COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./DUE DATE	☐ Special Exception to Deadline Date Policy	FOR NSF USE ONLY
NSF 23-200 01/18/2023		NSF PROPOSAL NUMBER
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)		2315782
ITE - NSF Engines - NSF Regional Inn		

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	UEI (Unique Entity Identifier)	FILE LOCATION
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746000813		

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE
UNIVERSITY OF TEXAS AT EL PASO

AWARDEE ORGANIZATION CODE (IF KNOWN)
0036616000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
500 W UNIVERSITY AVE
EL PASO,TX 79968-0001 US

NAME OF PRIMARY PLACE OF PERF
University of Texas at El Paso

ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE
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EL PASO,TX 79968-0001 US

IS AWARDEE ORGANIZATION (Check All That Apply) ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT
NSF Engines: Type-2: Paso del Norte Innovation for Defense and Aerospace (IDEA) Engine

SHOW LETTER OF INTENT ID IF APPLICABLE

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 14,999,999	120 months	10/01/2023	

THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR
☐ DISCLOSURE OF LOBBYING ACTIVITIES
☐ PROPRIETARY & PRIVILEGED INFORMATION
☐ HISTORIC PLACES
☐ VERTEBRATE ANIMALS IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☒ TYPE OF PROPOSAL **Research**

☐ HUMAN SUBJECTS Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☐ FUNDING OF INT'L BRANCH CAMPUS OF U.S IHE
☐ FUNDING OF FOREIGN ORGANIZATION OR FOREIGN INDIVIDUAL
☐ INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED
☒ COLLABORATIVE STATUS
A collaborative proposal from one organization (PAPPG II.D.3.a)

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Certification for Authorized Organizational Representative (or Equivalent)

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding conflict of interest (when applicable), flood hazard insurance (when applicable), responsible conduct of research, and organizational support as set forth in the NSF Proposal & Award Policies & Procedures Guide (PAPPG). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, §1001).

Certification Regarding Conflict of Interest

The AOR is required to complete certifications stating that the organization has implemented and is enforcing a written policy on conflicts of interest (COI), consistent with the provisions of PAPPG Chapter IXA; and that, to the best of his/her knowledge, all financial disclosures required by the conflict of interest policy were made; and that conflicts of interest, if any, were, or prior to the organizations expenditure of any funds under the award, will be, satisfactorily managed, reduced or eliminated in accordance with the organizations conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated and research that proceeds without the imposition of conditions or restrictions when a conflict of interest exists, must be disclosed to NSF via use of the Notifications and Requests Module in FastLane.

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Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

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(This certification is not applicable to conference proposals.)
By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Chapter IX.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research.
The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

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By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Dual Use Research of Concern

By electronically signing the certification pages, the Authorized Organizational Representative is certifying that the organization will be or is in compliance with all aspects of the United States Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern.

Certification Regarding the Meeting Organizer's Written Policy or Code-of-Conduct that Addresses Sexual Harassment, Other Forms of Harassment, and Sexual Assault

(This certification is only applicable to travel proposals)
By electronically signing the Cover Sheet, the AOR is certifying that prior to the proposer's participation in the meeting, the proposer will assure that the meeting organizer has a written policy or code-of-conduct that addresses sexual harassment, other forms of harassment, and sexual assault, and that includes clear and accessible means of reporting violations of the policy or code-of-conduct. The policy or code-of-conduct must address the method for making a complaint as well as how any complaints received during the meeting will be resolved. The proposer is not required to submit the meeting organizer's policy or code-of-conduct for review by NSF.

Certification Regarding Family Leave Status (or equivalent)

(This certification is only applicable to career-life balance supplemental funding requests)
By electronically signing the certification pages, the Authorized Organizational Representative hereby certifies that the request for a technician (or equivalent) is because the (PI/co-PI/senior personnel/ NSF Graduate Research Fellow/postdoctoral researcher/graduate student) is, or will be, on family leave status (or equivalent) from the organization in accordance with the organization's policies. The Authorized Organizational Representative also affirms that the organization is able to fill the position for which funding is being requested, in an appropriate timeframe.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Raul Chavez**	**Electronic Signature**	**Jan 18 2023 06:56 PM**

TELEPHONE NUMBER	EMAIL ADDRESS	FAX NUMBER
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Overview

NSF Engines: Type-2: Paso del Norte Innovation for Defense and Aerospace (IDEA) Engine
PI/Project Director: Ahsan Choudhuri; The University of Texas at El Paso; NSF ID: 000714800
Lead Organization: The University of Texas at El Paso (Aerospace Center and W. M. Keck Center for 3D Innovation) (UEI C1DEGMMKC7W7)

Purpose and vision: To revitalize the American defense industrial base and to propel the Paso del Norte region into economic parity and competitiveness, the IDEA Engine will foster innovation in and affordable access for small and medium manufacturers to defense-critical applied research and development. The IDEA Engine will exponentially expand our nation's aerospace and defense talent-force by tapping the potential of our hidden talent pool.

Key potential outcomes:

- Democratization of use-inspired research and development in aerospace and defense for use by small and medium manufacturers
- Expanded access to in-demand skills development for aerospace and defense manufacturing in high schools, through paid internships in research labs and through training programs targeted at low wage earners.

Intellectual Merit

This proposed NSF Engine will address key vulnerabilities in the nation's defense industrial base by:

1. Developing a **Public Innovation Architecture** to support the use-inspired Research and Development needs of small and medium manufacturers in the Paso del Norte region to help them compete for business in aerospace and defense markets.
2. Developing **Public Innovation Infrastructure** with next-generation digital engineering capabilities to support product and process innovation for Paso del Norte SMMs to support the aerospace and defense supply chain.
3. Deploying **Talent Infrastructure** focused on economic mobility for Paso del Norte residents through the development of in-demand skills needed by aerospace and defense industries.

The IDEA Engine will address 5 of 14 defense critical technologies identified by the Department of Defense to include advanced materials, trusted AI and autonomy, space technology, renewable energy generation and storage, and hypersonics by focusing on the broad dissemination of those innovations for use by small and medium manufacturers.

Broader Impacts

The IDEA Engine will catalyze the rapid growth of the aerospace and defense manufacturing sector in the Paso del Norte Region. The IDEA Engine builds from significant investments and partnerships that have been developed over the two decades to fuel growth in this sector. This growth will lift the region's median income to the national average and increase the region's corporate footprint. The capital influx will spill over into other regional industries, creating broad and inclusive wealth building in this historically poor region. The IDEA Engine's will expand the nation's defense industrial base by maturing the capabilities of small and medium manufacturers in the region. The IDEA Engine will create a replicable model that the rest of the nation can use to expand access to innovation to small and medium manufactures and to create a diverse talent force with next generation skills.

Key Words: public innovation; aerospace, defense, manufacturing

(b)(4)

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For font size and page formatting specifications, see PAPPG section II.B.2.

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

NSF Engines: Type-2: Paso del Norte Innovation for Defense and Aerospace (IDEA) Engine
PI/Project Director: Ahsan Choudhuri; The University of Texas at El Paso; NSF ID: 000714800
Lead Organization: The University of Texas at El Paso (Aerospace Center and W. M. Keck Center for 3D Innovation) (UEI C1DEGMMKC7W7)

The Paso del Norte Innovation for Defense and Aerospace (IDEA) Engine is working to fuel the growth of a dynamic aerospace and defense manufacturing sector in West Texas and Southern New Mexico. The collective vision of IDEA Engine's collaborators is to leverage regional assets and strengths to:

- **Re**-imagine the Paso del Norte region as an advanced manufacturing and knowledge-based economy.
- **Re**-invent our economy to produce catalytic growth that increases the share of jobs in advanced industries in the region from 3.2% to 25%.
- **Re**-deploy our manufacturing capabilities to support U.S. aerospace and defense industries.
- **Re**-build our talent force with next generation STEM skills for aerospace and defense manufacturing, guaranteeing the entire community a path to the middle class.

The NSF can accelerate this growth by investing in the Paso del Norte IDEA Engine. With the NSF's catalytic investment, the IDEA Engine will create a scalable model for reinvigorating the failing American defense industrial base through the democratization of innovation for small and medium manufacturers and by developing robust workforce development pipelines that tap our hidden talent pool to join the aerospace and defense (A&D) manufacturing workforce. The region historically lags national averages for income because of a deficit in innovation and STEM jobs in advanced industries. NSF's investment in the IDEA Engine will guarantee the Paso del Norte region a fair share of American prosperity by bringing much needed economic growth and prosperity to a region that is 79.3% Latino.

Societal and Economic Challenges

"Vital Signs 2022" published by the National Defense Industrial Association (NDIA) sounded the alarm about the health and readiness of our nation's defense industrial base (NDIA 2022). For the first time, the NDIA gave the defense industrial base an overall "unsatisfactory, failing" grade. This report added to the drumbeat of alarm expressed by the Administration, Congress, and the Department of Defense (DoD). Our material support for the war in Ukraine has further illuminated weaknesses in our defense industrial supply chain (Herbst and Cafarella 2022). The signs of vulnerability in our defense industrial base are a call for immediate and urgent action and sustained focus and investment. This moment demands a comprehensive course of action that includes enlisting new talent, manufacturers and startups into the defense industrial base and building a public innovation infrastructure that addresses our failure to take critical defense-applicable innovation to market.

With support from the NSF, the IDEA Engine seeks to address critical vulnerabilities highlighted in "Vital Signs 2022." Specifically, the IDEA Engine will address innovation, competition, industrial security, and production inputs including the costs of goods, workforce productivity, workforce diversity, and the STEM talent pool.

In its "Technology Vision for an Era of Competition," the Department of Defense (DoD) indicates that "strategic competitors to the United States have greater access to commercial state-of-the-art technologies than ever before and can wield these technologies to be disruptive to America's interests and its national security… In an ever shifting and fast-moving global environment, technological advantage is not stagnant and the DoD cannot rely on today's technology to ensure military technological dominance tomorrow. It is imperative for the Department to nurture early research and discover new scientific breakthroughs to prevent technological surprise. The Department must harness the incredible innovation ecosystem both domestically and globally in order to stay ahead of our competitors." (Shyu 2022)

Small and Medium Manufacturers (SMMs) remain extraordinarily critical to maintaining a vibrant and secure U.S. A&D supply chain, but fewer and fewer SMMs are participating in the defense industrial base (NDIA 2022). With a smaller workforce, limited resources, and non-existent research and development infrastructure and budget, SMMs are virtually excluded from the highly stratified U.S. innovation ecosystem. The U.S. innovation apparatus is highly concentrated in research universities, federal laboratories, prime contractors, technology start-ups, and R&D firms who are often the recipients of the largest share of federal innovation funding for small businesses. This concentration creates significant structural barriers for innovation to flow from this constrained environment to SMMs. The erosion of Tier 2 and Tier 3 suppliers from the defense supply chain is partly due to SMMs' inability to connect to and source innovation for reinvention and survivability.

The IDEA Engine is tackling this national challenge to reinvigorate our once vital manufacturing base and to increase economic mobility for our region's residents through the creation of innovation jobs. The Paso del Norte region is an eight-county region that sits on the U.S./Mexico border in the American Southwest. It includes six counties in West Texas (El Paso, Hudspeth, Brewster, Culberson, Jeff Davis and Presidio) and two in Southern New Mexico (Doña Ana and Sierra County). The cities of El Paso and Las Cruces are the largest metropolitan areas in the largely rural Chihuahuan desert community. The region has a population of 1.1 million people, with El Paso (860,485) and Doña Ana (218,157) counties home to 96.9% of its residents. This region is predominantly Latino (79.3%) (U.S. Census Bureau 2022).

The U.S. Economic Development Administration (EDA) designates six of the eight counties (Culberson, Doña Ana, El Paso, Hudspeth, Presidio, and Sierra) as Persistent Poverty Counties, meaning that poverty rates there have stayed above twenty percent for at least 30 years. It is likely that poverty rates in these counties will persist at high levels without significant structural change in an economy that is predicated on the growth of STEM occupations. The median income for families in this region is well below the national average. The national median income in 2021 was $70,784 while the average median income of the Paso del Norte region was $46,190, a gap of $24,594. The gap between average median income in these counties and the national median income has only widened since 1997 when the gap was $14,258 (U.S. Census Bureau).

One reason for low incomes is the lack of high-paying STEM jobs in the region, relative to other markets. Workers who receive STEM training in local universities, community colleges, and technical schools tend to leave the region for work because of the lack of STEM occupations and the relatively low pay compared to other markets.

Paso del Norte Regional Assets and Opportunities

The Paso del Norte region is the ideal location from which to launch a revitalized American A&D manufacturing sector. It has the right alignment of public and private investment and partnership directed at facilitating the advance and commercialization of core technologies vital to maintaining our nation's security. The Aerospace Center and the W.M. Keck Center for 3D Innovation (Keck Center) anchor this effort through their research preeminence in aerospace, defense and advanced manufacturing technologies and through their approach to talent development. The Aerospace Center and Keck Center have significant expertise in five of the 14 critical technology areas highlighted by the Department of Defense (DoD) in its "Technology Vision for an Era of Competition" (Shyu 2022): advanced materials, trusted AI and autonomy, space technology, renewable energy generation and storage, and hypersonics. The centers also have a rare capability that is in urgent demand given the nation's STEM talent crisis: they produce highly skilled engineering graduates with a demographic profile that is underrepresented in the nation's aging, mostly white male A&D workforce.

The **Aerospace Center** has expanded beyond its initial research focus when it was founded in 2009 as the Center for Space Exploration Technology Research. In partnership with NASA, the DoD, the Department of Energy, and many A&D industry partners, this premiere, minority-serving research center explores new technologies and challenges in space, aeronautics, defense, and energy using digital tools

and skills that are transforming the way engineers design, build and test. The Aerospace Center has grown from a 3,000 square foot lab employing 30 students as research assistants to over 35,000 square feet in laboratory space and 8,000 acres of test facilities employing 200 students today and still growing. The Aerospace Center's mission is to educate and prepare a diverse, future-ready workforce for high-paying, in-demand careers through project-based learning in applied, cutting-edge research in aerospace, defense, and energy.

The **W.M. Keck Center for 3D Innovation**—a unique multidisciplinary research facility—is leading the additive manufacturing revolution through applied research in the use and development of additive manufacturing (AM) technologies with primary focus areas in AM Technology Development, Engineered and Structured Materials, and Advanced AM Applications. The Keck Center was established in 2000 and is arguably the best equipped academic AM laboratory focusing on additive manufacturing (AM) in the world. This center occupies 13,000 square feet of floor space within the university, with an additional 17,000 square feet of floor space in downtown El Paso as research infrastructure. The Keck Center houses more than 100 AM systems with powder-based metal fabrication capabilities unparalleled at any university along with multiple UTEP-developed custom hybrid polymer AM systems used, in part, for fabricating unique 3D electronic structures. The Keck Center boasts combined facilities for AM (metal, polymer, ceramic, electronics, and large-area), subtractive manufacturing, CAD and simulation, reverse engineering, metrology, materials characterization, mechanical testing, post-processing, synthetic and analytical chemistry, and cell culture.

The Aerospace Center and the Keck Center are frequent collaborators who have also developed and scaled a solution to the STEM talent crisis facing our nation with a student-centered research model unlike any other in the nation. One of the biggest threats to our nation's global competitiveness is our inability to tap the full breadth of our diverse talent pool for participation in the aerospace, defense, and advanced manufacturing industries. The Centers' research programs exist as a vehicle for the economic mobility of their students, who join the centers as paid research assistants. Over the last decade, these two centers have placed more than 1,000 of their graduates in high-paying careers in the A&D workforce at employers like NASA, Lockheed Martin, and Blue Origin. UTEP is an open access, R1 institution, and the students that are employed as research assistants reflect the demographics of the communities that they serve. The Centers' students are 80% Latino, two-thirds come from families who make less than $37,000 and half of their students are the first in their family to attend college. The two centers are national leaders in training female engineers—29% of their students are women, which is much higher than peer institutions—however they won't be satisfied until 50% of their research assistants are female.

Both centers have expanded their talent development expertise to focus on building a pipeline to the middle-skill workforce for A&D manufacturing. Partnering with the Western Technical College, the Aerospace Center developed the curriculum for an associate degree in Aerospace and Defense Technologies. The Aerospace Center is now working with the El Paso Community College to build short skills development courses. With funding from the DoD, the Keck Center has developed a robust curriculum for additive manufacturing that has trained over 1,000 DoD personnel across more than 30 military sites (national and international), including warfighters and support staff, engineers and technicians, and DoD contractors.

Both centers are deeply connected to the national A&D ecosystem through long standing partnerships with Lockheed Martin, Blue Origin, NASA, the DoD, and Siemens. The two centers rely on a strong working collaboration with the National Center for Defense Manufacturing and Machining (NCDMM) to inform their workforce and economic development efforts. NCDMM is driving manufacturing innovation throughout the defense industrial base to ensure the U.S. warfighter always

has a superior advantage. As a key national partner, NCDMM has helped facilitate the rapid growth of both centers through funding, research, market expertise, and partner connections.

In addition to research and talent development strengths, the region contains significant airspace proving ground assets, military installations and anchor A&D employers. The Paso del Norte's desert climate offers ideal flight test conditions: a stable, mild climate and a dry clear atmosphere. The region also features the nation's largest open-air test range: White Sands Missile Range (WSMR). WSMR has over 4,000 square miles of surface-to-space airspace. It is the only airspace in the continental U.S. that is not controlled by the Federal Aviation Administration (FAA). WSMR has direct control over the airspace and commercial flights are not allowed through its airspace. This tightly controlled airspace is perfect for horizontal and vertical flight testing.

Spaceport America in Sierra County has access to this airspace through its agreements with WSMR. It gains access to an additional 2,000 square feet of airspace through an agreement with the FAA. This airspace access was one reason why Virgin Galactic choose to locate its launch facilities at Spaceport America as its anchor tenant. HAPS Mobile/AeroVinronment, UP Aerospace and SpinLaunch are also tenants at the Spaceport.

The low population densities of the rural portions of the Paso del Norte region has attracted Blue Origin to this region. Blue Origin uses its spaceport in Culberson to launch its New Shepherd and New Glenn rockets. It also uses this facility as a test stand for its rocket development projects.

The region is also home to Fort Bliss, one of the military's most significant power projection platforms that trains, sustains, mobilizes, and deploys members of the joint team to conduct global, full spectrum operations in support of the national military strategy. Fort Bliss is home to the 1st Armored Division, the 32nd Army Air and Missile Defense Command and Joint Modernization Command. Fort Bliss also transitions approximately 19,000 soldiers a year into civilian life, representing a significant potential workforce for A&D manufacturing.

The IDEA Engine's vision is to use these regional assets as anchors for the growth of a significant regional A&D manufacturing industry. Over last several years, the Aerospace Center and Keck Center have expanded their focus beyond the campus to the community as a way to nurture economic opportunity for their graduates. This work led to a regional economic development effort called El Paso Makes: Innovation Network for Manufacturers that leverages the research preeminence, talent development and industry connections of the two sister centers to develop an advanced technology-based industrial economy for the region and an integrated workforce with all-skills spectrum for small and medium high-tech business expansion.

Alignment with Current Maturity Phase of Innovation Ecosystem and State of Practice

Over the last two decades, the Paso del Norte region has experienced a transformational expansion of aerospace, defense and advanced manufacturing research, infrastructure, and talent development that includes two new spaceports and significant and rapid growth of the Aerospace Center and the Keck Center. Efforts to leverage university-based research assets for economic development impact began in Southern New Mexico in 2004 with the startup of the Arrowhead Center at New Mexico State University and in West Texas in 2017 with an economic development partnership called El Paso Makes. These economic development partnerships have grown out of UTEP and NMSU and are supported by both the public and the private sector. The Paso del Norte IDEA Engine in its nascent phase of growth knits together the economic development potential of the entire region for maximum impact.

The El Paso Makes partnership—which is led by the Aerospace Center and the Keck Center at UTEP—includes the City of El Paso, the County of El Paso, Workforce Solutions Borderplex, the Regional Council of Governments, the El Paso Chamber and our national partner, the National Center for Defense Manufacturing and Machining. The El Paso Makes partnership created the A&D Innovation Network for Manufacturers to provide services and support to West Texas manufacturers to make them more

competitive and to help them compete for business in A&D markets. A $3 million award from the EDA and the City helped expand the effort in 2021 by funding core services needed to help SMMs compete for business in A&D markets. The strength of those partnerships was a significant contributor to the region's successful bid for a $40 million Build Back Better Regional Challenge grant (BBBRC). This grant, coupled with matching funds of $43 million in community commitments, significantly expanded support for SMMs and startups in West Texas. This funding was a down payment on the development of the Advanced Manufacturing District, a purpose-built manufacturing campus that will help SMMs overcome some of the barriers to entrance into A&D markets through shared physical, cybersecurity, and digital infrastructure. The BBBRC also provides new resources to connect SMMs to innovation through the Aerospace Center and Keck Center.

The IDEA Engine will knit together the El Paso Makes initiative with significant public and private investment and activity in Southern New Mexico for maximum economic impact through regional coordination. Spaceport America coordinates their economic development activities and marketing efforts with other Southern New Mexico partners to include Arrowhead at New Mexico State University, Dona Ana County, the City of Las Cruces and the Mesilla Valley Economic Development Alliance. These regional partners have identified A&D manufacturing as critical to growing their economy.

Major Gaps to be Addressed

The U.S. is lagging our strategic competitors in maturing and taking to market critical defense technologies. More focus and funding on applied research in defense critical technologies is needed, and the country needs to significantly expand the impact of all research centers of excellence working in these technologies, especially those with an intentional focus on talent development to meet the urgent demands of this workforce. In addition, the U.S. innovation apparatus is highly concentrated with significant structural barriers to bringing applied research to market. Too often quality applied research that could advance A&D systems lies dormant in laboratories and R&D firms.

With the rapid decay of our defense industrial base, the country must urgently tackle the structural barriers that prevent small and medium manufacturers from successfully competing for work in the A&D sector. The Paso del Norte region is home to a nimble and resilient base of small and medium manufacturers with capabilities that are in demand in A&D. Initial resources and infrastructure available to these manufacturers support their growth into this sector but left unaddressed is affordable access to use-inspired research and innovation infrastructure.

Development of middle-skill talent is imperative for building a technology economy in anchored the Paso del Norte region in the A&D manufacturing sector. As the rapid growth of this sector continues and as existing manufacturers transition to advanced production and new manufacturers are added to support the defense industrial supply chain, a sustained supply of mid-skill talent is critical to maintain and grow the ecosystem. The U.S. is at the tipping point for manufacturing skill gaps, especially in the A&D sector. The only way to sustain global competitiveness and technical superiority is to build a skilled workforce that taps the full breadth of U.S. talent to include Latinos, Blacks, and women—all currently underrepresented in this workforce.

Creating Innovation Sector Jobs

To revitalize the American defense industrial base and to propel the Paso del Norte region into economic parity and competitiveness, the IDEA Engine will foster innovation in and affordable access to defense-critical applied research and development and exponentially expand our nation's A&D talent-force.

More than 70% of components, subsystems, and systems integrated into A&D products by Prime Contractors originate from the supply chain. The health of the U.S. Defense supply base depends on the robustness and competitiveness of the supply chain tiers. However, without access to innovation, lower tier suppliers are highly vulnerable to becoming uncompetitive, unprofitable and in some cases obsolete. The sector urgently needs an open innovation ecosystem with a public innovation infrastructure

backhaul that capitalizes digital transformation of product and process development for supporting SMMs.

With support from the NSF, the IDEA Engine seeks to address critical vulnerabilities highlighted in "Vital Signs 2022" and defense critical technology needs by developing an open innovation architecture that is anchored by the principal of equitable access to innovation and innovation infrastructure. Specifically, the IDEA Engine proposes to:

1. Develop a **Public Innovation Architecture** to support the use-inspired Research and Development (R&D) needs of SMMs in the Paso del Norte region.
2. Develop **Public Innovation Infrastructure** with next-generation digital engineering capabilities to support product and process innovation for Paso del Norte SMMs to support the A&D supply chain.
3. Deploy **Talent Infrastructure** focused on economic mobility for Paso del Norte residents through the development of in-demand skills needed by A&D industries.

NSF's investment in our region will expand access to the middle class through skills development training, significantly expand the SMMs that are the backbone the nations' defense industrial base and provide infrastructure necessary for the growth of our anchor A&D employers.

Public Innovation Architecture

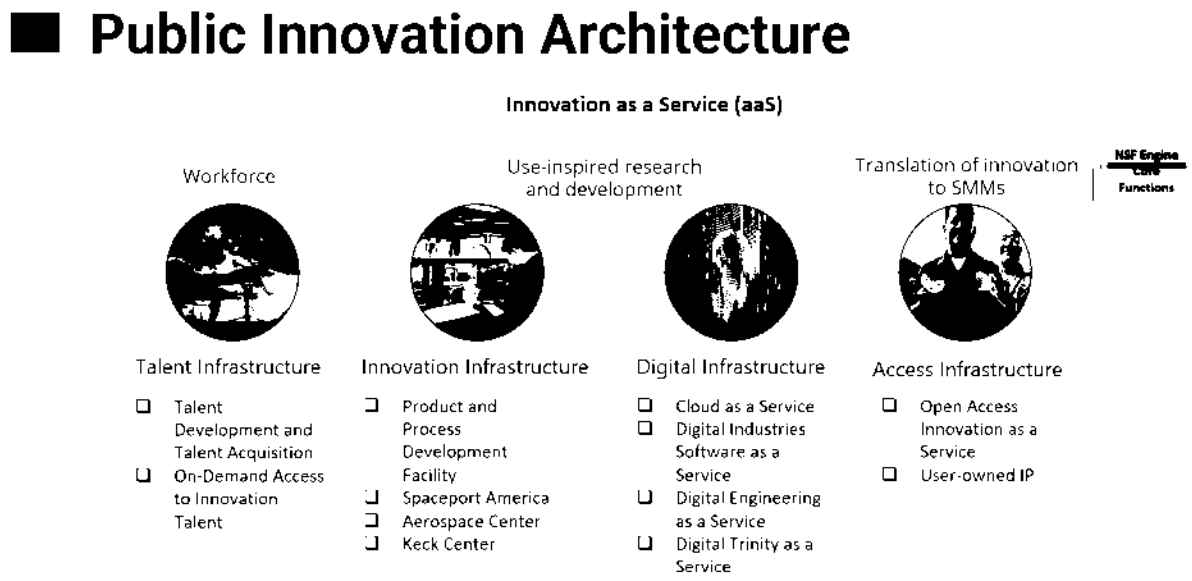

Figure 1: Public Innovation Architecture

The IDEA Engine's **Public Innovation Architecture** will be a creative, open innovation ecosystem that fosters engineering and manufacturing innovation. It will speed up capability development of regional SMMs with democratic and open access to use-inspired R&D. The Public Innovation Architecture is a way to disrupt the traditional R&D process by de-stratifying innovation ecosystems to ensure broad and affordable access to innovation processes. The IDEA Engine will provide Innovation as a Service (aaS) to SMMs in the Paso del Norte Region. **Figure 1** shows the framework of the IDEA Engine's Public Innovation Architecture.

The Paso del Norte IDEA Engine's use-inspired R&D strategy will be anchored by the *User-Defined,* and *User-Engaged* paradigm needed to provide innovation support and long-term capacity development of SMMs for the A&D supply chain. The R&D tasks undertaken by the IDEA Engine will intersect with the SMMs' innovation and growth aspirations as well as product and process innovation demanded by the continuously evolving A&D product characteristics and market demands. IDEA Engine's use-

inspired R&D strategy will be distinctly different from the technical support generally provided by various Manufacturing Extension Programs (MEPs). The overarching objectives of IDEA Engine are to bring the SMMs within an Open Innovation Architecture so that they can innovate new products and processes, improve existing products and processes, acquire new talents, and create long-term value and growth for their enterprise. The R&D tasks supported by the IDEA Engine will remove capital, infrastructure, and talent barriers to allow the SMMs to be highly innovative entities. The IDEA Engine anticipates that the most Use-Inspired R&D tasks will be within the Cluster Strengths (**Figure 2**) of the nearly existing 300 SMMs in the Paso del Norte region.

The Aerospace Center and Keck Center are the two top-performing university research centers at UTEP with an active grant and contract portfolio of more than $150 million. They provide institutional and regional strategic capabilities in A&D technologies and advanced manufacturing. Both centers have capabilities to support sub-pilot to commercial scale technology development, prototype to commercial product demonstration and commercialization, as well as test and evaluation. However, an overarching focus of these centers is to create a meaningful Launchpad for the economic development of the Paso del Norte region by providing the expertise, facilities, and capabilities for meaningful collaboration among industries, government agencies, and regional partners and stakeholders, along with the local small, medium, and large technology-based business enterprises clustered around a common theme of Innovation for Prosperity. The Aerospace Center and Keck Center operate Industry Recharge Centers to provide innovation services to industry partners. With funding from the NSF, the Centers will provide use-inspired research and development tasks to Paso del Norte SMMs competing for A&D work through their Recharge Centers. This open access to R&D would be a competitive differentiator which could meaningfully impact the ability of an SMM to win a contract. Because the R&D tasks are funded by NSF for a specific SMM use it would not be restricted by the traditional institutional IP ecosystem which too often creates a barrier for innovation to translate to the marketplace.

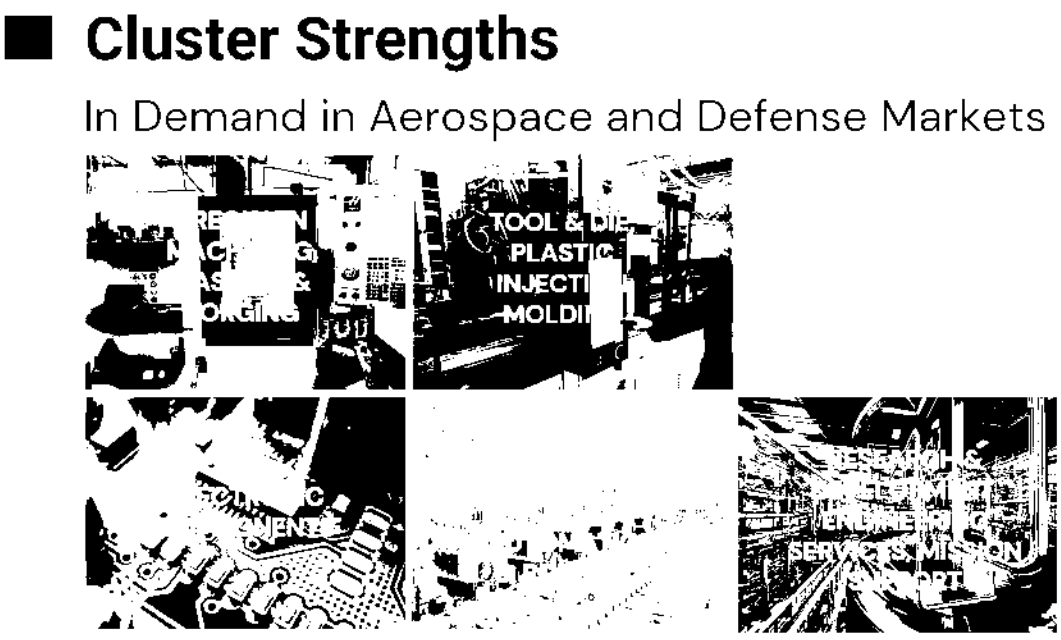

Figure 2: Cluster Strengths

The Cluster Strengths are also mapped with 5 of the 14 critical technology areas highlighted by the Department of Defense (DoD) in its "Technology Vision for an Era of Competition," including *advanced materials, trusted AI and autonomy, space technology, renewable energy generation and storage*, and *hypersonics* that are also mapped to the core capabilities of the Aerospace Center and the Keck Center.

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Public Innovation Infrastructure

The public innovation infrastructure that will be built and made accessible through the IDEA Engine will be a combination of hard and soft infrastructure: a highly skilled workforce, physical infrastructure, digital infrastructure, and access to innovation. The IDEA Engine will combine open innovation concepts with the emerging digital engineering paradigm and other resources to create an innovation platform for Paso del Norte SMMs to compete in A&D markets. This public infrastructure will reduce costs for start-ups and SMMs while increasing access to cutting-edge design and testing tools needed to spur growth.

The IDEA Engine proposes to build a **Product and Process Innovation Facility (PPIF)** to serve as the integration hub and headquarters for the IDEA Engine with the core mission of translating research and development to practice. The PPIF will be built by the City of El Paso at the Advanced Manufacturing District and managed by NCDMM through a subsidiary that NCDMM will create for the IDEA Engine. The PPIF will house the IDEA Engine's administrative operations, High-Bay Product and Process Development Facility, Conventional and Additive Manufacturing Capabilities, and the Aerospace and Defense Technologies and Manufacturing Training Center (ADTech@El Paso). NCDMM will also use this subsidiary to coordinate access to the use-inspired R&D and research infrastructure at the Aerospace Center and the Keck Center, access to product and process innovation at the PPIF, access to A&D test capabilities at Spaceport America, and access to digital infrastructure for SMMS located in the region.

Additional Public Innovation Infrastructure will include **Spaceport America** and the expansive research infrastructure of the Aerospace Center and the Keck Center. Spaceport America's FAA-licensed launch complex, situated on 18,000 acres adjacent to the U.S. Army White Sands Missile Range, has a rocket-friendly environment of 6,000 square miles of restricted airspace, low population density, a 12,000-foot by 200-foot runway, vertical launch complexes, and about 340 days of sunshine and low humidity.

Funding from the NSF will expand the Aerospace Center's research infrastructure at their Tech1 Campus at the Fabens Research Airport with a new **Industry Commons**. This Industry Commons will be available to startups working to mature and commercialize A&D technology with innovation support from the Aerospace Center. The Keck Center will use funding from the NSF to develop and equip available space in their **3D Engineering and Additive Manufacturing Technologies Center** in Downtown El Paso. This new space will expand their research capabilities to support SMMs as they adopt additive manufacturing technologies into their production processes.

Digital infrastructure will be built to support SMMs as part of the public innovation infrastructure. Digital engineering is a cutting-edge manufacturing paradigm that accelerates the design and production

process by shifting design, testing, and lifecycle management to digital environments. The DoD has mandated that all its suppliers implement digital engineering processes, leading to a rapid adaptation of the workflow in the A&D industry. The IDEA Engine's Digital Infrastructure will include an Industrial Cloud that is compliant with the DoD's Cybersecurity Maturity Model Certification (CMMC) and that hosts digital industries software. This digital infrastructure is increasingly necessary to compete for A&D contracts but the expense required to build it is out of reach for most SMMs.

Talent Infrastructure

The Paso del Norte's traumatic experience with the loss of tens of thousands of middle-income manufacturing jobs in the 1990s as a result of NAFTA and globalization left many families with the conclusion that college was the only path left to join the middle class. Instead of evolving, technical education atrophied as schools resolved to focus on college-readiness instead. Undervaluing technical education and expertise came with significant costs to residents and the economy. Employment in A&D industries, even for technicians, provides a pathway to the middle class, but there is not enough skills-based training in place to meet the labor demands. For some residents, college is not the right fit, or is simply a luxury out of reach. For these residents, there are few affordable technical education programs to prepare them for employment in high-demand industries like A&D manufacturing. Without intentional educational pathways, 27% of our workforce is employed in low wage occupations making less than living wage with no prospects for social mobility (Workforce Solutions Borderplex 2022).

A&D manufacturers often complain that new graduates of engineering and technician programs often don't have the skills needed to be immediately productive and so require additional expensive onsite training to skill them to the demands of their new job. The Aerospace Center and the Keck Center address this skills gap by employing students in their labs as research assistants. Student classroom learning of theory and practice is integrated with industry-aligned skills development in their research labs in an iterative Design-Build-Test Cycle made up of multi-disciplinary teams. This intentional skills development has produced graduates that are in high demand because of their ability to immediately provide value to their new employers.

The Paso del Norte IDEA Engine will develop Aerospace and Defense Technologies and Manufacturing Training Center (ADTech), an innovative skills development platform to train the workforce that is in high demand in A&D and advanced manufacturing. As national leaders in creating educational pathways built to support student economic mobility and experts on the in-demand skills needed by industry, the Aerospace Center and the Keck Center will partner with school districts, community colleges, technical schools and training programs to deploy an agile, skills-based training platform that takes advantage of an open talent ecosystem, vocational training, digital learning, and comprehensive partnership coordination that meets the needs of A&D employers.

ADTech will be a strategic deployment of talent development programs across the region that will include three components:

1. Development of Career and Technical Education (CTE) curriculum that supports A&D manufacturing that will be adopted by Paso del Norte high schools.
2. Skills development of engineering students and technician students from the region through employment as research assistants and research technician interns at the Aerospace Center, Keck Center, and PPIF.
3. Establishment of four interoperable training centers in El Paso, Las Cruces, Van Horn, and Alpine and two mobile centers to serve remote areas.

School Districts are increasingly working to revitalize their CTE programs around industry sectors that are in high demand and that pay a living wage. The growth of the A&D manufacturing in the region is an opportunity for their students either through a career or college path. ADTech will develop CTE curriculum that aligns with curriculum standards and requirements at the Texas Education Agency and the New Mexico Public Education Department and that also meets the workforce demands of the A&D

manufacturers. ADTech will work with local school district to adopt this curriculum in area high schools, train high school teachers to support the CTE programs and then work to place high school students with ADTech CTE certifications in A&D manufacturing jobs or in postsecondary educational that build from the student's ADTech CTE certifications. High school graduates who receive ADTech certification will have the option to immediately enter the A&D workforce with in-demand skills and certifications. These jobs pay wages in excess of the region's living wage.

An investment by the NSF will expand skills development for engineering students and technician students through more paid research assistant and research technician internship opportunities at the Aerospace Center, the Keck Center, and the PPIF. All R&D tasks requested through the PPIF will by supported by these positions. The Aerospace Center and Keck Center have expanded access to these positions to students from other schools and have long offered these positions to undergraduates. This investment will expand access to more students from schools in the region to include NMSU, Sul Ross University, El Paso Community College, Dona Ana Community College, Odessa Community College and Western Technical Institute. It will also provide new opportunities for technician students. Students who work in research laboratories—particularly those with a focus on applied research and use-inspired research—are able to learn the skills that are in demand in industry and are much more marketable when they graduate.

ADTech will also establish of four interoperable training centers in El Paso, Las Cruces, Van Horn, and Alpine and two mobile centers to serve remote areas that will focus on training residents who have a high school degree or some college but are currently earning less than the living wage. Ninety-one thousand Paso del Norte residents, 27% of our workforce with a high school degree or some college, are currently earning less than the living wage ($14.29). Through these training centers, ADTech will place low wage earners in our region, who are 79% Latino on a path to the middle class.

Through these training centers, ADTech will accelerate the development of skilled technicians to support the needs of A&D manufacturing employers. Employees working in this sector receive wages and benefits far higher than the regional average. The median non-STEM occupation hourly wage in Paso del Norte is $14.42; while median hourly wage for STEM occupations is at $30.58 (Workforce Solutions Borderplex 2020). Programming at these training centers is designed to tackle the barriers preventing low wage earners from pursuing skills training. It is also designed to meet Fort Bliss' requirements for Career Skills Programs offered to transitioning soldiers. Training courses are short, and all trainees will receive stipends for the duration of the training. Many residents working in low-wage occupations cannot afford to forgo a paycheck, even for training that results in higher wages. Training will be tailored for industry-specific needs in in-demand occupations, providing on-the-job/internship/apprenticeship training with prospective employers to increase the odds of successful job placement.

Structured as stackable credentialing (independent/lattice, supplemental/value-added, and progressive), the ADTech training centers will recruit low-wage earners who have barriers that prevent them from pursuing higher education or additional skills training. ADTech @El Paso will also recruit from the talent pipeline of the nearly 19,000 soldiers transitioning from Fort Bliss annually. None of the current approved Career Skills Programs offered by Fort Bliss build on the technical skills—such as operating and maintaining weapons systems—that the soldiers learned while in service. These skills are in high demand in A&D manufacturing but there are limited opportunities available to soldiers at Fort Bliss to credential and build on these skills to help them transition to civilian employment.

Each training program will consist of 12 weeks of in-person, remote, and hands-on training and 8-12 weeks of on-the-job/internship/apprenticeship training with prospective or current employers or at the Aerospace Center, Keck Center, or PPIF. Trainees will receive a $480 weekly stipend, as well as a wide range of traditional, non-traditional certification and industry-recognized credentials through the program. IDEA Engine partners will develop job placement services and on-the-job training with prospective employers to guarantee employment after the successful completion of training. A

preliminary list of industry-recognized certifications trainees may acquire include Associate Certified Electronics Technician, Communications Journeyman's Certification, Fiber Optics Certification, Soldering Certification, Cable Wire Harness Certification, and OSHA 30-hour Certification. Industry partners have identified key in-demand positions where the workforce is in short supply. These positions (**Figure 4**) will be the initial focus of the training centers but the program will be built to be nimble with the ability to react quickly to market demands.

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ADTech will significantly expand our region's skilled talent force to support the growth of A&D manufacturing, and it will expand the path to the middle class for low wage earners.

The University of Texas at El Paso (UTEP)—a leading Hispanic Serving Carnegie Classification Research 1 institution—will have the primary responsibility for integrating and implementing the project and managing the Paso del Norte IDEA Engine governance.

Core to the success of the IDEA Engine's Public Innovation Architecture and Public Innovation Infrastructure is the capability integrations of nine committed IDEA Engine partners (**Fig. 5**).

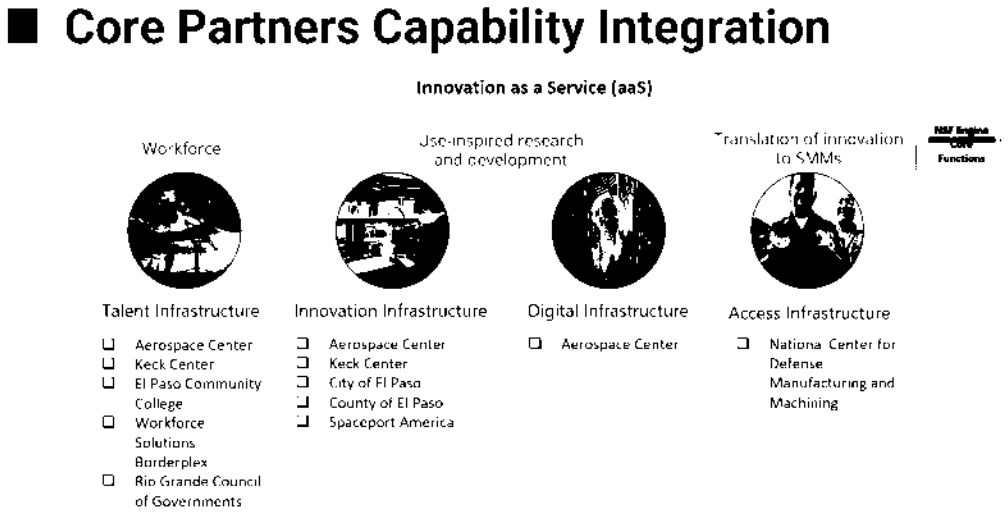


Figure 5: Core Partners Capability Integration

Aerospace Center	• Manage governance • Supply IDEA Engine Management and Coordination	• Partner coordination for maximum impact
Aerospace Center	• Coordinate ADTech implementation • Develop ADTech Career and Technical Education (CTE) curriculum to be adopted by area high schools • Train high school teachers to teach ADTech CTE curriculum • Develop A&D technologies curriculum for ADTech Training Centers • Employ Research Assistants and Research Technician Interns on all use-inspired R&D task orders to support their skills development	• A&D systems • Development of curriculum for middle school and high school STEM programs • Development of A&D technologies curriculum for technical schools • Talent development of students whose demographics are underrepresented in STEM
W.M. Keck Center for 3D Innovation	• Develop advanced manufacturing curriculum for ADTech Training Centers • Employ Research Assistants and Research Technician Interns on all use-inspired R&D task orders to support their skills development	• Additive manufacturing, hybrid manufacturing, advanced materials • Development of additive manufacturing training programs • Talent development of students whose demographics are underrepresented in STEM
Workforce Solutions Borderplex	• Design system to recruit trainees for ADTech, provide stipends and ongoing support for trainees and to facilitate job placement • Recruit participants for ADTech • Coordinate input from A&D manufacturers about labor needs • Collect data about participants and program outcome • Manage stipend payments for all trainees and match with additional resources for wraparound services, • Facilitate job placement for trainees	• Development, resourcing and implementation of innovative workforce solutions, particularly for populations who have to overcome structural barriers to enter the job market • Job placement • Tracking labor demand • Tracking workforce development outcomes • Tracking job market gaps
El Paso Community College	• Work with the Aerospace Center and Keck Center to design curriculum and training for ADTech	• Development of workforce training programs, particularly those that

	• Provide training for ADTech training centers • Match NSF resourcing of ADTech with available state and federal funding	support students whose demographics are underrepresented in STEM occupations
Rio Grande Council of Governments	• Coordinate with regional school districts to adopt ADTech curriculum as Career Technology Education courses • Coordinate with smaller governing entities and organizations in the region to recruit SMMs and trainees from rural communities	• Community engagement, creative solutions and partnerships for resourcing under-resourced communities and populations
Aerospace Center	• Coordinate the development of public innovation architecture and infrastructure • Provide use-inspired Applied R&D for SMMs as tasked by the National Center for Defense Manufacturing and Machining • Connect Paso del Norte SMMs with new Public Innovation resources • Provide innovation support to startups who are maturing A&D systems and are located in the Industry Commons	• A&D systems • Digital engineering • Developing programs and resources to support SMMs who want to compete for A&D markets • Database of El Paso SMMs
W.M. Keck Center for 3D Innovation	• Provide use-inspired Applied R&D for SMMs as tasked by the National Center for Defense Manufacturing and Machining • Develop available space at the 3D Engineering and Additive Manufacturing Technologies Center as a part of the Public Innovation Infrastructure • Support public innovation architecture and infrastructure with research expertise	• Additive manufacturing, hybrid manufacturing, advanced materials
City of El Paso	• Design and Construct the Product and Process Innovation Facility in the Advanced Manufacturing District • Serve as master developer of the Advanced Manufacturing District to support growth in this sector • Provide economic development incentives and permitting support to A&D manufacturers expanding in El Paso	• Successful real estate development of the El Paso International Airport's real estate holdings to maximize benefits to economy and to generate revenues for airport operations • Economic development
County of El Paso	• Construct the Industry Commons at the Tech1 Campus as part of the Public Innovation Infrastructure • Serve as master developer of the Tech1 Campus to support growth in this sector	• Capital planning and management • Economic development with a focus on rural areas outside of the El Paso city limits

	• Provide economic development incentives and permitting support to A&D manufacturers expanding the region	
Spaceport America	• Provide affordable access to Spaceport America with NSF funds for SMMs to test and evaluate A&D systems as part of the IDEA Engine's Public Innovation Infrastructure • Connect existing Spaceport America tenants to new Public Innovation resources and to ADTech training resources • Continue recruiting new tenants to Spaceport America using expanded Public Innovation and ADTech resources as an additional incentive	• Spaceport management to support the growth of the commercial space sector and the regional economy
Aerospace Center	• Develop an Industrial Cloud that is compliant with the DoD's Cybersecurity Maturity Model Certification (CMMC) and that hosts digital industries software. • Train SMMs to access digital infrastructure and use digital industries software.	• Developing and managing digital infrastructure • Digital engineering • Skills development for digital engineering, particularly for students whose demographics are underrepresented in STEM
National Center for Defense Manufacturing and Machining	• Set up a subsidiary to operate and manage the Product and Process Innovation Facility (PPIF) • Coordinate access for SMMs to Public Innovation Architecture and Public Innovation Infrastructure through the PPIF • Source and fund aerospace, defense, advanced manufacturing and advanced materials IP with NSF funds and develop mechanism to make accessible and affordable to SMMs in the region • Coordinate innovative teaming with national partners to advance national defense priorities and regional economic development priorities	• A&D manufacturing • Advanced manufacturing • A&D markets • Creative teaming and resourcing to address defense critical technology and workforce challenges

The following Core Leadership Team will be responsible for the successful implementation of the Paso del Norte IDEA Engine. The Aerospace Center will organize monthly coordination meetings of partner organizations to ensure accountability and open communication. The Aerospace Center will work directly with partner organizations to ensure tasks are completed and that projects and outcomes meet expectations and align with NSF requirements.

Ahsan Choudhuri, Ph.D.	Associate Vice President, Aerospace Center, UTEP	• Applied research in A&D systems • Digital engineering, • Talent development of students whose demographics are underrepresented in STEM • Partnering for impact
Ryan Wicker, Ph.D.	Director, W.M. Keck Center for 3D Innovation, UTEP	• Applied research in additive manufacturing, hybrid manufacturing, • Talent development of students whose demographics are underrepresented in STEM • Partnering for impact
Frank Armijo	Chief Executive Officer, IDEA Engine	• Business and technology business strategies for A&D • Global Supply Chain, Contracting and Mergers and Acquisition Strategies • Industry and Media Communications Strategies • Board and Policy Experience • International Trade Compliance and Export Policy Experience • Executive Coaching
Susie Byrd	Executive Director, Aerospace Center, UTEP	• Community and economic development • Partnership coordination • Governance • Project management • Partnering for impact • Development of resources and services to support SMMs who want to compete for A&D markets
Subawardee Leadership Team		
Sam Rodriguez	City of El Paso Chief Operations and Transportation Officer, City of El Paso	• Capital planning and management • Commercial development of airport land holdings to support economic development and airport operations • Economic development
José Landeros	Director of Capital Planning and Management Performance, County of El Paso	• Capital planning and management • Economic development
Leila Melendez	CEO, Workforce Solutions Borderplex	• Development, resourcing and implementation of innovative workforce solutions, particularly for populations who have to overcome structural barriers to enter the job market

Scott McLaughlin	Executive Director, Spaceport America	• Aerospace engineering design • Business development • Economic development in the commercial space sector
Annette Gutierrez	Executive Director, Rio Grande Council of Governments	• Community engagement, creative solutions and partnerships for resourcing under-resourced communities and populations
Steven E. Smith, Ed.D.	Vice President of Instruction and Workforce Education, El Paso Community College	• Workforce education developed to respond to industry demand
Randy Gilmore	Vice President and Chief Development, Officer, National Center for Defense Manufacturing and Machining	• A&D manufacturing • Advanced manufacturing • A&D markets • Innovative partner teaming to solve defense critical issues • Fund development

The Aerospace Center will convene the Governance Board quarterly to report on progress, activities and fund management and to solicit direction about IDEA Engine strategy and resourcing. The Governance Board will be made up of administrative leadership from each partner organization. This Governance Board will be an expansion of the West Texas A&D Manufacturing Coalition Governance Board that was organized to govern the EDA's Build Back Better Regional Challenge Award.

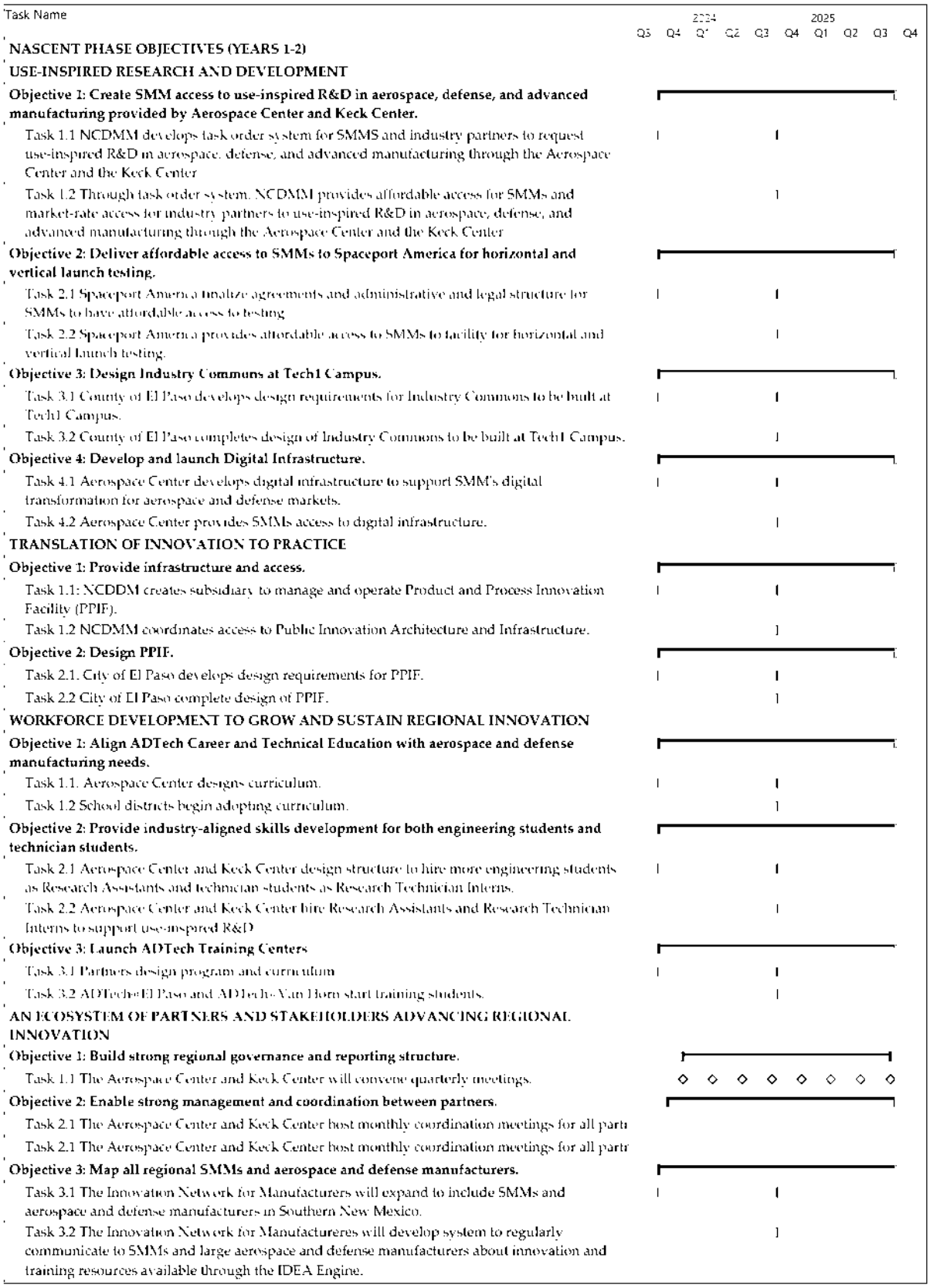
Ahsan Choudhuri, Ph.D.	Associate Vice President, Aerospace Center, UTEP
Ryan Wicker, Ph.D.	Director, W.M. Keck Center for 3D Innovation, UTEP
Tommy Gonzalez	City Manager, City of El Paso
Betsy Keller	County Administrator, County of El Paso
Leila Melendez	CEO, Workforce Solutions Borderplex
Scott McLaughlin	Executive Director, Spaceport America
Annette Gutierrez	Executive Director, Rio Grande Council of Governments
Dr. William Serrata	President, El Paso Community College
Randy Gilmore	Vice President and Chief Development, Officer, National Center for Defense Manufacturing and Machining

The goals of the Paso del Norte IDEA Engine are to:

1. Develop a **Public Innovation Architecture** to support the Use-Inspired Research and Development needs of Small and Medium Manufacturers in the Paso del Norte region,
2. Develop **Public Innovation Infrastructure** with next-generation digital engineering capabilities to support product and process innovation for Paso del Norte SMMs to support the A&D supply chain, and
3. Deploy **Talent Infrastructure** focused on economic mobility for Paso del Norte residents through the development of in-demand skills needed by aerospace and defense industries.

By 2033, the Paso del Norte IDEA Engines' goal is to bring 300 new business entrants from the Paso del Norte region into the defense industrial base to create 4,000 new engineering and technologist jobs and 13,000 new manufacturing and technician jobs.

Implementation Plans



Task Name	'26 Q3	Q4	Q1	Q2	Q3	Q4	'27 Q1	Q2	Q3	Q4	'28 Q1	Q2	Q3	Q4	'29 Q1
EMERGENT PHASE OBJECTIVES (YEARS 3-5)															
USE-INSPIRED RESEARCH AND DEVELOPMENT															
Objective 1: Provide SMMs access to the Aerospace Center and Keck Center's use-inspired R&D in aerospace, defense, and advanced manufacturing.															
Task 1.1 Through task order system, NCDMM provides affordable access for SMMs and market-rate access for industry partners to use-inspired R&D in aerospace, defense, and advanced manufacturing through the Aerospace Center															
Task 1.2 IDEA Engine markets innovation available resources to aerospace and defense manufacturers.															
Objective 2: Provide affordable access to SMMs to Spaceport America for horizontal and vertical launch testing.															
Task 2.1 Spaceport America provides affordable access to its facilty to SMMs for horizontal and vertical launch testing.															
Task 2.2 IDEA Engine markets innovation resources available to aerospace and defense manufacturers.															
Objective 3: Build and launch the Industry Commons at Tech1 Campus.															
Task 3.1 County of El Paso constructs Industry Commons at Tech1 Campus.															
Task 3.2 Startups working to mature into aerospace and defense systems move into Industry Commons.															
Objective 4: Expand access to Digital Infrastructure.															
Task 4.1 Aerospace Center provides access for SMMs to digital infrastructure.															
Task 4.2 IDEA Engine markets available innovation resources to aerospace and defense manufacturers.															
TRANSLATION OF INNOVATION TO PRACTICE															
Objective 1: Provide Infrastructure and access.															
Task 1.1: NCDMM coordinates access to Public Innovation Architecture and Infrastructure.															
Task 1.2 IDEA Engine markets available innovation resources to aerospace and defense manufacturers.															
Objective 2: Build and launch Product and Process Innovation Facility.															
Task 2.1: City of El Paso constructs Product and Process Innovation Facility (PPIF).															
Task 2.2 NCDMM provides SMMs with use-inspired R&D through the PPIF to support product and process improvements															
WORKFORCE DEVELOPMENT TO GROW AND SUSTAIN REGIONAL INNOVATION															
Objective 1: Align career and technical education with aerospace and defense manufacturing.															
Task 1.1: Aerospace Center provides training to high schools who adopt ADTech Curriculum															
Task 1.2 Aerospace Center expands curriculum and number of school district who adopt ADTech CTE															
Objective 2: Provide industry-aligned skills development for engineering students and technician students.															
Task 2.1 Aerospace Center and Keck Center hire Research Assistants and Research Technician Interns to support use-inspired R&D															
Task 2.2 Aerospace Center and Keck Center expands opportunities to students from HBCUs and MSIs that are outside the region															
Objective 3: Increase footprint of ADTech Training Centers.															
Task 3.1 ADTech Las Cruces and ADTech+ Alpine start training students.															
Task 3.2 Mobile ADTech start training students.															
AN ECOSYSTEM OF PARTNERS AND STAKEHOLDERS ADVANCING REGIONAL INNOVATION															
Objective 1: Maintain and build on strong regional governance and reporting struct															
Task 1.1 The Aerospace Center and Keck Center will convene quarterly meetings.	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
Objective 2: Enable strong management and partners coordination.															
Task 2.1 The Aerospace and Keck Center will host monthly coordination meetings of all partners.															
Objective 3: Connect all SMMs and aerospace and defense manufacturers.															
Task 3.1 The Innovation Network for Manufacturers will expand its annual Aerospace and Defense Supplier Summit.															
Task 3.2 The Innovation Network for Manufacturers wil develop and host an annual Aerospace and Defense Technology Forum															

Task Name	'28 Q1	Q3	'29 Q1	Q3	'30 Q1	Q3	'31 Q1	Q3	'32 Q1	Q3	'33 Q1	Q3	'34 Q1
GROWTH PHASE OBJECTIVES (YEARS 5-10)													
USE-INSPIRED RESEARCH AND DEVELOPMENT													
Objective 1: Provide SMMs access to the Aerospace Center and Keck Center's use-inspired R&D in aerospace, defense, and advanced manufacturing.													
Task 1.1 NCDMM scales affordable access for SMMs and market-rate access for industry partners to use-inspired R&D in aerospace, defense and advanced manufacturing through the Aerospace Center and the Keck Center													
Task 1.2 NCDMM developes a scaled-fee structure for innovation resources as SMMs grow.													
Objective 2: Provide affordable access to SMMs to Spaceport America for horizontal and vertical launch testing.													
Task 2.1 Spaceport America scales affordable access to its faciltiies to SMMs for horizontal and vertical launch testing.													
Task 2.2 NCDMM develes a scaled-fee structure for innovation resources developed as SMMs grow.													
Objective 3: Develop Industry Commons at Tech1 Campus													
Task 3.1 Aerospace Center provides innovation support to startups in the Industry Common													
Task 3.2 Startups graduate out of Industry Commons and move to Advanced Manufacturing District.													
Objective 4: Scale access to Digital Infrastructure.													
Task 4.1 Aerospace Center scales access to digital infrastructure for SMMs.													
Task 4.2 NCDMM develops scaled fee structure for innovation resources as SMMs grow.													
TRANSLATION OF INNOVATION TO PRACTICE													
Objective 1: Provide Infrastructure and access.													
Task 1.1: NCDMM coordinates access to Public Innovation Architecture and Infrastructure.													
Task 1.2 NCDMM develops a scaled-fee structure for innovation resources as SMMs grow.													
Objective 2: Develop Product and Process Innovation Facility.													
Task 2.1. NCDMM scales access for SMMs to use-inspired R&D through the PPIF to support product and process improvements.													
Task 2.2 NCDMM develops a scaled-fee structure for innovation resources as SMMs grow.													
WORKFORCE DEVELOPMENT TO GROW AND SUSTAIN REGIONAL INNOVATION													
Objective 1: Align career and technical education with aerospace and defense manufacturing													
Task 1.1. Aerospace Center expands curriculum and number of school district who adopt ADTech CTE.													
Objective 2: Provide industry-aligned skills development for engineering students and technician students.													
Task 2.1 Aerospace Center and Keck Center hire Research Assistants and Research Technician Interns to support use-inspired R&D.													
Task 2.2 Aerospace Center and Keck Center expands opportunities to students from HBCUs and MSIs that are outside the region.													
Objective 3: Scale ADTech Training Centers.													
Task 3.1 ADTech scales its programs at all locations.													
Task 3.2 ADTech scales its mobile program.													
AN ECOSYSTEM OF PARTNERS AND STAKEHOLDERS ADVANCING REGIONAL INNOVATION													
Objective 1: Maintain and build on strong regional governance and reporting structure.													
Task 1.1 The Aerospace Center and Keck Center host quarterly meetings.													
Objective 2: Enable strong management and coordination between partners.													
Task 2.1 The Aerospace Center and Keck Center host monthly coordination meetings of all partners.													
Objective 3: Connect all SMMs and aerospace and defense manufacturers.													
Task 3.1 The Innovation Network for Manufacturers expands its annual Aerospace and Defense Supplier Summit.													
Task 3.2 The Innovation Network for Manufacturers expands its annual Aerospace and Defense Technology Forum.													

Use-Inspired Research and Development

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(b)(4)

Translations of Innovation to Practice

To ensure coordinated access to use-inspired R&D, the IDEA Engine proposes to:

- Build a Product and Process Innovation Facility (PPIF) to serve as the integration hub and headquarters for the IDEA Engine with the core mission of translating research and development to practice.

The same state of practice, metrics for success and data gathering and tracking from the Use-Inspired R&D section apply to this section as they are fully integrated with the same goal.

Workforce Development to Grow and Sustain Regional Innovation

To exponentially expand our region's skilled talent force to support the growth of aerospace and defense manufacturing and to expand pathways to the middle class, the IDEA Engine's ADTech will:

1. Develop of Career and Technical Education (CTE) curriculum that supports A&D manufacturing that will be adopted by Paso del Norte high schools.
2. Provide skills development training of engineering students and technician students from the region through employment as Research Assistants and Research Technician Interns at the Aerospace Center, Keck Center and PPIF.
3. Establish 4 interoperable training centers in El Paso, Las Cruces, Van Horn, and Alpine and 2 mobile centers to serve remote areas.

Currently, 27% of our workforce is employed in low wage occupations making less than living wage with no prospects for economic mobility (Source: Workforce Solutions Borderplex Analysis). Average earnings per job in aerospace and defense manufacturing sector in the Paso del Norte region is $109,665 which significantly outpaces average earnings for most jobs in the region. ("Growing the Aerospace and Defense Manufacturing Sector in the Paso del Norte Region," December 2022, Lightcast). Creating a path to jobs in A&D manufacturing will create real economic mobility for Paso del Norte residents.

The region's A&D manufacturing sector is more diverse than the national workforce. Sixty-one percent of the Paso del Norte workforce are people of color, compared to only 31% nationally. Our diversity is driven by the large number of Latino workers in the region and the high concentration of Black workers in this sector. Despite defying national trends, our A&D manufacturing workforce is not fully representative of our community's demographics. Latino workers hold 62% of all jobs in the region but only 46% of jobs in this sector ("Growing the Aerospace and Defense Manufacturing Sector in the Paso del Norte Region," December 2022, Lightcast). Women are 50% of our workforce but only hold 22% of jobs in this sector. Through an expansion of training options and a recruitment effort that is highly focused on Latinos, women, rural residents and low wage earners, our goal is to have the A&D manufacturing sector fully represent the demographics of the region as this sector grows.

The Blue Origin Spaceport in Van Horn, Texas and Spaceport America in Sierra County, New Mexico represent a huge opportunity for rural residents to work in innovation jobs close to home. Despite the proximity of these jobs, rural residents don't have access to training that will prepare them to compete for these jobs. ADTech will address this with the placement of training centers in Van Horn and Alpine, Texas and with mobile training centers to access more remote rural areas of the region. The development of ADTech CTE programs that can be adopted by area high schools also expands access to a career pathway to aerospace and defense manufacturing for rural residents.

Metrics for Success

- 4,000 successful job placements in aerospace and defense manufacturing for ADTech participants
- 100% of new job placements result in an increase from prior wages
- 100% of new job placements result in a wage is at least 20% higher than the living wage
- Latinos will make up 60% of all new job placements

- Women will make up 40% of all new job placements
- Rural residents will make up 20% of all new job placements

Workforce Solutions Borderplex will be responsible for data gathering and tracking to measure progress against our goals.

Data Gathering and Tracking

- Demographics of all residents served by ADTech to include race, ethnicity, gender and veteran status and whether they live in an urban or rural community
- Wages at the time of enrollment
- Completion
- Job placement
- Wages in new job

An Ecosystem for Partners and Stakeholders Advancing Regional Innovation

To strengthen our ecosystem for partners and stakeholders advancing regional innovation, the IDEA Engine proposes to:

1. Connect and coordinate the aerospace and defense manufacturing assets and initiatives of West Texas and Southern New Mexico
2. Market the assets of the entire Paso del Norte region including the Public Innovation Architecture and Public Innovation Infrastructure dedicated to serving SMMs and industry
3. Expand the Innovation Network for Manufacturers to include Southern New Mexico

Currently, there is coordinated alignment in West Texas to grow A&D manufacturing and coordinated alignment in Southern New Mexico to grow the commercial space sector. The Paso del Norte Region will knit together the efforts of each region for maximum economic impact. The governance body and management team will represent all participating entities committed to growing this innovation ecosystem and work to grow working partnerships between the IDEA Engine and all universities, community colleges, technical schools, school districts, economic development agencies, and city and county governments in Paso del Norte.

The Innovation Network for Manufacturers has an active membership of 50 manufacturers. We will grow that number to 300 by enrolling more in El Paso and West Texas and adding Southern New Mexico to our region of service. The Innovation Network will connect SMMs to the Public Innovation Architecture and Public Innovation Infrastructure and to new customers in A&D markets. The Innovation Network has a strong industry partners network committed to sourcing suppliers from our region to include Blue Origin, Lockheed Martin, Bell Helicopter, Boeing and Raytheon but we will continue to expand this network to support our efforts.

Metrics for Success

- 300 active members of the Innovation Network

The Aerospace Center manages and tracks the number of members in the Innovation Network and their engagement with the Innovation Network services and events.

Deliverables

Goal 1: Develop a **Public Innovation Architecture** to support the Use-Inspired Research and Development needs of Small and Medium Manufacturers in the Paso del Norte region.

• SMM access to use-inspired R&D in aerospace, defense and advanced manufacturing through the Aerospace Center, the Keck Center and the Product and Process Improvement Facility and to the region's Public Innovation Infrastructure
Goal 2: Develop **Public Innovation Infrastructure** with next-generation digital engineering capabilities to support product and process innovation for Paso del Norte SMMs to support the aerospace and defense supply chain
• Product and Process Improvement Facility for SMMs to develop and improve products and production processes
• SMM affordable access to Spaceport America provides affordable access for horizontal and vertical launch testing
• Industry Commons at Tech1 Campus where Aerospace Center will work directly with startups to mature aerospace and defense systems
• SMM access to digital infrastructure needed to compete for aerospace and defense markets
Goal 3: Deploy **Talent Infrastructure** focused on economic mobility for Paso del Norte residents through the development of in-demand skills needed by aerospace and defense industries.
• High student access to Career and Technical Education courses that prepares them to enter the aerospace and defense workforce when they graduate
• Engineering student and technician student access to paid internship opportunities in the Aerospace Center, the Keck Center and PPIF that prepares them to enter the aerospace and defense workforce when they graduate
• Low wage earner access to 20-week, paid training that prepares them to enter the aerospace and defense workforce upon completion

Leadership Team

The core management team will initially be structured within the **UTEP Aerospace Center's Economic Development and Workforce Excellence Division**. The project will utilize a *team of teams* organizational model for responsive implementation the project (William F. Meehan III and Kim Starkey Jonker, Team Of Teams: An Emerging Organizational Model, Forbes, May 30, 2018). **Dr. Ahsan Choudhuri**, Associate Vice President and founder of the Aerospace Center, will serve as the Principal Investigator (PI) of the project. Dr. Ahsan Choudhuri is a renowned expert in A&D systems and served as a PI and Co-PI of more than $150 million in extramural funding in the last ten years, including multiple EDA funded projects. **Dr. Ryan Wicker**, Executive Director and founder of W. M. Keck Center for 3D Innovation, will serve as the Co-Principal Investigator (Co-PI) of the project. Dr. Ryan Wicker is a world-renowned expert in additive manufacturing and served as PI and Co-PI of nearly $150 million in extramural funding.

Frank Armijo, a highly qualified aerospace and defense executive, will serve as the project management team's **Chief Executive Officer.** Frank Armijo is a retired executive with the Lockheed Martin corporation. Frank's experience includes leading several Lockheed Martin businesses, strategy and business development for civil, DoD, international and commercial clients. Frank's experience includes national security, energy, technology integration, cyber security, logistics and mission services. Throughout his more than 35-year career, Mr. Armijo leadership includes Federal, Commercial, State and International initiatives to include North America, Europe, Middle East and Asia. As capture executive Frank led the capture of several federal, international and commercial contracts valued in the hundreds of millions and large multi-billion dollars awards. Frank also led several lines of business and programs as President and General Manager of the Mission Support Alliance, a Lockheed Martin joint venture, President of Lockheed Martin Energy and LM EPC. He served as Chairman of MSA and Chairman of Missile and Fire Control's STELaRLab Technology Council, Lockheed Martin's only non-USA Research

and Development laboratory. His roles also included Vice President of Energy Solutions and Vice President, Strategy and Business Development for the Civil line of business.

Mr. Armijo will initially be hired as a consultant by the Aerospace Center but then will be employed by NCDMM through their new Paso del Norte subsidiary once it is created. Managing and coordinating access to the Public Innovation Architecture and the Public Innovation Infrastructure outside of the university system will allow greater flexibility to respond quickly to market demand. Mr. Armijo will report to the Aerospace Center and NCDMM and will be responsible for strategic leadership and management of the project, including coordination of component projects, partnerships and resource development, and communication with the NSF Grant Management Team. Mr. Armijo will manage, staff and equip the Product and Process Development Facility (PPIF) and develop the system for SMMs to access all innovation resources.

Susie Byrd, the Executive Director of the Aerospace Center with primary responsibility for managing the Economic Development and Workforce Excellence Division, will be responsible for developing the Aerospace and Defense Technologies Training Centers (ADTech) in coordination with industry and subawardees. She will also manage the regional governance and partner coordination. Susie has years of experience in community and economic development and has been coordinating regional partners to support this effort in various roles since 2019. The **Aerospace Center's Business Operations Team,** in coordination with the **Office of Research and Sponsored Projects (ORSP)**, will provide all financial management and control and compliance support to the project team. With an active grant portfolio of more than $500 million and a component of one of the largest university systems in the nation, UTEP maintains stringent internal control as well as a compliance / audit process to ensure the highest quality of financial management and regulatory compliance.

Randy Gilmore, Vice President and Chief Development Officer of the **National Center for Defense Manufacturing and Machining**, will be responsible for setting up a Paso del Norte subsidiary to manage the Product and Process Development Facility (PPIF). As Vice President and Chief Development Officer, Randy has responsibility for providing market research and analysis and general management planning concerned with development of NCDMM business. He is responsible for the overall long-range market planning for the corporation. He previously held the position of VP and Chief Technology Officer and provided technical leadership in advanced manufacturing technologies and processes, promoting NCDMM's mission, adding new insight to NCDMM business strategy, and developing NCDMM's Alliance Partner network. Once the NCDMM subsidiary is operational, it will employ Frank Armijo as CEO and will have primary responsibility for operating the PPIF and coordinating access to the Public Innovation Architecture and Public Innovation Infrastructure.

ADTech partners include Workforce Solutions Borderplex, El Paso Community College and the Rio Grande Council of Governments. **Leila Melendez, CEO of Workforce Solutions Borderplex**, will lead their efforts to design and implement a system to recruit trainees for Aerospace and Defense Technologies and Manufacturing Training Centers (ADTech), provide stipends and ongoing support for trainees and to facilitate job placement. Leila has led Workforce Solutions Borderplex for three years as their CEO and for three years as their Chief Operating Officer. Leila has expertise in building innovative workforce programs that meet industry needs through strategic partnerships. **Steven E. Smith, Ed.D, the Vice President of Instruction and Workforce Education for El Paso Community College**, will lead their efforts to provide instruction for ADTech Trainees. In his role at EPCC, he oversees all instructional and continuing education programs at five campuses. EPCC is a comprehensive urban college with 28,800 credit students and 5,000 continuing education/non-credit students in El Paso, Texas. **Annette Gutierrez, the Executive Director of the Rio Grande Council of Governments**, has been a key convener of rural leaders and organizations to make sure that residents in those areas are connected to ADTech opportunities.

The **City of El Paso led by Sam Rodriguez, the Chief Operations and Transportation Officer,** will

be responsible for the design and construction of the Product and Process Improvement Facility which will be part of the City's Advanced Manufacturing District. Sam led efforts to master plan, finance and fund the Advanced Manufacturing District. **Jose Landeros, Director of Capital Planning and Management Performance for the County of El Paso,** will be responsible for the design and construction of the Industry Commons at the Tech1 Campus. Jose leads the County's capital planning and strategic management efforts and has been key to advancing the development of Tech1 Campus. These new assets will be part of the Public Innovation Infrastructure.

Scott McLaughlin, the Executive Director of Spaceport America, will be responsible for making Spaceport America's test facilities and capabilities part of the IDEA Engine's Public Innovation Infrastructure. Scott A. McLaughlin is a highly experienced engineer and executive with a diverse background in both design and business. He has worked in both the private and government sectors and has traveled around the world installing, maintaining, and marketing specialized wind radar systems. His innovative designs support space launch, test ranges, aviation operations, weather service networks, atmospheric research, pollution studies, and shipboard-based wind measurements. Users include research and defense agencies such as NASA, NOAA, DOE, U.S. Army, U.S. Navy, U.S. Air Force, universities, as well as customers in Spain, Taiwan, India, UAE, Thailand, Kuwait, Mexico, Samoa, and Colombia.

Culture of Innovation

The IDEA Engine's proposal democratizes access to innovation for all SMMs in the region. SMMs in the region are resilient and nimble and many have been in operation for decades. They have had to innovate and hustle to survive NAFTA, globalization, the 2008 recession and COVID-19. However, their true potential and capacity has not been unleashed because they don't have the innovation expertise and they can't afford much of the expertise and technology that would allow them to maximize their potential in support of the defense industrial base. Developing a Public Innovation Architecture with Public Innovation Infrastructure will rapidly expand the culture of innovation in our region like a contagion.

Culture of Diversity, Equity, Inclusion and Accessibility

One of the biggest threats to our defense industrial base is the country's inability to tap the full breadth of its diverse talent pool. The country has an aging workforce that doesn't reflect the changing demographics of our nation. Paso del Norte talent and skills are currently not contributing to reclaiming dominance in aerospace and defense manufacturing, an industry which is predominantly white and male with few concentrations of economic activity located in rural areas. The US cannot compete globally with an A&D workforce that is 8.7% Hispanic and 24.8% female and executive leadership that is 3.7% Hispanic and 28.1% female when our nation is 18.5% Hispanic and 50.8% female (AIA 2021).

The Paso del Norte region, a minority dominant community, outpaces the nation in its successful efforts to expand economic opportunities to Hispanics, women, residents of limited means and from all zip codes. The region's cultural competency and historic commitment to equity have allowed it the privilege of embracing the abundance of talent that exists throughout the region, even in the most remote areas and even from the most under-resourced neighborhoods.

No institution reflects this equity success more profoundly than UTEP. The Aerospace and KECK Centers at UTEP are national leaders in both the number and percent of undergraduate and graduate engineering degrees awarded to underrepresented minorities. Currently, 85% of students working in the Centers are Hispanic and 32% are women, putting them in a category all their own for R1 universities. UTEP was ranked first in the U.S. for its success in achieving both competitive research and student social mobility. The Aerospace and Keck Centers are experts at creating systems of equity where everyone is responsible for creating and maintaining a culture of diversity, equity, and inclusion. This expertise informs the vision, plan, and deployment of resources throughout this program.

Most of the local suppliers that the Innovation Network has engaged with are minority-owned and/or women-owned and very few of them have been engaged previously through traditional economic development efforts. A couple are also veteran-owned and one, Tigua, Inc., is owned by a federal recognized Native American tribe, the Ysleta del Sur Pueblo. The workforce for these companies is predominantly Hispanic, and women make up a sizable portion of this workforce. These suppliers are underrepresented in A&D markets. This proposal changes that reality.

Despite the evidence that diversity increases profitability and performance, a 2020 analysis by the Kaufman Fellows indicate that 79.2% of startup executives were white, and only 2.6% are Hispanic, even though Hispanics make up 17% of the working age population (Deconstructing the Pipeline Myth and the Case for More Diverse Fund Managers - Kauffman Fellows). The Industry Commons at Tech1 Campus will have an intentional focus on recruiting startups that are Hispanic and/or women owned and on matching startups with a workforce that is Hispanic and female and underrepresented in startup ecosystems. The IDEA Engine will recruit spinoffs from the Aerospace Center and Keck Center and recruit prospective startups from our alumni network who are working in aerospace and defense industries. Reflecting the demographics of El Paso, this pipeline of prospective startups is predominantly Hispanic, and Hispanic female talent in this pipeline is abundant. Tech1 Campus is in a poor, rural area in east El Paso County.

ADTech expands UTEP's equity impact by creating economic mobility through short-term technical training and new Career and Technical Education programs in area high schools. ADTech will focus specifically on recruiting from our hidden talent pool, the 27% of our current workforce with a high school degree or some college who are currently earning less than the living wage ($14.29) in occupations with no path to the middle class. The IDEA Engine will ensure that our talent pipeline reflects the demographics of our region, which is 79% Hispanic and 49% female. These new participants in the nation's A&D workforce will surge diversity, inclusion and equity advances for the A&D industry. Blue Origin and tenants at Spaceport America often recruit for skilled technicians outside of rural West Texas because of the region's existing skills gaps. Placing ADTech @Van Horn and @Alpine and providing mobile ADTechs for more remote areas will prepare rural residents living for quality jobs at Blue Origin and Spaceport America.

Across all projects, the IDEA Engine will document the demographic information of businesses and residents that it serves to include gender, race, ethnicity and whether they live in an urban or rural area. The team will consistently review this information to ensure that it is serving a broad and diverse cross section of the community that is reflective of our community's demographics. If the management team notes any area of weakness, it will identify barriers to participation, make necessary changes to service delivery to overcome these barriers and strengthen outreach to populations that it has identified as under-represented in its work.

The Paso del Norte is 79% Hispanic and 49% female. The business ownership, executive teams, design teams, and workforce that will enter our nation's aerospace and defense manufacturing sector through this intervention in the Paso del Norte will diversify and strengthen these markets and would be a replicable model for the nation. An investment by the NSF in the IDEA Engine would be the single biggest and most transformational public investment in creating equity in the A&D industry.

Partnerships

The West Texas partners in the IDEA Engine have been working together for five or more years to grow the aerospace and defense manufacturing sector. Because of that, they have established trusted and mutually beneficial relationships based on a shared vision for the region and on following through on all commitments. The partners are expanding to include Southern New Mexico and a new partner, Spaceport America. This expansion creates new opportunities for economic impact.

New resources through the NSF will add additional complexity to the economic development work and require a clear understanding from all the partners about how the money flows, who is responsible for what, how SMMs access innovation resources through the IDEA Engine and that benefits accrue to residents from throughout the region.

All core and contributing partners will have a seat on the Governance Board with the right to vote on all strategic decisions of the IDEA Engine. IDEA Engine partners will receive bi-annual budget and progress reports. UTEP will present to the governing bodies of each partner entity annually. Partners will be responsible for deliverables and tasks outlined in this proposal. At the beginning of the proposal period, UTEP will develop an agreement with each partner detailing the statement of work and will require quarterly budget and progress reports from each. Any partner hosting IDEA Engine data will be required to host that data in compliance with our Data Management Plan.

Evaluation Plan

We will evaluate our success based on several key indicators and expected outcomes:

Indicators
• Number of jobs in aerospace and defense manufacturing
• Productivity
• Median Household Income
• % of STEM occupations
Expected Outcomes by 20333
• 300 new entrants from the Paso del Norte Region to the defense industrial base
• 4,000 new engineering and technologist jobs
• 13,000 new manufacturing and technician jobs

The Aerospace Center hired Lightcast, a global leader in labor market analytics, to develop baseline data of our emerging aerospace and defense manufacturing sector and benchmark that data against markets with mature aerospace and defense manufacturing sectors. That report is titled "Growing the Aerospace and Defense Manufacturing Sector in the Paso del Norte Region." We will hire Lightcast in year 5 and year 10 of the grant to update this report against our goals and key indicators.

Long Term Sustainability Plan

The IDEA Engine be developed with a stringent resource sustainability matrix for its operation beyond the project period to ensure a continuous service support system to grow our local aerospace and defense manufacturing ecosystem and to maintain and grow ADTech. UTEP has institutionalized this initiative as part of its Economic Development Division under its renowned Aerospace Center. The IDEA Engine will develop public-private as well as industry partnerships to support its continued operations of the Innovation Network. Line-item funding from the State of Texas, the City of El Paso, the County of El Paso, and Paso del Norte Counties will be solicited to support the program after the initial funding period. The IDEA Engine will also develop an industry cost-share model that will support ongoing operations. The Paso del Norte Community Foundation has committed to assisting with fundraising from the region's philanthropic community to support the program beyond the initial funding period.

ADTech's program design also aligns closely with the Department of Labor and the State of Texas and New Mexico funding priorities for workforce development, which will make it a candidate for additional funding. Once ADTech is established, an industry cost-share model will be implemented to support the training programs. The region's philanthropic community has a strong history of giving to education and workforce programs that result in economic mobility.

The IDEA Engine will have a transformative impact on the Paso del Norte region: increased economic output via a greatly expanded A&D manufacturing sector, economic resilience that comes with a diversified economy, and widely distributed opportunities for economic mobility for area residents through training programs and entrepreneurship.

The success of the IDEA Engine will reach far beyond the borders of the region of service to produce benefits throughout the United States. First, it will address the advancement and translation of defense-critical technologies to the marketplace and address critical vulnerabilities in the nation's defense industrial base.

The IDEA Engine's vision is complex and ambitious, but it is also replicable. Other communities and industrial sectors will be able to learn from the IDEA Engine's work to create models for change in their own areas of advanced industry focus. Roughly speaking, the IDEA Engine creates evidence-based models for change in three pathways: technical, industrial, and workforce development. Each of these pathways will speed innovation, bring new ideas to market and bring economic equity to communities that engage with them.

The IDEA Engine is developing tools to democratize access to innovation in the A&D sector. While knowledge in these fields is advancing rapidly so are barriers to benefiting from this advanced knowledge and technologies. Cutting edge research requires access to costly computational, regulatory, and physical infrastructure. The expense of this infrastructure is so great that it threatens to exclude all but the largest firms from the innovation space. This bottleneck eliminates large swaths of talented and creative people from entering the field, reducing the ideas and innovations that are possible within it. The A&D sector is particularly emblematic of this problem, but barriers to participation are reducing creativity and innovation in any number of other industrial sectors.

The innovation architecture and infrastructure that the IDEA Engine will pilot and improve can become industry agnostic. That is, the tools that the IDEA Engine develops can be used in other fields to reduce barriers to entry and bring more people and firms into the industry. By democratizing the innovation process and infrastructure, the IDEA Engine's tools will broadly increase use-inspired R&D and all the country to fully benefit from the talents of all of its citizenry.

Finally, and perhaps most importantly, the IDEA Engine will be piloting and testing new educational pathways to STEM careers. These new pathways will take advantage of both traditional (university and community colleges) and nontraditional (apprenticeship and vocational) entry points into the sorts of high paying, stable jobs that the middle class is built on. The curriculum that the IDEA Engine will develop, which are based on successful skills-based research programs already producing great results at the Aerospace Center and the Keck Center, will excel at bringing people from all communities into greater educational and job placement opportunities. The IDEA Engine begins this process in the Paso del Norte region, but eventually hopes to attract students from outside its region to its workforce development programs.

The IDEA Engine aims to launch transformation not just in the Paso del Norte region, but in the United States as a whole. The country has not yet tapped all of its diverse talent and won't be able to unlock its full potential until that happens. The IDEA Engine seeks to reach, train, and provide opportunity to our hidden talent pool.

NSF Engines: Type-2: West Texas Aerospace and Defense Manufacturing Innovation Engine
Proposal ID 94458

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