



University of Nevada, Reno

A National Tier 1 University

NAASIC

Nevada Advanced Autonomous Systems Innovation Center

Understanding and Implementing Advanced Technologies

Warren “Bum” Rapp

Director, NAASIC Business Development

Sponsored by the State of Nevada
Knowledge Fund



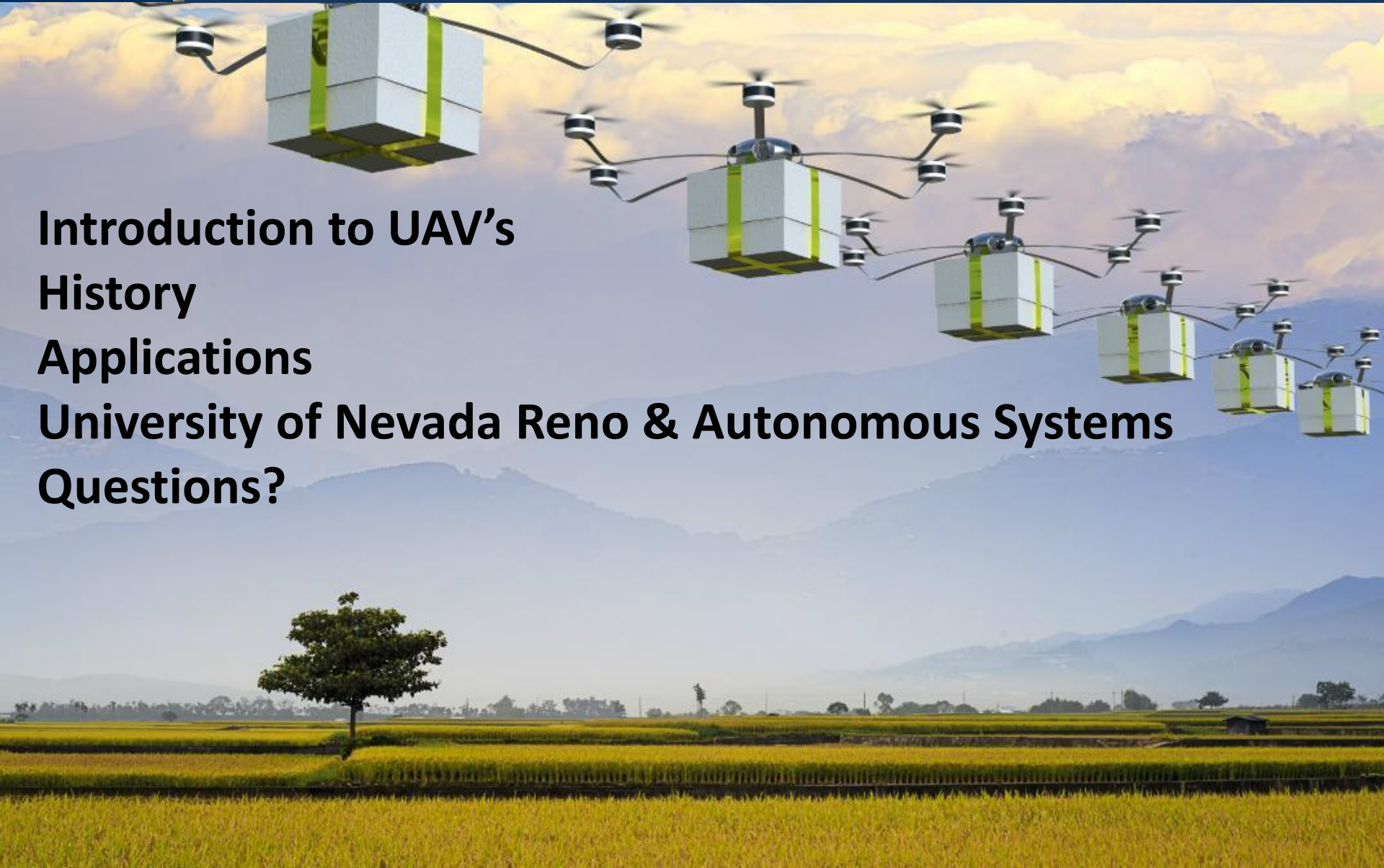
Presentation Topics

**Introduction to UAV's
History**

Applications

University of Nevada Reno & Autonomous Systems

Questions?





Explanation of Terms



UAS- Used by FAA, **Unmanned Aerial Systems**

UAV- Used commonly by civilian commercial market, **Unmanned Aerial Vehicle**

RPA- Used by the Military, **Remotely Piloted Aircraft**

Drone- Used heavily by the Media and Public, reference to ***Military and Civilian unmanned aircraft.***

Autonomous Systems- Unmanned robots and UAV's that can be programmed to function without the direct interaction with humans.





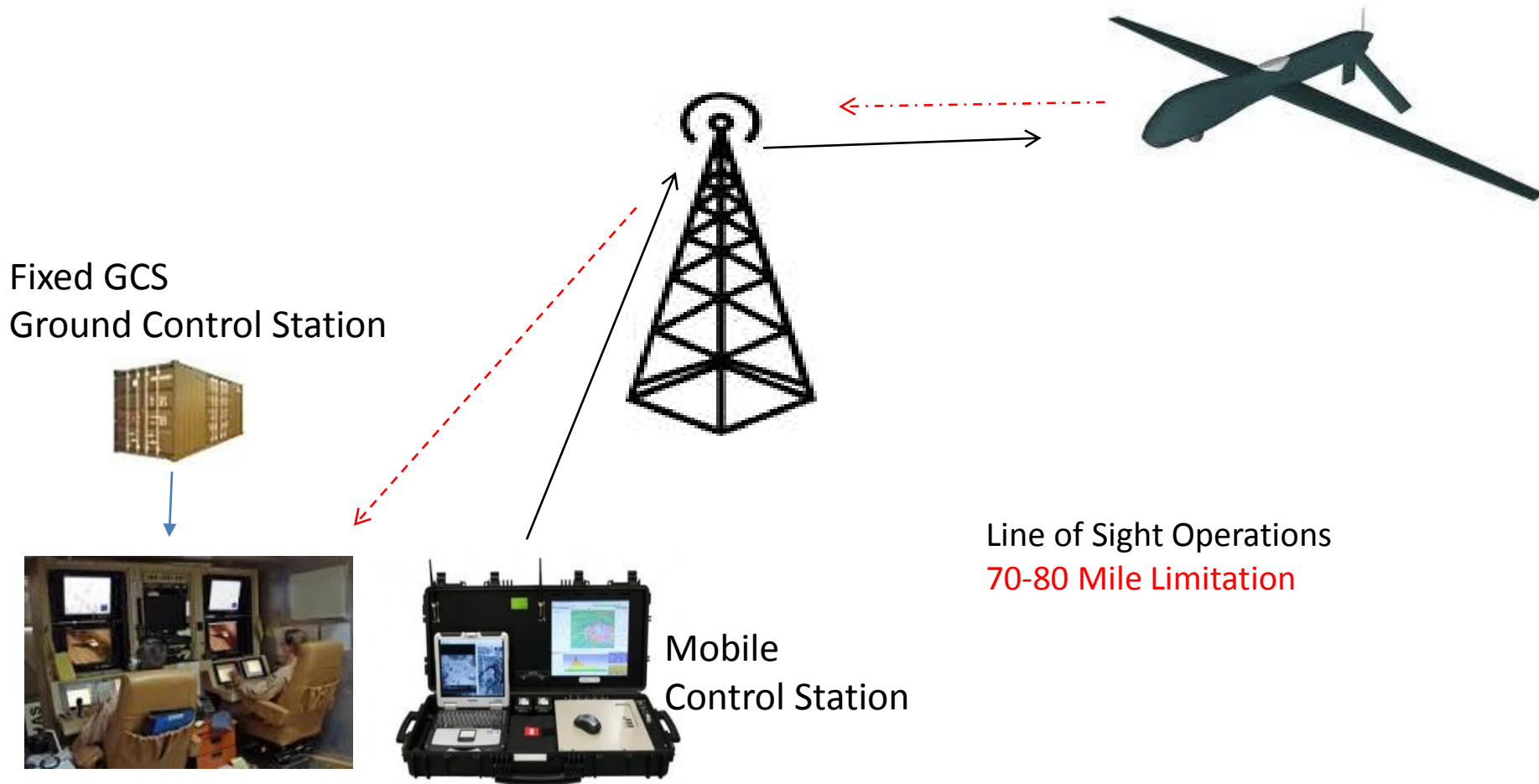
History of Unmanned Aerial Vehicles

1. On **August 22, 1849**, the Austrians, who controlled much of Italy at this time, launched some 200 pilotless balloons against the city of Venice. The balloons were armed with bombs controlled by timed fuses.
2. In **1898**, UAS technology(Balloon) was put to use in the **Spanish American War**, resulting in the first military aerial reconnaissance photos. First unmanned remote controlled boat (Teleautomaton), also used during this conflict.
3. **1920's**- First Remote Control Unmanned Aerial System (Messenger) successfully tested. Two hour flight with a 90 mile accuracy. Also developed by Sperry.
4. **WWII-1944-1945** German's developed and implemented V-1. First version of jet powered, remote controlled plane that performed a one way cruise missile type mission with 25% Accuracy.
5. **1964-1975** AQM Lightning Bug- Vietnam Support-3,435 sorties flown: 84% Accuracy
6. From **1980-Present**-Numerous UAS Aircraft from all across the globe. United States, Israel, Asia, and Europe leading in technology development of Unmanned Aerial Systems.





Military UAV's in Nevada



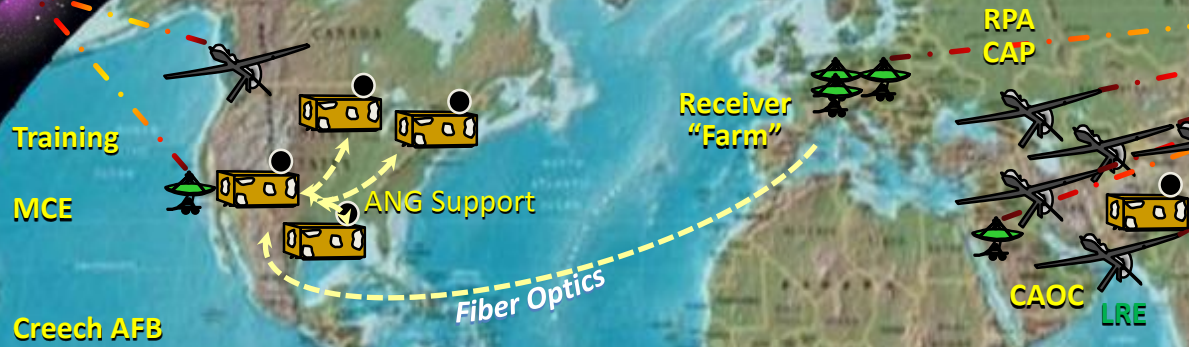
Basic Concept of UAS Operations



Remote Split Ops

(2003-Present)

Satellite



N

Humor Moment

TOP GUN
FIGHTER
PILOT



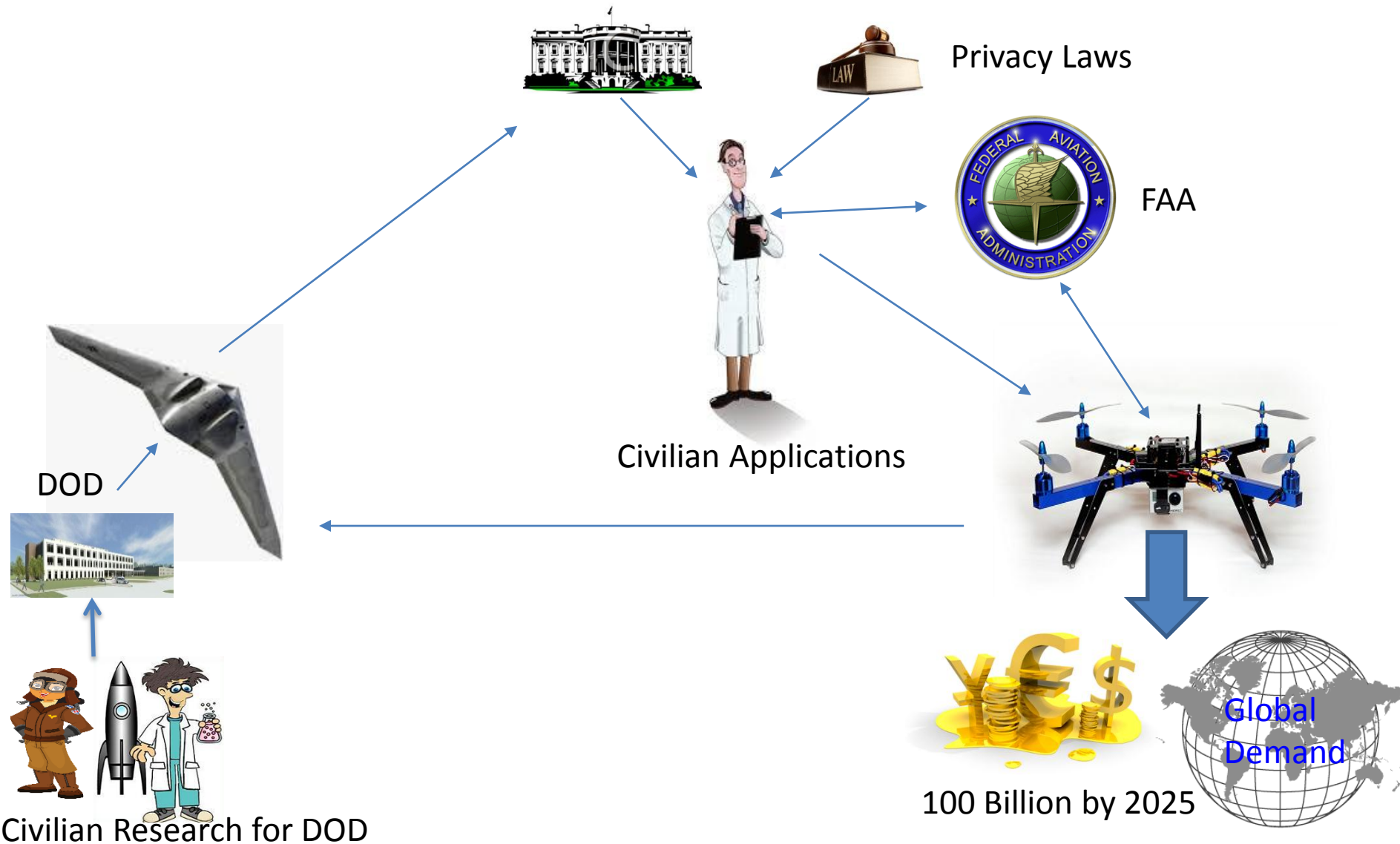
TOP GUN
DRONE PILOT



2012
CHEN



Military Technology Transfer





FAA Chooses Nevada as a UAV Test Site! (Dec 2013)



The Door is open for UAV Industry to come to Nevada!



Autonomous Systems Applications



Now what?

N

UAV Research and Testing Starts



N

UAV Applications

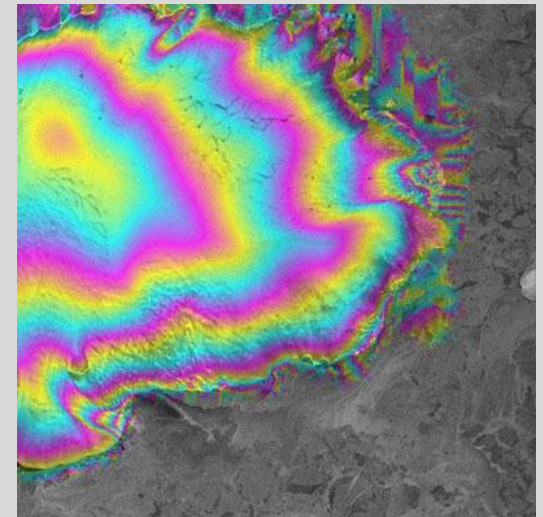
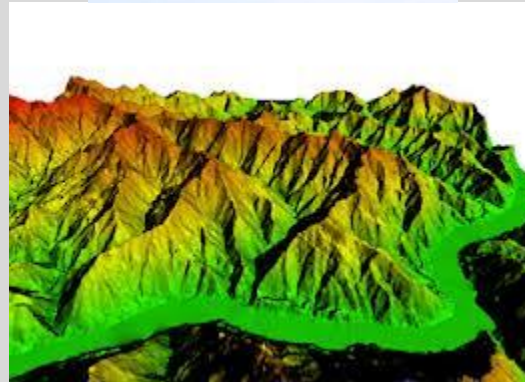




Autonomous Systems Applications

Mining

The primary use of aircraft within the mining industry is for exploration; to map out tracts of distant terrain and to explore for potential mineral deposits. The nature of such missions makes the use of UAVs a natural fit, but that is not the only area of mining operations in which unmanned aircraft excel.



UAVs are also cost effective. Without the maintenance and staffing costs of helicopters and light aircraft, UAVs are cheaper to run and require less to launch, mobilize, set up, relocate and refuel.



Autonomous Systems Applications

Package Delivery!



Flirtey





International Partnerships

Nick Anderson ©12-4-12
HOUSTON CHRONICLE

There are
some glitches
in the returns
process...

amazon.com

MEW



Autonomous Systems Applications

Telemedicine



Telemedicine Conference was sponsored by UNR in September of 2014. Additionally there was Telemedicine Conference at South Lake Tahoe in September as well.





UAV Air Ambulance?



Possible?



Air Ambulance Video



Autonomous Systems Applications

Wildlife Management

Unmanned aerial vehicles and thermal imaging—NPS has been working with USGS and the University of Florida to test small, remotely operated airplanes and heat-detecting sensors for use in detecting pythons in the Everglades. These technologies may be useful to detect and aid in the capture of pythons in their natural habitats.





Autonomous Systems Applications

Wildlife Protection



Park rangers and army personnel in Nepal carry unmanned aerial vehicles used to track wildlife and poaching activity. The drones, which can be programmed to fly automatically, are outfitted with cameras that relay live video to the ground. ***World Wildlife Fund*** is testing simple, inexpensive versions of these aerial vehicles in Nepal and Namibia using a ***\$5 million grant from Google.***

Math and science is what a team from the University of Maryland has brought to the drones vs. poachers war in South Africa.



A large rhino horn can fetch as much as \$250,000 in underground markets



Autonomous Systems Applications

Climatology/Meteorology



In a paper published in Atmospheric Science Letters, researchers believe cloud seeding marine stratocumulus clouds — which cover an estimated quarter of the world’s oceans — with “copious quantities of seawater cloud condensation nuclei” that it would help to tame the formation of deadly and destructive hurricanes.





Autonomous Systems Applications

Agriculture



RMAX UAS helicopter has been servicing crops in Asia for almost 20 years!
Manufactured by Yamaha.



The Association for Unmanned Vehicle Systems International predicted high demand for agriculture drones that will be able to spray crops with herbicide and pesticide and offer access to cheap, timely data on crop health.

UAV's vs. Wildlife

Small UAV's have been used to study Humming Bird Territorial habits and defense tactics





Nature's Justice!

The FAA is not the only one
keeping our airspace safe!





UAV vs. Hawk



Hawk 1

UAV 0



Autonomous Systems Applications

Robotics (Nevada)



Robotically Assisted Mining Shovel



Baxter gets Assembled



Northern Nevada First Tech Challenge



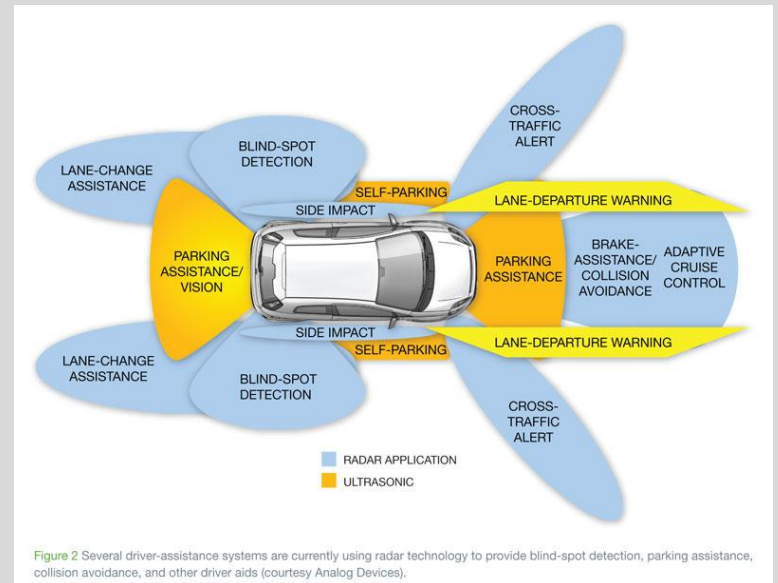
Nevada tested first Robotic Truck Driver



Autonomous Systems Usages

Driverless Vehicles

Nevada was the first state allowing the licensing of Autonomous Vehicles. California, Florida, and Michigan have followed.



Questions to Ponder?

With all of these great applications, why is the FAA is so strict on UAV Regulations and Rules?





Why we have the FAA!



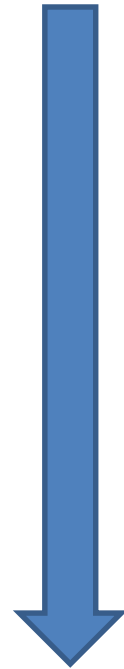
DJI Phantom in Palm Beach, Florida



ANY RISK INVOLVED HERE?



Falling from a 1,000 feet: Takes 7.9 seconds



170MPH



Wrangling in the Technologies!





How does NAASIC make it work for Nevada?

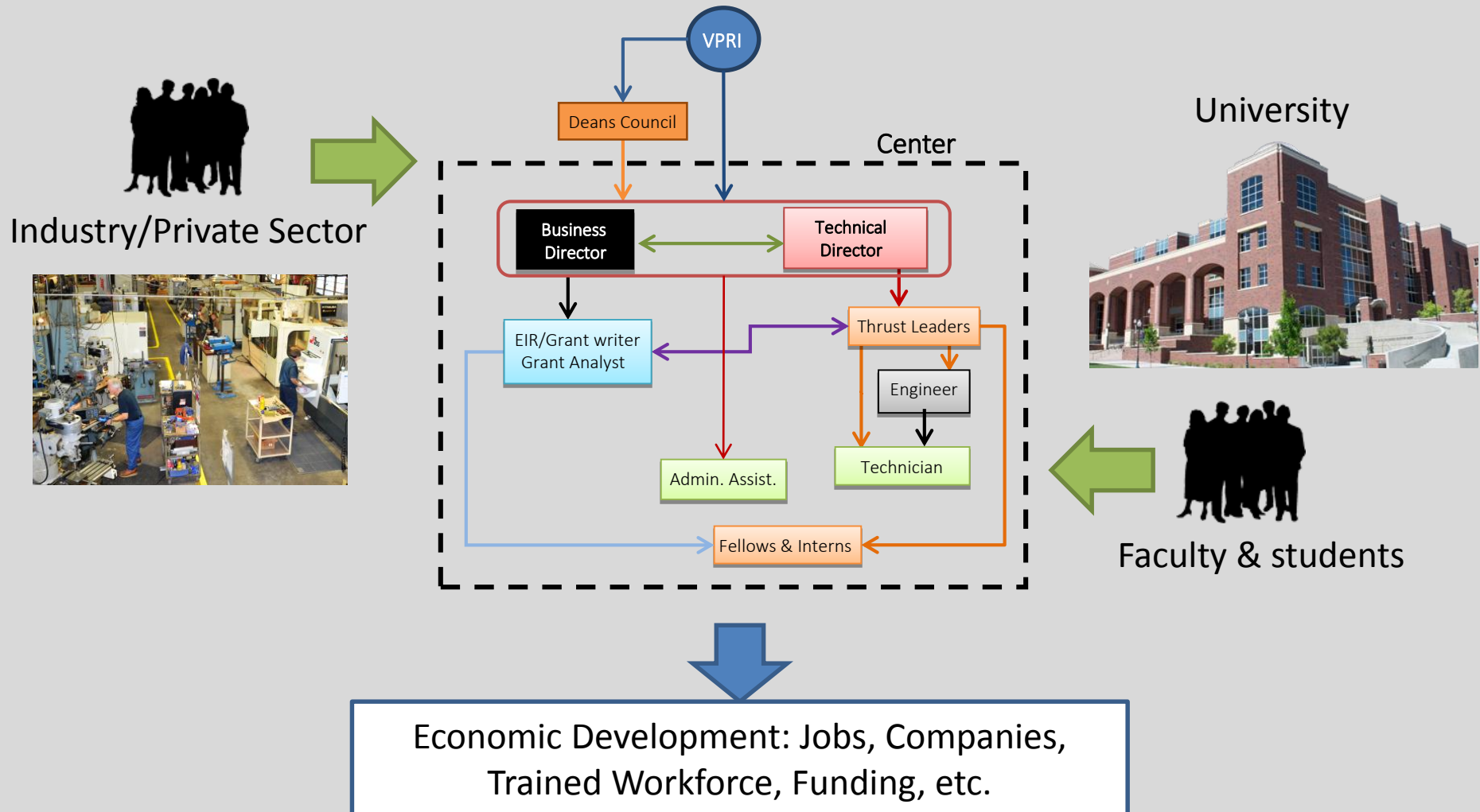




Mission

Solve emerging complex problems in the development, application, and commercialization of autonomous systems through unique industry-university partnerships, innovation, cooperative research, and entrepreneurship.





Creating Skilled Cohort for the Future of Nevada



**New UAS Minor Program
CSE/EBME/ME**



University of Nevada Reno

Our Numbers are growing and our Students are Excited!



Questions?



German "Spectracopter"



Australia's Flirtey Hexacopter



Amazon Delivery Copter



FedEx Unmanned Cargo Flights