NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NASA SHARED SERVICES CENTER / JOHN C. STENNIS SPACE CENTER
JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION (JOFOC)
For Liquid Nitrogen Air Separation Unit (LNASU)

1. **Federal Acquisition Regulation (FAR) 6.104-1(a)(1) – Identification of the agency and the contracting activity, and specific identification of the document as a "Justification for other than full and open competition."**

   This document is a justification for other than full and open competition prepared by National Aeronautics and Space Administration (NASA), John C. Stennis Space Center (SSC).

   The procuring agency is the NASA, and the contracting activity is NASA Shared Services Center (NSSC).

2. **FAR 6.104-1(a)(2) – The nature and/or description of the action being approved:**

   This justification provides the rationale for contracting by other than full and open competition to award a sole-source contract to Nikkiso Cosmodyne for procuring a Pine 8 Liquid Nitrogen Air Separation Unit. The PINE plants are novel cryogenic air separation plants specifically designed to produce high efficiency, low-cost liquid nitrogen. Their process allows for high nitrogen yield and lower specific power consumption than conventional solutions. The PINE system uses an air-cycle refrigeration process and includes a feed air compressor, air treatment module, air recycle compressor, two booster loaded turboexpanders, and a single cold box that efficiently packages all of the cryogenic equipment. All components of the PINE plant have been designed to be transportable under standard shipping permits.

3. **FAR 6.104-1(a)(3) – A description of the supplies or services required, to meet the Agency's needs (including the estimated value):**

   The Pine 8 system is a modular, cryogenic air separation unit designed by Nikkiso Cosmodyne to produce high-purity liquid nitrogen at a rate of 86 metric tons per day (TPD). It utilizes an advanced air-cycle refrigeration process and includes a feed air compressor, air treatment module, recycle compressor, turboexpanders, and a cold box that houses the core cryogenic equipment. The system is engineered for high efficiency, low specific power consumption (0.79 kWh/Nm^3), and ease of transport and installation. Its robust design supports reliable, unattended operation at steady state, with remote monitoring capabilities and a user-friendly control interface. The Pine 8 is part of Nikkiso Cosmodyne's PINE series, which has been deployed globally in over 450 installations.

   At SSC, the Pine 8 system will support critical testing and operational missions by supplying Grade B liquid nitrogen, as specified by MIL-PRF-27401. This high-purity nitrogen is

essential for maintaining cryogenic conditions in test stands and other systems, ensuring safety and performance during propulsion testing and other aerospace operations. The system's modular, skid-mounted design allows for integration with existing infrastructure at the High Pressure Gas Facility (HPGF), Building 3305, where it will tie into current liquid nitrogen storage tanks and distribution systems.

The period of performance for the LNASU system is estimated to be no more that 18 months after the contract is awarded resulting in the delivery of the fully fabricated and tested system to SSC. [redacted]

4. **FAR 6.104-1(a)(4) – An identification of the statutory authority permitting other than full and open competition:**

   The statutory authority permitting other than full and open competition is 10 U.S.C. 3204(a)(1), as implemented by FAR 6.103-1, Only one responsible source and no other supplies or services will satisfy agency requirements.

5. **FAR 6.104-1(a)(5) – A demonstration that the proposed contractor's unique qualifications or the nature of the acquisition requires use of the authority cited:**

   The rationale supporting the use of 10 U.S.C. 3204(a)(1) is described below.

   Unique features of the Pine 8 Liquid Nitrogen Air Separation Unit include:
   1. High-Efficiency Cryogenic Process
      - Air-cycle refrigeration with dual turboexpanders (warm and cold) and booster compressors enables high nitrogen yield with low specific power consumption (0.79 kWh/Nm^3).
      - Produces 86 metric tons per day (TPD) of Grade B liquid nitrogen at high purity (≤100 ppm O_2).
   2. Modular, Transportable Design
      - The system is modular and skid-mounted, with most components (except the cold box) designed to fit into standard ISO containers.
      - The cold box is pre-piped and dimensionally optimized for easy inland and ocean transport, simplifying logistics and installation.
   3. Advanced Control and Monitoring
      - Features a redundant PLC-based control system with a user-friendly HMI interface.
      - Includes remote monitoring and control capabilities via internet or phone line.
      - Built-in event logging, first-out annunciation, and advanced functional testing tools enhance operational safety and diagnostics.
   4. Flash Gas Recovery Option
      - Offers an optional flash recovery system that recycles nitrogen boil-off gas from storage tanks back into the cold box, improving efficiency and reducing waste.

5. Proven Reliability and Support

- Backed by over 50 years of cryogenic experience and more than 450 global installations by Nikkiso Cosmodyne.
- Supported by worldwide field service, spare parts availability, and in-factory/on-site training.

In September 2025, SSC/NSSC issued a Request for Information (RFI 80SSC025K0001) seeking proposals for a modular, cryogenic liquid nitrogen generation system. The RFI outlined the agency's need for a high-capacity, high-purity nitrogen production plant to support critical testing and operational requirements at the HPGF. The system was expected to integrate with existing infrastructure, deliver reliable performance, and meet stringent technical specifications, including production rates of approximately 75 to 100 metric tons per day.

In response to this solicitation, Nikkiso Cosmodyne submitted the only response, offering its PINE series cryogenic air separation plants—specifically the Pine 7 and Pine 8 models. The response detailed the technical capabilities, modular design, and operational advantages of the systems, with the Pine 8 system ultimately aligning closely with NASA's requirements. The submission included comprehensive commercial, technical, and performance documentation, demonstrating Nikkiso Cosmodyne's extensive experience in cryogenic plant design and manufacturing.

As the sole respondent to RFI 80SSC025K0001, Nikkiso Cosmodyne's response represents a unique and tailored solution for NASA's liquid nitrogen needs at Stennis. The company's long-standing track record, combined with the Pine 8 system's efficiency and transportability, positions it as a strategic asset for supporting ongoing and future propulsion testing missions.

Nikkiso Cosmodyne is the only responsible source capable of fulfilling the requirements outlined in RFI 80SSC025K0001 due to a combination of proprietary technology, specialized expertise, and unmatched experience in the design and manufacture of modular cryogenic air separation systems. The company's PINE series, including the Pine 8 system, is a highly specialized solution that integrates advanced air-cycle refrigeration, dual turboexpanders, and a compact cold box design—features that are not readily available from other vendors. These systems are engineered for high-efficiency liquid nitrogen production with low specific power consumption, and are designed for modular deployment, making them uniquely suited for NASA's infrastructure and operational needs at SSC.

Nikkiso Cosmodyne's proprietary design and manufacturing processes are protected by limited rights in data and are the result of over 50 years of continuous innovation in cryogenic technology. The company has delivered more than 450 cryogenic plants

worldwide, and its systems are supported by in-house engineering, fabrication, and testing capabilities. The Pine 8 system, in particular, includes a pre-piped cold box optimized for transport, a redundant PLC-based control system with remote monitoring, and optional flash gas recovery—all of which reflect a level of integration and performance that is not available from other commercial sources. Additionally, Nikkiso Cosmodyne's systems are supported by a global network of field service engineers and spare parts, ensuring long-term reliability and support.

No other known vendor currently offers a modular, skid-mounted cryogenic nitrogen generation system that meets the specific technical, logistical, and operational requirements outlined in RFI 80SSC025K0001. The absence of alternative responses to the RFI further substantiates that Nikkiso Cosmodyne is the only source with the capability, experience, and proprietary technology to meet NASA's needs. Awarding this contract to another vendor would require significant time and resources to develop a comparable system from scratch, introducing unacceptable delays and risks to mission-critical operations. Therefore, Nikkiso Cosmodyne is not only the most qualified source but the only responsible source capable of performing this specialized work.

6. **FAR 6.104-1(a)(6) – A description of the efforts made to ensure that offers are solicited from as many potential sources as practicable, including whether a notice was or will be publicized as required by part 5 and, if not, which exception under part 5 applies:**

In addition to the RFI, a pre-solicitation notice to the Government Point of Entry (GPE) website (Sam.gov) was published on November 17, 2025, in accordance with FAR part 5. This posting informed potential sources of NASA's intent to award this sole-source contract to Nikkiso Cosmodyne. The results of this notice are summarized in Section 10 below.

7. **FAR 6.104-1(a)(7) – A determination by the contracting officer that the anticipated cost to the Government will be fair and reasonable:**

The contracting officer's signature on this document indicates that the contracting officer has determined that the anticipated cost to the government will be fair and reasonable. The contractor must be required to submit a proposal to be evaluated and negotiated by the Government. Prior to execution of the contractual instrument, a proposal analysis will be performed. The proposal analysis will ensure that the final agreed-to price for the contract action is fair and reasonable in accordance with FAR part 15.

The proposed pricing for the Pine 8 liquid nitrogen generation system will be determined fair and reasonable based on a comprehensive evaluation of historical and current pricing data obtained through multiple competitive and market research efforts conducted by NASA. Specifically, pricing data has been collected and analyzed from the following sources:

- **RFI 80SSC022K0001**

- **RFI 80SSC020K0002**
- **RFQ 80SSC025R7009**
- **RFI 80SSC025K0001** (current)

These prior solicitations and market inquiries provided a baseline for evaluating the cost of modular cryogenic air separation units with similar technical specifications, production capacities, and delivery requirements. The pricing submitted by Nikkiso Cosmodyne under RFI 80SSC025K0001 for the Pine 8 system—[redacted]—is consistent with the pricing trends observed in these earlier RFIs and RFQs, particularly when adjusted for inflation, scope enhancements, and updated technical requirements.

Furthermore, the pricing includes detailed breakdowns of equipment costs, optional components, and delivery terms, as outlined in Schedule A of the RFI 80SSC025K0001 response. The cost structure reflects industry-standard practices for cryogenic plant fabrication and incorporates value-added features such as proprietary cold box design, integrated control systems, and modular transportability.

8. **FAR 6.104-1(a)(8) – Description of the market research conducted, and the results, or a statement of the reason market research was not conducted (e.g., urgent, and compelling requirement):**

In preparation for the acquisition of a modular cryogenic liquid nitrogen production system under RFI 80SSC025K0001, NASA SSC conducted market research in accordance with FAR Part 10. This research included a formal Request for Information (RFI) process, technical reviews, and comparative analysis of historical and current market data. The RFI was publicly posted in September 2025 and specifically targeted original equipment manufacturers (OEMs) capable of supplying a commercial off-the-shelf (COTS), modular, skid-mounted cryogenic air separation unit (ASU) for high-purity liquid nitrogen production.

The RFI outlined detailed technical and operational requirements, including production capacity (75–100 metric tons per day), cryogenic air separation technology, modular design, and integration with existing infrastructure. The Government received only one response from a responsible source—Nikkiso Cosmodyne—despite the open post and targeted outreach. This lack of alternative responses, combined with the highly specialized nature of the requirement, supports the conclusion that Nikkiso Cosmodyne is the only responsible source currently capable of meeting NASA's needs.

In addition to the current RFI 80SSC025K0001, pricing and technical data were also reviewed from previous procurement methods, including RFI 80SSC022K0001, RFI 80SSC020K0002, and RFQ 80SSC025R7009. These prior efforts provided a benchmark for evaluating the reasonableness of Nikkiso Cosmodyne's RFI response and confirmed the absence of other viable sources offering comparable systems. The Pine 8 system proposed by Nikkiso Cosmodyne aligns precisely with the Government's requirements and incorporates proprietary design elements, modular transportability, and proven performance metrics that are not available from other vendors.

This market research effort validates the assumption that no other source is capable of delivering a system with the required performance, modularity, and integration capabilities within the necessary timeframe. Therefore, the use of other-than-full-and-open competition is justified under FAR Subpart 6.302-1, "Only One Responsible Source," based on the results of thorough and well-documented market surveillance.

9. **FAR 6.104-1(a)(9) – Any other facts supporting the use of other than full and open competition:**

   None

10. **FAR 6.104-1(a)(10) – A listing of the sources, if any, that expressed an interest in writing in the acquisition:**

    Per FAR part 5, a pre-solicitation notice of NASA's intent to award this sole-source action was posted on the GPE website (Sam.gov) on November 17, 2025 with a closing date of December 03, 2025. (See Section 6 above).

    Noblegen Cryogenics, a global manufacturer of turnkey liquid nitrogen (LN_2) generator systems, responded to the pre-solicitation. In their response, Noblegen indicated that while they offer point-of-use LN_2 generation systems ranging from 10 liters per day to 900 liters per day, the capacity requirements outlined in this solicitation exceed the capabilities of their current product line. Noblegen provided general product information and a brochure for consideration in future procurements. As their available systems do not meet the technical requirements specified in this tender, their response was reviewed and formally dispositioned as non-compliant with the required capacity, and therefore not eligible for further consideration under this procurement.

    Additionally, Messer LLC responded to the Request for Information (RFI) posted in September 2025. Following technical evaluation, Messer was determined not capable of meeting the requirements. Messer inquired whether NASA would consider an onsite supply agreement; however, NASA confirmed that such an arrangement would not be considered, as the Agency's intent is to procure, own, and operate the LN_2 generation system.

    No additional written responses expressing interest were received.

11. **FAR 6.104-1(a)(11) – A statement of actions, if any, the agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required:**

    The Agency will continue to examine the market in the future for alternative solutions or new sources before executing any subsequent acquisitions for the same requirements.

LIQUID NITROGEN AIR SEPARATION UNIT (LNASU)
JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION
SIGNATURE PAGE

I certify that the facts presented in this justification are accurate and complete.

Thomas Carroll
Digitally signed by Thomas Carroll
Date: 2025.12.04 09:01:33 -06'00'

Thomas "Tommy" Carroll
Technical Representative

I hereby certify that the above justification is complete and accurate to the best of my knowledge and belief.

Adrianne Ragan
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Adrianne Ragan
Contracting Officer

APPROVED:

James Bailey
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James Bailey
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