PFI:AIR PROGRAM OBJECTIVES

- Leverage NSF research award investments to accelerate the translation and transfer of research discoveries into commercial realities.
  - AIR-Technology Translation (TT)
    - Faculty members translate research results achieved under a current or prior (within six years) NSF research award onto a path toward commercial reality. AIR-TT research is focused on understanding key behavior/ characteristics/ processes in order to develop, demonstrate and evaluate a proof-of-concept, prototype, or scale-up.
    - Grantees demonstrate an initial understanding of the market potential and commercialization strategy at the proposal stage. This understanding is expected grow and mature over the course of the award.
  - AIR-Research Alliance (RA):
    - Faculty members engaged in research through a current or prior (within three years) NSF funded Research Consortium (such as an NSF Center) develop additional research partnerships and secure third-party funding to accelerate translation and transfer of research results into competitive technologies and commercial reality.
    - "Translational" or "use-inspired" research is necessary to accelerate Center-derived, market-valued technologies toward commercial realization. Third party funding will enable additional business activities such as market studies, the development of a business plan, patent filings, etc. AIR-RA grantees demonstrate an initial understanding of the market potential and commercialization strategy at the proposal stage that will grow over the course of the award.
- Engage students and faculty in entrepreneurial/ innovative thinking.
  - Participation in an AIR-TT or AIR-RA award will provide participants (undergraduate students, graduate students and/or post-docs, and faculty) experiences that will enhance their knowledge of research translation, innovation, and entrepreneurship beyond the usual academic research experience.
- Catalyze the development or enhancement of a network of connections between research partners and investors
  - AIR-RA: The partnerships and collaborations between the NSF-funded research alliance, third party investors and research partners will lead to a sustainable academic-based innovation ecosystem and enable the creation of new jobs.
  - AIR-TT: There is a participant/collaborator on the award who has "business experience" and will advance the PI's understanding of the process necessary for successful commercialization of technology.

PFI:AIR LONG-TERM LOGIC MODEL

INPUTS

- Initial discovery from an NSF-funded research award, now focused on market opportunity
- Funding and Logistics
  - TT: $200K for 18 months
  - RA: $800K for 3 years
- Expertise NSF-funded researchers
  - TT: Plus co-PI or senior personnel with "business experience" (e.g., tech transfer office, business school, been part of a start-up)
  - RA: Plus research partners (may be additional researcher from university, business, industry, etc. must add tech/research capability that team does not already have)
- Process, Materials and Resources
  - TT: contributed by university
  - RA: contributed by university and research partner(s)
  - RA: 1-to-1 match funding from 3rd party investor(s)
- Preliminary market understanding
- Students and/or Postdocs
- RA: Cooperative Research Agreements and/or Partnership Letters
- TT (subset): Cooperative Research Agreements and/or Partnership Letters, if partnership involves IP
- A subset of awardees are I-Corps graduates
- Opportunities to attend Tech Showcase events

PROJECT ACTIVITIES

- **TECHNOLOGY ADVANCEMENT**:
  - Identify and overcome technical and/or market barriers and improve specs to move the technology closer to commercialization
  - Develop, demonstrate and evaluate prototype or proof-of concept
  - Market/commercialization research
    - TT: ~10-20% time and/or budget is spent on market related activities
    - RA: ~10% time and/or budget is spent on market related activities (with budgetary assistance from 3rd party investors)
  - Midterm Accountability
    - TT: Annual Report
    - RA: Midterm Review and response to recommendations from internal review at NSF
- **PARTNERSHIP MODEL**:
  - Networking with research partner(s) and 3rd party investors (or potential investors for TT)
    - RA: Establishment of a sustainable relationship between academic research team, research partner(s), and 3rd party investor(s)
    - TT: Establishment of relationship with person who has business experience
  - Leveraging of additional capital from sources outside the university or NSF (RA and a subset of TT)
  - Make progress on a commercialization plan for how to get product to market
- **HUMAN CAPITAL**:
  - Education of students and/or postdocs in use-inspired research, innovation, and entrepreneurial experience

OUTPUTS

- **TECHNOLOGY ADVANCEMENT**:
  - Prototype, proof-of-concept, or scale-up
  - A subset of awardees publish their research findings
  - A subset of awardees file patent and license applications of new technology developed from AIR awards, or demonstrate progress in the patent/licensing process
  - More fully-developed marketing/commercialization plans are produced
  - TT: A subset of awardees identify other funding sources to continue the development of their technology (e.g., STTR, private investment)
  - RA: A subset of awardees successfully translate at least one technology into use
- **PARTNERSHIP MODEL**:
  - A subset of 3rd party investors/research partners/collaborators continue the relationship after the life of the award
  - Memoranda of Understanding or Cooperative Research Agreements between partners are established if appropriate for continuation of the relationship
- **HUMAN CAPITAL**:
  - Students and Postdocs are trained in real-life practicality of technology transfer and use-inspired research.

IMMEDIATE OUTCOMES

- **TECHNOLOGY ADVANCEMENT**:
  - Knowledge and information in the technology sector is advanced
  - Researchers and/or students pursue further research funding (public or private) for the AIR-supported technology
  - A subset of awardees identify new or different applications for the technology
- **HUMAN CAPITAL**:
  - A subset of researchers and/or students (academic and/or industry) working on AIR research become innovators and/or entrepreneurs in other contexts
- **BUSINESS DEVELOPMENT**:
  - A subset of new businesses are incorporated around the funded technology and/or by AIR partners
    - TT: A subset of awardees license the technology

INTERMEDIATE OUTCOMES

- **TECHNOLOGY ADVANCEMENT**:
  - RA: Technology iteration cycle is shortened due to involvement of research partners and 3rd party investors
- **HUMAN CAPITAL**:
  - Student participants pursue career in practically oriented research
- **PARTNERSHIP MODEL**:
  - Partnerships from AIR awards are sustained over time to work on new technologies
  - New academia-industry partnerships are formed by AIR awardees based on lessons learned in the AIR program
- **BUSINESS DEVELOPMENT**:
  - Jobs are created via hiring employees to companies established from AIR funded award
- **ACADEMIC CULTURE**:
  - Research and partnership increase academic institutional reputation as an "innovation hub"
  - Universities demonstrate culture shift by rewarding innovation and commercialization efforts in T&P process alongside research, teaching, and service

LONG-TERM OUTCOMES/IMPACT

- **TECHNOLOGY DEVELOPMENT**:
  - Improved technology available in the market leading to more competitive products
- **PARTNERSHIP MODEL**:
  - Adoption/dissemination of the AIR partnership model by other institutions
  - University continues to promote and support similar partnerships via AIR or other avenues
- **ACADEMIC CULTURE**:
  - Academic culture shifts to value academic-industry partnerships

Possible Indicators for AIR

Human Capital Development

- **ATTRIBUTION**
- Number of academic participants pursuing continued relationship with their AIR partners or pursuing involvement with other industry partners
- Number of students and postdocs trained by AIR PI
- **CONTRIBUTION**
- Number of faculty reporting career changes/enhancements or research approaches as a result of the relationship sponsored by the AIR award
- Number of start-ups formed by members of the AIR partnership team
- Number of students/postdocs educated/trained in AIR labs
- Number of students/postdocs in AIR labs reporting training in market practicalities
- Number of AIR students/postdocs/PIs who become innovators or entrepreneurs outside of or in addition to academia
- Number of AIR students/postdocs/PIs who pursue practically oriented research careers after the life of the award
- Number of new professional development opportunities for employee/researcher training and/or exchange created as a result of the AIR partnership
- Specific training opportunities in innovation/entrepreneurship are developed

Technology Advancement

- **ATTRIBUTION**
- Number of AIR projects that successfully develop a prototype, proof-of-concept, or scale-up
- Identification of the reason for failure if the AIR-supported technology does not successfully translate to commercial application
- Number of publications resulting from the AIR sponsored research during/after the award
- **CONTRIBUTION**
- Number of AIR awardees reporting shorter-than-anticipated technology iteration cycle due to research partners and 3rd party investors
- Publications on technology and/or advancements in the underlying discovery supported by the AIR award
- Growth in IP position of the technology (patent and licensing application and activities)
- Number of AIR awardees who identify new or different applications for the technology
- Number of projects that successfully translate technology to commercial application
  - Via licensing
  - Via small business start-up

Business Development

- **ATTRIBUTION**
- Number of AIR technology-related patents or licenses purchased from university IP
- Number of AIR awards resulting in MOUs or CRAs between partners
- Number of AIR PIs submitting to other IIP programs (e.g., I-Corps, SBIR, etc.), or other NSF tech transfer programs, or other federal agencies
- Number of new or continuing awards in tech transfer or research from other agencies or institutions leveraged from the AIR award
- **CONTRIBUTION**
- Number of AIR awardees that incorporate a business based on their technology
- Number of employees hired by businesses created from AIR funded technology

Quality, health, and sustainability of Partnership Model

- **ATTRIBUTION**
- Number of industry participants pursuing continued relationship with their AIR partners or other academic partners, collaborators, or 3rd party investors
- Number of partnerships from AIR awards that are sustained to work on new technologies after the life of the award
- Number of AIR awardees that form new academia-industry partnerships after the life of the award
- Number of new 3rd party investors attracted to AIR-RA after AIR is awarded, but prior to the end of the award
- **CONTRIBUTION**
- Number of similar partnerships via AIR or other avenues that university continues to promote and support
- Number of universities adopting similar partnership programs
- Number of new potential industry partners that seek relationships with the academic institution due to AIR success

Academic culture that values Academic-Industry Partnerships

- **ATTRIBUTION**
- Number of new AIR awards put forward by universities that previously received AIR awards
- **CONTRIBUTION**
- Number of university departments that recognize partnerships with industry and/or commercialization efforts as part of tenure & promotion process
- Number of universities that report or otherwise demonstrate in public literature their reputation as an "innovation hub", specifically citing AIR awards
- Number of new AIR awards that previously received I-Corps awards

Data Sources for AIR Indicators

RPPR/Annual Report

- Publications on technology and/or advancements in the underlying discovery supported by the AIR award
- Growth in IP position of the technology (patents and licensing activities)
- Number of patents or licenses purchased from university IP
- Number of students and postdocs trained by AIR PI

Other NSF Data Systems

- Number of AIR PIs submitting to other IIP programs (e.g., I-Corps, SBIR, AIR, etc.) or other NSF programs
- Number of new or continuing awards from NSF

Life-of-award Monitoring System

- Identification of the reason for failure if the AIR-supported technology does not successfully translate to commercial application
- Number of AIR PIs submitting to other federal agencies
- Number of new 3rd party investors attracted to AIR-RA projects after the AIR grant is awarded

Post-award Monitoring System

- Publications on technology and/or advancements in the underlying discovery supported by the AIR award
- Number of AIR technology-related patents or licenses purchased from university IP after the award
- Number of academic participants pursuing continued relationship with their AIR partners or with other industry partners
- Number of industry participants pursuing continued relationship with their AIR partners or other academic partners
- Total number of new partnerships developed out of this relationship (aggregate data from post-award monitoring system)
- Number of AIR PIs submitting to other federal agencies
- Number of new or continuing awards from other agencies or institutions leveraged from the AIR award
- Growth in IP position of the technology (patents and licensing activities) after the award
- Number of AIR-supported technologies that have successfully translated to commercial application
- Number of new positions and opportunities for employee training created as a result of the AIR partnership
- Number of students/postdocs continuing in related fields and/or similar innovation or entrepreneurial partnerships
- Number of faculty reporting career changes/enhancements or research approaches as a result of the relationship sponsored by the AIR award
- Number of new research directions identified (e.g., new and/or different applications of the AIR technology)
- Number of start-ups formed by any members of the AIR partnership team
- Number of AIR partnerships reporting development of a business plan for the platform technology
- Shortening of average development cycle of platform technology to commercialization
- Identification of the reason for failure if the innovation does not make it to market

Other Data Sources (University Reporting, Google Scholar, Internal NSF)

- Number of similar partnerships via AIR or other avenues that university continues to promote and support
- Number of universities adopting similar partnership programs
- Number of new potential industry partners that seek relationships with the academic institution due to AIR success
- Number of new AIR awards put forward by universities that previously received AIR awards
- Number of university departments that recognize partnerships with industry and/or commercialization efforts as part of tenure & promotion process
- Number of universities that report or otherwise demonstrate in public literature their reputation as an "innovation hub", specifically citing AIR awards