

ELEPHANT'S, iPHONES & BOMBS

Unmanned Drones in Conservation

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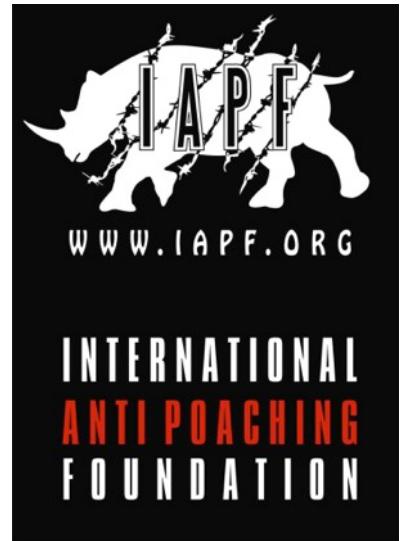
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In the wild, far northern reaches of Mozambique lies one of the most remote and extraordinary places on the African Continent. Niassa Reserve is a vast wilderness area and home to an elephant population of 13,000. This population is under constant attack from uncompromising poachers, determined to supply the black market with ivory. I traveled to Lugenda Camp within Niassa in an effort to understand the situation. I had no idea the unmanned drones that I had last seen in Iraq, were lurking on the horizon just behind me.

It's summer 2007. I'm hiding out in an abandoned aircraft hanger in southern Iraq. Today was a long one in which we narrowly escaped two roadside bombs reaching our destination. By nighttime, we can hear the unmistakable high-pitched motor of an unmanned drone patrolling the black sky above us. It's seeking out the insurgent teams that would attempt to stop us again tomorrow with earth shattering explosions, sending molten fragments of metal our way at a rate of two kilometers per second. Once identified, a gun ship will neutralize the threat. The noise of the gunship engaging is what signals a completed mission. Without that confirmation, it's easy to lie awake wondering what will be waiting for you in the morning. It's Ramadan, and just before the call to prayer, we get the confirmation. The drone had fulfilled its role.



Niassa Reserve: One of the numerous river systems running through the vast wilderness. These rivers are home to many that make their livelihoods through fishing. But with this privilege also comes the opportunity to exploit the many elephants that rely on the water source for daily survival.

Fast-forward 5 years and I'm standing on the top of an inselburg in Niassa Reserve. My senses have been re-sharpened to the sounds and smells of the African bush. Already this week within a small radius, 6 elephants have been murdered. Heavily armed Tanzanian gangs cross the border illegally to take advantage of the infinite remoteness that engulfs us. We are burdened by a lack of resources that makes me want to scream with frustration to all of humanity. This morning I saw a dead elephant up close with its face cut away. I started to wonder; why could I have a drone flying over my head in Iraq protecting me, but these ancient creatures can't drink from a watering hole without the threat of a heavy calibre bullet ripping through soft tissue, skull and eventually brain matter?

I no longer wear the uniform, fully complimented with all the gear hanging off it that would make an advance on any insurgent position a better than average chance of success. We don't have a helicopter gunship. I'm in bare feet, my hair has grown out and there is an old Czech made AK-47 with worn wooden grips at my side. I haven't been deployed by any force and no longer take home a wage. This is a war being fought by a select few and there are no joining papers to sign. All that exists is deep understanding of what needs to be done.

It is in Niassa where we will join the race to implement the technology into conservation that has revolutionized the way things are done on the regular battlefield. We are entering the Drone Age. In the past decade, a trillion dollar mobile phone industry has made technology previously reserved for the military, now accessible for civilian application. Riding on the coattails of this revolution, we do our best to gain momentum for the use of advanced technology in conservation. "Pilotless aircraft have changed fighting much as night-vision technology did in the 1980s and 1990s," stated Col. John Burke, project manager for the Army's UAV (Unmanned Aerial Vehicle) program back in 2006. "It's very seldom that you see a revolution in warfare like this."

I knew there were problems with elephant poaching in Mozambique. When I arrived in Niassa I met with Derek Littleton, a hardened Zimbabwean that manages Lugenda, a 4600 km² conservation area. He has fought hard to preserve this area for 12 years now, but his resolve is constantly being challenged. To give you some perspective, Niassa is 42,000 km², the 3rd largest reserve in Africa. This is the same size as Denmark, and larger than 114 other countries on the planet. Denmark has 73,000 km of roadway. Niassa has around 2000 km, making most areas inaccessible by vehicle.



A predominantly Muslim society in this region believes that the elephant is made up of many animals, one of these being the pig. For this reason no meat is taken from the poached animal, just the ivory. Protein comes separately from fish or poached bushmeat as livestock in this area is unsustainable due to Tsetse Fly.

Compiling one of the largest conservation areas of Miombo woodlands in the world, it is also the most ecologically diverse area of Mozambique - A country now booming back to life after 15 years of civil war. Niassa is often described as one of the last wild places on the African continent, with most areas untamed by man. It is the most extraordinary place I have ever seen. The limited visitors that do make it here experience something that few will ever know of.

Niassa has built up fantastic wildlife populations thanks to hard work by dedicated conservationists such as Anabela Rodrigues who has administered Niassa for the past 12 years. The Wildlife Conservation Society's new government contract also gives hope for a prosperous future. The elephants of Niassa however are now under extreme and constant threat. Chinese contracts to log the ancient forests surrounding the Reserve have greatly increased their presence in the area. Subsequently, the interest for ivory is unshakable; like a moth to the light. As the threat surges, the resources become increasingly limited and something 'out of the box' is required. Last year 1372 new elephant carcasses were counted

in the reserve since the previous survey of 2009. Anabela Rodrigues who has administered Niassa for SNR recognizes that “this is a very serious poaching trend.” According to Derek, “In 2012 the trend has worsened and up to 6 elephants a day are being poached in the reserve.”



Up to 37,000 elephants are being poached each year across Africa. The ivory is sent to Asia where rising economic superpowers are now well positioned to buy up the white gold.

Elephants, the world's largest land mammals, are tremendously sophisticated creatures. They possess extraordinary intelligence and live amongst complex social structures, capable of adapting to vastly contrasting surroundings. Regarded as a keystone species, they play a vital role in shaping Africa's habitats and disperse seeds across their wide ranges. These seeds lead to the forests of tomorrow that give us the air we breathe. They also attract tourists from across the globe that inject funding and support extensive employment. Despite this, they face a multitude of serious threats; most recognized being the illegal killing for ivory. Despite a 23-year international ban on trade in ivory, they continue to be shot for their prized tusks, with most of the material ending up on sale in Asia.

When Simon Beart approached me in Melbourne in early 2012 and said he would like to build drones for the IAPF, I politely replied, as I generally do, and forgot about it. I've had plenty of these offers in the past. Running a not-for-profit I have a simple formula that helps me avoid disappointment. 95 people out of a hundred that offer you help, never come through. The faster I can reply to these 95 people, the quicker I get to my 5 - The really dedicated ones.

Two days after arriving to meet Derek's team in Niassa I received an email from Simon saying he was a week away from being airborne. The cogs immediately began to turn. We started the logistical task of completing the drones and bringing them to Africa. A drone would be good, but it wouldn't be enough. We needed an additional capability and there was only one place to go for this. Flir lead the market in lightweight, thermal imaging cameras, suitable for the exact thing we were doing. A thermal imaging camera displays an area in 2 dimensions. It distinguishes everything in layers depending on the heat signature that it puts out. A human being against the night backdrop of the Africa bush is perfect illustration of white on black.



Simon Beart: A former naval helicopter technician, holding one of the drones used in early development. These drones have limited capability, but serve a purpose for conservationists.

The drones we are using are small in comparison to a Predator UAV (Unmanned Aerial Vehicle) that routinely patrols the skies anywhere the United States has an interest in. But it has a purpose. It's a great example of what technology should be: smaller, lighter, easier to function, sophisticated and cheaper. Gyroscopes, which measure rates of rotation; magnetometers, which act as digital compasses; pressure sensors, which measure atmospheric pressure to calculate altitude; accelerometers, to measure the force of gravity - all the capabilities of these technologies are now embedded in tiny chips that you can buy at an electrical store. Global Positioning Systems which cost tens of thousands of dollars in the 90's are now a thumbnail size device and cost as little as \$10.



A basic ground station setup: Off the shelf versions of these can run into the tens of thousands of dollars. Our system comprising of two donated laptops worked just fine.

why not extract some of the rangers from the field. They can then be trained as a specialist reaction unit and on constant standby to respond to real time intelligence. Doubling your manpower in Africa doesn't always solve the problem - it often increases it. The drone is a tool that can reduce deployed manpower in the field.

As trials begin, the complex list of unforeseen problems in one of Africa's most remote areas becomes evident. 3 days into operations, we crash and badly damage the first drone; the wings ripped from the fuselage and the volatile battery packs destroyed. 90% of the problems we encounter are software related. Online support networks help us problem solve and not long after re-entering operations, the drone locates the dying embers of a poachers campfire in the early hours of the morning. A radio call from Simon relays the position and Derek prepares his ground units for deployment. Stalking through the bush towards the target I wonder to myself how long it would have taken to locate this well hidden camp without the drone. Weapons raised, the raiding line closes the final 50 meters silently and takes the camp by surprise just after 5 am. A week earlier, a

In Niassa, the drone allows us to have eyes on the target, to see things out in front of us and in places we don't have the resources to get to. Previously we would walk around, waiting to bump into something. Now, we peek over the horizon. The drone can provide day or night aerial intelligence, surveillance, target acquisition, and reconnaissance. Real-time intelligence is everything in an operational environment. Having this far exceeds locating a 2-day old footprint or worse still, the mutilated carcass of an animal. Having the resources to follow up on intelligence is critical too. If we can cover with a drone in a few hours what a ground team covers in a week



The nearest major town is Pemba, a 12 hour 4X4 drive away from the testing site. Future trials are being conducted a little closer to ongoing support.

similar raid ended in a fire-fight with one ranger shot through the shoulder and one wounded poacher fleeing back to Tanzania. Of the 4 people in this camp, 2 have fishing licences. The other two are Tanzanian, have no paperwork, and poor excuses as to why they are in the area. They are arrested and taken to the nearest police headquarters 4 hours away for further questioning.



The next drones being developed by IAPF aim to have an endurance of 6-8 hours, stabilised imagery, target acquisition/locking and tracking, and a range of up to 400kms.

system, not requiring money. They now see what they never had, and need it. Driving through villages I see shiny new motorbikes, iPhones and designer clothes; all undoubtedly purchased with the backing of the ivory trade. What complicates conservation further is that elephants here are considered vermin. Crop raids and fatalities as a result of human encroachment into wildlife areas create a constant divide between the two species. The poachers are doing the locals a great justice, and pocketing the consequence.

What is needed in Niassa is a fulltime drone with a long-range capability. This will help patrol the vast areas and channel the limited resources to where they can be of most effect. I envisage a drone, with a 20-hour endurance, flying endless grids across the Reserve - The 'unblinking eye'. Live feedback is channelled through computer recognition software which is programmed to alert staff of any incursions. The drone locks onto the target and guides ground teams into position whilst the entire incident is recorded. This type of capability will cost around US\$130k. Many will argue the money could be much better spent in other places. I couldn't think of a more worthy place. But I'm biased. Now imagine the capabilities of this technology injected into the Rhino Wars raging further south.

The Journey

In 2008 I left Iraq for good after 3 years of duty in the 'Sandpit'. I had saved and invested considerably and could afford not to work for the foreseeable future, and that was the plan. Eager for adventure, I'd heard about the work of anti-poaching units some years earlier and earmarked it for a



6-month tour. I arrived in Africa at the beginning of 2009 aged 29. It was in Zimbabwe where the purpose of my journey through life really hit home. I was face-to-face with the harsh reality of rangers on the front line, with little resources, trying to defend a global treasure from a determined enemy. It was not something I could ever turn my back on. I grit my teeth, liquidated my assets and set up the International Anti-Poaching Foundation.

The seed for my frustration that would lead to the start of the IAPF was watching underpaid and underappreciated rangers sent out on missions in harms way. Before I set out on my first patrol in Zimbabwe, I knew already what was needed to win the battles these rangers faced on a daily basis. It's not a hard one to pinpoint - Training, equipment, mentoring, institutional support and persistence. Taking my boots off after that first patrol, I boldly stated, "Access to the right technology would win this entire war." And I stand by that comment. The drones which had helped bring me home safely from Iraq, were at the top of my list. I spent the next three years working with rangers, training them, running operations and above all - learning. We built affiliations that gave us access to reserves, equipment and manpower. We established two training facilities to teach rangers. The experience reiterated that little has changed in decades when it comes to patrolling vast wilderness areas. It generally consists of a small team, with a weapon or two, basic rations and limited communications sent out on extended patrols.

I'm often asked how I can focus so hard on protecting animals when there are people suffering around the world. I ask them if they would have more of a problem with a dog digging up their flowerbed or a terrorist launching a chemical attack in their city centre. Both are at about the extreme levels of what animals and humans are intentionally capable of doing to really upset your day.

Over the past few years I have really started to struggle on a personal level with the way things are unfolding on a global scale. We now share a planet with 7 billion other people. All fighting hard each day for a better job, to build a grander house and drive a faster car. We spend more and more each waking moment to advance, to grow bigger, faster and stronger. We spend more protecting our own species than anything else on the planet. Healthcare, border protection, defence, disease cure and energy. We no longer live in a society. We live in an economy. In the short-sightedness of our quest to advance, we have foolishly pushed ourselves to a point where we are scrambling for solutions. We need to decide what is important and then make decisions that matter. This generation will be judged by our moral courage to protect what is right and every worthwhile action requires a level of sacrifice.

If we can justify spending a trillion dollars on advancing the way we talk to each other, then how do we make sure the use of this same technology is available for saving what our human march forward is



Niassa - One of the largest and most remote wilderness areas on the earth is patrolled by less than 150 rangers. This is a classic example of the overall global communities priority and the struggle for underappreciated and unrenewable assets which we will be held accountable for.

destroying? Drones have been available for well over a decade for defence and energy. We must for now sit here grateful for the fact we have been able to build just a few for the purpose of saving these magnificent creatures.

True wilderness areas are shrinking. They are a global asset. They were created for a reason and that is to preserve what little we have left. Why must the conservation of these areas be an ongoing struggle? Why must those dedicating their lives to protecting these areas be in constant battle with each other for funding? I think it's unfortunate that struggling or poorly administered African countries should be left with the burden of having to fund all the costs of conservation in these wilderness areas. These are the world's assets to experience and the responsibility therefore should be a global one.

We are doing our best to hold back the tide of human encroachment - The unbalanced challenge between dwindling wilderness areas and rapidly increasing human populations. If we all don't begin respect this planet, and I mean wholeheartedly, then it is going to chew us up and spit us out.

This project is a big step for us. The Drone Age is coming to conservation and we must be given the capacity to embrace it. This project does not just represent what can be done for the elephants of Niassa, but what should be a global focus. It is high time that conservationists around the world be given access to the equipment that is out there. My vision is that one day soon, wildlife all over the world will have a watchful eye flying over, just as our soldiers do on the battlefield.

At the time of releasing this article two major news documentaries (including 60 Minutes) had been released highlighting the use of unmanned drones in IAPF conservation operations.

Following both documentaries a conference was held in Sydney involving some of Australia's leading minds in UAV technology. Subsequently a team was formed and now working on the next phase of IAPF UAV's. By September 2013 there are plans in place to be producing affordable drones with stabilised thermal/nightvision/colour imagery with live video feedback, target acquisition, locking and tracking, 6-8 hour endurance, 50km live video feedback to base and a range of 400km.

The team consists of:

- 1: Ian Mackenzie-Ross:** Project Manager: Australian Defence Force UAV Program
- 2: Dr KC Wong:** Head of Unmanned Aerial Research University of Sydney, School of Aerospace, Mechanical & Mechatronic Engineering / President of Association for Unmanned Vehicle Systems Australia
- 3: David Hobby:** UAV Specialists & twice World Champion Aeromodeller
- Simon Beart:** Helicopter technician & UAV Technical Development Manager: IAPF
- 4: Ross Osborne:** Aerospace Engineer & Intelligence Surveillance and Reconnaissance (ISR) solution specialist
- 5: Damien Mander:** IAPF CEO
- 6: LT Col Brett Chaloner:** Australian Defence Force
- 7: Cameron Hall:** Business Strategist – T2 Consulting
- 8: JC Strauss:** Anti-Poaching expert

To view 60 Minutes and Carte Blanche please follow these links:

60 Minutes - http://www.youtube.com/watch?v=y0yxQYca-U&feature=player_embedded
Carte Blanche - http://www.youtube.com/watch?v=WlI3W8w6voE&feature=player_embedded

IAPF would like to thank Derek Littleton and the team at Lugenda, Conservation Guardians, Rani Resorts, Anabela Rodrigues, 60 Minutes, Wildlife Conservation Society, Carte Blanche, Eco Ranger, Rhino Revolution, Australian Geographic, Good Weekend Magazine, ABC, Alston and all the generous donors from Australia and around the world that care about something so precious, yet so far away.

We need financial assistance to continue - If you need more information or would like to contribute to the UAV Program then please visit:

www.iapf.org or email: simon.beart@iapf.org