



2022 BLACK HILLS DEFENSE & INDUSTRY SYMPOSIUM:

LEADING THE NATIONAL
DEFENSE DISCUSSION

MARCH 14-16, 2022
RAPID CITY, SD

CO-HOSTED BY:





JASON COMBS

Jason Combs is the University Program Director at the South Dakota School of Mines and Technology. Prior to his current position, he served as the NSIN Chief of Staff in the National Capital Region. Jason also has over 25 years of service in the Department of Defense, including time in uniform as well as time serving as a government civilian. His active duty time included operational assignments in the B-1 and staff assignments on both the Headquarters Air Force Staff and Joint Staff. Jason served his final two years on active duty as the Director of the VCJCS Joint Staff Innovation Group applying entrepreneurial problem solving approaches to National Security Problems. In this role, he led senior strategists, planners and analysts to develop novel warfighting concepts and capabilities for the vice chairman of the chiefs of staff. He provided military expertise to the chairman of the joint chiefs of staff seminars, wargames, politico-military table-tops and workshops. Jason's awards include the Defense Superior Service Medal, the Legion of Merit, the Bronze Star, the Meritorious Service Medal, the Air Medal, and the Aerial Achievement Medal. Jason holds a degree in biology from the United States Air Force Academy; a master of military arts and sciences degree; a master of airpower art and science degree; and is also a graduate of the Air Force Weapons School, Army Command and General Staff College, the School of Advanced Air and Space Studies and the Air Force National Defense Fellowship program. He holds the rating of command pilot and has more than 2,000 flight hours, with more than 400 combat hours. He has flown the B-1, T-37, T-38, AT-38 and F-16 aircraft. Jason enjoys exploring the outdoors with his wife and is passionate about problem solving, learning, and teaching.



National Security Innovation Network

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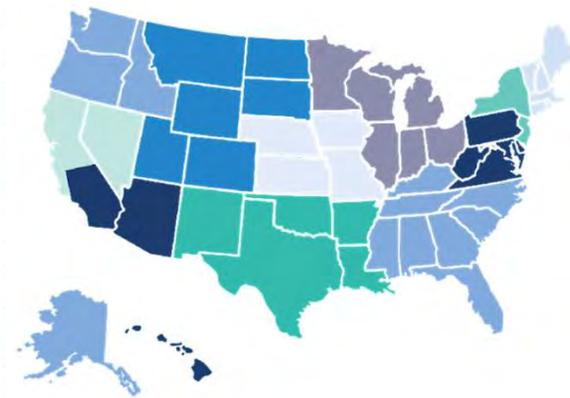
Who

- › DoD program office reporting to the Under Secretary of Defense for Research & Engineering
- › Program of Record FY20
- › NSIN pays for all programming



What

- › Partners with universities and the venture community to bring innovative tools and solutions to warfighters

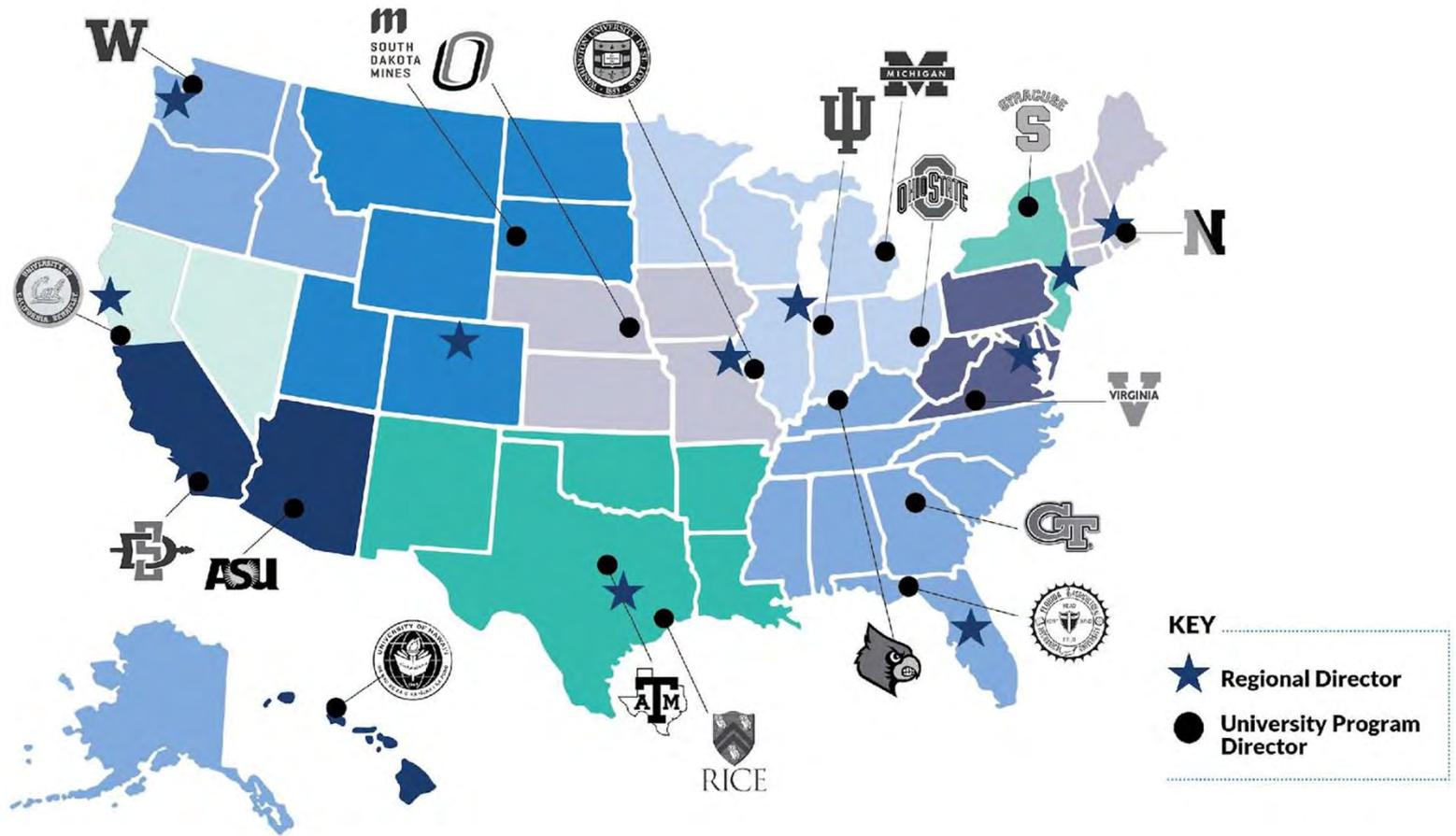


Where

- › HQ in Arlington, VA
- › 33 regional positions across 20 states
- › 21 embedded personnel at universities

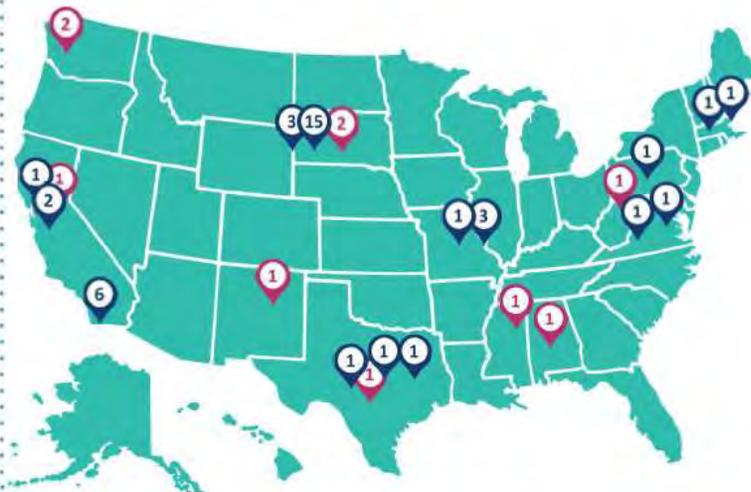


NSIN University Partners



NSIN

ELLSWORTH AFB USE OF NSIN PROGRAMS TO SOLVE PROBLEMS



RESOURCES GAINED FOR PROBLEM SOLVING

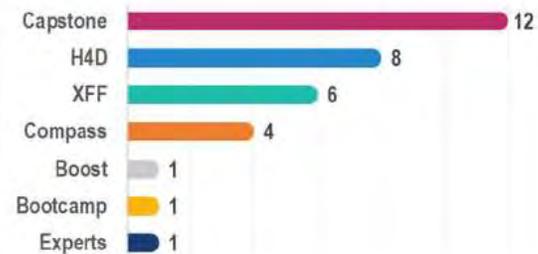


28,560 Hours
(13.7 FTEs)

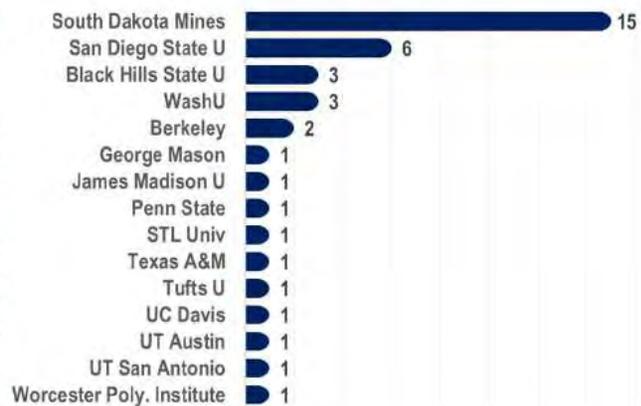


\$1.1M SBIR

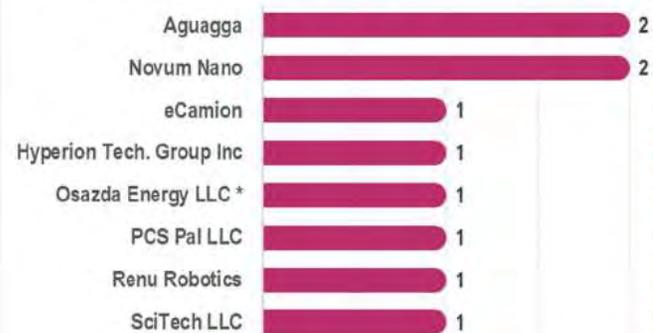
NSIN PROGRAMS (33)



UNIVERSITY COLLABORATION (15 / 39)

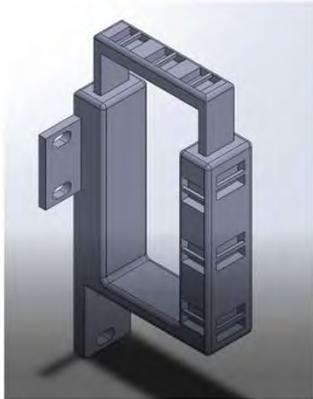


STARTUP COLLABORATION (8 / 10)

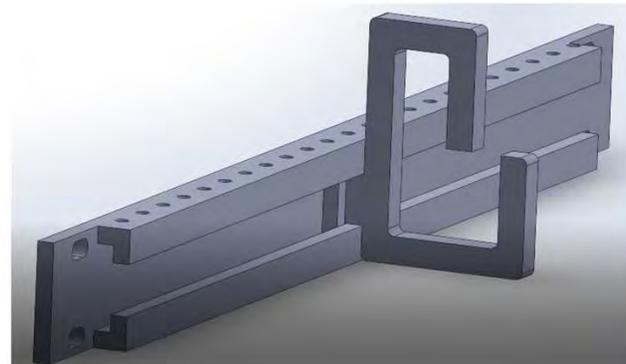


Engineered Network Cable Closet Management Brackets

Cable Bundler



Cable Hooked Brackets



- Ellsworth using at the base now
- Using on future network requirements with new mission

Glycol (Deicing Fluid) Recovery

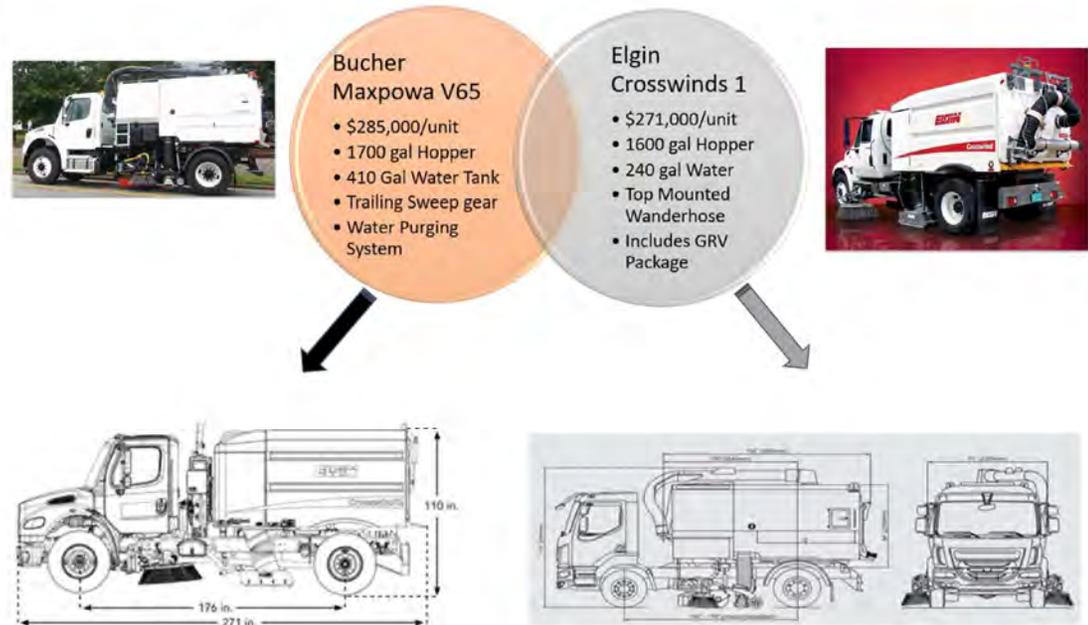
Problem: Ellsworth recovery vehicles at end of service life with known no suitable replacement

Student team identified 2 suitable alternatives

- Sustainable
- 38% less expensive (GRV in use \$460,00)
- Use beyond Glycol collection
- More features than current option (Wand)

Propylene Glycol (Deicing Fluid) Recovery Options

South Dakota School of Mines <-> Ellsworth AFB Hacking 4 Defense (H4D) Fall 2021



Replacement option now on Ellsworth End of Year Funding List



Example of one of three Energy Resilience Trade Off Matrices

- Generations
- Storage
- Management
- Protection

Generation Data

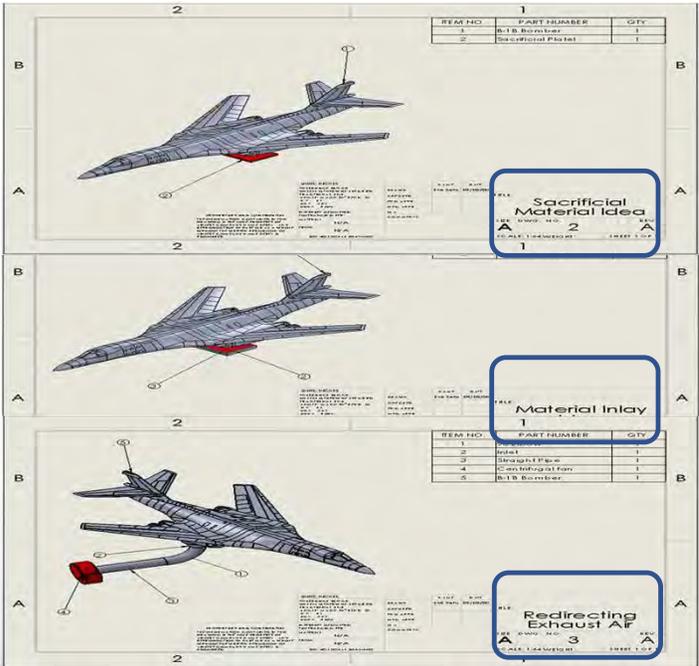
Data	Capital Cost [USD/kW]	Fixed O/M Cost [USD/kW-year]	Variable O/M Cost [USD/MWh]	LCOE Score	Capacity Factor	Lead Time [yrs]	Carbon Footprint	Legal Feasibility	Technical Feasibility	Dependency Reduction	Vulnerability (Severity)	Vulnerability (Frequency)
Nuclear LW	6336	122	2.38	72	92.0%	6	12	2	10	10	2.7	7
Nuclear SMR	6802	122	3.02	72	92.5%	6	12	5	10	10	2.7	7
Wind	1846	26	0.00	29	35.4%	3	11	6	7	3	5.3	5.7
Geothermal	2772	138	1.17	35	74.3%	4	38	8	1	10	6.3	5.3
Petrol Fuels	1082	35	5.72	58	66.1%	1	1000	8	10	9.5	4	5.7
Hydrogen Combustion	5000	35	5.72	40	50.0%	3	280	7	3	6	4	5.3
Hydroelectricity	2769	42	1.40	35	41.5%	4	24	10	1	10	3.5	5.3
Solar	1612	15	0.00	40	24.9%	2	48	10	10	5.5	5	6.3
Natural Gas	978	35	5.72	58	56.0%	2	490	9	10	4	3	5.7
Fuel cells	6866	31	0.51	40	90.0%	3	280	10	5	9.5	5.5	6.8

Generation Comparisons

Scaled (out of 10) (worst to best)	Capital Cost	Capacity Factor	Lead Time	Carbon Footprint	Technical Feasibility	Legal Feasibility	Dependency Reduction	Vulnerability (Severity)	Vulnerability (Frequency)	TOTAL
Weight	1	1	1	1	1	1	1	1	1	
Nuclear LW	3.66	9.2	4	9.88	10	2	10	2.7	7.0	58.4
Nuclear SMR	3.20	9.3	4	9.88	10	5	10	2.7	7.0	61.0
Wind	8.15	3.5	7	9.89	7	6	3	5.3	5.7	55.6
Geothermal	7.23	7.4	6	9.62	1	8	10	6.3	5.3	60.9
Petrol Fuels	8.92	6.6	9	0	10	8	9.5	4.0	5.7	61.7
Hydrogen Combustion	5.00	5.0	7	7.2	3	7	6	4.0	5.3	49.5
Hydroelectricity	7.23	4.2	6	9.76	1	10	10	3.5	5.3	57.0
Solar	8.39	2.5	8	9.52	10	10	5.5	5.0	6.3	65.2
Natural Gas	9.02	5.6	8	5.1	10	9	4	3.0	5.7	59.4
Fuel cells	3.13	9.0	7	7.2	5	10	9.5	5.5	6.8	63.2

- Helps evaluate tradeoffs between different priorities
- Ellsworth can modify to fit how they weight different variables
- Has been used to help identify SBIR companies with technologies that will move Ellsworth towards its resiliency goals
- 140 Pages of research with references and summaries – Provided Ellsworth with a common reference and foundation across the base

Getting out of the Building



FINAL RECOMMENDATIONS

1. Coating
 - Hard barrier
 - Impedes fluid penetration
 - High adhesion
 - High temp resistant
2. Trough System
 - Fluid direction
3. Accumulation basin
4. Removable tote
 - Collected fluids
 - Easy disposal

Led to SBIR Submission by Novum Nano



What the team learned was Tricresyl phosphate, a chemical in the APU oil, was the main culprit. The leaking fluids can react with the concrete and change properties and composition. Degradation reaction is accelerated by APU heat/force. This chemical is not common in other fluids on the airfield, just in the APU oil.



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