JUSTIFICATION FOR SINGLE SOURCE (BRAND NAME) AWARDS IAW FAR 13.106-1

(OVER MICRO-PURCHASE THRESHOLD($3.5K) BUT NOT EXCEEDING THE SAT ($150K))

1. ACQUISITION PLAN ACTION ID:	1A. PROJECT/TASK No.	1B. ESTIMATED AMOUNT:
VA260-17-AP-7116	N/A	[redacted]

2. BRIEF DESCRIPTION OF SUPPLIES OR SERVICES REQUIRED AND THE INTENDED USE:

The Real-time Data Acquisition and Control System is a platform to sense, control, and develop new lower limb prostheses and biomechanical mechatronic devices. It is a modular electronic instrumentation platform for data acquisition and motion control. In one configuration, the system will be configured to act as a real-time lower limb powered prosthetics controller. The system will control the motion and behavior of custom lower limb powered prostheses as part of our research and development efforts. This system will be used to develop new state-of-the-art power lower limb prosthetics for veterans with lower limb loss. This system is a general-purpose data acquisition and control system and will be used for a variety of funded Research Rehabilitation and Development projects such as prosthetics and mechatronic device development.

3. UNIQUE CHARACTERISTICS THAT LIMIT AVAILABILITY TO ONLY ONE SOURCE, WITH THE REASON NO OTHER SUPPLIES OR SERVICES CAN BE USED:

The system must be **compatible with National Instruments LabVIEW software** to maintain compatibility with the following existing devices that will interface with the proposed system.

1. Existing custom software programs written in LabVIEW. We have previously developed custom LabVIEW software packages that we plan to run on the new system. To maintain consistency with our existing custom software, the new system must also be able to run National Instruments LabVIEW software.
2. Robotic Gait Simulator – is a robotic system that will work in conjunction with the Real-time Prosthetics Controller system. The robotic gait simulator is programmed in Labview. The new Real-time Prosthetics Controller must also run LabVIEW to maintain interoperability with the Robotic Gait Simulator.
3. Laboratory speed timing gates, are devices that accurately measure walking speed. The timing gate system uses LabVIEW and will be integrated into the new Real-time Prosthetics Controller system.
4. Two Kollmorgen AKD® Series DC servo motors. These motors control the powered prosthetic foot and must communicate with the proposed Real-time Data Acquisition and Control System. We have a specific make and model for these motors which must communicate with the Real-time Data Acquisition and Control System. The Real-time Data Acquisition and Control System must be able to communicate and control these specific Kollmorgen AKD® Series DC servo motors.

Because we want to maintain compatibility with the above-mentioned devices National Instruments is the only manufacturer that will meet our requirement to use LabVIEW software and interface with our existing devices.

We require a **graphical programming environment** to program the Real-time Data Acquisition and Control System. National Instruments LabVIEW is the only graphical programming environment that enables us to very quickly develop powerful test software with support for thousands of instruments and technologies such as real-time control, digital filtering, multicore deployment, and field-programmable gate arrays (FPGAs). No other company or vendor offers a graphical programming environment that has the features, flexibility, and modules that we require.

We require a **field programmable gate array module** that can be programmed to run custom LabVIEW software to perform data acquisition, digital & analog I/O, and motion control.

The requirements for the proposed Real-time Data Acquisition and Control System rapidly change as the state-of-the-art in powered prosthetics continually advances. Therefore, we **require a modular, expandable, and upgradeable system**. National Instruments in the only company that offers a highly modular, expandable, and upgradeable system with hundreds of modules that can added to a CRIO hardware system to meet our current and future needs.

National Instruments is the only company that can supply a Real-time Data Acquisition and Control System that meet our requirements, specifically we need:

1. Embedded real-time controller (1.91 GHz quad-core Intel Intel).
2. Reconfigurable chassis with 16 or more slots.
3. Shared timing and synchronization across controller, chassis and modules.
4. Data acquisition (64 channels, 16-bit resolution; 500 kS/s aggregate sampling rate.
5. Motion controller that can control two Kollmorgan AKM brushless DC servo motors (AKM21I BLDC Motor, 2002 RPM@24VDC, 0.180Nm).
6. Integrated wireless sensor network system with two wireless analog input nodes.

4. DESCRIPTION OF MARKET RESEARCH CONDUCTED AND RESULTS OR STATEMENT WHY IT WAS NOT CONDUCTED:

Our team has several engineers with 10 to 20 years of experience working with real-time systems. We are experts in the field and have detailed knowledge of the current market offerings. This knowledge has been developed by 1) attending national and international conferences and trade shows, 2) reading trade publications, 3) speaking to other experts in the field at universities and companies, 4) developing a network of contacts at leading companies. Based on this detailed knowledge of the marketplace, and our additional market research outlined below, we conclude that National Instruments is the only manufacturer that can meet our requirements of the Real-time Data Acquisition and Control System.

We used the following methods to conduction market research;

1. Web search for systems and companies that meet our requirements.
2. Contacted the leading five companies that offer products in this area and asked for quotes and proposed systems.
3. Asked our colleagues who work in this area for referrals to companies that might meet our requirements.

4. Created a list of possible system solutions from a variety of vendors and compared features, performance, and price.
5. Developed and used an automated computer script to evaluate approximately 200 servo motors and drives on their ability to meet our performance requirements (kinematic and kinetic tracking). From this analysis, we identified a single company and motor that will meet our needs. National Instruments is the only company that will appropriately integrate with these motors while also meeting our other specifications.

5. Contracting Officer's Certification: *Purchase is approved in accordance with FAR13.106-1(b). I certify that the foregoing justification is accurate and complete to the best of my knowledge and belief. A determination of price reasonableness will be made prior to award IAW FAR 13.106-3.*

Signature: Sandra J. Johnson 749522

Digitally signed by Sandra J. Johnson 749522
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Title: Contracting Officer – Program Contracting Activity Central