



Aircraft for Rhino and ENvironmental Defense



Speakers/Panel



- Dr. Jean Koster, Prof. University of Colorado
- Student Panel:
 - Ms. Laura Kruger, Project Manager
 - Mr. Andrew Levine, System Engineer
- Mr. Phelps Lane,
 - CEO, HELIOS Torque Fusion Inc.
- Eric Schmidt,
 - Director, Wildlife Protection Solutions



Outline



The Poaching Problem

Team AREND Project

Discussion

The White House

Office of the Press Secretary



For Immediate Release

July 01, 2013

Executive Order -- Combating Wildlife Trafficking

EXECUTIVE ORDER

COMBATING WILDLIFE TRAFFICKING

By the authority vested in me as President by the Constitution and the laws of the United States of America, and in order to address the significant effects of wildlife trafficking on the national interests of the United States, I hereby order as follows:

<http://www.whitehouse.gov/the-press-office/2013/07/01/executive-order-combating-wildlife-trafficking>



Executive Order



Section 1. Policy. The poaching of protected species and the illegal trade in wildlife and their derivative parts and products (together known as "wildlife trafficking") represent an **international crisis** that continues to escalate. Poaching operations have expanded beyond small-scale, opportunistic actions to coordinated slaughter commissioned by armed and organized criminal syndicates. The survival of protected wildlife species such as elephants, rhinos, great apes, tigers, sharks, tuna, and turtles has beneficial economic, social, and environmental impacts that are **important to all nations**.

Anyone who has accustomed himself to regard the life of any living creature as worthless, is in danger of arriving also at the idea of worthless human lives.

- *Albert Schweitzer*



Wild at Heart



The Poaching Problem

Poaching Cruelty



www.defenceweb.co.za



Pictures Courtesy of Albina Hume (University of Pretoria)

Picture courtesy of Lowveld Rhino Trust;
<http://lowveldrhinotruster.org/#>



Poaching Cruelty



<http://ewn.co.za/2014/01/06/6-rhino-poached-in-Kruger-Park>

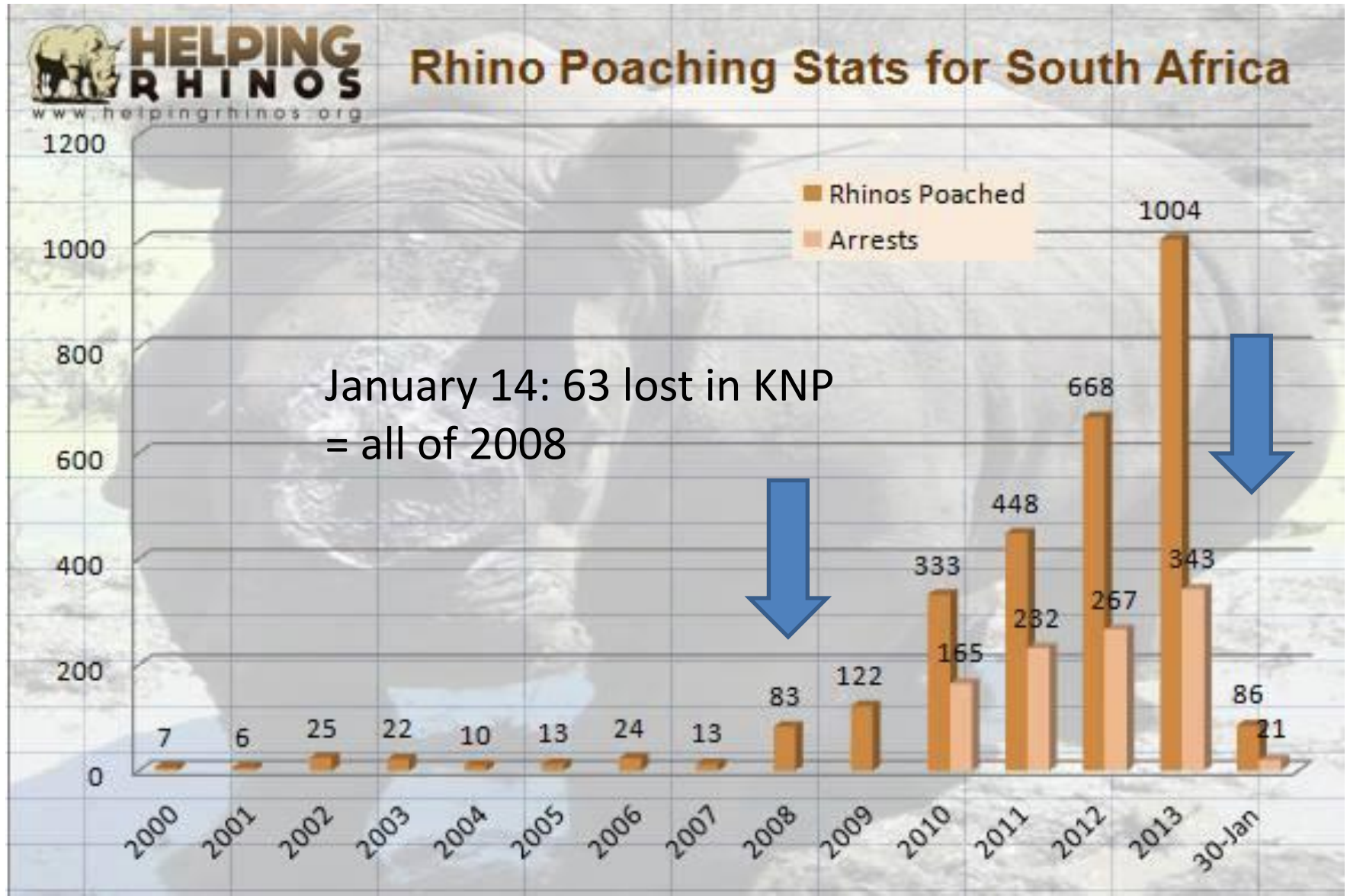


<https://www.facebook.com/TheSanWildRhinoSanctuary?ref=stream>



More details on poaching cruelty:
<http://facebook.com/teamAREND>
Do not show to small children!

Exponential Growth



What we do NOT hear about



Dangerous and Boring



SanWild Rhino Sanctuary

Dangerous: they can be ambushed.
Boring: they miss passing poachers.

Drones increase play instinct which keeps them alert and give them advantage.

Statistics



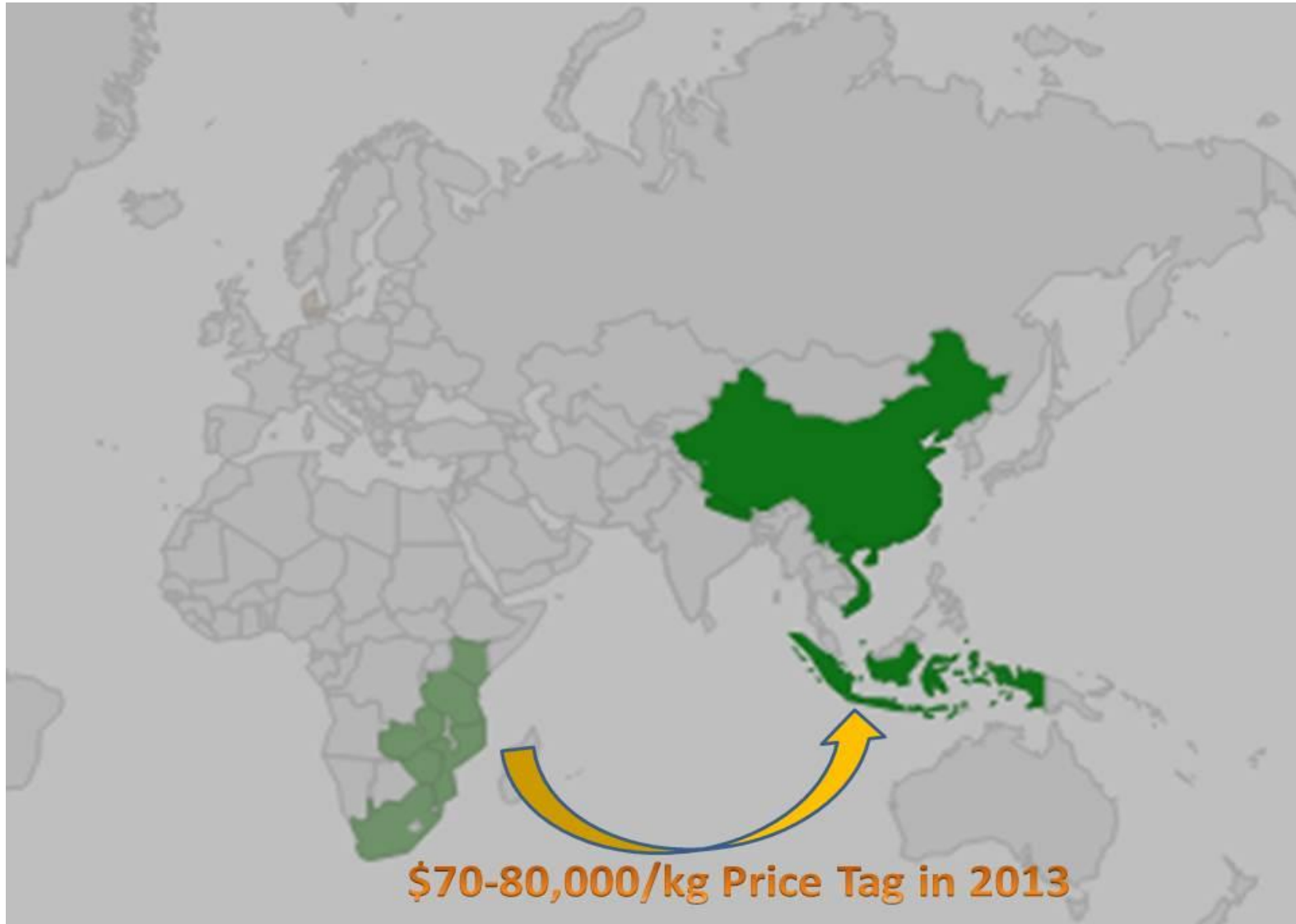
Rhino poaching statistics

SA	2010	2011	2012	2013	2014
KNP (SANParks)	146	252	425	606	63
MNP (SANParks)	0	6	3	3	0
GP	15	9	1	8	0
LIM	52	74	59	114	6
MP	17	31	28	92	3
NW	57	21	77	87	2
EC	4	11	7	5	0
FS	3	4	0	4	4
KZN	38	34	66	85	8
WC	0	6	2	0	0
NC	1	0	0	0	0
	333	448	668	1004	86

Rhino poaching arrests statistics

South Africa - Arrests	2014	2013	2012	2011	2010
KNP	14	133	73	82	67
MNP	0	0	0	0	0
Gauteng (GP)	0	10	26	16	10
Mpumalanga (MP)	0	34	66	73	16
Eastern Cape (EC)	0	0	0	2	7
Limpopo (LP)	0	70	43	34	36
North West (NW)	4	26	32	21	2
Free State (FS)	0	7	6	0	0
KwaZulu-Natal (KZN)	3	63	20	4	25
Western Cape (WC)	0	0	0	0	2
Northern Cape (NC)	0	0	1	0	0
Total	21	343	267	232	165

Rhino horn trade route

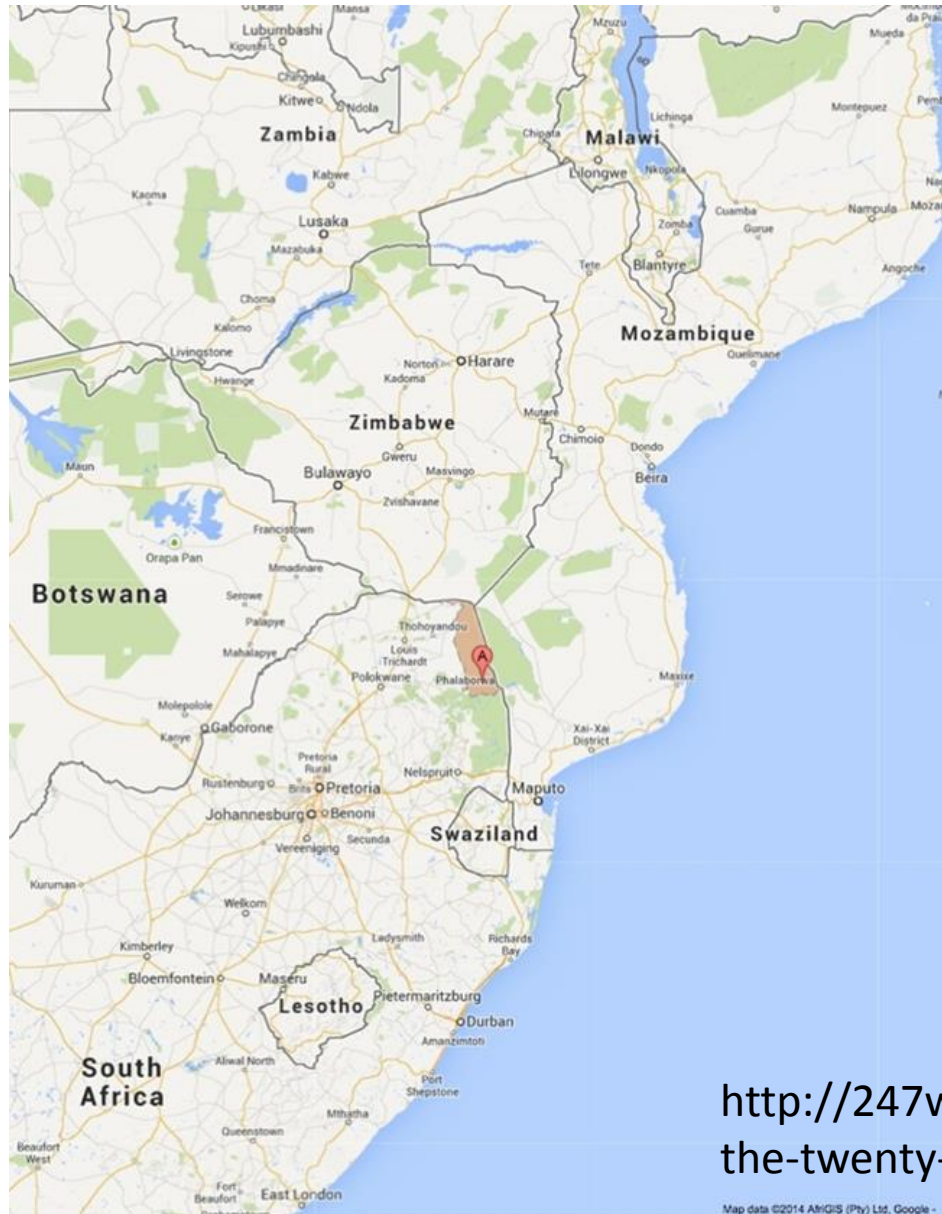


\$70-80,000/kg Price Tag in 2013

Arrest Opportunities



Kruger National Park



Wall Street Journal:

2nd poorest Nation:
Zimbabwe

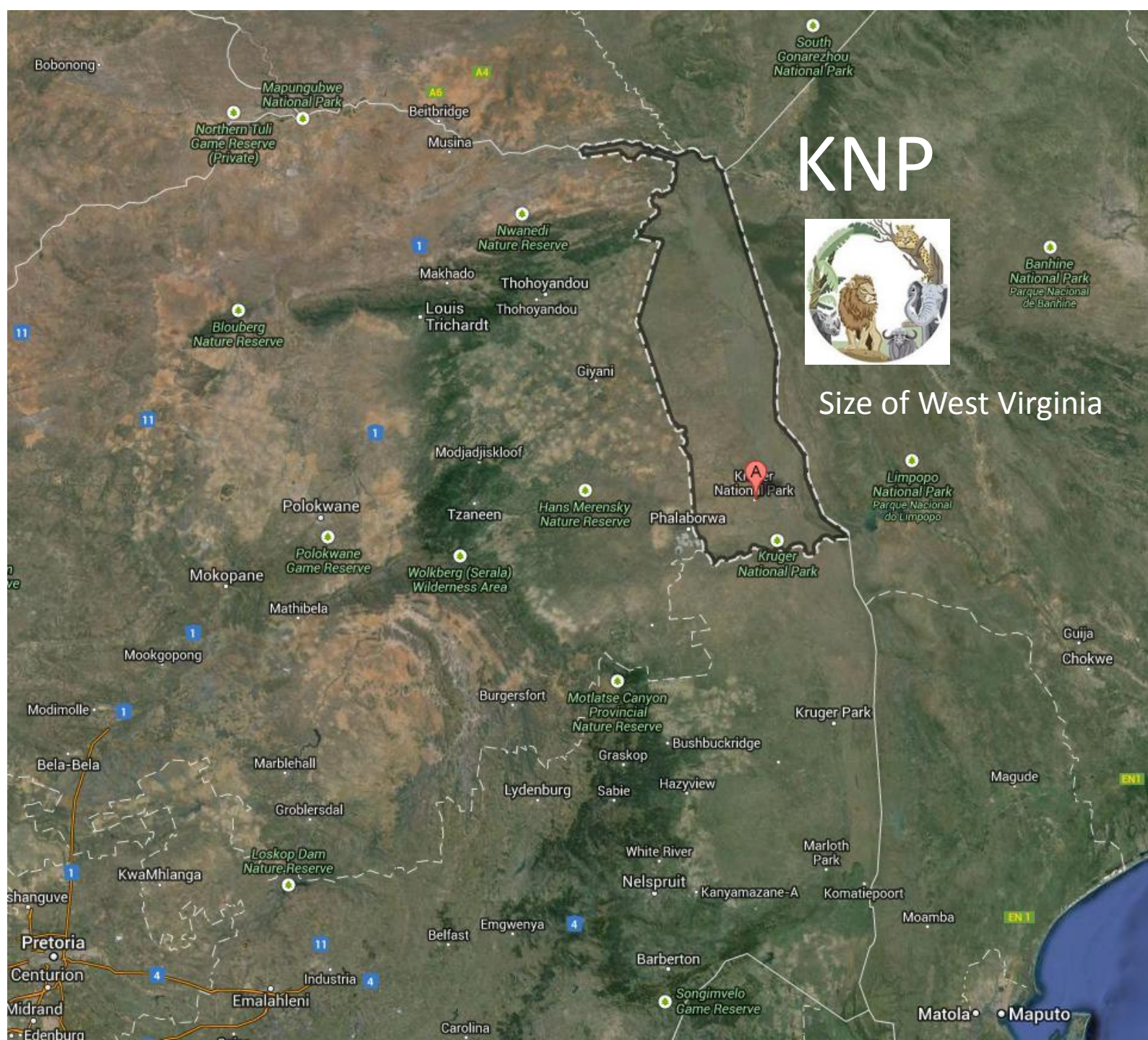
12th poorest Nation:
Mozambique

<http://247wallst.com/investing/2010/07/06/the-twenty-poorest-nations-in-the-world/>

KNP



Size of West Virginia



Dehorning & Relocating



Dehorning did not work: poachers also take stumps that fetch \$50K or less



Rescue and Arrests



Veterinarians trying to save a poached rhino that survived



Photos: WO1 Noel Kloppers

Arrest success < 5%
Poaching success > 95%



Punishments easy to absorb with earnings of \$3-400,000 per horn!



Team AREND Project

AREND is Afrikaans for Eagle



AREND membership

2/25/2014:



- Four Universities in 4 countries (Colorado, Helsinki, Pretoria, Stuttgart)
- 28 senior and graduate students (aerospace, mechanical, electrical, software engineering)
- Eleven Professors at the four Universities
- 15 engineering advisors from industry
- 6 advisors from wildlife science and management.
- Company affiliations of external engineering advisors:
 - NIST; Airspace Guardian; Four Winds Interactive; Blue Atmos LLC; Helios Torque Fusion; First RF Corp; AMA, NREL; Sand Souci Enterprise; Athena ISR; All Source Analysis; AugustaWestland; SUAS News; National Aeronautical Committee, South Africa; 2 undisclosed.
- Affiliations of wildlife scientists:
 - Denver Zoo; Wildlife Protection Solutions, Denver; Protecting African Wildlife (PAW) Conservation Trust (UK), Centre for Wildlife Management, Pretoria.

AREND Project Objectives



Design, Build, Test, and Fly an unmanned aircraft sensor system to detect and distinguish humans and large animal at an altitude of ~ 400 ft. AGL in South Africa's National Park system by the end of the Fall 2014 semester.



AREND Stakeholders



- Wildlife Conservation UAV Challenge
 - Organization of a global competition on designing a UAV for anti-poaching efforts and various technology services.
- Helios Torque Fusion Inc.
 - Developer of hybrid propulsion systems.
- Wildlife Protection Solutions Org.
 - a Colorado 501(c)(3) not-for-profit organization
 - international non-profit group dedicated to the conservation of endangered species.
- CU Dept. of Aerospace Engineering Sciences
 - Graduate design course
 - Global Collaborations

AREND GOALs and OBJECTIVES



- Goal: Poachers and rhinos shall not meet
- Ultimately the objective is to prevent the death of any rhino to poaching
- Goal: High Endurance Quiet Electrically Assisted Glider for Harsh Environment
- Create an aircraft to assist the rangers in:
 - Finding poachers on a mission
 - Tracking poachers with horn
 - Finding caches of weapons, horn, other

Ranger's Primary Objectives



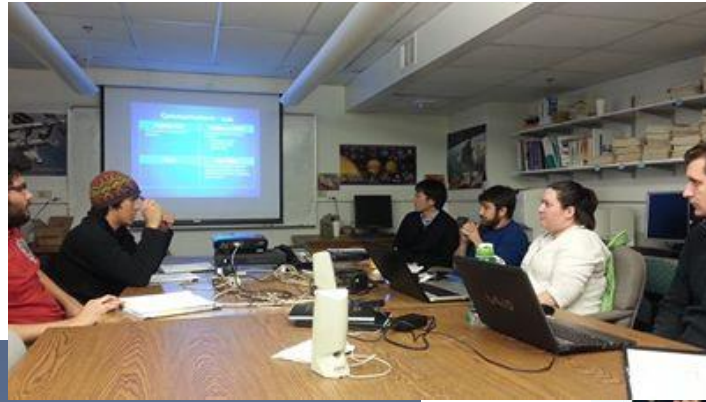
- Ideally poachers should be prevented to enter the park.
- If poachers enter, their presence should be noted a.s.a.p.
- Poachers should be unable to reach the rhino.
- Poachers should be prevented from killing a rhino.
- If poachers succeed they should be arrested within park boundaries.
- If poachers get away it should be known where they went.
- Gather intelligence about poachers and strategies.

Ranger's Secondary Objectives



- Driving up the cost and risk of poaching significantly
 - Currently arrest rate is at 5%
- Ceasing weapons and equipment
 - Find caches for weapons, equipment, horns
- Better knowledge of animal migration
- Raising awareness of “African Crisis”

WHO we Are



Engineering Students





Conceive, Design, Build, and Operate a UAV that helps fight Rhino Poaching



ASEN 5018/6018 section 18; Spring and Fall 2014

Develop a special, remotely-piloted hybrid aircraft meeting stringent operation-in-wilderness requirements, and equipped with diverse sensors to detect poachers

University Collaborations	Stuttgart, Pretoria, Metropolia Helsinki
Industry Collaborations	Helios Torque Fusion, NIST, Four Winds Interactive; other
Endorsing Organizations	Wildlife Protection Solutions; African Conservation Foundation; Protecting African Wildlife Conservation Trust (UK); Denver Zoo

Interested in being part of the team?

The team needs aerospace, mechanical, electrical, computer engineers.

Skills needed in structures, composite materials, fabrication, aerodynamics, thermodynamics, controls, (power) electronics, sensors and instrumentation, software, etc.

Prof. Jean Koster; jean.koster@colorado.edu

AREND Global Team





Academic
Advisors
& Leads

Holger
Kurz
US

Jean
Koster
CU

Donna
Gerren
CU

Joe
Tanner
CU

Laura
Kruger
CU

Laurent
Dala
UP

John
Monk
UP

Wouter
van Hoven
UP

Lelanie
Smith
UP

Antti
Piironen
MU

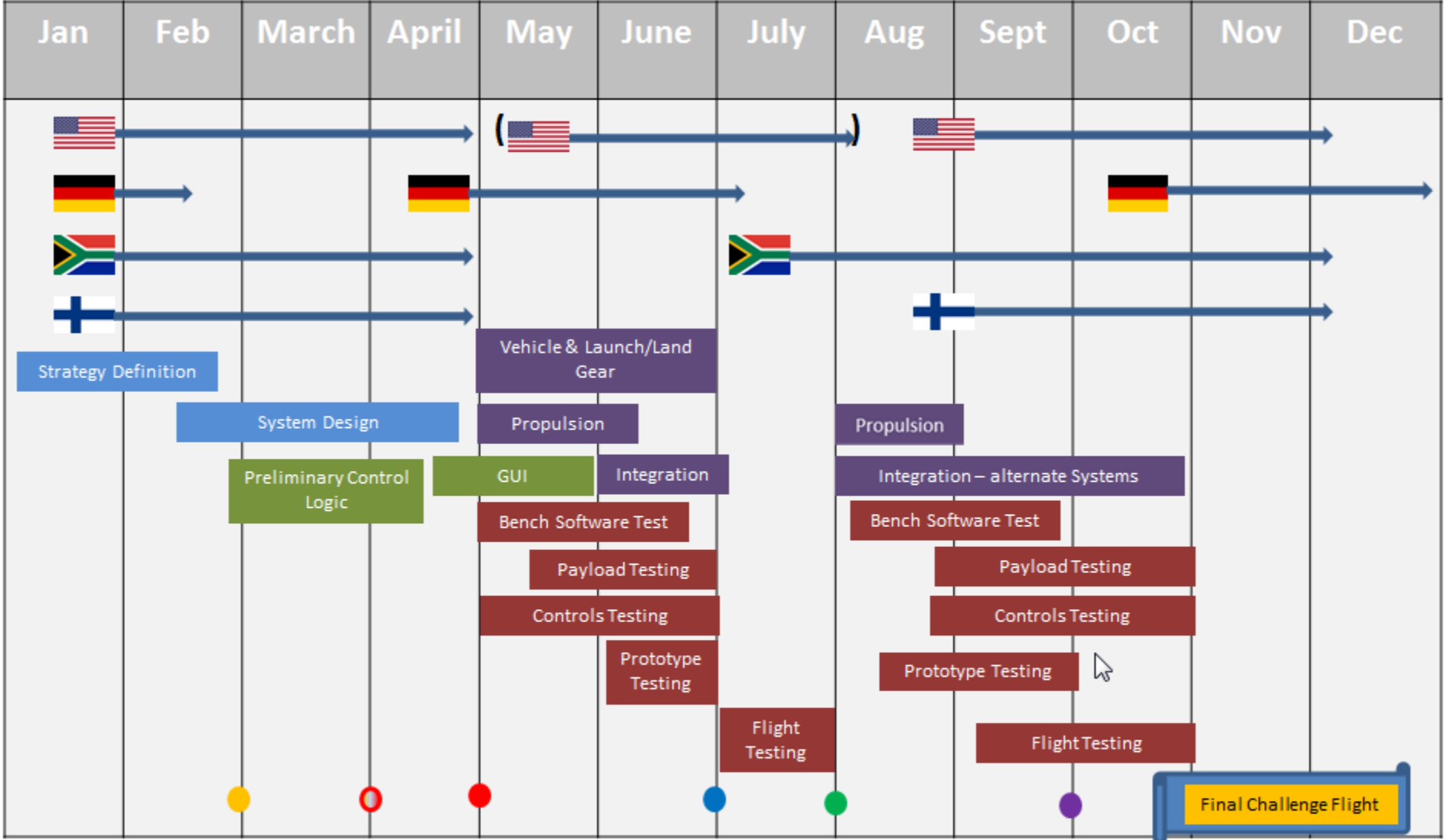
Anssi
Ikonen
MU

Ewald
Kraemer
US

Claus-Dieter
Munz
US

Peter
Middendorf
US

Dominique
Bergmann
US



● Feb. 28 UAV Concept

● March 31 Preliminary Design Review

● April 30 Critical Design Review

● June 30 Flight Readiness Report

● July 31 Flight Test Report

● Sept. 30 Final Design Report

CU (U.S.) [Jan. 13th – May 8th], [May 12th – Aug. 9th], [Aug. 24th – Dec. 17th]

US (Germany) [Oct. 17th – Feb. 8th], [April 7th – July 19th], [Oct. 13th – Feb. 14th]

UP (S. Africa) [Jan. 6th - May 29th], [July 1st - Dec. 5th]

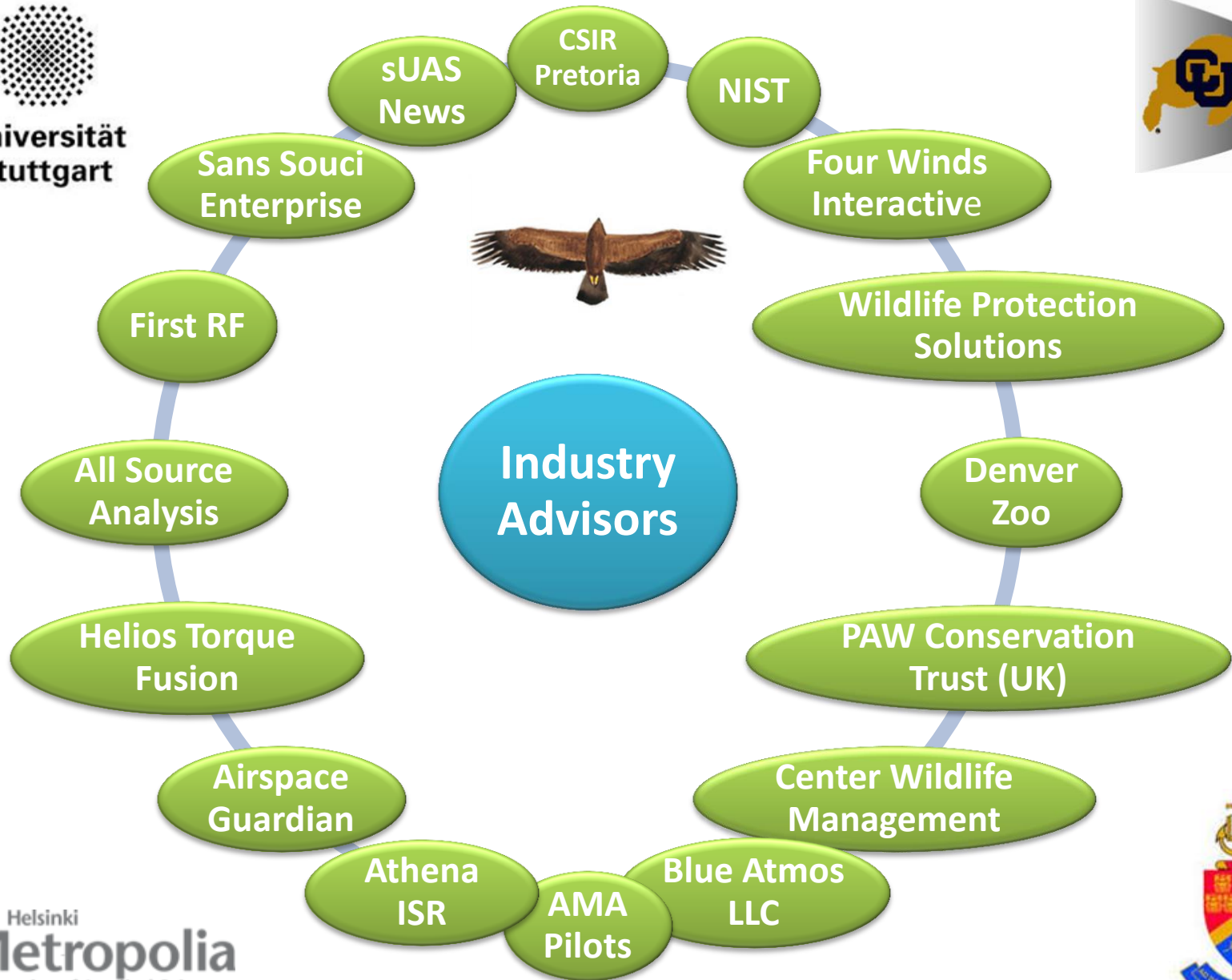
MU (Finland) [Jan-May], [Aug.-Dec.]

Design

Software

Manufacturing

Testing



Important Dates

wcUAVc



February 28, 2014: Team Design Concept

April 30, 2014: Critical Design Review

June 30, 2014: Flight Readiness Report

July 31, 2014: Flight Test Report

September 30, 2014: Final Design Report

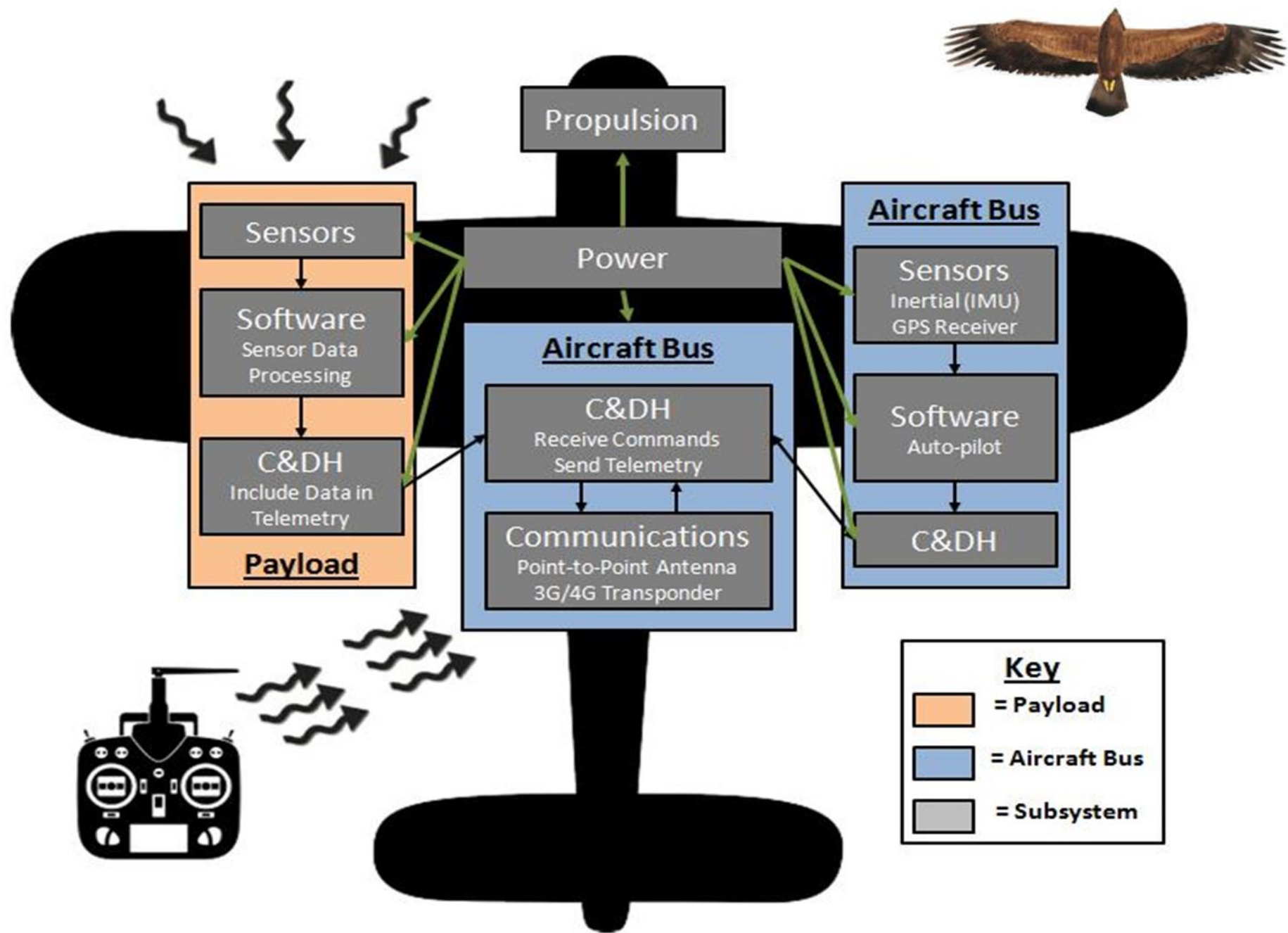
November TBD, 2014: Competition in SA

Requirements/Strategy



- Aircraft mainly for reconnaissance
- System shall handle harsh environment
- Carried by jeep and launched quickly
- Shall be quiet in flight
- Detect poachers; alert Rangers





Helios Torque Fusion

Hybrid Propulsion Technology



HTF brings hybrid-electric propulsion systems to aircraft. Combines the benefits of electric power with the benefits of liquid fuels, through the use of parallel drivetrains with unique energy sources.

Helios Torque Fusion Transmission System

Electric Drive
Series-Hybrid Drive
Internal Combustion Engine
Drive

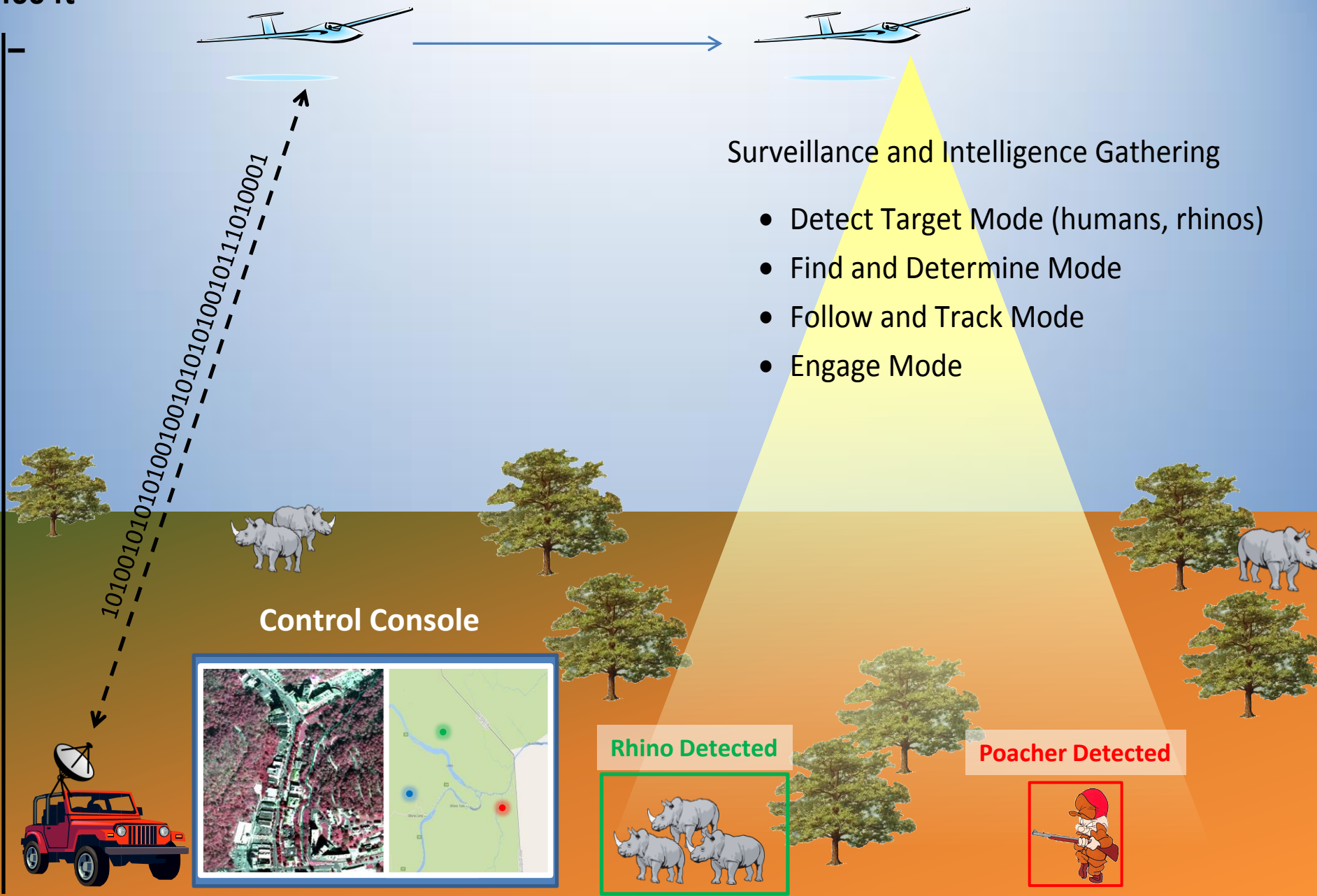
Quiet, all- electric drive mode	Liquid-Fuel Endurance	Redundant Power Source in Failure Mode	Egress Boost "Dash Mode" without oversizing ICE
Yes	Yes	Yes	Yes
Yes	No	No	No
Yes	Yes	No	No
No	Yes	No	No

Advantages:

1. Better endurance / longer range
2. Stealth / quiet operation of electric drivetrain
3. Fuel efficiency of hybrid optimization
4. Redundant power supply for emergency operation / failure scenarios



400 ft



Surveillance and Intelligence Gathering

- Detect Target Mode (humans, rhinos)
- Find and Determine Mode
- Follow and Track Mode
- Engage Mode

Control Console

Rhino Detected

Poacher Detected



Don't be one of the millions
who turn their back on this



HELIOS
Torque Fusion, Inc.



Helsinki
Metropolia
University of Applied Sciences



University of Pretoria



Let's give them a
chance to celebrate
more Valentine days!

Panel Discussion

<http://youtu.be/yccID-2jlfM>

<http://facebook.com/teamAREND>

