRM	Verification Cross Reference Matrix

# Attachment 1

## Certification of Non-U.S. Citizens

\_\_\_ There is NO participation by Non-U.S. Citizens proposed for this effort

\_\_\_ The following Non-U.S. Citizen(s) are participating in this effort:

Non-U.S. Citizen Name, Contact Info	Country of Citizenship	Primary Employment Location	Employer	US Work Authorization (Visa, Green Card, Etc)	Justification*

\*The Justification section should clearly outline the rationale behind the individual's request for participation, the type of data they will have access to, and other pertinent information regarding their skill set/expertise.