
***GRAND FORKS REGION
UNMANNED AVIATION
BUSINESS DEVELOPMENT
ROADMAP***



4 Jun 2007

- **To describe options for developing unmanned aviation-related business in the Grand Forks/Red River Valley region**

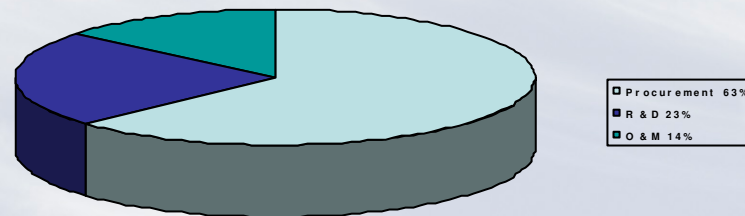
- **UAS industry overview**
- **Current UAS assets and infrastructure**
- **Needed infrastructure**
- **Competitors**
- **Long term UAS market assessment**
- **Near term business opportunities and tailored strategies**

1. UAS INDUSTRY OVERVIEW

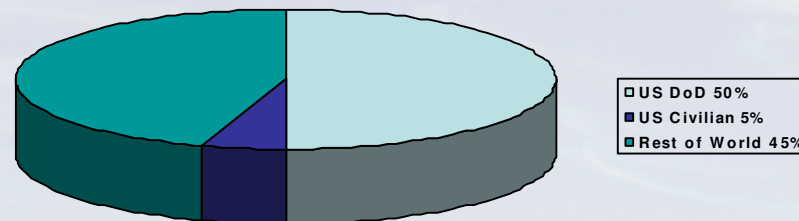
- **What is the current size of the UAS market?**
- **What are the likely dynamics of the market over the next decade?**
- **Which segments will see the largest growth?**
- **What will be the regional trends in research and production?**
- **Is a civilian market likely to emerge over the next decade?**

CURRENT MARKET SIZE

- U.S. DoD: \$12.2B over FY2007-11 @ 46% growth rate

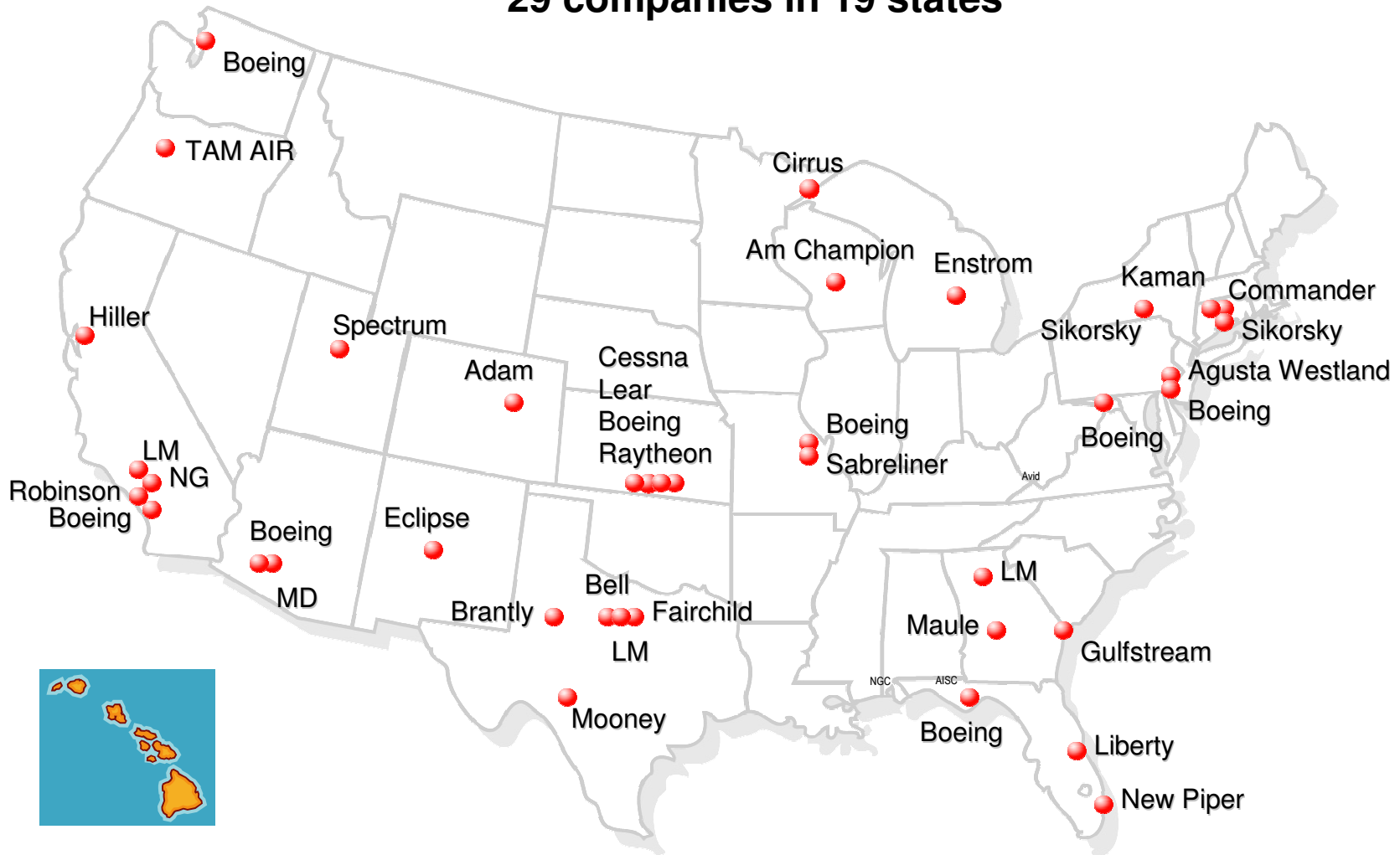


- Worldwide: \$24.4B over FY2007-11, over 50 countries



- **Airspace regulations = largest single dynamic for next decade**
 - **107 COA requests in 2006 to 428 in 2010 (400%)**
 - **5 SAC requests in 2005-06 to 42 in 2010 (840%)**
 - **“File & fly” above 50K ft and below 1K ft by 2012-2016**
- **Largest growth segments over coming decade:**
 - **Customer: DoD @ 46% and \$800M through 2011**
 - **Category: Small UASs**

29 companies in 19 states



85 companies in 33 states
Over-supply, under-demand

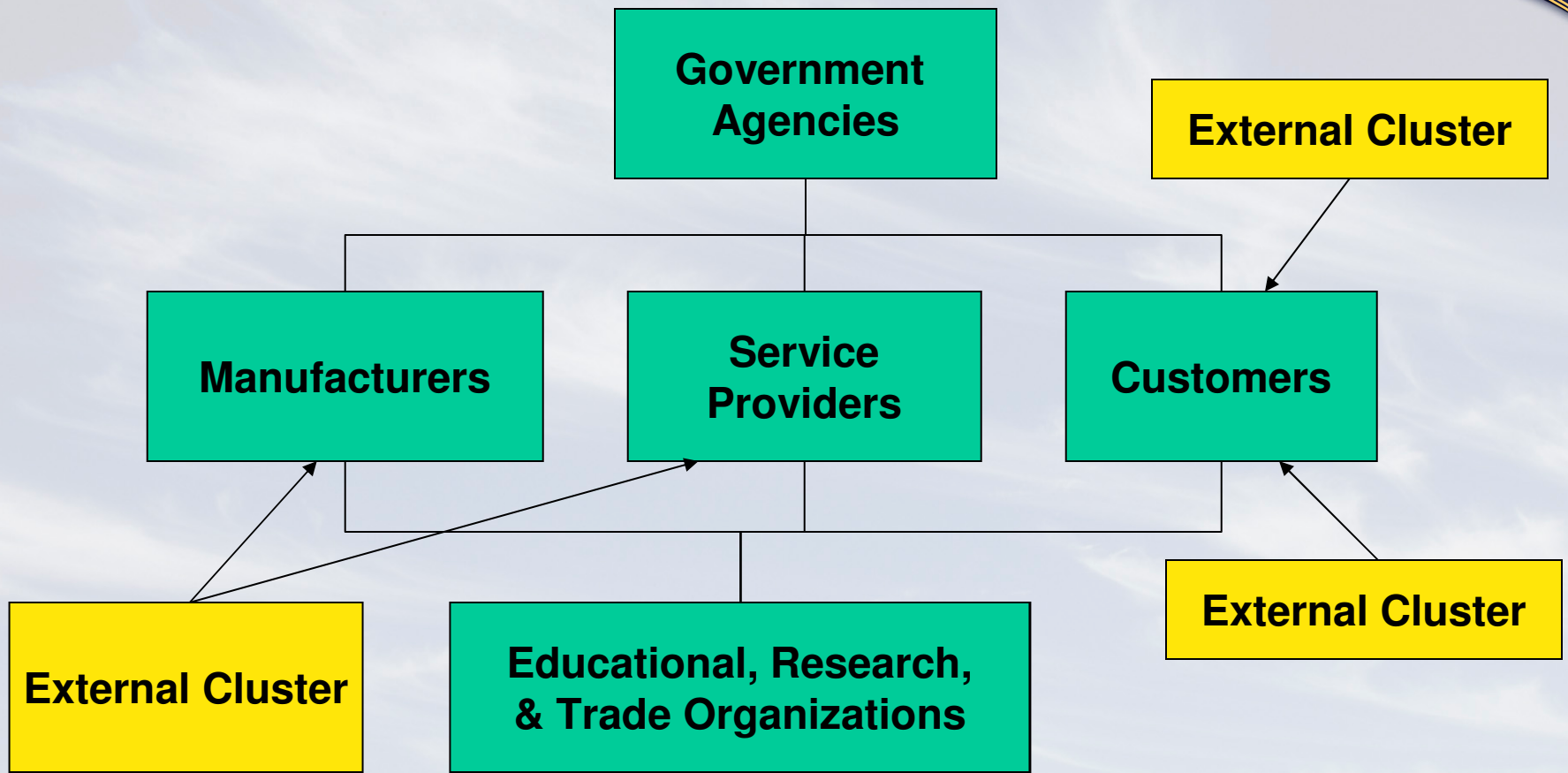
- Larger companies
- Smaller companies (<20 employees)

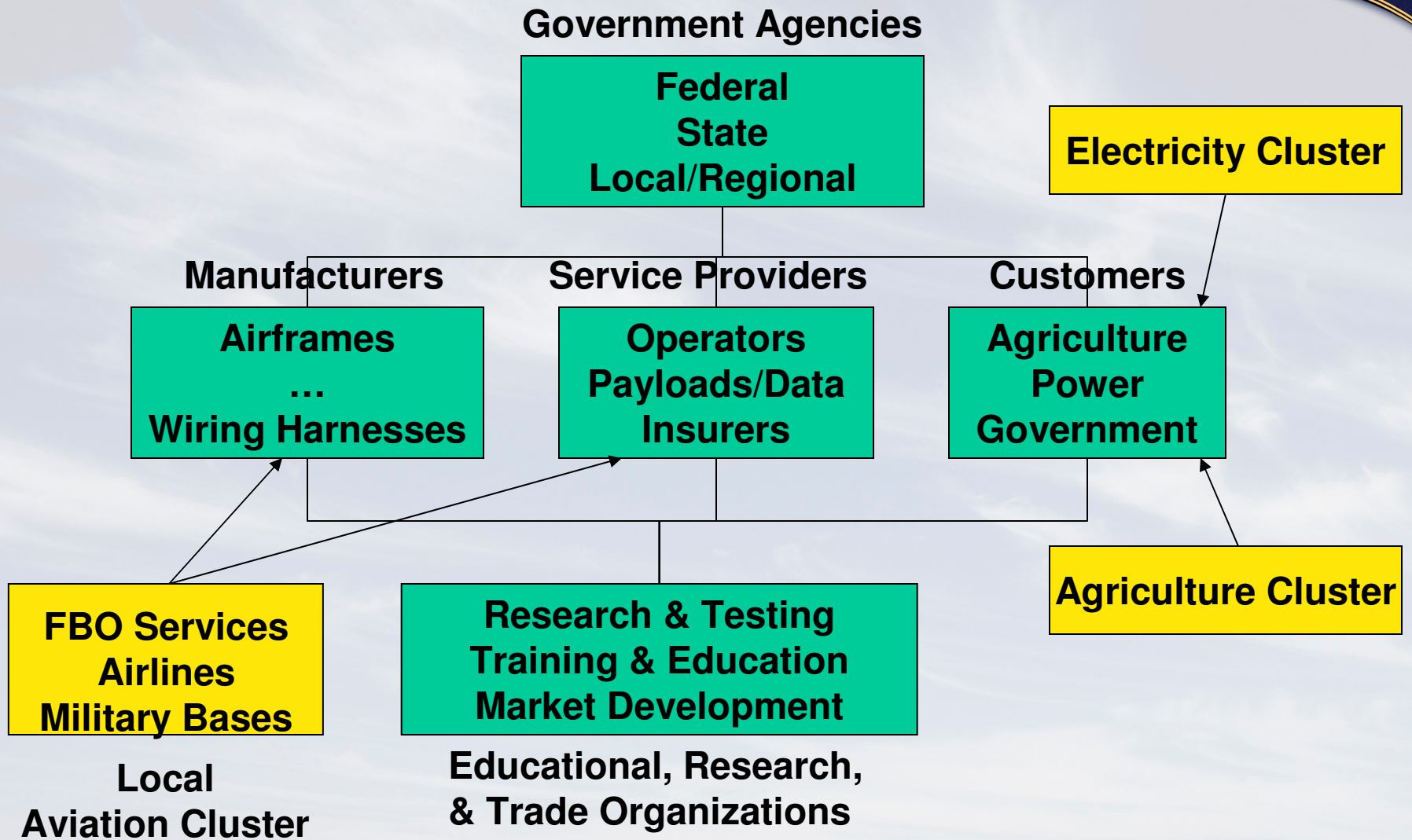


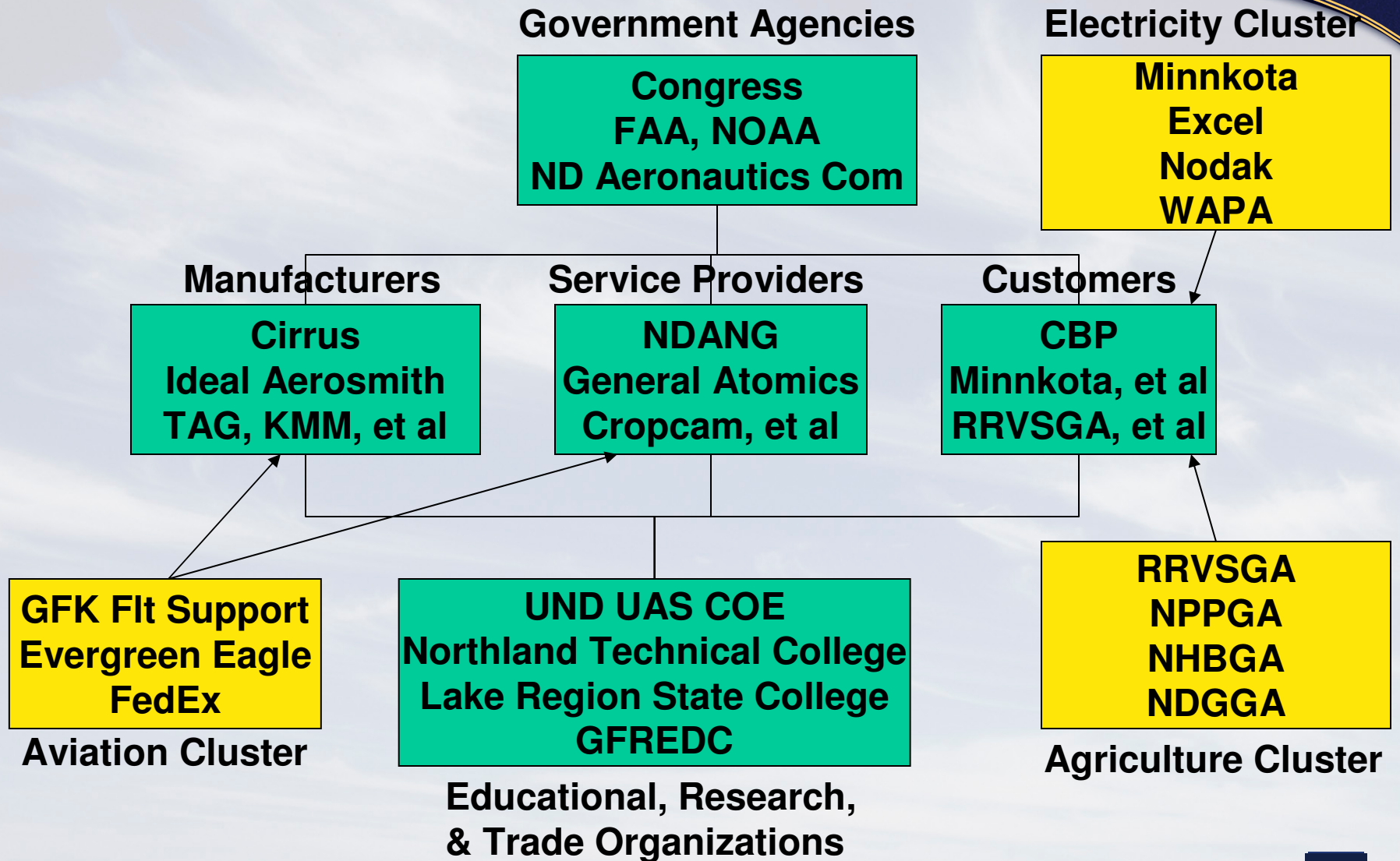
- **Precision Agriculture**
 - 2000 RPHs (ex. Yamaha R-Max) & 5000 pilots in Japan since 1990
 - Cropcam, Calmar Labs, AeroView Int'l
- **Cinematography**
 - Coptervision since 1998
- **Weather/Climate Studies**
 - Aerosonde since 1996
- **Today: Service recipients (customers) must be the UAS owner/operator**

2. CURRENT ASSETS & INFRASTRUCTURE

- **Influential, supportive, accessible, & responsive Congressional delegation and State officials**
- **Educated, stable, motivated, & productive workforce**
- **Schools & curricula to produce an aviation workforce**
- **Aviator-friendly state laws for aviation insurance**
- **Transportation and information infrastructure to support new & expanding businesses**
- **83% VFR flying weather per year**
- **Uncrowded skies (3.6 flying hours/square mile/year)**





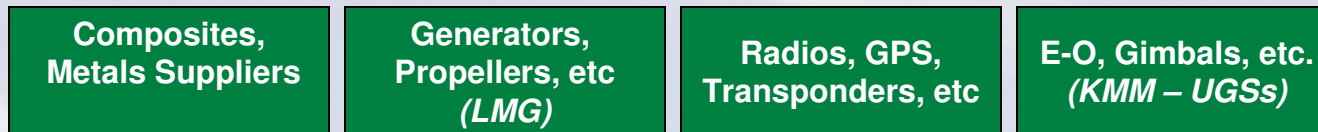


Unmanned Aircraft System

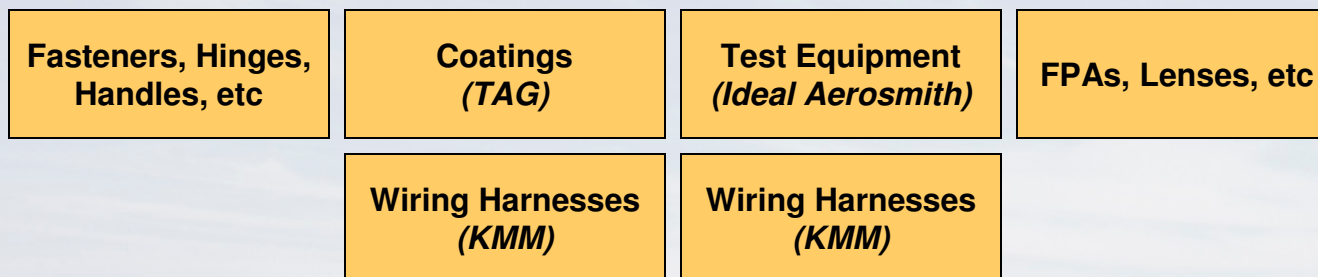
Tier 1 – Major Components



Tier 2 - Subcomponents



Tier 3 – Subassemblies/Parts



3. NEEDED INFRASTRUCTURE

- **Special use airspace (SUA)**
- **Runway, hangar, living accommodations within a SUA**
- **RF Experimental Test Station status (NTIA Red Book)**
- **Aviation insurer(s) for UASs**
- **Training/curricula**
 - **Systems engineering (UND)**
 - **Photogrammetry/remote sensing/image interpretation (NCTC)**
 - **Fiberglass manufacturing (HS) (LRSC)**

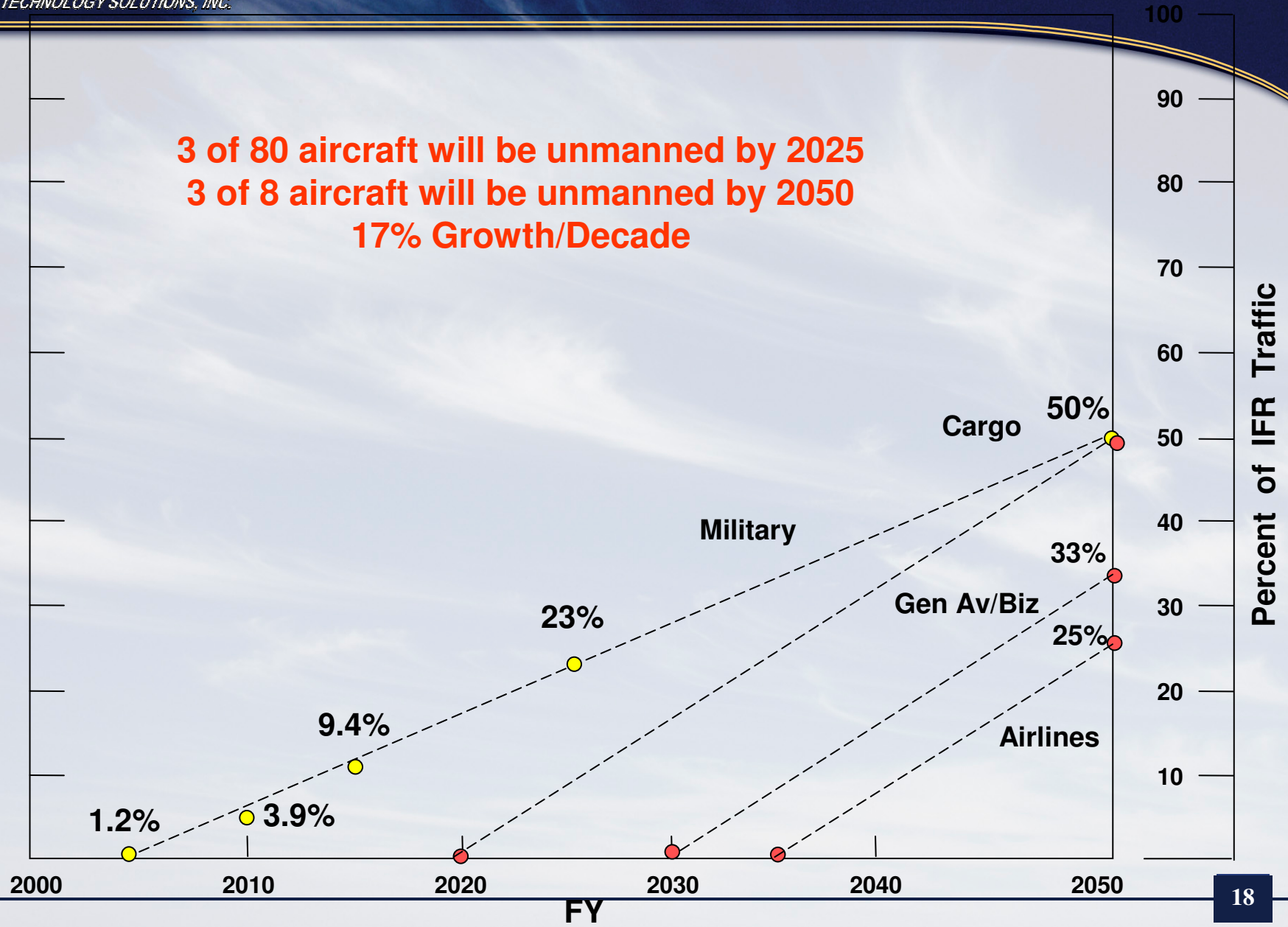
<u>Proposed Course</u>	<u>Similar UND Course(s)</u>	<u>Student Focus</u>
Intro to Unmanned Aviation*	AVIT 101, 102	All
Airmanship	AVIT 102, 142 (cadet program)	Pilots
Aviation Weather*	AtSc 231	All
Data Links & Compression*	EE 411	All
Intro to Robotics	EE 428, EE 405	Engineers
Human-System Interfaces	AVIT 250	All
GPS and INS Navigation*	None	Engineers, pilots
Radar Sensing	EE 430, AtSc 441	Sensor operators
Electro-optical Sensing*	EE 456	Sensor operators
Electives	AVIT 103, 208, 222, 323, 324, 327; ME 446, 449	

4. COMPETITORS

Facility	SUA?	COA?	Rwy?	Hgr?	RF?	Exp?
Grand Forks AFB						
Nekoma/Park River				?		
Camp Grafton	R5401	n/a				
<i>Regional</i>						
- Smokey Hills ANG, KS	R3601A	n/a				
- Idaho Nat'l Lab, ID						
<i>National</i>						
- TAAC, NM	WSMR					
- Pecos County ADC, TX						
<i>International</i>						
- RATUFC, Finland		n/a			?	
- NEAT, Sweden		n/a			?	

5. LONG TERM MARKET ASSESSMENT

3 of 80 aircraft will be unmanned by 2025
3 of 8 aircraft will be unmanned by 2050
17% Growth/Decade



6. BUSINESS OPPORTUNITIES

- **Near term (UASs unable to fly locally)***
 - **12 NTOs valued at \$11.2M**

- **Long term (UASs able to fly locally via SUA, COA, or SAW)**
 - **19 LTOs valued at over \$7.8 to 15.4M**

***Note: Recent DoD-FAA MOA will allow military UASs to:**

- **Fly within LOS of a non-dual use Class D airfield w/COA**
- **Fly UAS <20 lb within LOS over gov't land w/out a COA**

NEAR TERM OPPORTUNITIES

NTO #	Business	Description
1	attraction	Local Raytheon sensor service center (NTO 10)
2	attraction	Local General Atomics ops/maintenance office
3	attraction	UND human factors studies for General Atomics
4	creation	Newly formed local UAS ops/mx business
5	expansion	UND training Army Fire Scout pilots
6	expansion	UND training Navy Fire Scout pilots
7	expansion	UND training Army Warrior pilots
8	expansion	TAG anodizing Honeywell TPE331 engine parts
9	expansion	TAG anodizing Rolls Royce AE3007 engine parts
10	expansion	Raytheon subcontracts sensor servicing to Ideal
11	retention	Ideal Aerosmith assumes GFAFBs PMEL functions
12	retention	Alion develops anti-ice coating for UASs

LTO #	Business	Description
1	attraction	Cold weather test/exercise site for Army/AAI RQ-7
2	attraction	Cold weather test/exercise site for Army/NGC MQ-8
3	attraction	Cold weather test/exercise site for Army/GA MQ-1C
4	attraction	DHS/TSA demo for rail/power line surveillance
5	attraction	NDHP demo for accident reconstruction
6	attraction	ND sheriffs demo for marijuana interdiction
7	attraction	NDDOT demo for route planning, flood warning
8	attraction	Precision ag for RRV sugar beet growers
9	attraction	Precision ag for RRV potato growers
10	attraction	Precision ag for RRV bean growers

LTO #	Business	Description
11	attraction	Precision ag for RRV small grain growers
12	attraction	Cattle monitoring for ND stockmen associations
13	attraction	RR Water Basin Board demo for dam inspection
14	attraction	Power line patrol for Minnkota Power
15	creation	Newly formed local precision ag business (LTO 8-11)
16	creation	Create UAS-oriented airport(s)
17	expansion	Predator & Cirrus wiring harness work sub to KMM
18	expansion	KMM/Packet Digital ground sensors to CBP
19	expansion	ND insurance brokers offer UAS coverage

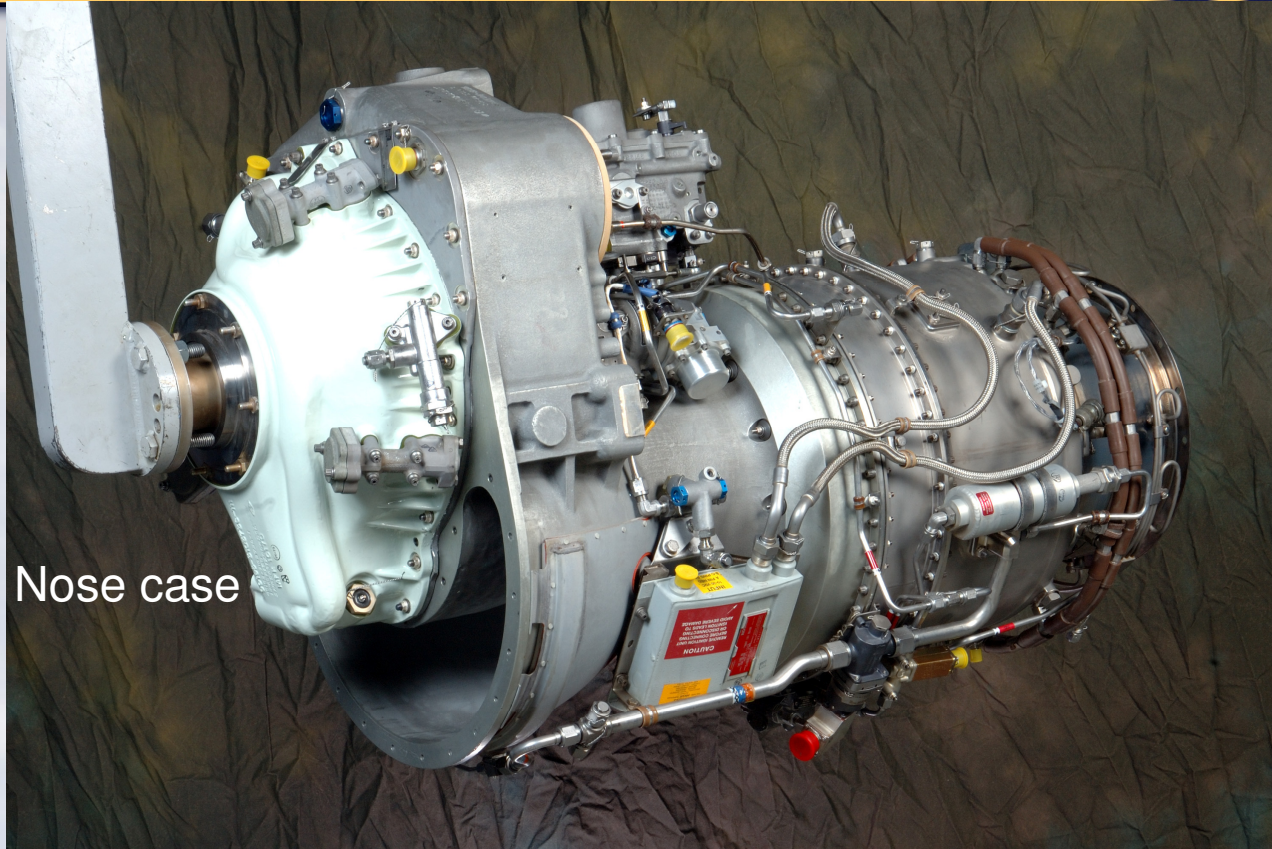
VALUE & LIKELIHOOD

Estimated Annual Value	\$1M+	<ul style="list-style-type: none"> •NTO 5 •NTO 7 •LTO 8 •LTO 11 	<ul style="list-style-type: none"> •NTO 6 •LTO 9 •LTO 10 	NTO 2
	\$100K-\$1M	<ul style="list-style-type: none"> •NTO 8 	<ul style="list-style-type: none"> •NTO 4 •NTO 12 •LTO 2 •LTO 3 •LTO 17 •LTO 18 •LTO 19 	<ul style="list-style-type: none"> •NTO 1 •NTO 10 •NTO 11 •LTO 1 •LTO 14 •LTO 15 •LTO 16
	\$10K-\$100K		<ul style="list-style-type: none"> •NTO 3 •NTO 9 •LTO 4 •LTO 13 	<ul style="list-style-type: none"> •LTO 5 •LTO 6 •LTO 7 •LTO 12

Probability: High

Medium

Low



Magnesium Nose case

- **Opportunity:** Anodizing magnesium parts for Predator B TPE331 engines
- **Provider:** Technology Applications Group (TAG – Bill Elmquist)
- **Customer:** Honeywell **Est Value: \$300-700K/yr**
- **Issue:** Uses epoxy paint for corrosion control

- **Opportunity: Airmanship training of non-rated UAS pilots**
 - **UND trains 45 Army cadets/year**
 - **UND operates S-300 helos, manned version of Fire Scout UAS**
 - **No airmanship training provided Army & Navy enlisted pilots**
- **Provider: UND Odegard School**
- **Customer(s): Army (Fire Scout, Warrior), Navy (Fire Scout)**
- **Est. Value: \$1.6M to \$6.8M/year**
- **Issues: Army & Navy buy-in (\$)**
- **Next Step: Convince Army/TRADOC/UAS TSM of value of instilling airmanship in UAS pilots via flight training**



- **Soldier/Sailor + UND training = MQ-8B Fire Scout UAS pilot**
- **Better airmanship = Fewer “pilot error” mishaps
= Greater mission effectiveness**

LONG TERM OPPORTUNITY

- **Opportunity: Precision agriculture by UAS**
- **Provider: Cropcam, AeroView, Yamaha, or a new company**
- **Customer(s): Red River Valley Sugarbeet Growers Assn.**
 - Northern Plains Potato Growers Assn.
 - Northarvest Bean Growers Assn.
 - North Dakota Grain Growers Assn.
- **Est Value: \$7.8M to \$15.4M/year (=5 to 10% of crop value saved)**
- **Issues: FAA regulation of small UASs**
- **Next Steps: Arrange meeting between growers and providers**
 - Petition FAA for relief from Policy 05-01 (SAC rqmt) for small UASs
 - Arrange for UAS insurance coverage



Grid: E Lat: 49.486269 Lon: -98.218239 Alt:121.996200m FileName: IMG0470.JPG

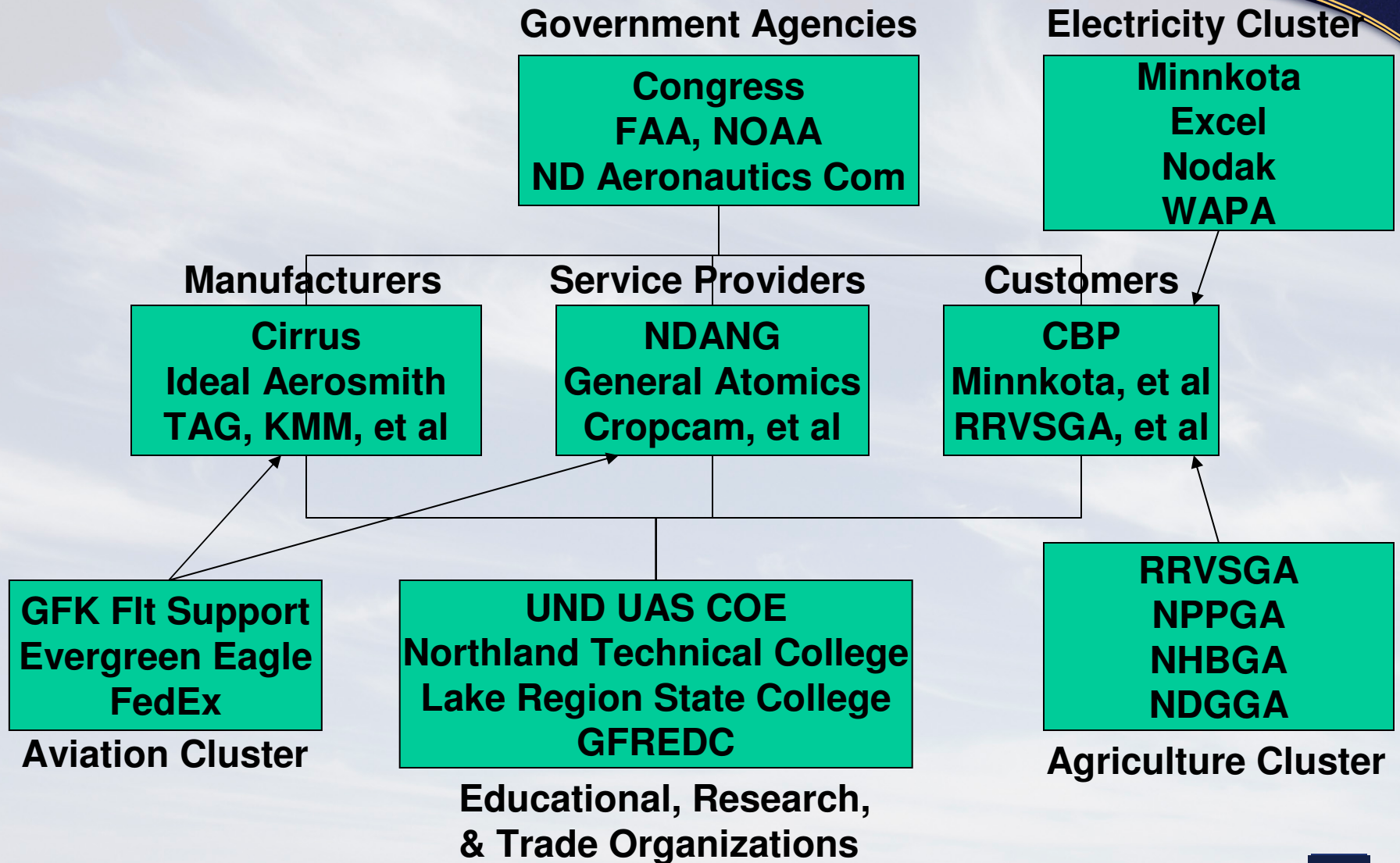
Potato fields from 400 ft

Not Drained

Drained


- **UAS + MSI camera + Photogrammetry = Improved crops**

OPPORTUNITIES BY CLUSTER



NTOs

LTOs

<p>Attraction</p>	<p>LTO 4 DHS/TSA Demo LTO 5 NDHP Demo LTO 6 ND Sheriffs Demo LTO 7 NDDOT Demo LTO 13 RRV Water Board Demo</p>
<p>Creation</p>	<p>Government Agencies</p> <div style="border: 1px solid black; background-color: #00FF99; padding: 5px; display: inline-block;"> <p>Congress FAA, NOAA ND Aeronautics Com</p> </div> 
<p>Expansion</p>	
<p>Retention</p>	<p>Est Value = \$250K</p>

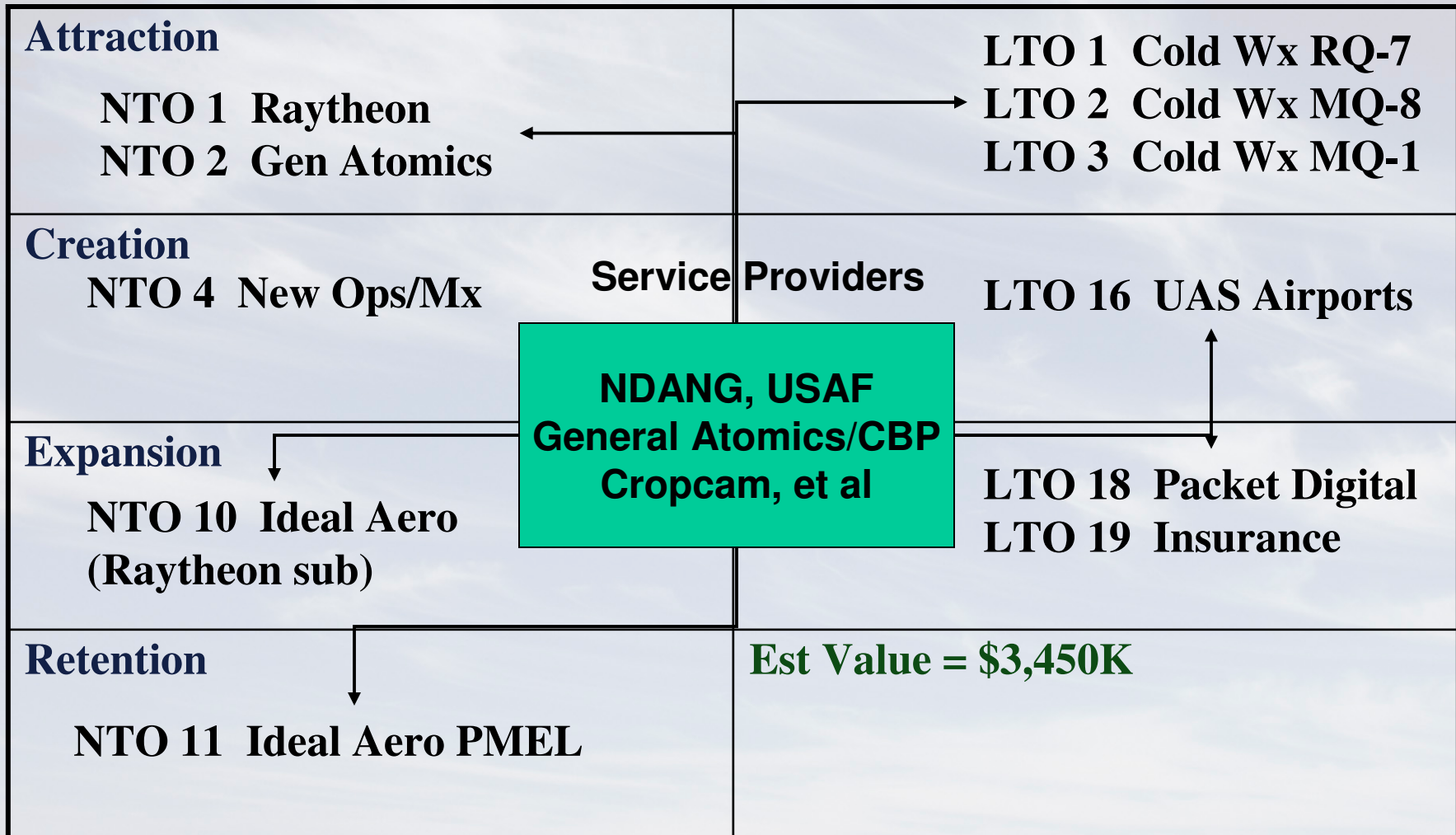
NTOs

LTOs

<p>Attraction</p>	
<p>Creation</p>	
<p>Expansion</p> <p>NTO 8 Honeywell (TAG) NTO 9 Rolls Royce (TAG) NTO 10 Raytheon (Ideal Aero)</p>	<p>Manufacturers</p> <div style="border: 1px solid black; background-color: #00FF99; padding: 5px; text-align: center;"> <p>Cirrus Ideal Aeromith TAG, KMM, et al</p> </div> <p>LTO 17 Wiring Harnesses (KMM) LTO 19 Insurance</p>
<p>Retention</p>	<p>Est Value = \$1,370K</p>

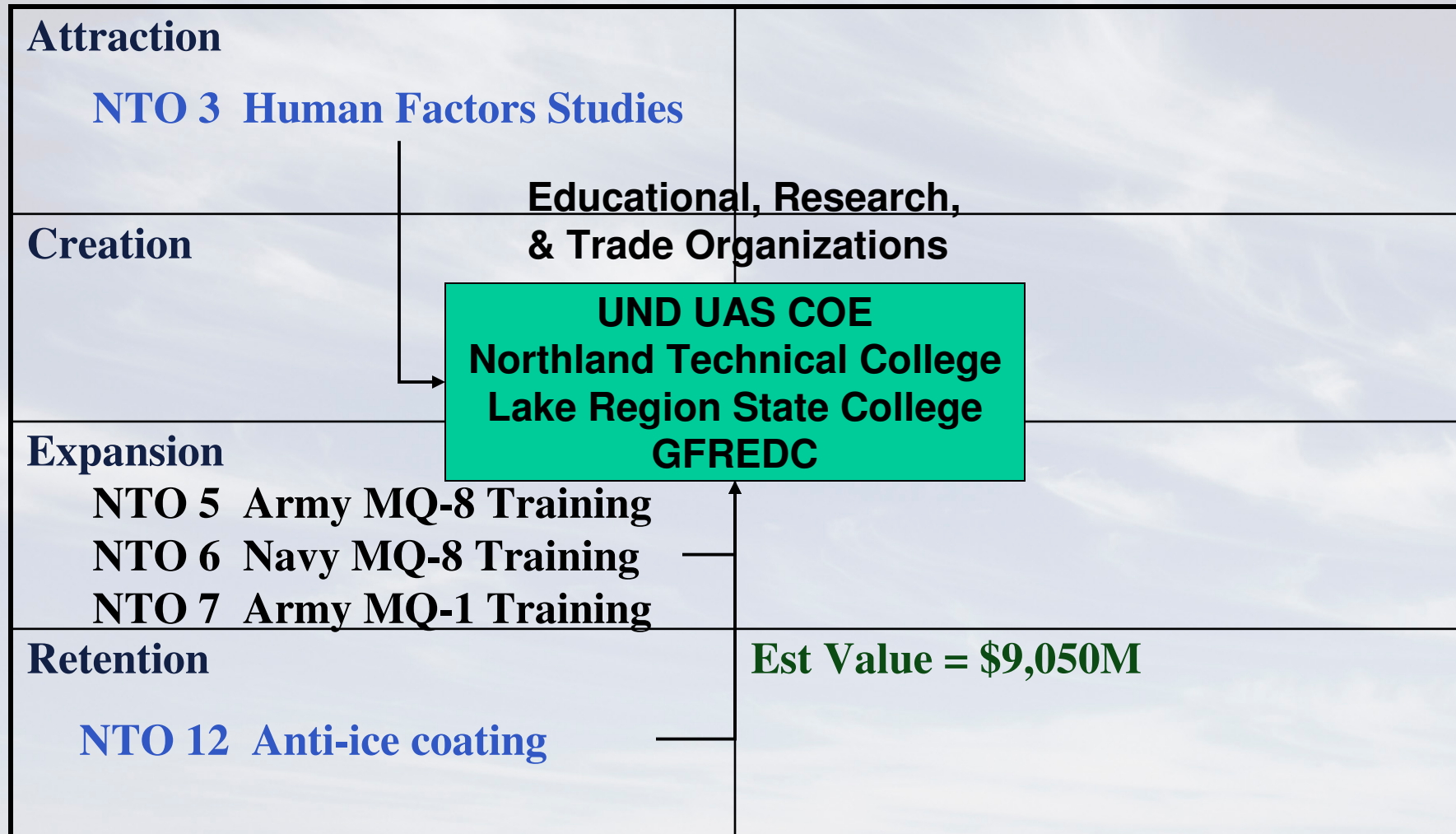
NTOs

LTOs



NTOs

LTOs



AGRICULTURE CLUSTER

NTOs

LTOs

<p>Attraction</p>	<p>LTO 8 Sugarbeet Growers LTO 9 Potato Growers LTO 10 Bean Growers LTO 11 Small Grains Growers</p>
<p>Creation</p>	<p>LTO 15 New Precision Ag</p>
<p>Expansion</p>	<p>LTO 19 Insurance</p>
<p>Retention</p>	<p>Est Value = \$6,950M to \$13,450M</p>

Agriculture Cluster

**RRVSGA
NPPGA
NHBGA
NDGGA**

ELECTRICITY CLUSTER

NTOs

LTOs

<p>Attraction</p>	<p>LTO 4 DHS/TSA Demo → LTO 14 Power Line Patrol</p>
<p>Creation</p>	<p>Electricity Cluster</p>
<p>Expansion</p>	<p>Minnkota Excel Nodak WAPA</p> <p>→ LTO 19 Insurance</p>
<p>Retention</p>	<p>Est Value = \$400K</p>

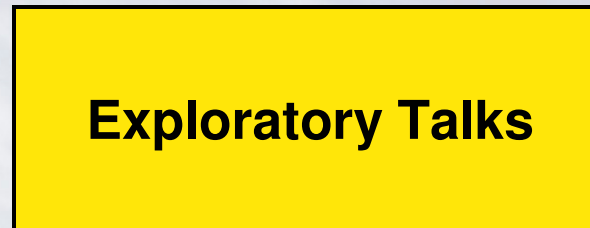
- Activities

- Arrange meeting with Growers & Providers

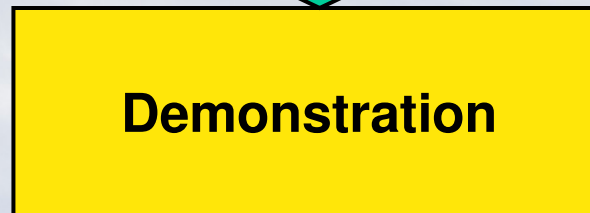
- Conduct demonstration over selected field(s)

- Sponsor/fund start-up of local Provider

- Local Provider serves Growers outside RRV and ND, other crops



Gate 1



Gate 2



Gate 3



- Timeline/Exit Criteria

- 3 mos before season

- Growers elect to fund demo

- 6 mos during season

- Decision criteria met for crop improvement

- 2-4 years in business

- Provider consistently shows profit

- **Discuss WBS NTO chart (handout)**

- **Discuss WBS LTO chart (handout)**

UPCOMING EVENTS

- **31 May 07– DoD-FAA MOA signed, will allow UAS pattern work at GFAFB**
- **Jun 07 – Arrival of first NDANG MQ-1/Predator**
- **25-27 Jun – First UAS flights in R5401 (Raytheon Cobra for UND)**
- **20 Sep 07 - CBP/AMO “Rollout” ceremony at GFIA with Predator B fly-in (POC: John Kimmel)**
- **Oct 07 – Arrival of first CBP Predator B and GCS**
- **Mar 08 – CBP Predator B operations start**
- **Mar/Apr 08 – Third RRV UAS Action Summit held**

NEXT STEPS

- Evaluate/prioritize/select specific NTOs and LTOs to pursue
- Develop detailed business development plans for each
- Tailor infrastructure investments to support BD efforts
 - Invest in R5401 or new R-area over GFACFB?
- Implement BD plans (customer visits, infrastructure RFPs)

- **Supporting initial UND offerings of UAS courses**
 - **MTSI teaches 3-day course on unmanned aviation**
 - **Taught at Ga Tech, MIT, ERAU, AIAA, AFTPS, NTPS**
 - **Continuing Ed credit given at Ga Tech**
- **Flying power line patrol for Minnkota**
 - **Flew fixed and rotary wing UAS utility demos in Texas**
- **Flying rail/power line demo for DHS/TSA**
 - **Have discussed UAS demos with TSA rail/power offices**
 - **Have conducted UAS demos for DHS, USCG, DARPA, etc.**
- **Planning/conducting precision agriculture UAS demonstrations**
 - **MTSI's staff has veteran flight test planners**

- **Organizing future UAS Action Summits**
- **Serving as liaison between UAS vendors and Grand Forks community**
- **Conducting due diligence of interested UAS vendors for Grand Forks**

- **Brig Gen (Ret) Al Palmer, UND**
 - **Greg Richards, American Crystal Sugar Co.**
 - **Dave Loer & Al Tscheppen, Minnkota Power**
 - **Mark Ewens, National Weather Service**
 - **Lonnie Rogers, Brian & Darren, Ideal Aerosmith**
 - **Bill Elmquist, TAG**
 - **Gerald Muizelaar, LM Glasfiber**
 - **Lee Anderson, Cirrus Design**
 - **Kristin Hedger, Killdeer Mountain Manufacturing**
 - **Joel Jorgenson, Packet Digital**
 - **Capt Kevin Robson and Lt Rogers, North Dakota Highway Patrol**
 - **Les Noehre, North Dakota Dept of Transportation**
 - **Julie Ellingson, ND Stockmen's Association**
 - **Dave Knopf, USDA/NASS**
 - **Dean Bruce Smith & UND faculty, staff, and innovators**
- ...Thanks*

QUESTIONS?