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# UAV – bare ny teknologi eller en ny strategisk virkelighet?

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# Introduksjon

I løpet av det siste tiåret har verden opplevd en voldsom vekst i bruken av ubemannede luftsystemer. De er gjerne kjent under den engelske forkortelsen UAV (Unmanned Aerial Vehicle) eller med det begrepet som ofte brukes i norsk dagligtale – «droner». Særlig kjent er USAs bruk av UAV i grenseområdet mellom Afghanistan og Pakistan, hvor blant annet UAV-ene MQ-1 Predator og MQ-9 Reaper benyttes til målrettede angrep mot ledere i Taliban og al-Qaida, som del av den såkalte «Global War on Terrorism». Nylig (23. mai 2013) forsvarte USAs president Barack Obama denne bruken av droner i en bredere anlagt tale om amerikansk utenrikspolitikk, samtidig som han kritiserte selve begrepet «Global War on Terrorism» og presiserte at man var nødt til å få en slutt på den krigen som nå er inne i sitt tolvte år.

Selv om president Obama skulle lykkes med å finne en avslutning på den krigen USA begynte i kjølvannet av angrepene mot New York og Washington 11. september 2001, er det liten tvil om at bruken av UAV og tilknyttede våpensystemer vil fortsette. I skrivende stund er det hovedsakelig USA som er i førersetet når det gjelder utvikling og bruk av UAV-er, men dette vil etter all sannsynlighet snart endre seg. En rekke nasjoner, deriblant flere NATO-land, har lagt inn store bestillinger på UAV-systemer, og det er derfor lite trolig at USA vil kunne opprettholde sitt tilnærmede monopol særlig lenge. Dette faktum, samt de åpenbare utfordringene man står overfor ved utviklingen av for eksempel våpensystemer som er i stand til finne mål og avfyre prosjektiler uten menneskelig medvirkning, førte blant annet til at Christof Heyns, FNs høykommissær for vilkårlige, summariske og utenomjuridiske henrettelser, overfor FNs menneskerettsråd 30. mai 2013 tok til orde for et verdensomspennende moratorium innenfor det han omtalte som «lethal autonomous robotics».

Det er åpenbart at bruken av UAV reiser en rekke utfordringer og dilemmaer – politisk, juridisk, teknologisk og etisk. I takt med ny teknologisk utvikling og tilpasning utvides stadig bruksområdet til UAV-ene. I USA utdannes det nå flere UAV-operatører enn jager- og bombeflypiloter til sammen, og fortsatt er målutvelgelsen og beslutningen om å avfyre våpen i all hovedsak menneskestyrt. Mulighetene teknologien åpner for, for eksempel i form av

svært små, autonome og våpenbærende UAV-er, gjør imidlertid at de fremtidige perspektivene både viser et stort utviklingspotensial og samtidig også er ganske skremmende.

Internasjonalt har derfor debatten rundt bruken av UAV pågått lenge, mens den i Norge har vært mer lavmælt og begrenset. Generalinspektøren for Luftforsvarets (GIL) Luftmaktseminar 2013 var av denne grunn i sin helhet viet dette emnet, og nettopp de erfaringer, utfordringer og muligheter som ligger i bruken av våpensystemer som har UAV som basis. Eller som seminarets tittel er: «UAV – bare ny teknologi eller en ny strategisk virkelighet?» Kan for eksempel introduksjonen av UAV sammenlignes med den betydningen atombomben fikk for strategisk tenkning, og har vi i det hele tenkt over hvordan UAV som system påvirker (alternativt burde påvirke) vårt syn på militærmakt? Hvilken betydning vil UAV få for luftmakten generelt, for det norske luftforsvaret og Norge spesielt, samt for vår stilling som alliansepartner i NATO?

Dette er blant de sentrale problemstillingene som ble tatt opp under seminaret, hvis bidrag i form av bearbeidede artikler er samlet her i denne utgaven av *Luftkrigsskolens skriftserie*. Utgaven er delt i fire, basert på opplegget for seminaret. Artiklene er skrevet dels på norsk og dels på engelsk, alt etter-som hvilket språk de opprinnelige foredragene ble holdt på. Foruten foredrag og diskusjon inneholdt seminaret også en teknologiutstilling hvor deltakerne kunne ta den teknologiske utviklingen innenfor UAV-feltet i nærmere øyesyn.

## Seminarets oppbygning

Første del av årets luftmaktseminar, «Dronenes tidsalder?», ble innledet av dr. Peter W. Singer, forfatter av en av de bøkene som foreløpig må regnes som et av standardverkene om UAV, *Wired for War – The Robotics Revolution and Conflict in the 21st Century*. Artikkelen hans tar utgangspunkt i denne boken, og behandler noen av de problematiske aspektene knyttet til UAV. Blant annet ser Singer nærmere på hva som skjer når man fjerner mennesket både fra innsiden av krigsmaskinen og kanskje også fra dens beslutningsprosess, samt hva det at man kan gå til krig uten å risikere tap av egne soldater vil gjøre med demokratiske beslutningsprosesser knyttet til krig og fred.

Juridiske utfordringer og muligheter ved bruk av UAV er tema for det neste bidraget, skrevet av førsteamanuensis Sigmund Simonsen ved Luftkrigsskolen. Han tar opp spørsmålet om hvilke rettsregler som gjelder for bruk

av droner, og diskuterer om gjeldende regler fremstår som foreldede eller uhensiktsmessige, slik at det er behov for nye. Videre drøfter han fordeler og utfordringer ved bruk av droner – rettslig sett, i den hensikt å gi et overblikk over det samlede regelverket og klargjøre hovedtrekkene.

Den første delen avsluttes deretter av den anerkjente militærhistorikeren Martin van Creveld, som gir et overblikk over luftmaktens utvikling frem til i dag. Sentralt i artikkelen hans står de ulike utfordringene luftmakten og luftforsvaret i særlig mindre land vil møte fremtiden, både som følge av høye kostnader til utvikling av nye flytyper og opprettholdelse av selvstendige nasjonale luftforsvar. Dette innebærer at det blir stadig færre bemannede fly, og at droner derfor kan komme til å fylle enda flere av de rollene innenfor luftmakten enn de allerede gjør i dag.

Seminarets andre del tok for seg «Teknologi og muligheter» knyttet til UAV, og besto blant annet i den tidligere nevnte teknologiutstillingen. Her er tre av de foredragene som ble gitt under denne sesjonen samlet. Innledningsforedraget ble holdt av oberstløytnant Bryan Callahan, en tidligere F-16 pilot fra US Air Force (USAF) som senere har omskolert seg til UAV-operatør (eller, som han helst vil beskrive det, RPA (Remotely Piloted Aircraft)-pilot). Callahan har operert både MQ-1 Predator og MQ-9 Reaper, og gir i sitt bidrag et inntrykk av denne virksomheten sett fra et USAF-perspektiv, både når det gjelder operasjoner UASF gjennomfører i dag, hvilke erfaringer («Lessons learned») man har gjort så langt, og hvor man er på vei med hensyn til bruk av UAV i fremtiden.

Deretter følger et perspektiv fra et land som rent maritimt sett har mye til felles med Norge, selv om det ligger på andre siden av jordkloden og er betydelig større, nemlig Australia. Wing Commander Anthony O'Leary i Royal Australian Air Force gir i sitt bidrag et innblikk i den australske beslutningsprosessen knyttet til anskaffelse av en maritim UAV. Dette er særlig relevant for Norge, da en maritim UAV – som O'Leary poengterer – vil kunne være mye mer utholdende og ha større rekkevidde enn en bemannet plattform.

Avdelingen «Teknologi og muligheter» avrundes med en artikkel om et UAV-system som Norge har bestilt, nemlig NATOs nye Air Ground Surveillance (AGS)-system. Oberstløytnant Scott Coon, sjef for NATO AGS Operations, gir en introduksjon til dette programmet, som vil koste 1,2 milliarder euro og er basert på UAV-en RQ-4B Global Hawk. Selv om programmet selvsagt er avhengig av at teknologien fungerer og at bevilgningene kommer, er Coons konklusjon interessant. Han presiserer at den kanskje viktigste forutsetningen for at AGS-systemet skal kunne fungere, er den menneskelige fak-

toren: personellet som skal drifte systemet, og NATO-alliansens evne til å trene dem.

Det menneskelige perspektivet kommer enda tydeligere frem i neste del, «Just another Airplane?». Forsker Kristin Bergtora Sandvik ved PRIO tar i sin artikkel utgangspunkt i den noe uheldige sammenstillingen som ofte gjøres i den offentlige debatten mellom det å operere UAV-er og det å spille dataspill. Med sitt bidrag ønsker hun å tilføre denne debatten substans ved å gi en dypere forståelse av hvem UAV-operatørene er, og hva som skiller for eksempel reell målutvelgelse fra dataspill. Blant annet diskuterer hun den såkalte «Bugsplat»-metaforen, og understreker at kritikere av droner har et ansvar for å sette seg inn i terminologi og strategier for bedre å kunne bidra til debatten rundt bruken av dem.

UAV-operatørene står også sentralt i dr. Peter Lees bidrag, og da særlig med tanke på den avstanden som finnes mellom dem og målene de angriper. Lee anlegger et historisk perspektiv og ser på hva slags yrkesetos som gjør seg gjeldende hos britiske UAV-operatører kontra RAF-piloter tradisjonelt sett. Samtidig diskuterer han bruken av UAV på bakgrunn av etiske betenkeligheter knyttet opp mot all krigføring, og da særlig knyttet til skader på sivile. Blant annet hevder han at selv om avstanden fra UAV-operatøren til målet gjør at det rent fysiske motet ikke lenger trenger å være sentralt, er moralsk mot avgjørende. Han mener også at overvåkningsteknologien innebygd i dronene gjør den rent visuelle kontakten mellom operatør og mål større, ikke mindre, til tross for at den rent fysisk kan være svært stor.

Professor Rune Ottosen ved Høgskolen i Oslo og Akershus avrunder så denne avdelingen med en artikkel som blant annet tar for seg mediedekningen av droneangrep. Han bygger på artikler i *Aftenposten* og *The New York Times*, sett opp mot tilsvarende dekning i *Yemen Times*. Videre går han inn på hvordan det er å leve med droner konstant svevende over seg, blant annet med utgangspunkt i rapporten «Living under drones», som er utarbeidet ved *Stanford University's International Human Rights and Conflict Resolution Clinic* og *the Global Justice Clinic of the New York University School of Law*. Ottosen ser også nærmere på ulike effekter bruken av droner har hatt på internasjonal politikk og internasjonale relasjoner.

I seminarets fjerde og siste del ble «Det norske perspektivet» diskutert. Naturlig nok ble denne delen innledet av forsvarsminister Anne-Grete Strøm-Erichsen, som understreket at selv om man fra norsk side ved flere anledninger har uttrykt bekymring over bruken av droner, er de en del av fremtidig krigføring – også for det norske forsvaret. I et kortere og mellomlangt perspektiv vil de riktignok hovedsakelig fungere som et supplement til eksisterende platt-

former, men forsvarsministeren la vekt på at man må være åpen for at droner på sikt kan komme til å erstatte enkelte av de strukturelementene som finnes i dag. I første omgang vil de imidlertid bli benyttet til overvåkning i det hjemlige forsvaret, i form av AGS-samarbeidet i NATO.

Overvåkning vil sannsynligvis kun være et første steg i innfasingen av droner i det norske forsvaret. Kadett Jens Henrik Paulke ved Luftkrigsskolen forsøker i sitt innlegg å se på hvilke andre bruksområder droner kan ha, og tar for seg ulike scenarioer. Etter hans oppfatning representerer ikke UAV-ene noe revolusjonerende nytt, men han påpeker samtidig at det er helt nødvendig at man i Norge får startet en diskusjon rundt bruken av dem. Paulke fremhever at kadettene på hans kull alle har en fellesnevner i det at UAV ikke er noe som blir diskutert på deres tidligere tjenestesteder, selv om de representerer flere ulike bransjer og våpengrener.

Seniorforsker Lorns Harald Bakstad ved FFI tar deretter for seg en del anbefalinger for Norges fremtidige bruk av droner – basert på historikk og erfaringer gjort ved bruk av enkle overvåkningsdroner i Afghanistan. Han viser til at dronetjenesten i Forsvaret har 40-årsjubileum i 2013, selv om det først var i 2011 at Norge fikk en drone i operativ taktisk bruk, nemlig RQ-11B Raven, som ble tatt i bruk i Afghanistan fra og med PRT 17. Dette har gitt det norske forsvaret nyttige erfaringer, og Bakstad mener det er viktig å ta med seg disse i arbeidet med å bygge en organisasjon for bruk av UAV-er, noe særlig AGS-systemet gir anledning til.

Det er ikke til å komme forbi at bruk av droner innenfor Nordområdene vil by på store teknologiske utfordringer. Seniorforsker Fritz Bekkadal ved MARINTEK legger i sitt innlegg vekt på at Nordområdenes geografiske avstander og store økonomiske verdier fordrer utviklingen av nye, innovative og radiobaserte kommunikasjonsløsninger. Han forsøker å vise hvordan man kan møte de utfordringene man står ovenfor, og påpeker at den infrastrukturen som finnes i dag, ikke er god nok med tanke på kommunikasjon og avanserte overvåkningssystemer. I sin artikkel skisserer Bekkadal derfor hva slags systemer man fortrinnsvis bør utvikle på dette området i fremtiden.

Fremtiden er også stikkord for astrofysiker Eirik Newth, som i sitt innlegg forsøker å tenke seg et scenario hvor Norge blir angrepet av en dronesverm – The Black Cloud – i 2050. Som vi nevnte innledningsvis, er perspektivene man kan trekke når det gjelder fremtidig bruk av droner, tidvis ganske skremmende, og det er også tilfelle i Newths bidrag. Her blir Oslo angrepet av tusenvis av droner som blant annet er i stand til å kommunisere med hverandre. De er ikke sendt ut av en stat, men av «The Siberian Cartel», som ikke benytter dronene til å gå til tradisjonell krig, men snarere som et utpressingsmiddel for

å få ta del i de rike naturressursene som issmeltingen i Arktis har gjort det mulig å utvinne.

Nå er det som kjent vanskelig å spå om fremtiden, men at droner kommer til å sette sitt preg på fremtidens luftmakt, er det liten tvil om. Likevel kan det diskuteres hvor stort dette preget vil bli. Kan for eksempel den økte bruken av droner sammenlignes med utviklingen av atomvåpen? En av verdens fremste militærhistorikere, professor Sir Hew Strachan ved Oxford University, tar opp dette spørsmålet i seminarets avsluttende innlegg. Etter hans oppfatning er egentlig ikke løsningene UAV-ene representerer for de relevante taktiske og operasjonelle problemene spesielt nye. Strachan mener derfor at droner i seg selv vil ha liten innvirkning på strategisk teori. De kan imidlertid få det i praksis, i den forstand at strategien – slik den blir iverksatt i praksis – er noe som blir utformet av politikere og det de finner maktpåliggende, ikke av generaler og klassisk strategisk teori.

Oppsummert kan man vel derfor kanskje si at vi vet lite sikkert om hva fremtiden vil bringe, ei heller om hvordan UAV-er eller droner konkret vil påvirke utviklingen av luftmakten på lengre sikt. Vi håper likevel at disse artiklene vil kunne gi et innblikk i noen av de utfordringene og problemstillingene som fremstår som mest sentrale på dette feltet, og at den foreliggende utgaven av *Luftkrigsskolens skriftserie* kan bidra til å danne et godt faglig utgangspunkt for en debatt som også er svært aktuell for Norge: debatten om fremtidig bruk av UAV, og hvilke implikasjoner dette vil få for det norske forsvaret.

Trondheim, juni 2013

Torgeir E. Sæveraas og Marianne Eidem

# I. Dronenes tidsalder?

# Wired for War: What the Robotics Revolution Means and What to Watch for Next

P.W. Singer

A few years ago, members of the leading robotics trade group gathered in San Diego. The Association for Unmanned Vehicle Systems International (AUVSI) felt the meeting was needed, as the group had come a long way in a short time. Formed in 1972 by a few United States Air Force (USAF) officers and contractors in Dayton, Ohio, who had become enamored of the earliest forms of airborne robotic planes for surveying the battlefield, the first meetings barely filled a small conference room. Today, the AUSVI has grown to over 1,500 member companies and organizations from 55 countries. Its conferences and events now fill entire convention centers.

Precisely because of this headlong growth, the organizations' membership was engaged in a formal exercise of institutional soul-searching. At this crucial turning point in its history, the topic that these leading figures and firms in the industry convened to discuss was what exactly the "story" of robotics entailed—and, in particular, that of military systems? That is, what should the field be telling its own members and, even more crucially, the public about its role and future?

This question of "story" is not a simple one, and indeed was taken so seriously that the moderator for the event wasn't a scientist or chief executive, but a professional storyteller. His role was to help the gathering pull together decades of technological and political developments into a single, coherent narrative. As one attendee summed up: "Where have we come from? Where are we now? And where should we—and where do we want to—go next?"

These questions are useful guides, not just for those in the field but also those outside of it. Inspired by them, this chapter will walk the reader through some of the most important aspects of that "story" of robotics, especially those that might apply to the future of the military.

## Where Have We Come From?

While unmanned systems have a long history, dating back to Leonardo da Vinci's designs for a robotic knight and including equipment like German remote-controlled torpedo boats in World War I, it was not until just a decade ago that they truly took off in war.[1] Advances in technology made unmanned systems more usable, especially through the incorporation of global positioning system (GPS) technology, which allowed such systems to locate themselves in the world and in turn, pinpoint what they were seeing. At the same time, the messy new conflicts that followed 9/11 drove demand. When US forces first went into Afghanistan, the US military had only a handful of unmanned aerial systems (UAS, also called "remotely piloted aircraft" or, more colloquially, "drones") in the air, none of them armed, and zero on the ground. Now it has a force inventory of more than 8,000 in the air and more than 12,000 on the ground. Another example of the extent of change is that in 2012, the USAF trained more unmanned system operators than fighter and bomber pilots combined.

But when we think about technologies like the Predator or the PackBot, we need to remember that they are just the first generation, the Model T Fords and Wright Flyers, compared to what is already in the prototype stage.[2] We are still at the "horseless carriage" stage, describing these technologies by what they are not, rather than wrestling with what they truly are. These technologies are "killer applications" in all meanings of the term. They are technologies that advance the power of killing, but also have a disruptive effect on existing structures and programs. That is, they are akin to advancements like the airplane or the steam engine in allowing greater power and reach in war, but they are also akin to what iPods did to the music industry—changing it forever.

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1 "Robotic Knight.» http://www.da-vinci-inventions.com/robotic-knight.aspx (accessed February 12, 2013).
Shortridge, Bud (2010): "Remote Control in 1917 – Was This Possible?» http://navalmerchantshiparticles.blogspot.com/2010/05/remote-control-enemy-is-it-possible.html#!/2010/05/remote-control-enemy-is-it-possible.html%20i (accessed February 12, 2013).

2 "Defense and Security.» http://www.irobot.com/en/us/robots/defense.aspx (accessed February 12, 2013).

## What Next? The Robotics Revolution

While many are surprised by the existing use of robotics, the pace of change won't stop. We may have thousands now, but as one three-star USAF general noted in my book *Wired for War*, very soon it will be "tens of thousands."[3]

But the numbers matter in another way. It won't be tens of thousands of today's robots, but tens of thousands of tomorrow's robots, with far different capabilities.

One of the laws in action when it comes to technology is Moore's law—that the computing power that can fit on a microchip doubles just under every 2 years or so.[4] It has become an encapsulation of broader exponential trends in technology that have occurred through history, with technology constantly doubling upon itself in everything from power to storage to broader innovation patterns. If Moore's law holds true over the next 25 years, the way it has held true over the last 40 years, then our chips, our computers, and, yes, our robots will be as much as a billion times more powerful than they are today.[5] But Moore's law is not a law of physics. It doesn't have to hold true. What if our technology moves at a pace just 1/1000 times slower than it has historically? In this slowed-down scenario, we'd only see a "mere" 1,000,000 times the change.

The bottom line is that what was once only fodder for science fiction conventions like Comic-Con is now being talked about seriously in places like the Pentagon. A robotics revolution is at hand.

To be clear, the robot revolution happening is not the *Robopocalypse* that Steven Spielberg is preparing to film.[6] It is not the type where you need to worry about the former governor of California showing up at your door, à la *The Terminator*.[7]

Instead, ever so often, a technology comes along that changes the rules of the game. These technologies—whether it is fire, the printing press, gunpowder, the steam engine, the computer, etc.—are rare, but truly consequential.

Revolutions are often misunderstood and definitely oversold. We saw this

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3 Singer, Peter (2009): *Wired for War: The Robotics Revolution and Conflict in the 21st Century.*wiredforwar.pwsinger.com (accessed February 12, 2013).

4 "Moore's Law Inspires Intel Innovation.» http://www.intel.com/content/www/us/en/silicon-innovations/moores-law-technology.html (accessed February 12, 2013).

5 "Singularity.» http://scalometer.wikispaces.com/singularity (accessed February 12, 2013).

6 "Robopocalypse.» http://www.imdb.com/title/tt1541155/ (accessed February 12, 2013).

7 "The Terminator.» http://www.imdb.com/title/tt0088247/ (accessed February 12, 2013).

with Network-centric warfare, which was wrong both in terms of its definition and its very subject. Networks matter, but as enabling tools, not as the end of the story. That is, no technology can "lift the fog of war," as the acolytes of Donald Rumsfeld claimed. Nor will historians care that military units went from using fax machines to email. They will care, however, that humans went from fighting inside machines to not.

In sum, the key to what makes a revolutionary technology is not merely its new capabilities, but its questions. Truly revolutionary technologies force us to ask new questions about what is possible that wasn't possible a generation earlier. But they also force us to relook at what is proper. They raise issues of right and wrong that we didn't have to wrestle with a generation earlier.

The historical comparisons that people make to the robotics revolution illustrate this. In the course of hundreds of interviews for writing a book, experts were asked to give historical parallels to where they thought we stand now with robotics. As noted earlier with the comparison to the "horseless carriage," many of them, especially engineers, likened where we are now with robotics to the advent of the automobile. Indeed, at this stage of the last century, Ford was selling fewer than 1,000 cars a year. Within a decade, especially spurred on by the military proving ground of World War I, it was selling a million a year.

If the horseless carriage is the parallel drawn, think of the ripple effect that cars had on everything from our geopolitics to our law enforcement. A group of people who were, at the time, desert nomads became crucial players in the global economy simply because they lived over a sticky black substance previously considered more of a nuisance than anything else. The greater use of that same—now crucial—resource has changed the global climate. The growing use of horseless carriages, in turn, has led to new concepts that are reshaping the landscape, whether through highways and suburbia, or through new social notions.[8]

Others, such as Bill Gates, made a different comparison to the computer in 1980.[9] Much like robots today, the computer back then was a big, bulky device for which we could only conceive a few functions. Importantly, the military was the main spender on computers' research and development, and a key client driving the marketplace, again comparable to the development of robots.

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8 Ingrassia, Paul: *Engines of Change: A History of the American Dream in Fifteen Cars*. http://www.npr.org/books/titles/151869884/engines-of-change-a-history-of-the-american-dream-in-fifteen-cars (accessed February 12, 2013).

9 Gates, Bill: "A Robot in Every Home.» http://www.scientificamerican.com/article.cfm?id=a-robot-in-every-home&ref=sciam (accessed February 12, 2013).

But soon, computers changed. They became smaller. We figured out more and more functions and applications that they could perform, both in war and in civilian life. Hence, they proliferated. It soon got to the point where we stopped thinking of most of them as "computers." People now drive cars with more than 100 computers inside. No one calls them "computerized cars." Similarly, there are a number of computers in a kitchen, which are called such things as "microwave" or "coffee maker."

The same is happening with robotics—there are changes not just in size and proliferation, but also in reconceptualization. Indeed, if one buys a new car today, it will come equipped with technologies like "parking assist" or "crash avoidance." These are new ways of saying that we stupid humans are not good at parallel parking and very often don't look in our blind spots. So, the robotic systems in our car will handle these tasks for us.

But, again, just as the story of the automobile was more than just the shift from owning horse stables to owning garages, so too the story of the computer was more than never having to remember long-division tables again. What was important, again, was the ripple effects. The game-changing technology reshaped the modern information-rich economy, allowing billions of dollars to be made and lost in nanoseconds. It led to new concepts of social relations and even privacy. One can now "friend" someone in China one has never met. Of course, we may now be concerned about our children social-networking with people whom they have never met. The computer has become a tool of law enforcement (imagine the TV show *CSI* without computers), but has also led to new types of crime (imagine explaining "identity theft" to J. Edgar Hoover). It may even be leading to a new domain of war, the so-called "cyber war."

This comparison is a striking one because it illustrates how bureaucracies often have a hard time keeping up with revolutionary change. For example, while computers were obviously important by then, the director of the FBI was so averse to computers that he didn't have one in his office and never used email, as late as 2001. Just as amazing is the fact that the current US secretary of Homeland Security, the agency in charge of the civilian side of American cyber security, didn't use email even in 2012.[10]

The final comparison that is made is perhaps a darker one. It refers to the

10 Straw, Joseph (September 28, 2012): "Homeland Security Secretary Janet Napolitano says she doesn't use email.» http://www.nydailynews.com/news/politics/homeland-security-secretary-janet-napolitano-doesn-email-article-1.1170915 (accessed February 12, 2013).

work on the atomic bomb in the 1940s. Scientists, in particular, talk about the field of robotics today in much the same way they talked about nuclear research back in the 1940s. A young engineer or computer scientist will find himself or herself drawn toward it. It is the cutting edge. It is where the excitement is, and where the research money is.

But many worry that their experience will turn out just like that of those amazing minds that were drawn toward the Manhattan Project, like a moth to an atomic flame.[11] They are concerned that the same mistakes could be repeated—of creating something and only after the fact worrying about the consequences. Will robotics, too, be a genie we one day wish we could put back in a bottle?

The underlying point here is that too often in discussions of technology we focus on the widget. We focus on how it works and its direct and obvious uses. But that is not what history cares about. The ripple effects and the dilemmas created by them are what make that technology revolutionary. Indeed, with robotics, issues on the technical side may ultimately be much easier to resolve than dilemmas that emerge from our human use of the technology.

## How Our Robots Are Changing

The first key ripple effect with robotics is the diversification of the field and expansion of the market itself.

The initial generations of aerial robots were much like the manned systems they were replacing, even down to some of them having the cockpit where a pilot once sat painted over. Now we are seeing an explosion of new types, ranging in size, shape, and form. With no human inside, they can stay in the air not just for hours, but for days, months, and even years, having wings the length of a football field. Alternatively, they can be as small as an insect.[12] In addition, of course, they need not be modelled after our manned machines, but can instead take their design cues from nature, or even the bizarre.[13]

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11 "The Manhattan Project: Making the Atomic Bomb.» http://www.atomicarchive.com/History/mp/index.shtml (accessed February 12, 2013).

12 Smith (June 18, 2012): "The Future of Drone Surveillance: Swarms of Cyborg Insect Drones.» http://www.networkworld.com/community/blog/future-drone-surveillance-swarms-cyborg-insect-drones (accessed February 12, 2013).

13 Bruner, Raisa (June 5, 2012): "New Hydrogen-Powered Spy Drone Takes Flight.» http://abcnews.go.com/Blotter/huge-hydrogen-powered-spy-drone-takes-test-flight/story?id=16502318 (accessed February 12, 2013).
Axe, David (November 18, 2010): "'Snake-Bot' Evolves into Shorter, Smarter 'Worm-Bot.'» http://www.wired.com/dangerroom/2010/11/snake-bot-evolves-into-shorter-smarter-worm-bot/ (accessed February 12, 2013).

The other key change is their gain in intelligence and autonomy. This is a whole new frontier for weapon development. Traditionally, weapons have been compared based on their lethality, range, or speed. Think about the comparison between a World War II Gladiator biplane that equipped Norwegian forces at the start of the war and a Spitfire that they flew at the end. The Spitfire could be considered superior because it flew faster, further, and carried more armament. The same could be said in comparing the MQ-9 Reaper UAS with its earlier version, the MQ-1 Predator. The Reaper is better because it flies faster and further and carries more armament. But the Reaper is also something else that we couldn't say about previous generations of weapons; it is smarter and more autonomous. We are not yet in the world of *The Terminator*, where weapons make their own decisions, but the Reaper can perform operations like take off and land on its own, fly mission waypoints on its own, and carry sensors that make sense of what they are seeing, such as identifying a disruption in the dirt from a mile overhead and recognizing it as something that we humans call a "footprint."

From these changes comes a crucial opening up of the user base and the functionality of robotics. Much as we once could only use a computer if we first learned a new language like "Basic," so too could we only use robotic systems if we were highly trained. To fly an early version Predator drone, for instance, one had to be a rated pilot. Now, just as a 3-year-old can navigate an iPad without even knowing how to spell, so too can one fly some drones with an iPhone app.

This greater usability opens up the realm of possible users, lowering the costs and spreading the technology even further. Thus, we see the range of uses expand not just in the military, but also, once proved on the military side, moving over to the civilian world. Take, for example, aerial surveillance with UAS. It has moved from a military activity to border security to police to environmental monitoring.[14] Similarly, the notion of using a robotic helicopter to carry cargo to austere locations was first tested out by the US Marines in Afghanistan, but is now being looked at by logging companies.[15]

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"Weird Robots: Top Ten Creepiest Robots of All Time.» http://www.huffingtonpost.com/2009/11/05/weird-robots-top-10-creep_n_346642.html (accessed February 12, 2013).
Bagg, Julia: "Miami-Dade Police Department's Drones Ready to Fly.» http://www.nbcmiami.com/news/local/Miami-Dade-Police-Departments-Drones-Ready-To-Fly-137434223.html (accessed February 14, 2013).

14 Martin, Adam (January 25, 2012): "Using Drones to Capture Environmental Violations Makes Perfect Sense.» http://www.theatlanticwire.com/technology/2012/01/using-drones-capture-environmental-violations-makes-perfect-sense/47872/ (accessed February 14, 2013).

15 "Cargo Drone Makes Debut in Afghanistan.» http://www.foxnews.com/us/2012/01/07/cargo-drone-makes-debut-in-afghanistan/ (accessed February 14, 2013).

A key step in moving this forward in the United States will be the integration of unmanned aerial systems into the National Airspace System (NAS) and expanded civilian use. Congress has recently set a deadline of 2015 for the Federal Aviation Authority (FAA) to figure out how to make this happen. While it is unclear if the FAA will meet that deadline, the step is inevitable and, with it, the next ripple effect outward in the market.[16]

Indeed, what the opening of the civilian airspace will do to robotics is akin to what the Internet did to desktop computing. The field was there earlier, but then it boomed like never before. For instance, if you are a maker of small tactical surveillance drones in the United States right now, your client pool numbers effectively one: the US military. But when the airspace opens up, you will have as many as 21,000 new clients—all the state and local police agencies that either have expensive manned aviation departments or can't afford them.

Beyond the obvious applications moved over from the military side, the real change occurs when imagination and innovation cross with profit-seeking. This is where parallels to computer or aviation history hold most, as the civilian side then starts to lead the way for the military. For instance, the idea of moving freight via airplanes was not originally a military role. It started out in 1919 with civilians. Today, it is both a major military role (the US military's Air Mobility Command has some 134,000 members) and an industry that moves more than $10 trillion in global trade.[17] Moreover, a number of airfreight firms are starting to explore drone air cargo delivery.

If history is any lesson, there are many more ways we don't yet know of that robotics might be applied to other fields. Who saw agriculture as a field to be computerized? Yet, the application of computers has led to massive efficiency gains. So too is agriculture appearing to be an area in which robotics will drive immense change, from the surveillance of the fields to the crop-dusting to the picking and harvesting.[18]

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16 Boyle, Rebecca (February 7, 2012): "Drones Will Be Admitted to Standard US Airspace by 2015.» http://www.popsci.com/technology/article/2012-02/under-newly-authorized-airspace-rules-drones-will-fly-alongside-piloted-planes-2015 (accessed February 14, 2013).

17 "Air Mobility Command.» http://www.amc.af.mil/ (accessed February 14, 2013).

18 (September 11, 2011): "Multi Rotor Drone & Helicopters for Aerial Imaging, Crop Dusting and more.» http://www.flightschoollist.com/blog/2011/09/multi-rotor-drone-helicopters-for-aerial-imaging-crop-dusting-and-more/ (accessed February 14, 2013). (November 30, 2010): "Strawberry Harvesting Robot.» http://www.bing.com/videos/search?q=robotc+harvaster&view=detail&mid=DBE1FB9441E6F76CA689DBE1FB9441E6F76CA689&first=0&adlt=strict (accessed February 14, 2013).

## The Global Revolution

As this progress in robotics plays out, it leads to more ripple effects, notably on the global level. While this is a robotics revolution, it will not be solely an American revolution.

The United States is certainly ahead now in this revolution, and just as well, given that it outspends the rest of the world on military research and development.[19]

There is a rule, however, in both technology and war that warns that the United States should not rest on its laurels: There is no such thing as a permanent first-mover advantage. Companies like IBM and Commodore may have once led the world of computing, but their wares likely don't sit on your desk today. Similarly, the British may have invented the tank in World War I, inspired by an H.G. Wells short story about "Land Ironclads."[20] But it was the Germans who figured out how to use them better in the *Blitzkrieg* of World War II.

Today, there are more than 80 other countries building, buying, and using military robotics of some sort. They range from close allies like Canada and the United Kingdom to potential adversaries like Iran, China, Russia, and Pakistan. Indeed, China has gone from having no UAS under development just a few years back to showing off well more than 25 different models of Chinese-made drones at its tradeshows, ranging from the Predator-like "Pterodactyl" to a stealthy, lethal-looking "Dark Sword."[21]

## Battles of Ideas and Persuasion

The introduction of a revolutionary technology brings new races for ideas and new interactions of knowledge, power, and communication. In the case of robotics, a new fascinating cross has emerged between intellectual-property rights issues and defence studies.

As a critical field to security and industry, akin to the rise of the car, the

19 Singer, Peter W. (September 23, 2012): "Separating Sequestration Facts from Fiction: Sequestration and What It Would Do for American Military Power, Asia, and the Flashpoint of Korea.» http://www.brookings.edu/research/articles/2012/09/23-sequestration-defense-singer (accessed February 14, 2013).

20 "The Land Ironclads.» http://en.wikipedia.org/wiki/The_Land_Ironclads (accessed February 14, 2013).

21 von Kospoth, Nicolas (October 14, 2009): "China's Leap in Unmanned Aircraft Development.» http://www.defpro.com/daily/details/424/ (accessed February 14, 2013).

computer, or the atomic bomb, we are unsurprisingly seeing attempts at stealing information for copying abroad. The examples of this already range from advanced persistent threats in the cyber-security space, targeting the secrets of major defence manufacturers, to a sales guy for a small robotics maker, for example, who happens to see a clone of his firm's ground robot being sold at an Asian arms fare.

Beyond the stealing of design secrets, unmanned systems have also opened a competition to reach into the communications of the machines themselves. In Iraq, insurgents managed to hack into the video feed of US military drones, which, in effect, is the equivalent of a robber listening in on the police's radio scanner. What is even more notable is that the insurgents were able to do so using a $29 piece of software they had obtained from a Russian web site. It had originally been designed to allow college kids to illegally download movies online.

As we use more and more systems that are digitally controlled, where a human is not physically inside, we will see a new step in this race open. The battle is not just for design secrets and access to communications, but also for control. We enter into an era of what I call "battles of persuasion."

This is a fundamental shift. We have never been able to "persuade" a weapon to do what its owner didn't want. One could never change the direction of a bullet or arrow in mid flight, but now one can do the equivalent. The goal then moves from only seeking to destroy the enemy's plane or tank to co-opting it to "persuade" it to do things its original owners wouldn't want; for example: "Recode all allied soldiers as enemies, and all enemy soldiers as friendly." A human would ask why, needing motivation to change his or her ways, but with the proper access, a computer will just comply with the instruction.

## User Questions

The innovation spread of robotics, however, represents another trend of opportunity and peril. An ever-wider set of users is innovating for all sorts of positive purposes with robotics, from the great work being done by young students at robotics labs at McGill University to the team in Australia that built an autonomous drone to help find lost bushwalkers.[22]

22 "Centre for Intelligent Machines.» http://www.cim.mcgill.ca/ (accessed February 14, 2013).

However, not all of the people behind machines have only the best in mind. Take the traditional notion of using a robotic drone for surveillance. The new users have not just been militaries or police, but have also been civilians. These include news journalists, who have reported on natural disasters with drones, as well as parents who want new ways to watch their kids. A father in the United States gave new meaning to the term "helicopter parent," using an automated quadcopter drone to escort his child to the school bus stop.[23]

The problem is that each and every technology has its darker side. The same field of drone journalism that reports important stories with a whole new level of fidelity also advances the field of paparazzi. For instance, Gary Morgan, chief executive officer of Splash News, a celebrity-photo agency, has already said he'd like to be buzzing his quarry soon with silent, miniature drones mounted with tiny cameras: "It would strike fear in the hearts of every celebrity having a birthday party."[24] One also has the sense that a child may end up telling a therapist one day about his father loving him a bit too much, to the extent of following him with a drone.

## Open Source

On a more serious note, just as software has gone "open source," so has warfare. Robotics is not a technology like the atomic bomb or aircraft carrier, where only the great powers can build and use it effectively. Instead, just like with the "app" in the field of software, it is not just the big boys who control the field. The barriers to entry are not exceptionally high, and that means that bad actors will be able to gain and use this advanced technology.

If history is any guide, the repurposing of a low-entry revolutionary technology tends to happen fairly quickly. Indeed, the first car bomb was set off as early as 1905, used in an assassination attempt on the Ottoman sultan. Similarly, the first hijacking of a plane took place in 1931, very early in civilian air travel.

A particular area of concern, then, is the use of robotic systems by terrorists and other nonstate actors. Israel as a state has long used drones, and now so has

23 (November 30, 2012): Father builds flying drone camera to follow his children to the school bus stop." http://www.dailymail.co.uk/news/article-2240860/Father-builds-flying-drone-camera-follow-children-school-bus-stop.html?ito=feeds-newsxml (accessed February 14, 2013).

24 "Personal drones can snoop on you anywhere, anytime.» http://www.deccanherald.com/content/110787/content/213868/we-have-comments-tool.html (accessed February 14, 2013).

its nonstate opposition. Hezbollah, for example, is not a major state military, but it has already operated UAVs, as too has Hamas.

The impact of this trend is twofold. The first is that it reinforces the empowerment of individuals and small groups against the power of the state. During World War II, for example, Hitler's entire Luftwaffe could not manage to reach across the Atlantic to strike at Canada or the United States. Just a few years ago, a blind 77-year-old man managed to build his own drone that flew itself across the Atlantic.

Moreover, one man's hobby may be another man's plot. In 2011, the United States arrested Rezwan Ferdaus, a man who wanted to recreate the 9/11 attacks (not so ironically, he had been angered by drone attacks in the Mideast intended to stop terrorism). Unable to hijack planes, he instead obtained a large drone and planned to fly it into the Pentagon. Fortunately, he made the mistake of asking an FBI informant where he could obtain C-4 explosives. The plot was averted, but it shows that we are now in a world where it is easier to get the drone than the bomb.[25]

This greater reach and power may also see a lowering of the bar. One does not have to be suicidal to carry out attacks that previously might have required one to be so. This allows new players into the game, making al-Qaeda 2.0 and the next-generation version of the Unabomber or Timothy McVeigh far more lethal.

Just as car bombs are not the only way automobile technology has been misused, we should not make the mistake of only focusing on terrorism when it comes to the potential negative uses of robotics. The early horseless carriage may have been reworked into a car bomb by turn-of-the-century terrorists, but the main illegal use was as a getaway device for criminals. Similarly, the best example of innovation in the field of robotics currently might be the team of thieves in Taiwan, who used tiny helicopters equipped with pinhole cameras to carry out a jewellery heist. They made away with $4 million worth of loot before being caught.

25 (September 28, 2011): "Massachusetts Man Charged with Plotting Attack on Pentagon and U.S. Capitol and Attempting to Provide Material Support to a Foreign Terrorist Organization.» http://www.fbi.gov/boston/press-releases/2011/massachusetts-man-charged-with-plotting-attack-on-pentagon-and-u.s.-capitol-and-attempting-to-provide-material-support-to-a-foreign-terrorist-organization (accessed February 14, 2013).

## Doctrine

One of the things we learn in war colleges, however, is not how much technology one has or how good it is that determines the final winner. It is often more the doctrine, the overall package of training, organization, and so on of how we expect to fight and win, that determines success or failure in war.

The problem is that we are not sufficiently wrestling with these questions now. As one USAF captain said: "It's not 'let's think this better', it's only 'give me more'."

This desire for more is an important step, in that many militaries did not want to use unmanned systems (and some senior officers are still fighting them). However, it is still not the same as getting it right. Indeed, the US military now has the same number of unmanned ground vehicles (UGVs) as the British had tanks at the end of World War I. But, of course, the Germans were the ones who better figured out how to use the tank and win in the opening round of World War II.

Should we use our systems just like manned platforms? Is there no difference between, say, the drone and the F-16? Or should we organize them along the lines of mother ships? Or should we use them as swarms? Or are they best used as teams?

If we choose right, we will find the twenty-first–century Blitzkrieg. If we choose wrong, we will be remembered for building the robotic version of the Maginot line.

But how, in choosing the most successful doctrine, do you weigh the legal side of things? For example, many think that swarming is better than mother ships to reach the full advantages of more autonomous systems, but it also presents much tougher legal questions of accountability.

## The Biggest Impact

Perhaps the biggest ripple effect of the robot, however, is in reshaping the narrative in that most important realm of war. We are seeing a reordering of how we conceptualize war, how we talk about it, and how we report it.

In democracies, there have always been deep bonds between the public and its wars. Citizens have historically participated in decisions to take military action, through their elected representatives, helping to ensure broad support for wars and a willingness to share the costs, both human and economic, of enduring them.

In the United States, the Constitution explicitly divided the president's role

as commander-in-chief in war from Congress's role in declaring war. Yet, these links and this division of labor are now under siege as a result of a technology that our founding fathers never could have imagined.

We don't have a draft anymore. Less than 0.5 per cent of Americans over 18 serve in the active-duty military. We do not declare war anymore. The last time Congress actually did so was in 1942—against Bulgaria, Hungary, and Romania. We don't buy war bonds or pay war taxes anymore. During World War II, 85 million Americans purchased war bonds that brought the government $185 billion. In the last decade, we bought none and instead gave the richest 5 per cent of Americans a tax break.

Now we possess a technology that removes the last political barriers to war. The strongest appeal of unmanned systems is that we don't have to send someone's son or daughter into harm's way. But when politicians can avoid the political consequences of the condolence letter—and the impact that military casualties have on voters and on the news media—they no longer treat the previously weighty matters of war and peace the same way.

For the first 200 years of American democracy, engaging in combat and bearing risk—both personal and political—went hand in hand. In the age of drones, that is no longer the case.

In 2012, unmanned systems carried out strikes from Afghanistan to Yemen. The most notable of these continuing operations is the not-so-covert war in Pakistan, where the United States has carried out more than 350 drone strikes since 2004.[26]

Yet, this operation has never been debated in Congress. More than 8 years after it began, there is not even a single vote for or against it. This campaign is not carried out by the Air Force—it is being conducted by the Central Intelligence Agency (CIA). This shift affects everything from the strategy that guides it to the individuals who oversee it (civilian political appointees) and the lawyers who advise them (civilians rather than military officers).

It also affects how we, and our politicians, view such operations. US President Barack Obama's decision to send a small, brave Navy SEAL team into Pakistan for 40 minutes was described by one of his advisers as "the gutsiest call of any president in recent history." Yet, few even talk about the decision to carry out more than 350 drone strikes in the very same country, and certainly not with the same "gutsy" narrative.

I do not condemn these strikes—I support most of them, especially in the cases where it is the only way to get an identified terrorist leader. What

26 http://www.thebureauinvestigates.com/category/projects/drones/ (accessed February 14, 2013).

is troublesome, though, is how a new technology is short-circuiting the decision-making process for what used to be the most important choice a democracy could make. Something that would have previously been viewed as a war, not just by our leaders, but also by our media and public, is simply not being treated like a war.

The change is not limited to covert action. In the spring of 2011, the United States launched airstrikes on Libya as part of a North Atlantic Treaty Organization (NATO) operation to prevent Moammar Gadhafi's government from massacring civilians. In late March, the White House announced that the American military was handing over combat operations to its European partners and would thereafter play only a supporting role.

The distinction was crucial. The operation's goals quickly evolved from a limited humanitarian intervention into an air war that was supporting local insurgents' efforts at regime change. But the operation had limited public support and no congressional approval.

When the administration was asked to explain why continuing military action would not be a violation of the War Powers Resolution—a Vietnam-era law that requires notifying Congress of military operations within 48 hours and getting its authorization after 60 days—the White House argued that American operations did not "involve the presence of US ground troops, US casualties, or a serious threat thereof." But they did involve something we used to think of as war: blowing up stuff—lots of it.

Starting on April 23, 2011, American unmanned systems were deployed over Libya. For the next 6 months, they carried out at least 146 strikes on their own. They also identified and pinpointed the targets for most of NATO's manned strike jets. This unmanned operation lasted well past the 60-day deadline of the War Powers Resolution, extending to the very last airstrike that hit Gadhafi's convoy on October 20, 2011 and led to his death.

Choosing to make the operation unmanned proved critical to initiating it without congressional authorization and continuing it with minimal public support. On June 21, 2011, when NATO's air war was lagging, an American Navy helicopter was shot down by pro-Gadhafi forces. In the past, this would have been a disaster, with the risk of an American aircrew being captured, or even killed. But the downed helicopter was an unmanned Fire Scout, and the story didn't even make the newspapers the next day.

Congress has not disappeared from all decisions about war—just the ones that matter. The same week that American drones were carrying out their 145th unauthorized airstrike in Libya, the president notified Congress that he had deployed 100 Special Operations troops to a different part of Africa.

This small unit was sent to train and advise Ugandan forces battling the cultish Lord's Resistance Army, and was explicitly ordered not to engage in combat. Congress applauded the president for notifying it about this small noncombat mission, but did nothing about having its laws ignored in the much larger combat operation in Libya.

We must now accept that technologies that remove humans from the battlefield, from unmanned systems like the Predator, to cyber weapons like the Stuxnet computer worm, are becoming the new norm in war.[27] And, like it or not, the new standard we've established for them is that leaders need to seek approval only for operations that send people into harm's way—not for those that involve waging war by other means.

Without any actual political debate, we have set an enormous precedent, blurring the civilian and military roles in war and circumventing the Constitution's mandate for authorizing it. Freeing the executive branch to act as it chooses may be appealing to some now, but many future scenarios will be less clear-cut. And each political party will very likely have a different view, depending on who is in the White House.

The ease of operations raises concern not just in the initiation of operations, but also in how we frame them, sometimes only focusing on the seeming absence of direct risks, ignoring the broader context. Unmanned operations are not "costless," as they are too often described in the news media and government deliberations. Even worthy actions can sometimes have unintended consequences. Faisal Shahzad, the would-be Times Square bomber, was drawn into terrorism by the very Predator strikes in Pakistan meant to stop terrorism.

Similarly, CIA drone strikes outside of declared war zones are setting a troubling precedent that we might not want to see followed by the close to 80 other nations that now possess the same unmanned technology, including our allies, who have to start to contemplate the risks, but also including nations like China, Russia, Pakistan, and Iran, which might abuse these precedents in even worse ways.

A deep deliberation on war was something the framers of the Constitution sought to build into our system, and that example was followed by other systems of democracy in allied countries as well. Yet, these thinkers in past centuries could not have imagined war being reframed in such a manner. To them,

27 (March 4, 2012): "Stuxnet: Computer worm opens new era of warfare.» http://www.cbsnews.com/8301-18560_162-57390124/stuxnet-computer-worm-opens-new-era-of-warfare/ (accessed February 14, 2013).

war involved both the act of, and the risk of, violence. It was about killing, but it was also about sending people into harm's way to do so. Now, the technology opens up new possibilities, and new questions for our democracies.

## Leader Issues

There is also the uncomfortable fact that robotics is presenting new challenges of leadership. This is not merely about how best to lead a unit using robots. One USAF colonel talked to me about how he found that commanding a UAS unit was tougher than leading a regular manned unit.

There is also a bigger trend. Many have heard of the idea of "strategic corporals"—that greater and greater power and responsibility is being put in the hands of younger and younger troops. But there is a dirty little secret that people are somewhat afraid to talk about for risk of their careers. Let us call it the rise of the "tactical generals."

Robotics is making it very easy for leaders at the highest level of command to peer into and even take control of the lowest-level operations. One four-star general, for example, talked to me about how he once spent a full 2 hours watching drone footage of an enemy target and then personally decided what size of bomb to drop on it. These enhanced connections certainly help such commanders become better informed and take personal responsibility of the situation. But the line between timely intervention and micromanagement is a fine one. The four-star general can do the job of the captains, but those captains can't do the same regarding important strategic issues that only a four-star general has the authority to handle. Moreover, what happens when young officers, who are now cut out of the chain, advance up the ranks, without the experience of making the tough calls?

Even worse, civilian leaders are also tempted to intervene, as they too now have a new ability to watch and decide what's going on in wars. Referencing how President Johnson often tried to influence operations in Vietnam, the former USAF Secretary warned that "It'll be like taking LBJ all the way down into the foxhole."

We are seeing this happen with civilians running the air war in Pakistan, where it is a civilian agency carrying out a bombing campaign, with civilian lawyers deciding rules of engagement, and finally senior civilian leaders picking targets from a list of cards.

## Going to War

This changing meaning of "going to war" isn't just about the nation—it is also about the individual. For 5,000 years of humans at war, the experience of going to war had the same essential meaning. Whether one was talking about the ancient Greeks going off to fight Troy, or my grandfather going off to fight the Japanese in the Pacific theater of World War II, going to war meant going to a place of such danger that one might never come home again.

This essential truth is now changing. Note how a Predator pilot described his wartime experience of fighting insurgents in Iraq, while still being at home in Nevada: "You are going to war for 12 hours, shooting weapons at targets, directing kills on enemy combatants and then you get in the car, drive home, and within 20 minutes you are sitting at the dinner table talking to your kids about their homework."

This new experience of going to war is not easy. Indeed, far from the portrayal of UAS pilots as "video gamers" who don't care about what they do, these remote warriors are experiencing notable challenges, including rates of combat stress and burnout comparable to those physically in the field.[28]

Though they may be doing so from afar, these UAS pilots are still experiencing acts of violence. One American non-commissioned officer spoke to me about the heartbreak of watching a team of NATO soldiers die on screen, while the unarmed drone that her team was flying could only helplessly circle above. They also face a weird disconnect of being at home and at war simultaneously. Another officer spoke of standing in line at a Burger King, and then realizing she'd been part of a "kill chain" decision just half an hour earlier.

We have not been in this new world long enough to think that we can fully understand it all, but it is clear that all forms of war involve psychological costs.

## Conclusions

The ripple effects of robotics will continue to push out into all sorts of domains, in ways both expected and unexpected. Through it all, though, one fundamental principle will hold true, as it has in the past: There are always

28 Ortega, Colonel Hernando J. (February 3, 2012): "Combat Stress in Remotely Piloted/UAS Operations." http://www.brookings.edu/~/media/events/2012/2/03%20military%20medical%20issues/0203_military_medical_issues.pdf (accessed February 14, 2013).

two sides to technological revolutions. From our new technologies, we gain amazing capabilities that seem like they are straight from science fiction. But from those very technologies, we also gain new human dilemmas that seem like they are straight from science fiction. Moore's law is operative, but so is Murphy's.[29]

The issues of "drones," "unmanned systems," and "robots" all seem futuristic, but note how none of the examples that were explored in this chapter is from the future. This sets a great challenge for us all, well before we have to worry about our robotic vacuum cleaners sneaking up on us at night.

Are we going to let the fact that what is unveiling itself now seems like science fiction to keep us in denial of the fact that it is already part of our technological and political reality?

29 "Murphy's Laws Site – The origin and laws of Murphy in one place.» http://www.murphys-laws.com/ (accessed February 14, 2013).

# Rettslige utfordringer og muligheter ved bruk av droner i fredstid og i væpnede konflikter

Førsteamanuensis Sigmund Simonsen, Luftkrigsskolen

## Innledning

Bruken av droner (UAV) er tiltakende og omdiskutert. Kan hvem som helst fly en drone og drive overvåking i norsk luftterritorium? Når er det lov å bruke væpnede droner? Har USA lov til å bruke væpnende droner til å drepe terrorister i Pakistan og Jemen?

Dette er noen av de spørsmålene artikkelen vil berøre. Hovedspørsmålet er: *Hvilke rettsregler gjelder for bruk av droner?*

For å besvare dette vil artikkelen ta for seg norsk rett og folkeretten. Det sentrale vil være folkeretten, primært *militær bruk av droner i væpnede konflikter*. USAs omstridte droneprogram for å bekjempe terrorister berører imidlertid den uklare grensen mellom fredstid og væpnet konflikt. Derfor må rettsreglene både i fredstid og i væpnende konflikter skisseres. Formålet er å synliggjøre grensen og de prinsipielt høyst ulike regelsettene som kommer til anvendelse i fredstid og i en væpnet konflikt.

I artikkelen drøftes det om gjeldende regler fremstår som foreldede eller uhensiktsmessige, slik at det er behov for nye. Videre drøftes fordeler og utfordringer ved bruk av droner – rettslig sett. Artikkelens spennvidde er derfor relativt stort. Hensikten er å gi et overblikk over det samlede regelverket og klargjøre hovedtrekkene, fremfor å gå i detalj på enkeltregler og faktiske hendelser.

# Innledende om droner og begrepsbruken

## Hva er en drone? Kort om anvendelse og utvikling

En drone er en folkelig betegnelse på en flygende gjenstand som ikke styres av piloter, men av kontrollører på bakken eller eventuelt av dataprogrammer programmert av bakkepersonell. Andre utbredte betegnelser – med et noe varierende meningsinnhold – er *Unmanned Aerial Vehicle (UAV)*, *Unmanned Aerial System (UAS)*, *eller Remotely Piloted Vehicle (RPV)*. I det følgende brukes betegnelsen drone.

Droner varierer stort i størrelse, pris, anvendelsesområde, teknologisk kompleksitet, grad av autonomi (selvbestemmelse), osv.[1] Den norskproduserte Black Hornet er utstyrt med kamera og GPS-sender og veier bare 16 gram.[2] Forsvaret har foreløpig bare anskaffet en relativt enkel variant, Raven. Den fungerer nærmest som et modellfly som Hæren bruker til rekognosering over for eksempel en åskam. Mest kjent er dronen Predator (MQ 1), og storebroren Reaper (MQ 9), som kan operere over relativt store avstander og høyder, og som i tillegg kan utstyres med våpen (to eller flere Hellfire-missiler). Dronen Global Hawk kan også nevnes. Den har et vingespenn på størrelse med et sivilt passasjerfly (ca. 39 meter), har avanserte sensorer og kan overvåke enorme områder (ca. 100 000 km$^2$ i døgnet). NATO har anskaffet Global Hawk, og Norge er medeier i prosjektet.[3] Mens de minste dronene kan opereres av en enkelt operatør, krever de mest avanserte dronene en infrastruktur på bakken som er sammenlignbar med det bemannende fly krever.

Utviklingen av droner har eksplodert de siste ti årene. Det samme gjelder den militære og sivile bruken av dem. Droner har vist seg meget anvendelige til militær informasjonsinnhenting og målbekjempelse. Det er betegnende for utviklingen at det amerikanske forsvaret de siste årene har utdannet flere dronepiloter enn vanlige flypiloter. Droner som lett tilgjengelige overvåkingsplattformer er naturligvis også av stor interesse for politiet, tollmyndighetene, natur- og forurensningstilsynet, redningstjenesten og lignende, særlig når en tar i betraktning Norges langstrakte kyst og store land- og havområder.[4] Droner anses spesielt egnet til å utføre kjedelige, skitne og farlige oppdrag, som for eksempel grenseovervåking, inspeksjon av smittesoner/atomulykker og maktbruk. Sivilbruk er også tiltakende – fra eiendomsmeglere og journalister som ønsker å ta bilder fra luften, til sivile operatører som

1 Se Peter Singer og Lorns Harald Bakstad sine bidrag i denne utgaven av *Luftkrigsskolens skriftserie*.
2 Se Bakstads artikkel i denne utgaven av *Luftkrigsskolens skriftserie*.
3 Se Scott Coons bidrag i denne utgaven av *Luftkrigsskolens skriftserie*.
4 Tennøe, Tore og Moe, Åke Refsdal (2013): «Politiet bør vurdere droner.» Kronikk i *VG*, 20.05.13.

ønsker å tilby informasjonsinnhentings- eller transporttjenester. Teknologien tillater for eksempel at en sivil operatør overvåker et landområde, og at man mot betaling kan koble seg på via Internett for å se hvor bilen (med kona eller barna), utstyrt med GPS-sender, til enhver tid befinner seg. Slike tjenester kan tenkes koblet opp mot ansikts-/nummerskiltgjenkjenning. Når det gjelder fremtidig bruk av droner, setter knapt nok fantasien grenser. EU spår at det vil være mellom 30 000 og 40 000 operative droner i EU innen utløpet av dette tiåret.[5] En undersøkelse viser at folk flest synes at legitim, statlig bruk av droner er greit, mens de er tilsvarende skeptiske til kommersiell bruk.[6]

## Er droner undergitt rettslig regulering?

Den tiltakende bruken utgjør en stor og åpenbar regulatorisk utfordring. Mange synes å tro at droner ikke er undergitt rettslig regulering, bl.a. fordi det *per i dag* ikke finnes særskilt dedikerte drone-lover i Norge eller dronekonvensjoner internasjonalt. Det er en åpenbar feilslutning. Men hvilke regler som gjelder, er uklart.

Det første spørsmålet er om droner er å anse som et luftfartøy i den norske luftfartslovens forstand, og i folkerettslig forstand, og dermed underlagt den alminnelige luftretten.[7]

Begrepet luftfartøy er ikke definert i luftfartsloven, nettopp for at ikke den teknologiske utviklingen skal løpe fra en eventuell definisjon. Droner har mange av de samme egenskapene og anvendelsesområdene som bemannende fly. Den skaderisikoen og de faremomentene som bruken av droner innebærer overfor personer og objekter på bakken så vel som i luften, tilsier klart at de må være undergitt tilsvarende reguleringer. Luftfartsloven § 15-1 første ledd inneholder en forskriftshjemmel for ubemannede luftfartøy. Forskriftshjemmelen er hittil ikke benyttet, men den taler for at droner må anses som luftfartøy i lovens forstand. Flygende gjenstander må dessuten som hovedregel ha tillatelse til å operere i norsk luftterritorium, og de må følge de regler som gjelder for flyging i luftrommet.[8]

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5 Teknologirådet og Datatilsynet (2013): *Personvern. Tilstand og trender 2013*, s. 31.

6 Op.cit. s. 31.

7 Med den alminnelige luftretten siktes det til de alminnelige regler som gjelder for luftfartøy og luftfart, og som i hovedsak følger av LOV-1993-06-11 nr. 101 *Lov om luftfart (luftfartsloven)* og Chicago-konvensjonen av 1947. De sentrale aktører er Luftfartstilsynet i Norge og Den internasjonale organisasjonen for sivil luftfart (ICAO).

8 Norsk luftterritorium er luftrommet over sjø- og landterritoriet opp til verdensrommet (ca. 100 km opp i atmosfæren). Internasjonalt luftterritorium er luftrommet over internasjonalt farvann og økonomiske soner.

Uten å gå nærmere inn på spørsmålet er det rimelig klart at droner i dag *i utgangspunktet* må anses som *luftfartøy* i luftfartslovens forstand.[9] Det samme utgangspunktet er lagt til grunn i andre land og i forhold til den internasjonale reguleringen av luftfart.[10]

Det at droner anses som luftfartøy i henhold til både norsk og internasjonal luftrett, innebærer at bruken av droner *er* regulert. Videre innebærer det at man må ha *tillatelse* til å operere droner i luftrommet. I dag gis det kun tillatelse til å operere droner i segregert (spesielt avgrenset) luftrom. Det eksisterer ingen rett til uskyldig gjennomfart eller fri ferdsel i nasjonalt luftrom, verken for fly eller droner, slik det gjør i internasjonalt luftrom eller på havet. Det gjelder både sivile og militære droner. Med andre ord er det på ingen måte fritt frem. Tvert imot er utgangspunktet at man ikke har lov til å fly droner i norsk luftrom, med mindre man har fått særskilt tillatelse til det.

Både i Norge og internasjonalt arbeides det for tiden med å utvikle et regelverk for sivil bruk av droner.[11] Dette vil bli harmonisert med regelverket for bemannende luftfartøy. Sverige har allerede vedtatt en egen forskrift for droner. I fremtiden vil dermed droners adgang til luftrommet trolig formaliseres, standardiseres og harmoniseres, slik at disse fartøyene i større grad og enklere får tilgang til luftrommet. Det er ventet at bruken av større droner (startvekt over 150 kg) vil være regulert av et internasjonalt harmonisert regelverk, mens bruken av mindre droner vil være regulert i forskriftsform.

En forutsetning for adgang til luftrommet vil være at droner er sertifisert og godkjent for bruk i luftrommet. Det arbeides med internasjonalt standardiserte sertifiseringsordninger. Droner som skal operere utenfor operatørens synsfelt og i høyder for ordinær luftfart, må trolig være utstyrt med kommunikasjonsmidler og sensorer som gjør at de blir sett av andre luftfartøy og luftromskontrollørene, og slik at droneoperatøren ser andre luftfartøy og øvrige hindringer («see and avoid»). Videre vil det være naturlig å kreve ansvarsforsikring og sertifisering av droneoperatører.

Et særskilt spørsmål er om et missil, for eksempel Tomahawk, regnes som drone og luftfartøy. Dette spørsmålet er ikke uten videre opplagt og avklart. Inntil videre synes den rådende oppfatningen å være at et missil regnes som

9 Luftfartstilsynet (2011): *Bruk av ubemannede luftfartøy i Norge*. AIC-N 25/09. http://www.luftfartstilsynet.no/regelverk/aic-n/article1021.ece (lastet ned 28.05.13); for en nærmere redegjørelse se Johansen, Kjell-Sture (2008): UAV: *Ubemannede flygninger i lovtomt rom?* Mastergradsoppgave i rettsvitenskap. Universitetet i Tromsø.

10 Luftfartstilsynet (2011); Johansen (2008).

11 Luftfartstilsynet (2011): *Regelverksarbeid for ubemannede luftfartøy*. http://www.luftfartstilsynet.no/selvbetjening/allmennfly/UAS/article1939.ece (lastet ned 30.05.13)

et selvdrevet *våpen*, og ikke som et ubemannet luftfartøy (drone), som derimot regnes som en *våpenplattform* på linje med fly og helikopter.[12] Derfor er det unaturlig å anse et missil som et luftfartøy omfattet av den alminnelige luftretten. Samtidig går utviklingen av missiler i retning av en større grad av styring og kontroll, slik at de vil ha mange av de samme egenskapene som ubemannede luftfartøy. Dermed vil mange av de samme regulatoriske hensyn gjøre seg gjeldende (skaderisiko mv.). Enkelte droner vil på den annen side trolig utvikle seg i retning stadig mer autonome våpen/våpensystemer som vil likne missiler. Som følge av dette vil grensen mellom missiler og ubemannede luftfartøy kunne bli vanskeligere å trekke. Det at missiler ikke regnes som luftfartøy, betyr at den alminnelige luftretten ikke vil gjelde for dem. Imidlertid vil bruk av missiler i all hovedsak kun være aktuelt i væpnende konflikter. I så fall vil denne bruken fullt ut være regulert av krigens folkerett. Uansett er det behov for en nærmere gjennomgang av dette spørsmålet.

Et særnorsk unntak fra hovedregelen om at droner er å anse som luftfartøy i luftrettslig forstand, gjelder for modellfly.[13] Enn så lenge regnes ikke et modellfly som et ubemannet luftfartøy (drone) her i landet. Det kan dermed flys uten særskilt tillatelse fra luftfartsmyndighetene. Forutsetningen er at modellflyet holder seg under 400 fot, at det er i operatørens synsfelt, og at det kun brukes til *rekreasjon og lek/sport*.

Skal man drive overvåking eller ta bilder fra en flygende farkost – det være seg fly, droner eller modellfly – kreves det uansett, *av hensyn til rikets sikkerhet*, tillatelse fra Nasjonal Sikkerhetsmyndighet.

Av hensyn til personvern kan tillatelse fra Datatilsynet i noen tilfeller også være påkrevd. Teknologirådet, Datatilsynet og andre spår at de personvernrettslige utfordringene vil bli store. Det kan det heller ikke være tvil om.

Sikkerhetsmessige og personvernmessige hensyn tilsier således at bruken av droner verken er eller kan bli sluppet helt fri. Droner flyr på ingen måte i et lovtomt rom. Tiltakende ønsker om og behov for å fly dem sivilt må veies mot slike hensyn. Her som ellers må man i det pågående reguleringsarbeidet søke en rimelig balanse mellom kryssende hensyn.

I det følgende vil jeg imidlertid la de sivile luftrettslige og personvernrettslige utfordringene ligge. Jeg vil heller se nærmere på den rettslige reguleringen av droner som kan levere våpen.

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12 *HPCR Manual on International Law Applicable to Air and Missile Warfare* (2010), artikkel 1 (z), jf. *Commentary on the HPCR Manual* (2010), s. 50.

13 Se Skrede, Sindre (2012): «Fjernstyrt fornøyelse eller ulovlig spionasje?» *NRK Beta* 07.02.12. http://nrkbeta.no/2012/02/07/fjernstyrt-fornoyelse-eller-ulovlig-spionasje/ (lastet ned 31.05.13)

## Maktbruk i fredstid

Når det gjelder bruk av våpenbærende droner, må det skilles mellom bruk i fredstid og i væpnet konflikt (krig). Betydningen av den grensedragningen er særlig blitt aktualisert ved USAs handlinger i det som gjerne betegnes som en gråsone mellom krig og fred. Derfor vil jeg først skissere gjeldende regulering av våpenbærende droner i fredstid i Norge. Reguleringen er i det vesentligste sammenlignbar med rettstilstanden i USA og andre land, selv om praksis trolig varierer.[14] Spørsmålet er som følger: Når er det lov til å levere våpen fra droner i fredstid?

Så vidt jeg kjenner til, er bruk av våpenbærende droner ikke undergitt særskilt regulering verken i Norge eller i andre land. Dermed gjelder de samme regler som for andre våpenplattformer og annen våpenbruk, det være seg rifleskudd fra bakken eller fra helikopter eller bruk av skudd/missil fra kampfly. I utgangspunktet kan bare våpen fra en drone, enten det er tale om varselskudd eller rett ild mot personer eller objekter, brukes i den grad annen tilsvarende våpenbruk er tillatt. Særskilte hensyn som gjør seg gjeldende ved bruk av droner – for eksempel at dronen er fjernstyrt, hvilken våpentype det er, osv. – vil naturligvis måtte tas i betraktning ved den skjønnsmessige vurderingen av om våpen kan og skal brukes.

Hovedregelen når det gjelder våpen levert fra droner i fredstid, er derfor klar. Kriminelle eller andre, herunder terrorister som planlegger eller har utført terror, skal først og fremst, *om mulig*, bekjempes av politiet med det jeg kaller *«politimetoder»*. Det betyr at mistenkte skal pågripes av politiet, om nødvendig med bistand fra Forsvaret, med minimum bruk av makt, bringes for domstolene og eventuelt fengsles. Dette følger blant annet av politiloven, lov om politimyndighet i det militære forsvar og menneskerettighetene. For både politiet og Forsvaret er det dermed ubeværpnede droner som kan overvåke, som er aktuelle for bruk i fredstid i Norge. Politimetoder skiller seg dermed vesentlig fra det jeg kaller *«militære metoder»*, da sistnevnte sikter til *angrep* som i større grad vil kunne innebærer bruk av dødelige angrep.[15]

Politiet eller Forsvaret kan i fredstid kun anvende dødelig makt i ekstraordinære *nødvergesituasjoner* – til forsvar av seg selv, andre personer eller eiendom, hvor det står om liv eller vitale samfunnsinteresser, og hvor maktbruken fremstår som nødvendig og proporsjonal i forhold til trusselen, situasjonens alvor og forholdene for øvrig (ikke urimelig eller overdreven).

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14 For en sammenlignende studie av statlig bruk av dødelig makt, se Melzer, Nils (2008): *Targeted Killings in International Law*. Oxford: Oxford University Press.

15 Se Dahl, Arne Willy (2008): *Håndbok i militær folkerett*, Oslo: Cappelen, s. 30f.

Aktuelle hjemmelsgrunnlag for maktbruk ved hjelp av droner vil i så fall kunne være politiloven (utøvelse av politimyndighet), lov om politimyndighet i det militære forsvar (utøvelse av militær politimyndighet) og nødvergebestemmelsen i straffeloven.[16] Nødvergeretten og uskreven folkerett er aktuelle hjemmelsgrunnlag dersom det er tale om hevdelse av norsk suverenitet eller suverene rettigheter. Utøya 22. juli 2011 kunne vært et kontroversielt, men mulig, eksempel på akseptabel bruk i nødverge, fordi nær sagt alle midler trolig ville fremstått som nødvendige og proporsjonale for å stanse et pågående massedrap av ungdommer. Utfordringen i praksis vil ofte være krav til tilfredsstillende situasjonsforståelse og positiv identifikasjon. I den forbindelse vil nettopp overvåkingskapabiliteten til dronene kunne være nyttige, ved at de relativt raskt og enkelt vil kunne ta seg inn i vanskelig tilgjengelige, uoversiktlige og farlige områder for å finne ut hva som skjer.

Dersom det *ikke* foreligger en slik ekstrem og akutt nødvergesituasjon som nødvendiggjør og legitimerer bruk av militære metoder, vil dødelige angrep med våpen i fredstid levert fra en drone lett bli ansett som overdreven maktbruk eller endog *utenomrettslige henrettelser*, dvs. drap begått av offentlige etater uten lov og dom. Både overdreven maktbruk og utenomrettslige henrettelser er forbudt. Det følger ikke bare av norsk lov, men også av internasjonale menneskerettigheter, bl.a. retten til liv.[17] Retten til liv er en universell menneskerettighet av sedvanerettslig karakter. Forbudet mot utenomrettslige henrettelser må derfor anses å gjelde overalt, også i land som Pakistan, Jemen og Somalia.

Dermed er vi inne på diskusjonen om lovligheten av å bruke droner til å angripe og drepe terrorister i for eksempel Pakistan.

Mange synes nemlig å mene at det er fredstid og ingen pågående væpnet konflikt i Pakistan, slik at kun politimetoder og et minimum av maktbruk er tillatt. I så fall fremstår droneangrep på personer som overdreven maktbruk eller bent frem ulovlige utenomrettslige henrettelser.

16 LOV-1995-08-04 nr. 53: *Lov om politiet (Politiloven)* § 6, jf. FOR-1989-08-01 nr. 4872: *Våpeninstruks for politiet*; LOV 1988-05-20 nr. 33: *Lov om politimyndighet i det militære forsvar*, jf. FOR 1993-11-26 nr. 1299: *Forskrift om utøvelse av politimyndighet i det militære forsvar* § 2, jf. *Forsvarssjefens våpeninstruks*.

17 *FN-konvensjonen for sivile og politiske rettigheter*, artikkel 6; *Den europeiske menneskerettighetskonvensjonen*, artikkel 2; Disse gjelder som norsk lov, jf. LOV-1999-05-21 nr. 30: *Lov om styrking av menneskerettighetenes stilling i norsk rett (menneskerettsloven)*.

## Gråsonen mellom fredstid og væpnet konflikt: Politimetoder eller militære metoder?

President Obamas rådgiver, nå CIA-sjef, John O. Brennan, besvarte i 2012 den tiltakende kritikken ved å hevde at USA slett ikke driver med utenomrettslige henrettelser i fredstid.[18] Ifølge Brennan er USA i en væpnet konflikt med al-Qaida, Taliban og lignende grupperinger, og USA utøver sin selvforsvarsrett mot tidligere og pågående terrorangrep i tråd med folkeretten. Og i væpnende konflikter kan militære metoder anvendes i henhold til krigens folkerett (*jus in bello*), inkludert droneangrep mot terroristledere, såkalte «targeted killings».[19]

24. januar 2013 igangsatte FNs spesialrapportør på terroristbekjempelse, Ben Emmerson – til tross for Brennans forsikringer – en gransking av 25 droneangrep i Afghanistan, Pakistan, Jemen, Somalia og Palestina. Emmersons hovedspørsmål er da nettopp om det pågår en væpnet konflikt i disse områdene som gjør at fremmede stater lovlig kan drepe terrorister med våpen levert fra droner, og i tilfelle ja – overholdes krigens folkerett?[20] Dermed blir grensen mellom fredstid og væpnet konflikt avgjørende, siden hva som er tillatt av maktbruk varierer stort.

Innen juridisk teori fremstår denne grensen som stridens kjerne i debatten om USAs bruk av våpenbærende droner er lovlig eller ikke. I fredstid er droneangrep i utgangspunktet ulovlig. I væpnet konflikt er det i utgangspunktet lov.

### Når oppstår det en væpnet konflikt?

Litt forenklet kan man si at en *internasjonal* væpnet konflikt er et faktum når en stat tyr til våpen mot en annen stat.[21]

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18 Brennan, John (2012): «The Ethics and Efficacy of the President's Counterterrorism Strategy». Foredrag på Wilson Center 30. april 2012. http://www.wilsoncenter.org/event/the-efficacy-and-ethics-us-counterterrorism-strategy (lastet ned 28.05.13)

19 Det rettslige grunnlaget for amerikanernes dronebruk ble senere utdypet i et "Whitepaper» (notat) utarbeidet av Justisdepartementet, som NBC fikk tilgang til i februar 2013, se US Department of Justice (udatert): *Lawfulness of a Lethal Operation Directed Against a U.S. Citizen who is a Senior Operational Leader of Al Qa'ida or An Associated Force*. Tilgjengelig på: http://openchannel.nbcnews.com/_news/2013/02/04/16843014-justice-department-memo-reveals-legal-case-for-drone-strikes-on-americans?lite (lastet ned 28.05.13)

20 Emmerson, Ben (2013a): *Statement. United Nations Human Rights Office of the High Commissioner*. News Release 24.01.13. www.ohchr.org

21 Jf. fellesartikkel 2 i Genève-konvensjonene. Se bl.a. International Committee of the Red Cross (ICRC) (2008): *How is the Term «Armed Conflict» Defined in International Humanitarian Law?* Opinion Paper, March 2008. http://www.icrc.org/eng/assets/files/other/opinion-paper-armed-conflict.pdf (lastet ned 28.05.13); ILC The Hague Conference (2010): *Final Report on the Meaning*

En ikke-internasjonal (intern) væpnet konflikt internt i en stat oppstår når våpenbruken mellom en stats myndigheter og organiserte væpnende grupper o.l. er av en karakter og intensitet som gjør at politimetoder er utilstrekkelige *eller uhensiktsmessige* for å bekjempe trusselen.[22]

Grensen mellom fredstid og væpnet konflikt er imidlertid på ingen måte klar, verken i teori eller praksis. Tvert imot er det en glidende overgang (skala) fra fredstid til internasjonal/ikke-internasjonal væpnet konflikt. Denne overgangen må kunne karakteriseres som en rettslig gråsone. USAs dronebruk i Pakistan, Jemen og Somalia foregår da nettopp i denne rettslige gråsonen.

Enkelte vil da, som nevnt, hevde at det skal mye til for at maktbruken er så omfattende og alvorlig at man er over terskelen for væpnet konflikt. De mener vi må ha en høy terskel for å forhindre utidig og uforholdsmessig maktbruk. Andre mener det er fornuftig å legge en noe lavere terskel til grunn. Poenget er at plasseringen av terskelen for væpnet konflikt har stor betydning for hvilken maktbruk som er tillatt.

FNs spesialrapportør, Ben Emmerson, besøkte i mars 2013 Pakistan som ledd i sin gransking. Ifølge hans beretning ga myndighetene i Pakistan (representert ved utenriksministeren) klart uttrykk for at de ikke anså situasjonen i Nord-Pakistan (FATA) som en intern væpnet konflikt. Samtidig ga de uttrykk for at situasjonen hadde vært så vidt utfordrende at politiet måtte ha bistand av militæret. Hvorvidt situasjonens alvor, intensitet og art dermed tilså bruk ikke bare av politimetoder, men også militære metoder, er uklart.[23]

En væpnet konflikt vil måtte være både geografisk og tidsmessig begrenset. Men det er ingen som formelt beslutter når den oppstår eller hvor lenge den skal vare. Det er heller ingen som vedtar geografiske grenser for stridssoner. En væpnet konflikt oppstår idet militærmakt brukes som beskrevet, og da i de områdene militærmakten faktisk anvendes, og i den tiden stridighetene faktisk varer. For eksempel ble så vel al-Qaidas angrep på USA 11. september 2001 og et terrorangrep foretatt av 42 terrorister på en militærforlegning i Buenos Aires den 23. januar 1989 ansett som væpnende angrep som gjorde at det

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*of Armed Conflict in International Law*; Dahl (2008), s. 32; Dinstein, Yoram (2011): *War, aggression and self-defence*. Cambridge: Cambridge University Press, s. 3–15; Forsvarssjefen (2013): *Manual i krigens folkerett*. Oslo: Forsvaret, s. 11 og 15–16.

22 Jf. fellesartikkel 3 i Genève-konvensjonene og artikkel 1 (2) i andre tilleggsprotokoll til Genèvekonvensjonene. En ikke-internasjonal væpnet konflikt må holdes atskilt fra ikke-væpnede konflikter, som opptøyer, kriminalitet og lignende. Se bl.a. op.cit. Det er en del internasjonal rettspraksis på denne grensedragning, se særlig ICTY, *Tadic Case* (Dom) ICTY-94-1 (26.01.00), avsnitt 70.

23 Emmerson, Ben (2013b): *Statement of the Special Rapporteur following meetings in Pakistan*. Genève: United Nations Human Rights Office of the High Commissioner. 14.03.13. http://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=13146&LangID=E (lastet 28.05.13)

oppsto henholdsvis en internasjonal og en ikke-internasjonal væpnet konflikt.[24] Rettmessigheten av dronebruk handler derfor ikke om det skjer i eller utenfor en anerkjent krigssone (battle zone), men heller om det skjer innfor rammene av en væpnet konflikt eller ikke. Det blir derfor upresist når USA hevder at det eksisterer en ikke-internasjonal væpnet konflikt mellom USA og al-Qaida som legitimerer bruk av militære metoder. Kritikernes argumentasjon om at USA anvender makt utenfor anerkjente krigssoner, blir imidlertid like upresis.

## *Jus ad bellum*: Når er det lov å operere militære droner i andre staters luftrom?

### Problemstillingen

Dette leder til spørsmålet om når en stat har lov til å intervenere militært i en annen stat, og dermed krenke denne statens luftrom. Det er på det rene at USAs dronebruk i Pakistan i utgangspunktet krenker Pakistans luftrom og suverenitet. Spørsmålet er: Når er det lov?

Adgangen til bruk av militær makt på en annen stats territorium, reguleres av det folkerettslige regelsettet som kalles *jus ad bellum*. Hovedregelen er at stater skal avstå fra trusler om og bruk av militær makt mot andre stater mot en annen stats vilje.[25] Men det finnes to bredt anerkjente unntak fra dette aggresjonsforbudet.[26]

### Unntak: Autorisasjon fra FNs Sikkerhetsråd

Det første unntaket er autorisasjon fra FNs sikkerhetsråd, iht. FN-pakten kapittel 7.[27] En slik autorisasjon lå til grunn for den militære intervensjonen i Libya i 2011.[28] I den konflikten opererte USA/NATO droner og kampfly i

24 Om angrepet i Argentina, se avgjørelsen av The Inter-American Court of Human Rights, *Abella Case*, (Dom), No. 11.137 (18. november 1997), 1. avsnitt.

25 FN-pakten, artikkel 2 (4).

26 I folkerettsteorien diskuteres også andre mulige unntak, som for eksempel folkerettslig nødrett og unilateral humanitær intervensjon. Jeg går ikke inn på dem her.

27 En slik hjemmel følger ikke direkte av FN-pakten, men det er sikker rett at en slik hjemmel kan innfortolkes i FN-paktens kapittel 7, jf. artiklene 39 og 42.

28 Sikkerhetsrådsresolusjon 1973 (2011); Se Larsen, Kjetil Mujezinovic (2012): «Tolking av sikkerhetsrådsresolusjoner – en kommentar til Sverre Lodgaard», i *Lov og rett*, vol. 51, nr. 6 (2012), s. 363–369.

luftrommet over Libya. Dronebruken var lite omfattende sammenlignet med bruken av kampfly, noe som fremdeles er karakteristisk i konvensjonelle internasjonale væpnende konflikter.[29] FN-autorisasjonen – «… to take all necessary measures …» – innebar at bruk av kampfly og droner i Libya var lovlig så lenge bruken var nødvendig og for øvrig i overensstemmelse med hjemmelsgrunnlaget (mandatet/*jus ad bellum*) og humanitærretten (*jus in bello*).

Det er ingen rettslig vesensforskjell på om det var kampfly eller droner som ble brukt i en FN-autorisert operasjon. Bruk av droner i internasjonale væpnende konflikter har knapt vært problematisert eller kritisert i juridisk teori og den pågående offentlige debatten om dronebruk.

Det er uansett på det rene at FN ikke har autorisert USAs bruk av droner i Pakistan eller Jemen, slik at dette grunnlaget ikke er aktuelt med tanke på den debatten.

## Unntak: Utøvelse av selvforsvar

Det andre unntaket er utøvelse av staters selvforsvar iht. FN-paktens artikkel 51. Det var selvforvarsretten USA påberopte da de gikk inn i Afghanistan i oktober 2001.[30]

Vilkårene for lovlig selvforsvar er at en stat er utsatt for et væpnet angrep, og at en militær intervensjon i den angripende staten er en nødvendig og proporsjonal reaksjon for å stanse dette angrepet.

En omdiskutert, men mulig rett til preventivt selvforsvar finnes overfor umiddelbart forestående væpnede angrep hvor selvforsvar fremstår som nødvendig pga. en akutt, alvorlig (overveldende) trussel som ikke kan avverges på andre måter, og hvor det åpenbart er urimelig å kreve at staten venter til angrepet faktisk inntreffer.

Brennan og det amerikanske justisdepartementets notat påberoper USAs selvforsvarsrett som hjemmelsgrunnlag for droneangrep på terrorister som oppholder seg i Pakistan, Jemen og Somalia. I den forbindelse anfører USA i

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29 Woods, Chris og Ross K Alice (2012): «Revealed: US and Britain launched 1,200 drone strikes in recent wars». The Bureau of Investigative Journalism. 04.12.12: http://www.thebureauinvestigates.com/2012/12/04/revealed-us-and-britain-launched-1200-drone-strikes-in-recent-wars/ (lastet ned 28.05.13)

30 Det syntes å være bred enighet om at USA og allierte med hjemmel i selvforsvarsretten kunne intervenere militært i Afghanistan i 2001, men i etter tid og etter hvert som den væpnende konflikten har trukket ut, har flere stilt spørsmålstegn ved rettsgrunnlaget og varigheten. Se Ulfstein, Geir (2002): Terror og folkerett. *Lov og rett* nr. 2 (2002), s. 67–81; Gray, Christine (2008): *Use of Force*. Oxford: Oxford University Press, s. 159-175.

hovedsak at det er tale om utøvelse av selvforsvar mot gjentatte – dvs. allerede foretatte og fremtidige – terrorangrep som er planlagt og utført av Al-Qaida og tilsvarende organisasjoner. Terroristene utgjør slik sett en umiddelbar, alvorlig og reell trussel mot USA, som USA må kunne forsvare seg mot med dødelige angrep, når pågripelse og bruk av politimetoder ikke er et aktuelt alternativ.

Kritikken av USAs bruk av droner går i første rekke ut på at terrortrusselen ikke utløser rett til bruk av militærmakt på en annen stats territorium. Årsaken kan være at trusselen verken er alvorlig eller umiddelbar nok, og at andre mindre voldsomme alternativer derfor finnes.[31]

Hvorvidt USAs snevre adgang til utøvelse av selvforsvar er oppfylt, lar seg vanskelig avgjøre på generelt grunnlag og uten tilfredsstillende kjennskap til fakta i den enkelte sak (angrep).[32] Det kan neppe utelukkes helt at USA sitter på etterretning som tilsier at enkeltpersoner utgjør en høyst reell, alvorlig og umiddelbar trussel mot USA eller dets borgere, og at den trusselen vanskelig kan bekjempes på annen måte. På den annen side er legitimt å stille spørsmål ved om dette er situasjonen i alle tilfeller, og om ikke selvforsvarsretten og dronebruken har vært trukket for langt.

Ved utøvelse av selvforsvarsretten er det uansett liten grunn til å skille mellom bruk av våpenbærende droner og kampfly så lenge bruken er nødvendig og for øvrig i overensstemmelse med hjemmelsgrunnlaget (selvforsvarsretten) og *jus in bello*.[33] Når det gjelder bruken av droner i Afghanistan, knytter da heller ikke kritikken seg primært til hjemmelsgrunnlaget for bruken, men heller om bruken har vært i strid med *jus in bello*.[34] Det spørsmålet skal jeg gå nærmere inn på under neste hovedpunkt.

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31 Se for eksempel O'Connell, Mary Ellen (2010): *Unlawful Killing with Combat Drones. A Case Study of Pakistan 2004-2009. Legal Studies Research Paper No. 09-43*. Notre Dame: Notre Dame Law School.

32 USA er da nettopp kritisert for hemmelighold fordi det vanskeliggjør etterprøving. På den annen side kan det være legitime grunner for hemmelighold om operative detaljer og mønstre.

33 ISAF-styrkens hjemmelsgrunnlag er imidlertid en FN-autorisasjon iht. FN-pakten kapittel 7, jf. Sikkerhetsrådsresolusjon 1386 (2001) og senere resolusjoner (tidsforlengelser og utvidelser).

34 Enkelte har imidlertid også stilt spørsmål ved om maktbruken (herunder dronebruken) i den amerikansk ledede operasjonen *Enduring Freedom* er overdreven (disproporsjonal) i forhold til det opprinnelige hjemmelsgrunnlaget (selvforsvarsretten). Jeg går ikke nærmere inn på det spørsmålet her.

## Samtykke som grunnlag for droneangrep i en annen stat

Selv om angrepet 11. september 2001 ga grunnlag for å gå inn i Afghanistan, også med droner, kan ikke nødvendigvis USA med samme rett forfølge og angripe terrorister som flykter inn i nabostater, som for eksempel Pakistan eller Iran. I så fall vil det oppstå en væpnet konflikt mellom USA og disse statene, med mindre disse statene samtykket i suverenitetskrenkelsen.

USA anfører da nettopp at verken politiet eller militæret i Pakistan, Jemen og Somalia er i stand til å pågripe og håndtere terroristene i disse statene. Videre antyder USA at disse statene samtykker i, eller i det minste aksepterer, USAs droneangrep. Det er klart at om terroristene hadde befunnet seg i for eksempel Tyskland, Iran eller Russland, verken kunne eller ville USA ha flydd inn en væpnet drone for å angripe dem. USA måtte som et minstekrav, om tiden tillot det, først henvendt seg til myndighetene i det aktuelle landet og bedt dem håndtere trusselen, noe de tilsynelatende mener de har gjort overfor Pakistan, Jemen og Somalia.[35]

Amerikanerne anfører følgelig ikke selvforsvarsretten alene som hjemmelsgrunnlag for dronebruken i Pakistan, Jemen og Somalia. I tillegg anfører USA tilsynelatende det som regnes som et selvstendig rettsgrunnlag, nemlig samtykke fra den staten det interveneres i.

På dette punktet er imidlertid USA meget tilbakeholdne. De angivelige avtalene er hemmeligholdt og av den grunn omstridt i den offentlige debatten. Samtykke innebærer i dette tilfellet at USA får lov av pakistanske myndigheter til å bekjempe trusler i Pakistan, fordi landets egne politi- og militærstyrker ikke evner eller vil bekjempe trusselen selv. Det kan diskuteres om Pakistan har avgitt et reelt og gyldig samtykke. Ifølge avisen The Wall Street Journal foregikk samtykkeprosessen slik at USA jevnlig sendte telefax til pakistanske myndigheter og varslet om operasjoner i et område.[36] Pakistanske myndigheter klarerte da visstnok luftrommet. Ifølge *The Wall Street Journal* mener USA at fremgangsmåten er tilstrekkelig for å si at det foreligger et gyldig samtykke. Pakistan gjør lite for å klargjøre situasjonen. På den ene siden tolererer landets myndigheter tilsynelatende USAs bruk av UAV. På den annen side har spesielt Pakistans utenriksminister, sist i møte med Ben

35 Somalia anses gjerne som en såkalt "failed state» uten statlig styring og kontroll, og hvorvidt Somalia kan samtykke, blir dermed uklart. Artikkelens rammer tillater imidlertid ingen inngående redegjørelse for de faktiske forholdene i noen av disse statene.

36 Entous, A., Gorman, S. og Perez, E. (2012): «U.S. Unease Over Drone Strikes." *The Wall Street Journal*, 26.09.12. http://online.wsj.com/article/SB10000872396390444100404577641520858011452.html (lastet 12.08.13)

Emmerson i mars 2013, offentlig sagt at USAs bruk av droner skjer uten regjeringens samtykke og at angrepene derfor er en ulovlig krenkelse av Pakistans suverenitet. I et intervju med CNN i april i år innrømmet Pakistans eks-president, Pervez Musharra, at Pakistan i enkelte tilfeller hadde samtykket.[37]

Uansett, en avgjørende forutsetning for samtykke til en annen stats militære operasjoner på eget territorium er, som allerede nevnt, at man i dette tilfellet står overfor en intern væpnet konflikt. Selv om USA har innhentet samtykke, kan ikke USA bruke militærmakt i større utstrekning enn hva pakistanske myndigheter selv kunne ha gjort. Og det er nettopp den betingelsen som de argeste kritikerne av USAs dronebruk mener ikke er til stede. Etter deres oppfatning er det ingen væpnet konflikt i Pakistan, og følgelig vil utstrakt bruk av militære metoder (utover nødverge), herunder droneangrep på enkeltindivider, kunne være ulovlig.

At *deler* av *Nord-Pakistan* (FATA), i hvert fall tidvis, har vært kontrollert av militante grupperinger (Taliban, al-Qaida og lignende) som tydeligvis ikke lar seg bekjempe ved hjelp av ordinære politimetoder, taler for at det i det minste tidvis kan ha pågått en intern væpnet konflikt som nødvendiggjorde militære motoffensiver *i disse områdene i den tiden.* På samme måte kan det argumenteres for at situasjonen tidvis kan ha vært tilsvarende i Jemen og Somalia hvor ulike ekstremistgrupper har hatt kontroll på enkelte byer og områder.

Et viktig poeng er uansett at ett av disse *tre* rettsgrunnlagene må foreligge så lenge operasjonen pågår, fra begynnelse til slutt. Det vil for eksempel si at om Pakistan trekker sitt angivelige samtykke, må USA trekke seg ut eller påberope seg selvforsvarsretten alene.

Ifølge *jus ad bellum* må i tillegg maktbruken og operasjonen – som et hele, fra begynnelse til slutt – fremstå som nødvendig og proporsjonal. Det vil si at maktbruken må stå i rimelig forhold til målet og ikke fremstå som overdreven. Litt forenklet kan man si at maktbruk normalt er tillatt når og så lenge det er nødvendig og det er proporsjonalitet mellom mål og middel. Men dersom maktbruken fremstår som unødvendig eller urimelig voldsom og overdreven, er den verken akseptabel eller lovlig.

Stadig flere synes å mene at tolv år med krigføring mot al-Qaida er mer enn nok. Oppfatningen går på at dronebruken ikke bare er unødvendig og disproporsjonal, men direkte kontraproduktiv i forhold til målet om å bekjempe

37 Robertson, Nic og Botelho, Greg (2013): «Ex-Pakistani President Musharraf admits secret deal with U.S. on drone strikes.» CNN.com, 12.04.13. http://edition.cnn.com/2013/04/11/world/asia/pakistan-musharraf-drones (lastet 12.08.13)

terrorisme ved at det billedlig sagt «skapes ti nye terrorister for hver terrorist som drepes i droneangrep». I Stanford/NYU-rapporten *Living Under Drones* argumenteres det for at sivilbefolkningen i FATA-området opplever det som svært belastende, endog terroriserende, å leve med dronetrusslen og den konstante *plenklipperduren*.[38]

USA, ved John Brennan, hevder at al-Qaida og terrortrusselen ikke er bekjempet, verken i Pakistan eller i andre land, og at droneangrepene er nødvendige og rimelige.[39]

Dette understøtter et sentralt poeng, nemlig at meningsmotstanderne er relativt enige om rettsreglene. Det er først og fremst fakta, dvs. situasjonsforståelsen, man er uenig i og som er utfordringen. Og når situasjonsforståelsen er vidt forskjellig som den synes å være, gjør det at meningsmotstanderne lander på hvert sitt standpunkt mht. hvilke regler som kommer til anvendelse og om dronebruken er lovlig eller ikke.

Det er nemlig bred enighet om at folkeretten, herunder *jus ad bellum*, selvfølgelig gjelder fullt ut også ved bruk av droner. Det er ingen forhold som tilsier at *jus ad bellum* ikke gjelder, eller at det bør være særregler for droner. Man har verken større eller mindre rett til å krenke andre staters luftterritorium med droner.

## Bruk av droner i *væpnede konflikter – jus in bello*

### Innledning

Uavhengig av om *jus ad bellum*-reglene følges eller ikke, gjelder i tillegg *jus in bello* (humanitærretten) parallelt i væpnede konflikter.[40] Forutsetningen for å anvende de reglene som drøftes under dette punktet, er altså at det pågår en væpnet konflikt, og at bruk av militære metoder (angrep) derfor er nødvendig og i utgangspunktet tillatt. Hensikten med *jus in bello*-reglene er bl.a. å minske krigens lidelser. Men *jus in bello* tillater at så vel gjenstander som personer utsettes for direkte angrep. Spørsmålet er derfor: Hva er det lov å bruke droner til i en væpnet konflikt? Hvilke regler gjelder?

38 Se http://www.livingunderdrones.org/ (lastet ned 29.05.13)
39 Brennan (2012), op.cit.
40 Om forholdet mellom *jus ad bellum* og *jus in bello*, se Okimoto, K. (2012): *The distinction and relationship between jus ad bellum and jus in bello*. Oxford: Hart Publishing 2011, s. 12–25.

## Generelt om målutvelgelsesreglene (targeting)

Sentralt i spørsmålet om når droneangrep lovlig kan gjennomføres *i væpnede konflikter*, står *målutvelgelsesreglene (targeting*-reglene). De fastsetter hvilke mål som er lovlige og hvordan disse lovlig kan angripes.[41]

Målutvelgelsesreglene må sees i lys av de tradisjonelle grunnprinsippene om militær nødvendighet, humanitet, distinksjon og proporsjonalitet.

## Kravet om militær nødvendighet og distinksjonsprinsippet

Kort og upresist kan man si at kravet om *militær nødvendighet* gir en stats militære styrker tillatelse til å bruke den makt som er *nødvendig* for å svekke motpartens militære kapasitet. Det betyr at man i utgangspunktet også kan anvende bevæpnede droner i angrep.

Men det må skilles mellom sivile og lovlige militære mål. Dette såkalte *distinksjonsprinsippet/-kravet* gjelder fullt ut også ved bruk av droner. Militære styrker har naturligvis ikke større adgang til å drepe sivile eller ødelegge sivile objekter ved bruk av droner enn ved bruk av andre våpenplattformer, som for eksempel kampfly. Bare lovlige militære mål kan engasjeres – men det inkluderer også sivile som direkte deltar i strid i den tiden de faktisk deltar. Navngitte ledere av militære styrker eller andre stridende grupperinger, som også kan omfatte visse terroristgrupper, må normalt anses å ta direkte del i strid, og de vil derfor i utgangspunktet være lovlige mål. Verken statsledere, andre ledere eller navngitte personer nyter immunitet mot angrep iht. krigens folkerett når de deltar i strid. De kan angripes uten varsel og rettskjennelse i væpnende konflikter, i utgangspunktet også med våpen levert av droner. Følgelig er det ikke riktig å karakterisere slike lovlig angrep (kalt «targeted killings») som utenomrettslige henrettelser eller drap.

Sivile personer som kun indirekte deltar, som f.eks. opiumsbønder eller taxisjåfører, er derimot i utgangspunktet ikke lovlige mål. En situasjon som har vært gjenstand for meningsbrytning ved droneangrep, er den såkalte *svingdørsproblematikken* – «fighter om natten, bonde om dagen». Sivile kan som nevnt bare angripes «så lenge de deltar i strid». Hva så med sivile som regelmessig deltar i strid? Kan de bare angripes med «våpen i hånd»? Den rådende oppfatningen i folkerettsmiljøet er at sivile som er medlem av en gruppe stridende, i likhet med soldater, kan angripes så lenge vedkommende deltar aktivt i denne gruppen og i fiendtlige aktiviteter, med eller uten «våpen i hånd».[42]

41 Se nærmere på *Manual i krigens folkerett* (2013), kapittel 2 ff. Her skisseres kun hovedreglene.

42 Se for eksempel Den internasjonale Røde Kors-komiteen (ICRC) / Melzer, Nils (2009): *Inter-*

## Krav om at alle forholdsregler tas

Også ved droneangrep stilles det like store krav til at alle rimelige og praktisk mulige forholdsregler tas for å unngå, eller i det minste minimere, utilsiktede tap. Det vil si at man før og under angrep må gjøre det man med rimelighet kan forventes å gjøre for å forhindre tap av uskyldige sivile liv eller at gjenstander går tapt/skades.

Når det gjelder forholdsregler, stilles det krav om god etterretning ved at man må være rimelig sikker på at målet virkelig er lovlig (at det er det man tror det er). Med tanke på debatten omkring lovligheten av droneangrep i så vel Afghanistan som Pakistan, har såkalte *signature strikes* vært meget omstridt. Dette betyr at man hovedsakelig baserer målidentifikasjon (PID) på en persons livsførsel («pattern of life»). Rettslig sett er *signature strikes* problematisk, fordi det kan stilles spørsmål ved om livsførsel gir et tilfredsstillende faktagrunnlag for å avgjøre om en person er et lovlig mål eller ikke. Her som ellers er god og nøyaktig etterretning avgjørende for at vilkåret om positiv identifikasjon kan anses som oppfylt.[43]

## Kravet om proporsjonalitet

I tillegg gjelder proporsjonalitetsprinsippet. Innen *jus in bello* går dette ut på at faren for sivile tap (det noen kaller CDE: «Collateral Damage Estimate») må stå i rimelig forhold til forventede militære fordeler. Det er klart at hva som er rimelig, beror på en konkret skjønnsmessig vurdering, hvor så vel kvantitative (antall skadde/drepte og lignende) som kvalitative forhold (målets betydning, ulike hensyn som angrepets negative/positive effekter og lignende) spiller inn. Det er altså ikke slik at enhver tilfeldig skade på beskyttede sivilpersoner og sivile objekter er uakseptabel og ulovlig; det er bare disproporsjonale utilsiktede skadefølger på sivile som er ulovlige. Gjennomførte droneangrep i Pakistan blir ofte beskyldt for å forårsake uforholdsmessig store sivile tap. Dersom en terroristleder er et lovlig mål, vil et angrep på ham som samtidig innebærer at ti uskyldige blir drept, lett fremstå som disproporsjonalt og dermed ulovlig. Dersom de ti andre derimot er sivile som direkte deltar i

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*pretive guidance on the notion of direct participation in hostilities under international humanitarian law*. Genève: ICRC. Se http://www.icrc.org/eng/assets/files/other/icrc-002-0990.pdf (lastet ned 28.05.13).

43 Hvilke krav som stilles til positiv identifikasjon, vil variere ut fra konflikten og angrepets art. Det bør i det minste være mer sannsynlig at målet er lovlig enn at det ikke er det (mer enn 50 % sannsynlighet). Vanligvis kreves det ikke visshet (dvs. 100 % sannsynlighet). Det betyr at det er visst rom for feilvurderinger, det som i juridisk språkdrakt heter faktisk villfarelse.

strid og dermed i seg selv er lovlige mål, vil angrepet være i overensstemmelse med proporsjonalitetsprinsippet. Ofte er det uklart om øvrige drepte er sivile (ulovlige mål) eller medsammensvorne sivile som deltar i strid (lovlige mål). Dermed er det vanskelig å fastslå hvor mange uskyldige liv som har gått tapt i forbindelse med droneangrepene. *The Bureau of Investigative Journalism*, som følger USAs droneprogram tett, anslår at per mai 2013 er det gjennomført 369 droneangrep i Pakistan (317 av disse i Obamas presidentperiode). Tapstallene anslås til å være mellom 2541 og 3540 personer, hvorav mellom 411 og 884 var sivile, herunder mellom 168 og 197 barn.[44] Terrorekspertene David Kilcullen og Andrew Exum anslo i 2009 at i snitt femti utilsiktede liv gikk tapt for hvert tilsiktet mål (terroristleder).[45] Disse tallene synes høye, og om de stemmer, fremstår det som disproporsjonalt. Når det gjelder droneangrep, har også såkalt *double-tapping*, dvs. at man reengasjerer et mål, vært omdiskutert. Rettslig sett kan gjentatte angrep på et mål være utfordrende, siden det mellom det første og andre angrepet kan ha kommet uskyldige sivile hjelpemannskaper inn i målområdet. Tilstrømning av sivile kan bety at bl.a. proporsjonalitetskravet ikke lenger er oppfylt, og at et i utgangspunktet lovlig angrep må avbrytes.

## Humanitetsprinsippet

Humanitetsprinsippet/-kravet har et noe uklart rettslig innhold. Det er imidlertid et overordnet rettsprinsipp ment som en motvekt til prinsippet om militær nødvendighet.[46] Et særlig spørsmål i forhold til humanitetsprinsippet er om droner *per se* er et våpen som forårsaker overflødig skade eller unødvendig lidelse og dermed er forbudt.[47] Uten å gå i detalj mener de fleste folkerettsjurister, herunder Den internasjonale Røde Kors-komiteen, at droner i det store og hele verken er mer eller mindre humane enn andre våpenplattformer, som for eksempel kampfly og kamphelikoptre. Droner er følgelig *per se* ikke

44 The Bureau of Investigative Journalism: http://www.thebureauinvestigates.com/category/projects/drones/ (lastet ned 31.05.13). Tilsvarende tall for Jemen (2002–2013) er 46–56 bekreftede angrep, 240–349 drepte, hvorav 14–49 sivile og 2 barn. I tillegg kommer muligens 78–96 ubekreftede angrep. Somalia (2007–2013): 3–9 angrep, 7–27 drepte, hvorav 0–15 sivile (ingen barn). Se også http://www.livingunderdrones.org/ (lastet ned 29.05.13)

45 Kilcullen, David og Exum, Andrew M. (2009): «Death From Above, Outrage Down Below». New York *Times* 16.03.09, http://www.nytimes.com/2009/05/17/opinion/17exum.html?pagewanted=all&_r=0 (lastet ned 30.05.13)

46 Se nærmere Larsen, K.M., Cooper, C.G. og Nystuen, G. (red.) (2013): *Searching for a 'Principle of Humanity' in International Humanitarian Law*. Cambridge: Cambridge University Press.

47 Jf. Første tilleggsprotokoll til Genève-konvensjonene, artikkel 35 og 36.

et inhumant og dermed ulovlig våpen/våpenplattform. *Bruken* kan imidlertid være inhuman og ulovlig.

## Særlig om autonome droner

Humanitetsprinsippet har spesielt vært tatt opp i forbindelse med utviklingen av stadig mer autonome droner, dvs. droner som identifiserer og engasjerer mål uten at et menneske drar i avtrekkeren. Det finnes da også autonome våpen i bruk i dag, som for eksempel den britiske C-RAM-en som brukes til å forsvare installasjoner mot fiendtlige missiler som kommer så raskt på at et menneske ikke vil rekke å reagere. Droner er i dag mer eller mindre autonome, selv om ingen av dem, så vidt jeg kjenner til, er programmert slik at de «selv» bestemmer om våpen skal avfyres.[48] Effektive og avanserte våpen er ikke nødvendigvis uønskede eller forbudt. Også det er de fleste enige om. Forutsetningen er at *bruken* er forsvarlig og fullt ut i overensstemmelse med folkeretten. Autonome droner vil dermed ikke nødvendigvis være i strid med folkeretten, selv om det fremstår som etisk og rettslig problematisk at det ikke er et menneske som drar i avtrekkeren. Det er for eksempel vanskelig å se for seg at en autonom drone vil kunne programmeres til å foreta kompliserte helhetsvurderinger av nødvendighet og proporsjonalitet. De vil også mangle et solid moralsk kompass og en sunn samvittighet som man forventer at soldater er utstyrt med.

## Særlig om bruken av sivile droneoperatører (-piloter)

Et annet punkt som har vært fremtredende i debatter omkring lovligheten av USAs bruk av droner i Pakistan, Jemen og Somalia, er bruken av sivile (CIA) operatører/piloter, og endog private kontraktører.

I utgangspunktet er det bare uniformerte medlemmer av den stridende parts militære styrker som lovlig kan delta i strid, herunder gjennomføre angrep og straffefritt ta liv, (så fremt målet er lovlig). Det er ikke nødvendigvis forbudt å bruke sivile i militære operasjoner, men sivile vil ofte ikke ha de samme privilegier som soldater (kombattanter), som for eksempel krav på straffrihet for lovlige krigshandlinger og krav på krigsfangestatus om de blir tatt til fange.

48 Droner vil følgelig aldri være helt autonome, med mindre de en gang i fremtiden kan utstyres med avansert kunstig intelligens. Det vil alltid være et menneske som har programmert og dermed bestemt hvilke parametere som må være til stede for at dronen skal gjøre noe.

Det kan dermed stilles spørsmål ved i hvilken grad og på hvilken måte sivile aktivt kan og bør delta i strid. Ut fra krigens folkerett synes det problematisk at CIAs droneprogram fremstår som sivilt, men like fullt bærer preg av militære operasjoner i en væpnet konflikt. Bruk av sivile vil kunne være problematisk også av andre grunner, som for eksempel dersom de ikke har tilstrekkelig trening i og erfaring med krigens folkerett.[49] Bruken av hemmelige sivile operasjoner («covert operations») og CIA-droner bidrar uansett til at USAs droneprogram mistenkeliggjøres, og fremstår som noe som ikke tåler dagens lys.

## Ansvar

En særlig utfordring når det gjelder droner, og da især autonome droner, sies ofte å være plasseringen av ansvar. Når dagens UAV-er opereres av piloter langt unna krigssonen, synes mange å frykte at ansvaret pulveriseres og at risikoen for folkerettsbrudd øker. For hvem er ansvarlige for krigsforbrytelser begått av ubemannede luftfartøy? Kan droner refses eller fengsles? Naturligvis ikke. Men heller ikke denne problemstillingen er aktuell bare ved bruk av droner. I dagens nettverksbaserte forsvar er det mange komponenter som deltar og bidrar i angrep, både mennesker og maskiner, sivile som militære: Personen som nominerer et mål, beslutningsdeltakere i kommandosenteret, CDE-analytikere, dataprogrammerere, våpenoffiserer og piloter. Dersom noe går galt, blir det spørsmål om angrepet var forsvarlig – både som helhet og i hvert enkelt ledd. Pilotene bærer ikke ansvaret alene. Alle som medvirker, har en personlig forpliktelse og kan i prinsippet bli stilt til ansvar. Militære sjefer har i tillegg et kommandoansvar. Politikere har et politisk ansvar. Det gjelder om det er en drone eller et F-16 fly som leverer våpen.

## Bred enighet om at *jus in bello* gjelder fullt ut for droner

Internasjonalt er det bred enighet om disse prinsippene.[50] Det er et sentralt poeng ut fra denne artikkelens hovedspørsmål. Krigens folkerett – dvs. *jus ad bellum* og *jus in bello* – gjelder utvilsomt fullt ut ved bruk av droner i interne og internasjonale væpnede konflikter, slik de gjør for eksempel for kampfly

49 Artikkelens rammer tillater ikke en nærmere drøfting av disse kompliserte spørsmålene som også vil berøre amerikansk intern rett.

50 Se for eksempel Brennan (2011) vs. O'Connell (2010).

og kamphelikoptre. Dette er både USA og deres argeste kritikere skjønt enige om. Når det er sagt, eksisterer det en del gråsoneproblematikk og tolkningsspørsmål, dvs. legitim uklarhet om hvilke rettsregler som gjelder og nøyaktig hvilket innhold disse har. De nevnte gråsoneeksemplene er imidlertid også aktuelle ved bruk av andre ressurser, som for eksempel spesialstyrker og kampfly. Rettslig sett er det altså lite særegent ved droner.

## Behov for nye regler for droner?

I diskusjonene rundt lovligheten av bruken av droner hevdes det relativt ofte at dagens regler ikke passer for eller gjelder ved bruk av droner. Derfor er det behov for nye tidsriktige og spesialtilpassede regler – gjerne en internasjonal dronekonvensjon. Slike krav fremsettes oftest av ikke-jurister.

Selv om dagens regler ble til i en annen tid og for andre typer kriger, betyr ikke det at de er foreldet og uhensiktsmessige. Tvert i mot. Det er i dag oppnådd relativt bred enighet om dagens regler. Det taler for at regelverket oppfattes som hensiktsmessige, også i vår tid. Til tross for at enkelte hevder det motsatt, må man kunne si at reglene har tålt tidens tann. Det er også bred enighet blant folkerettsjurister om at dagens regelverk nødvendigvis må gjelde fullt ut også for droner. Selv om alle nå i prinsippet kan anskaffe seg en drone og fly den, betyr ikke det at å operere droner i luftrommet er tillatt. Det at droner lett kan fly inn i en annen stats luftterritorium og ta livet av enkeltpersoner med farlige tanker, betyr ikke at det er lov. Droner har ikke så spesielle egenskaper at dagens regler ikke kan sies å passe for dem, med den følge at reglene ikke gjelder. Tvert imot er det dronebruken som må tilpasse seg gjeldende regelverk og spilleregler.

Riktignok er enkelte av dagens regler vage ved at de forutsetter skjønnsutøvelse. Fordelen med at reglene er vage, er at de er fleksible og utviklingsdyktige. Dette betyr imidlertid ikke at reglene er uten innhold eller realitet. Skjønnsutøvelsen være rimelig og sunn. Og det finnes yttergrenser.

Det vil imidlertid alltid finnes rettslige gråsoner hvor det er rom for tolkningstvil og heftig diskusjon. Slik er det også på alle andre rettsområder, som for eksempel skatteretten. At folkeretten ikke alltid følges til punkt og prikke, betyr altså ikke at det ikke eksisterer regler, eller at de er uhensiktsmessige og grenseløst vage, og at vi trenger nye. Snarere tvert imot.

Riktignok kunne man alltids trengt et klarere regelverk, men når noen krever nye regler, blir spørsmålet: Hvilke regler mangler?

Da en gruppe folkerettseksperter skulle lage en folkerettsmanual (HPCR-manualen av 2010) for bruk av luftmakt, vurderte gruppen å utarbeide et eget

kapittel med særregler for droner.[51] Gruppen kom imidlertid frem til at det ikke var behov for det. Det er jeg enig i. Dette taler mot et prekært behov for nye regler.

Det er da også tvilsomt at det internasjonale samfunnet vil klare å utvikle et særskilt regelverk for droner som er bedre, klarere eller strengere enn det vi har i dag. En slik prosess vil dessuten kunne ta en del år. Et nytt regelverk vil også kunne skape nye gråsoner.

Det er følgelig ikke mangelen på regler som er hovedproblemet, men heller om de regler som finnes faktisk overholdes. Lover har ingen magisk kraft – slik at om noe bare blir forbudt, så blir det slik. Derfor er soldaten og offiserens profesjonsutdanning og etiske bevissthet vel så viktig som lover og regler, også ved bruk av droner og luftmakt.

## Mulige fordeler ved bruk av væpnede droner i væpnende konflikter

Den offentlige debatten dreier seg naturlig nok ofte om de problematiske sidene ved bruken av droner. Et eksempel kan være at terskelen for ulovlig bruk senkes, og at det er lettere å gå til krig og drepe når man sitter i en komfortabel stol 7000 kilometer fra målet uten risiko for tap av eget liv, spesielt når virkeligheten skiller seg lite fra den virtuelle verden skapt av PlayStation-spill som Call of Duty og lignende.

Våpenbærende droner har imidlertid også sine fordeler – rettslig sett. Til forskjell fra kampfly som for eksempel F-16, vil en drone kunne sirkle over et område i lengre perioder for på den måten å sikre at informasjonen om målet er best mulig, og at det beste tidspunktet for angrep velges, f.eks. med tanke på nærvær av sivile. Man vil kunne ha flere operatører som analyserer bildene på store dataskjermer, til forskjell fra de bitte små skjermene som finnes i et kampfly. Noen vil endog hevde at droneoperatørene som overvåker et mål i timevis, ja, kanskje i dagevis, tross PlayStation-effekten, får større nærhet til målet enn en pilot som befinner seg 20 000 fot over målet en kort tid. En drone vil heller ikke i krigens hete (*fog of war*) bli sint, sliten, frustrert og hevntørst, og dermed opptre uforsiktig eller direkte uansvarlig, selv om droneoperatøren vil kunne bli det på samme måte som kampflypiloten. Det er videre mindre risiko forbundet med bruk av droner, ved at risikoen for tap av eget personell er liten.

51 *HPCR Manual on International Law Applicable to Air and Missile Warfare* (2010), jf. artikkel 1 (dd) og (ee). Personlig meddelelse fra generaladvokat Arne Willy Dahl, som deltok i utarbeidelsen.

Droner kan derfor operere i langt lavere høyder, og dermed kanskje mer presist, enn et kampfly normalt vil gjøre. Kampfly opererer ofte i store høyder nettopp for å minimere faren for å bli skutt ned. Hellfire-missiler som sitter på Predatoren, har også mindre nedslagsfelt og kan derfor ha mindre feilmargin enn større missiler og bomber som kampflyene leverer, noe som også kan senke risikoen for utilsiktede tap. Ved større angrep, hvor mange kampfly er involvert, kan for eksempel overvåkingsdroner brukes som et viktig supplement, ved at de overvåker målområdet og passer på at sivile folkeansamlinger ikke kommer inn i der.

Alt i alt vil dette kunne medføre at man får bedre informasjon om målet og ikke minst om hva som er i nærheten av det. Dette kan forbedre både målverifikasjon (PID) og treffsikkerhet. Det kan lette evnen til å overholde distinksjonsprinsippet. I tillegg kan det bidra til at faren for utilsiktede sivile tap blir mindre, slik at proporsjonalitetsprinsippet overholdes med større margin.

Paradoksalt nok er hensynet til risikominimeringen brukt som et argument *mot* bruken av droner. Et annet underlig motargument er at brukerne av droner i enda større grad blir motstanderne overlegne, noe som medfører mangel på jevnbyrdighet. At den ene parten skal avstå fra å bruke avanserte våpen (les: feige våpen) fordi fienden ikke har slike faller på sin egen urimelighet. Det er jo nettopp mest mulig effektiv maktutøvelse med lavest risiko for egne liv og uskyldige siviles liv vi tilstreber. Dagens militære droneangrep karakteriseres da også av at de benyttes av USA og allierte i det disse som nevnt anfører å være lovlig bekjempelse av kriminell virksomhet (terror). Slik sett er kan lite rimelig å bedre terroristenes muligheter til å forsvare seg ved at man kun bruker våpen som terroristene også selv besitter.[52]

Oppsummeringsvis vil lovlig og fornuftig utnyttelse av dronenes overvåkingskapasiteter og presisjon vil dermed kunne øke evnen til å overholde folkeretten. Folkeretten er da også klart nok ikke til hinder for at Norge anskaffer droner, heller ikke de som kan levere våpen.

## Fremtidige utfordringer

En utfordring og bekymring som er langt større enn *vage og mangelfulle* regler, er at droner blir billigere, mer avanserte og allment tilgjengelige, og

52 Se Høiback, Harald (2013): «Luftmakt – høyde, hastighet og rekkevidde», i Høiback, Harald og Ydstebø, Palle (red.): *Krigens vitenskap – en innføring i militærteori*. Oslo: Abstrakt forlag, s. 288–289.

at fremmede stater, terrorister og andre kriminelle bruker dem til spionasje, angrep eller narkotikasmugling – for å nevne noen få eksempler. EU spår, som nevnt innledningsvis, at det om ti år vil finnes 30 000–40 000 droner i Europa. Det gjør noe med trusselbildet, både her til lands og i andre stater.

Droner vil også av våre myndigheter kunne oppfattes som et forførende lavterskelvåpen. Sammenlignet med kampfly og bakkestyrker fremstår droner som små, presise og effektive. Fotavtrykket de setter, er tilsynelatende lite – det er «no boots on the ground». Forestillinger om at det er størrelsen på våpenplattformen og ikke effekten på bakken som er avgjørende for om noe er akseptabelt, kan bidra til at presis og risikofri fjernstyrt krigføring og maktbruk i større grad fremstår som greit, ikke bare blant politikere og generaler, men også i befolkningen for øvrig.

Kanskje håper noen at droner er det perfekte gråsonevåpen – *the silver bullet*. Men noe slikt finnes som kjent ikke, like lite som rene og etisk/juridisk uproblematiske kriger. Fristelsen til å senke terskelen for dødelig maktbruk kan bli stor, både i og utenfor væpnede konflikter. Faren er at myndighetene og opinionen aksepterer maktbruk som ikke ville vært akseptabel om kun tyngre og tradisjonelle våpenplattformer (kampfly) hadde vært tilgjengelig, og at man dermed forføres til å tråkke over både moralske og juridiske grenser. Og opererer man i gråsoner og grenseland for det tillatelige, er det fort gjort å tråkke over. Det er vel nettopp dette forholdet som preger USAs bruk av droner i Pakistan, Jemen og Somalia.[53] I så fall vil bruk av droner kunne være en *slippery slope* – og en slik utvikling er det grunn til å være på vakt mot.

Dersom man bryter regelverket ved å tøye det for langt, undergraves ikke bare egne verdier og egen virksomhet, men også målet for operasjonen som typisk er å bekjempe kriminalitet og gjenopprette lov og orden i tråd med de *universelle verdier* man forsvarer, dvs. menneskerettighetene. Dette sluttpoenget illustrerer det nære avhengighetsforholdet mellom jus, militær strategi, etikk og politikk, som man bør ha i mente ved all bruk av militærmakt – også droner. En forutsetning for suksess – politisk og militært sett – er at man evner å overholde gjeldende spilleregler.

53 Kilcullen og Exum (2009).

# The Future of Airpower

Martin van Creveld

To understand the present and look into the future, one must study the past. Assorted dreamers and experimenters apart, airpower was born in the very last years of the nineteenth century. That was when lighter-than-air devices first made their appearance and began to be used in war. From that point on, it has developed at truly amazing speed. The first campaign in which aircraft were used and made their mark was the Italian one in Libya in 1911. The Italian Army—there was no air force yet—reconnoitered, dropped bombs, and provided liaison. All this it did in a huge, wild, and largely unknown theater of war that posed many challenges to pilots and machines alike. Airpower was also used during the Balkan Wars of 1911–1913, albeit amateurishly and on a very small scale.

During World War I, things changed. Over the 4 years that the conflict lasted, the most important belligerents, that is, France, Britain, Germany, Italy, Russia, and the United States, produced between them approximately a quarter of a million machines.[1] With them came the pilots needed to fly them, the infrastructure needed to support them, the research institutes needed to design them, and much more. By the time the conflict ended in November 1918, almost every single one of the present-day missions of airpower was already being practiced on a daily basis and on a very considerable scale. That included reconnaissance and surveillance (often carried out with the aid of balloons or, at sea, airships); artillery spotting; air-to-air combat, fought first with pistols, then with carbines, and finally with machine guns that were synchronized with the propellers; close support and interdiction (which at times could be very effective, as was proved at Megiddo in 1918); "strategic" bombing aimed at the enemy's deep rear; and liaison. At sea, it also included sea-to-air attacks, mine-laying, and anti-submarine warfare. Looking back, the only two important missions *not* yet practiced during this period were air transport on the one hand and air assault (using either parachutes or gliders) on the other. Both were developed during the interwar years. By 1939, both had progressed to the point where they were ready for action.

1 E. Angelucci (1990): *Rand McNally Encyclopedia of Military Aircraft*. New York: Gallery, p. 29.

During the late 1930s, airpower was able to show what it could do both in Europe, during the Spanish Civil War, and in the Far East, during the wars between Japan and China as well as the one between Japan and the Soviet Union.[2] As the German victories in Poland, Norway, the Low Countries, France, the Balkans, Crete, and Russia all proved, at the time World War II broke out, no large operation on land, offensive or defensive, stood any chance of succeeding unless it was strongly supported from the air. The Battle of Britain too proved the point, if proof was still needed. In the end, it was the failure of the Luftwaffe to gain command of the air over the Channel that forced Hitler to give up his plans for invading the British Isles. From late 1942 on, with the boot now on the other foot, the same applied to the Allies. Airpower helped smash the last German offensive at Alam Halfa; so impressed by British airpower was the German commander on the spot, Field Marshal Erwin Rommel, that he came away from the battle with what can only be described as a permanent trauma. In planning Operation Overlord, the largest amphibious landing of all time, the very first thing the planners did was to rule out any potential invasion spot that their fighters could not reach.[3] Later, airpower wrecked much of Germany's infrastructure including transportation, synthetic oil plants, and of course cities. The latter were turned into smoking ruins. It is pointless to give multiple examples as the point is clear.

The role of airpower at sea was as great as, if not greater than, the one it played on land. Both in the Mediterranean and in the Atlantic, the side able to back up its operations with airpower won. Both in the Mediterranean and in the Atlantic, the side which, for whatever reason, was unable to do so lost. The same was even truer of the war in the Pacific. Here operations opened with a mighty blow from the air—this, of course, refers to the Japanese attack on Pearl Harbor. They ended when a vast fleet of B-29 bombers, the largest and most powerful ever built until that time, turned most major Japanese cities into smoking ruins. Finally, just two of these machines, by dropping their nuclear loads on Hiroshima and Nagasaki, added the *grand finale* and ended the war almost on their own. The role of airpower in the surface and underwater campaign against Japan was equally important. By mid-1945, that campaign had all but destroyed the Japanese merchant fleet. By so doing, it ended communication between the various islands and brought the country to the edge of starvation.

Throughout the period in question, that is, the first four decades or so of

2 See A. Boyd (1977): *The Soviet Air Force since 1918*. New York: Stein & Day, pp. 85–87.
3 F. Morgan (1950): *Overture to Overlord*. London: Hodder & Stoughton, p. 132.

airpower, technological progress proceeded so rapidly as to be dazzling. For example, during World War I, whipping a new aircraft from the drawing board to operational deployment took a mere 18 months. Any aircraft older than that was considered fit only for heroes or fools (or for maritime patrol, a field where the allies, favored by geography and operating hundreds or even thousands of miles from shore, faced no opposition). However, the vast casualties suffered—as much as one-third of the order of battle *per month*—meant that, outside the training bases, there were few such aircraft to fool around with. During the interwar years, though the number of aircraft in service fell dramatically, technological innovations continued to follow each other at a dazzling pace. Among the most important ones were *stressed metal monoplanes*, closed glass cockpits, turbocharged engines, retractable undercarriages, and self-sealing fuel tanks. Instead of machine guns, many fighters now carried cannons. The last years before 1939 also witnessed the development of radar and various electronic navigation aids. Intrepid pilots in their magnificent flying machines broke one speed, altitude, range, and endurance record after another. Often this was done amidst tumultuous public interest that has since become all but inconceivable. One only needs to think of the reception Charles Lindbergh got after crossing the Atlantic in 1927.

The outbreak of World War II put an end to the races and the trophies. However, the absence of public display was deceptive. The number of military aircraft produced by all the major belligerents went up to three-quarters of a million.[4] If anything, technical progress was pushed ahead even more relentlessly than before. For example, during the 6 years the conflict lasted, both the famous British Spitfire and its most important rival, the German Me-109, went through eight or nine model changes, not counting many more variations. In both cases, the outcome was to double the power of their engines (from about 1,000 to about 2,000 horsepower) and increase their speed by about 40 per cent. Each belligerent carefully followed developments on the other side, examining downed aircraft, interrogating captured pilots, and copying or adapting innovations that it considered useful. Once again, the vast casualties suffered helped. If ever there has been a period of "creative destruction," this was it.

The constant improvements notwithstanding, by 1944–1945, both of the abovementioned aircraft were clearly outdated. Their places were being taken by the Typhoon and the Focke-Wulf 190 respectively. During the postwar decades, progress continued apace. Helicopters, first developed during the late

4 Angelucci (1990), p. 361.

1930s, entered the orders of battle from about 1945 on. Gradually, they took over a whole range of missions: including liaison, transport, casualty evacuation, observation, command and control, and airborne assault. During the 1970s, electronic warfare and air-to-ground combat were added. Today, in many theaters, the conduct of war without helicopters has become inconceivable.

Nevertheless, helicopters only formed one part of the process. Starting already in 1944–1945, faster, more capable, and much more expensive jet aircraft replaced piston-engined ones. Within two decades from the end of World War II, the maximum speed of fighter aircraft had trebled, from approximately 400 miles an hour to 1,200. Starting in the 1960s, air-to-air missiles gradually replaced cannons as the most important weapons with which pilots fought each other in the sky. A little later, various air-to-ground missiles took the place of "dumb" iron bombs. Less visible to the public were enormously improved command, control, and communications. By combining all these different elements into a single system, they acted as force multipliers.

In Korea, from 1950 to 1953, difficult terrain, the absence of a well-developed infrastructure north of the 38th parallel, and the extraordinary determination of the North Koreans to keep fighting while suffering horrendous casualties hamstrung allied airpower in particular. It was deprived of much of its sting and, in spite of vast efforts and heavy losses, never succeeded in delivering the knockout blow its advocates were always claiming was just around the corner.[5] Elsewhere, however, throughout the period from 1945 onwards, no large-scale conventional operation, either offensive or defensive, either on land or at sea, stood the slightest chance of succeeding without strong air support and, if possible, *command of the air*. This applied to the various Arab–Israeli wars, especially those waged between 1956 and 1973; the Indo–Pak wars of 1947–1971; the last stages of the Vietnam War (1973), when US airpower smashed the two attempts by North Vietnam to mount a conventional invasion of the south; the 1982 Falklands War (in almost seven decades, the only time when navies, accompanied by their respective air forces, fought one another on any scale); the first week of the 18-year Israeli invasion of Lebanon; the Iran–Iraq War of 1980–1988; and of course the wars America launched against Iraq in 1991 and 2003.

All this was good and well. Nor were the advocates of airpower slow to celebrate their achievements in these wars; like all modern armed forces, they

5 See C. C. Crane (2000): *American Airpower Strategy in Korea*. Lawrence, Ks: University Press of Kansa, especially pp. 171–84.

set up special public relations departments for the purpose. Especially after the 1991 Gulf War, so many volumes were written about the way airpower had transformed, was transforming, and would transform armed conflict that, had they been put aboard the *Titanic*, that ship would have sunk without any help from the iceberg.[6] The problem, though, was that large-scale operations gradually disappeared. Political scientists, economists, experts on international relations, and psychologists have invented all sorts of reasons to account for what some have started calling "The Long Peace." Some thought it was due to the growing cost and declining utility of war; some, that globalization and international trade was making all the difference; and some others, that we have all become nicer and kinder to each other. I *personally* believe that it has everything to do with nuclear weapon proliferation and very little with anything else.[7]

As fear of nuclear escalation caused large-scale warfare between important countries to all but disappear, armed forces became smaller and smaller. This was true both absolutely and, even more so, relative to the earth's population, which tripled during the same period. As they became smaller (and as their share of national budgets declined), armed forces needed fewer weapons and weapon systems. As fewer weapons and weapon systems were needed, their cost, especially the part of it associated with research and development, escalated far beyond inflation. If, in 1944, the US produced 96,000 military aircraft, today the four services of the largest and richest power in history can count themselves lucky if they receive 50 new aircraft per year. This has created a situation where major weapon systems developed for air warfare, and by no means only for air warfare, are produced in such low numbers that, like fake antiques, they have to be virtually hand-crafted. Some of the smaller developed countries, especially in Europe, have now reached the point where they make do, or will soon have to make do, without airpower at all.

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However, the end of large-scale warfare between major states did not spell the end of warfare as such. Instead, to use the terminology of Mary Kaldor, as early as the first years after 1945, the "new" wars started to replace the "old"

6 See above all, E. Cohen (ed.) (1993): *Gulf Air Power Survey*, 5 vols., Washington D.C.: Dept. of the Air Force.

7 See, for the debate, J. E. Mueller (2006): *The Remnants of War*. Syracuse, NY: Cornell University Press, as well as S. Pinker (2010): *The Better Angels of our Nature; Why Violence Has Declined*. New York: Penguin. For my own views see M. van Creveld (1993): *Nuclear Proliferation and the Future of Conflict*. New York: Free Press.

ones.[8] As recent events in Syria have demonstrated once again, the new wars were waged not by and between states but by different organizations. Operating inside states, they fought either the government or each other, albeit they often received outside intervention and support.

The wars in question did not know what one can call the "trinitarian" system of organization. Nor did they have clear fronts, or any distinctions between front and rear, or extensive lines of communication, which, as in Korea and many other places, could be subjected to air attack so as to bring traffic along them to a halt. Nor was the distinction between combatants and non-combatants observed. To the contrary, usually it was deliberately obliterated so as to make it hard if not impossible for the various "counterinsurgents" to tell who was who. Perhaps most characteristic of all, often it was not so much a question of two sides engaging in a single struggle but of many different ones unfolding and becoming mixed with each other at the same time.[9] Almost always the preferred strategy, adopted by necessity, was not decision but attrition. Instead of trying to destroy the enemy by a single blow, the objective was to bleed him to death by means of multiple cuts. For all those reasons, the wars also tended to be prolonged and extremely bloody. For example, the war in Afghanistan has now lasted for 10 years. This is longer even than the Vietnam War (which lasted 8 years), and longer also than any other war in over 200 years of American history.

As recent events in Syria also demonstrate, in this kind of war, airpower tends to be far less useful. Looking back over the last few decades, indeed, rarely has it enabled the side that employed it to obtain victory. The British in Malaysia used heavy bombers, but to no avail (the British "triumph" in Malaysia is a myth; it was achieved not of British arms but by British propaganda, which succeeded in snatching victory out of the jaws of defeat). In Indochina and Algeria, the French used the largest and most powerful air forces ever assembled for the purpose of colonial warfare until then. Yet the outcome was defeat and withdrawal. Acting on the belief that there was something wrong with the French, the Americans in Vietnam and the rest of Southeast Asia tried their luck at the same game, only to meet with an equally bad defeat. At the time, many partly blamed the democratic leaders and their peoples. They were, it was claimed, too cowardly and too tender-hearted—perhaps, as with "gradualism" in Vietnam, and also too ill-informed and too foolish—to use

8 M. Kaldor (1996): *Old and New Wars; Violence in a Global Era*. Oxford: Polity Press.

9 See on this most recently E. Simpson (2012): *War from the Ground Up*. London: Hurst, especially pp. 41–66.

airpower as ruthlessly as it should have been. This may or may not be the case, but the same can hardly be said of the Soviets in Afghanistan. At the time the Soviets invaded Afghanistan at the end of 1979, they were at the peak of their power. Thanks to this fact, but also owing to Afghanistan's geographical position, considerations concerning escalation, which in some ways helped shape the US effort in Vietnam (and Korea), did not have to be taken into account. Whatever good qualities Brezhnev and the other men in the Kremlin may have possessed, trust in harmony and understanding was not one of them. The same is true of Bashir Assad, a cold-blooded butcher if ever there was one.

An even better example of the limitations of airpower in this kind of warfare is provided by the Israelis in Lebanon. Following the 1967 Six-Day War, the Israeli Air Force, a small and partly outdated force that had previously barely attracted attention, acquired a global reputation as one of the best, perhaps even the best, of its kind. Not even the 1973 War, in which the air force proved less effective and which ended in a draw, did much to change this fact. Nine years later, a series of truly brilliant operations turned it into the envy of the world. Within a single day, it destroyed numerous Soviet-built Syrian anti-aircraft missile batteries considered among the most advanced in the world. While so engaged, it also shot down 100 Syrian fighters for the loss of just 1. That achievement is probably unmatched in the annals of military history.

This time, though, victory did not follow. Instead, there grew a nasty insurgency directed against the Israelis first by the Palestine Liberation Organization (PLO), then by Amal, followed by Hezbollah. For 18 years, the Israelis, their redoubtable air force included, struggled on and on. Equipped with some of the world's best aircraft flown by some of the world's best pilots, it launched, untold, thousands of missions of every kind—all against an opponent so weak that, in all those years, he was barely able to hit a single Israeli machine, let alone shoot it down. All this, however, was to no avail. In May 2000, the Israelis, drawing conclusions, finally threw in the towel and withdrew. Six years later, they fought another war, and again airpower, after putting on a brilliant performance during the first few days, proved a disappointment. It is true that this war ended in a victory of sorts for Israel; however, that fact was due to entirely different factors.[10]

The reasons why airpower has not been nearly as effective in combating rebels, insurgents, guerrillas, freedom fighters, or whatever they have called

10 See M. Van Creveld (2011): "The Second Lebanese War; a Re-assessment,» *Infiniti Journal*, Vol. 1, No. 3 (2011), at http://he.scribd.com/doc/106248344/van-Creveld-M-2011-The-Second-Lebanon-War-A-Re-Assessment-Infinity-Journal-Vol-1-No-3.

themselves and been called by others are not far to seek. First, such warfare tends to be waged in difficult terrain, whether natural—such as mountains, forests, and swamps—or artificial in the form of cities. This kind of terrain has never been, and still isn't, ideal for air-to-ground operations to be effective. Second, important targets such as bases, communication nodes, headquarters, and so on tend to be few in number, dispersed, and well camouflaged. In many cases, indeed, they hardly exist at all. As US Defense Secretary Robert McNamara once said when pressed as to why the USAF did not knock out North Vietnam's electrical system—the entire system in question was about as large as the one supplying Alexandria, Virginia. His pilots had knocked it out not once but many times over, and still the enemy kept coming. On the other hand, individual opponents, though more numerous, tend to be even more dispersed and camouflaged. Third, and most important, separating the opponents in question from their background, meaning the population at large, is often all but impossible. This problem, incidentally, affected the Italians as far back as 1911–1912, when their aircraft hit non-combatants (including, on at least one occasion, a hospital) so often that it was finally decided to forego bombing altogether and rely on leaflets instead.[11] In the vast majority of cases, airpower was a sledgehammer operating against flies.

Almost 70 years have now passed since the end of World War II; in all these years, it is next to impossible to find even one case when insurgents of any kind were able to operate a single combat aircraft or even a helicopter. That also applies to the Vietnam War when North Vietnamese aircraft hardly ever crossed the 17th parallel. Though there are a few exceptions, in the great majority of cases, this fact has not prevented those insurgents from emerging victorious. At present, both Syria and Afghanistan offer living proof of this fact. As they did so, the insurgents changed the map of the globe, bringing down some of the largest and most powerful empires that ever existed. All this was achieved, not with the aid of airpower but, to the contrary, in the teeth of everything it could do.

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Even as the postwar decades were unfolding, airpower began to be threatened by advancing technology. The first developments in this direction started becoming visible, indeed spectacularly so, during World War II itself. Unable

11 E. N. Bennet (1912): *With the Turks in Tripoli*. London: Methuen, pp. 142–43.

to build a bomber force that would answer the Allied attacks on their cities in kind, the Germans started working on missiles instead. Significantly, the service that developed the famous V-2 was not the Luftwaffe but the army (later on, production was put into the hands of Himmler and the SS).[12] This fact, as well as similar programs mounted in the United States and the Soviet Union after the war, proved that air forces were not necessarily the only services capable of designing missiles, and operating them. Early on, in fact, Soviet ballistic missiles were the responsibility of the artillery arm. At first the missiles, including the V-1 cruise missiles developed by the Luftwaffe, were too inaccurate and carried too small a payload to represent a serious challenge to bombers. Once nuclear bombs had been dropped on Hiroshima and Nagasaki, though, it quickly became all too easy to think forward about the day when missiles and bombs would be merged into a single weapon system, making bombers and their crews superfluous.

Throughout the 1950s, the throw-weight and range of missiles kept growing. A landmark was reached at the end of 1957 when the Soviets launched the first earth-circling satellite. It indicated the moment when missiles had become, or would soon become, capable of putting a hydrogen bomb on every point on earth regardless of geography and distance. By the 1960s, this possibility had become a reality at the hands of liquid-fueled missiles carrying a single warhead each. Not much later, their place was taken by solid-fueled ones carrying multiple warheads. Among the casualties were the B-70, only three prototypes of which were produced, and the B-58, which was only produced in limited numbers and never used in action. Later, they were followed by the B-1 and B-2. Though they were produced and entered service, they were only used on missions for which they had never been intended and then only to a very limited extent.

The first satellites did nothing except beep. This, however, soon changed. By the early 1960s, they started taking over a whole series of functions, especially intelligence. The means employed included ordinary cameras, infrared cameras, radar, and a whole array of electronic devices, many of which remain secret. All these kept improving at a breathtaking speed, allegedly to the point where it is now possible to read the license number of a car from outer space. Compared to aircraft, satellites had some disadvantages, including, above all, the fact that they could not, and still cannot, loiter over any given area. On

12 See on this story M. J. Neufeld (1995): *The Rocket and the Reich*. New York: Free Press, pp. 5–39, 136, 172, 190.

the other hand, they had the very great advantage that they were, and by a sort of tacit international agreement still continue to be, invulnerable. Once it is launched, a satellite can stay in orbit much longer than an aircraft can remain in the air. No wonder they have become the favorite platform for many forms of intelligence gathering, reconnaissance, surveillance, and damage assessment. In the functions of communication and navigation, however, they supplement air forces more than taking the latter's place.

In the 1970s, ballistic missiles started to be supplemented, and in some cases replaced, by cruise missiles. Early on, cruise missiles, owing above all to their computerized navigation systems, were very expensive. Later technological developments in the form of global positioning system (GPS) made them much cheaper and easier to build. Flying very low over land or sea, in some ways they are much harder to detect and shoot down than aircraft are. Angular velocity is just too great. In point of accuracy, they are now quite as good as aircraft. It is true that aircraft still retain some advantages, including the ability to carry heavier payloads, hit moving targets, and fly many sorties in succession. On many other missions, though, cruise missiles can perform almost as well as aircraft. They do so, moreover, without putting the lives of the pilots at risk.

The latest devices to join the growing list of those capable of taking over many, if not most, of the missions previously entrusted to aircraft, are drones. The first drones were built by and for the British Navy during the interwar period. However, they proved too unreliable and too inaccurate to enter operational service.[13] Some were built in the 1940s, 1950s, and 1960s, but various technical limitations meant that they only saw very limited use. The turning point came in Lebanon in 1982, when the Israelis used them for reconnaissance. Since then, they have multiplied, and their capabilities have improved beyond recognition. Some drones continue to be used for reconnaissance and other sorts of intelligence-gathering. Others serve for communication and electronic warfare. Others still carry missiles and are capable of engaging the enemy, as the US Predator does. Some drones are very small, and indeed there are stories about machines as small as flies that are, or soon will be, capable of entering through the window of a building in order to gather and send out information on what is going on inside.[14] Others are as large as passenger air-

13 See J. Farquharson (2002): "Interwar British Experiments with Pilotless Aircraft,» in *War in History*, Vol. 9, No. 2 (April 2002), pp. 197–218.

14 Anon, FIRST NAME (2011): "Micro-Machines are Go,» *Daily Mail Online*, 12.7.2011, at http://www.dailymail.co.uk/sciencetech/article-2013802/U-S-military-drones-small-look-like-insects.html.

craft, capable of staying in the air for days on end, and have a range measured in thousands of miles. Their ability to loiter over a given area makes them much better suited for surveillance than any other airborne platform. Last but not the least, those who operate them do not have to be present anywhere near the theater of war but can work while located on the other side of the world if desired. There is no question that in every advanced armed force around the world drones are now where the excitement is. By comparison, much of manned aviation has become stale, staid, and, quite often hoary with age.

As often, even more important than the technological changes are questions of organization. As mentioned, the very first drones were developed for the British Navy. It was the German *Army*, not the Luftwaffe, which developed and operated the V-2 (the V-1 represented little more than a hurried attempt by the Luftwaffe to catch up). After 1945, too, several navies and armies continued to develop ballistic missiles (and aircraft, but that is not at issue here) just as air forces did. Indeed, the rocket pioneer Werner von Braun, who was working for the US army, always claimed that, had he and his team not been stopped in their tracks by an act of Congress, they could have put a small satellite into orbit 2 or 3 years before the USAF achieved the same feat. Especially in countries such as Syria, Iraq (before it was demolished by the United States), and Iran, ballistic missiles tend not to be under the control of their respective air forces or even their regular armed forces. Instead, they are entrusted to special units forming part of some kind of force loyal solely to the regime. Something similar may apply to China, though in truth we do not really know. If any inefficiencies arise from this, presumably they are no worse than those growing from any other system of organization.

In this respect, geography also plays a role. As General Giulio Douhet and others early in the twentieth century saw it, the reason why "independent" air forces were needed was because they were capable of, and best used in, highly focused operations against targets located far in the enemy's rear.[15] Lurking in the background, of course, was World War I with its lines of impregnable defenses behind which civilian life could and often did proceed much as usual. That kind of logic does not, however, apply in the case of counterinsurgencies of every kind. In such conflicts, the enemy's center of gravity, assuming he has one, is likely located neither on another continent nor in another country. Instead he is found, if indeed he can be found at all, in the next province,

15 G. Douhet (1983 [1920]): *The Command of the Air*. Washington D.C.: Office of Air Force History, pp. 33–48.

the next town, the next block, the next street, the next building, and the next room. He may even be in the same room as you, hiding under the desk. Under such circumstances, having an independent air force to manage and operate "everything that flies" (to use Hermann Goering's phrase) very often does not make sense.

The problem first became evident in the mid-1950s. During the next decade, the widespread use of helicopters led to the establishment of entire airmobile units in several countries. Most were fairly small, but some were large enough to *have a real impact*. What set them apart was the fact that they were controlled by the army rather than the air force. The proliferation of drones, some of them particularly suited for cooperating with ground and sea forces, has made the question much more urgent. All around the world, armies and navies are clamoring for them, saying that they simply cannot wait for the air force headquarters to take action. *If only* because the time needed for ground troops to call for, and receive, air support has hardly changed between 1943 and 2003,[16] such demands are quite understandable and bound to multiply. Where air forces refused to cooperate, armies and navies sometimes went ahead and started building their own drones.

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To sum up, barely a century after airpower first made its appearance, it is being threatened from several directions at once. The first is the virtual disappearance of major war between major powers. As a result, even when the air forces of advanced countries do see action, their losses tend to be very small indeed. Miniscule losses mean that there is no incentive to replace old aircraft. Depending on the country in question, some of the aircraft now flying are about five decades old. These include the B-52, the KC-135, the Nimrod anti-submarine warfare aircraft, and the veteran Hercules transport. Early versions of several fighters now in use first became operational as far back as the mid to late 1970s. These machines are now twice as old as the men (and occasionally women) who fly them. The aircraft designers of World Wars I and II, and even those of the 1950s and 1960s, would not have known whether to laugh or to cry. It is true that the grandfather aircraft are being upgraded from

16 See, for the 2003 data, S. Shuger (2002): "Outgunned; What the Crusader Cancellation Really Means to the Army,» *Slate*, 23.5.2002, at http://slate.msn.com/id/2066158/. For those of 1943, as well as a discussion, see M. van Creveld (2011): *The Age of Airpower*. New York: Public Affairs, pp. 431–33.

time to time, especially in respect to their avionics and their engines. However, the airframes that contain the avionics and the engines do not have the gift of eternal life. As they age, keeping them in flying condition is becoming more expensive by the day. Wear and tear will take its toll.

The second reason is the plain fact that manned aircraft are disappearing like snow under the sun. For example, an F-35 fighter costs 180 times as much as the P-51 Mustang (also known as "the Cadillac of the Sky") fighter-bomber did back in 1944–1945, and this is after taking inflation into account. Some aircraft, notably the B-2, are much more expensive. Given such figures, the real miracle is not the decline in numbers but the fact that some people still think they can and should afford to buy such machines and operate them. Not only have many projects been cancelled, but developing new aircraft now takes so long—as much as two decades—that, by the time the first machines are finally ready, conditions have changed so radically as to render them more or less useless.

Third, when it comes to fighting what is by far the most common form of present-day warfare—meaning, of course, insurgencies of every kind—conventional airpower has repeatedly shown its limitations. Not so long ago, this was carried to the point where the US commander in Afghanistan, worried about the "collateral" damage his F-16s were doing, actually prohibited their use in the strike role. The more unmanned devices such as ballistic missiles, satellites, cruise missiles, and drones enter service and prove themselves, the less clear the rationale for keeping such airpower becomes. The success that airpower has recently enjoyed, as in the Israeli Operation Cloud Column of December 2012, is very much due to the use of drones. In fact, it was a drone that delivered the first blow in the war, killing a key Hamas leader.

Fourth, given all this, it is not at all clear that the rationale, first voiced by Douhet almost a century ago, for maintaining an independent air force to control "everything that flies" still holds. Whether they want to or not, air forces are likely to witness, indeed in quite some cases have already been forced to witness, the transfer of some of their assets to other services. The world is small, it is ever-changing, and airpower too may well need reconsidering.

# II. Teknologi og muligheter

# Remotely Piloted Aircraft: The USAF Perspective

Lieutenant Colonel Bryan Callahan, USAF

## Introduction

The objective of this chapter is, to paraphrase Bismarck, to learn from our experience.

Some of these are hopefully positive, and some of these, in the future, hopefully our NATO partners can avoid, so they don't make the same mistakes as we did.

Beginning on a philosophical note, let us introduce a new term—remotely piloted aircraft (RPA). This acronym has become near and dear to the philosophical hearts in the United States Air Force (USAF), because every time someone says "drone" on CNN, it induces a quiver. What is a drone? It is designed to go out in combat autonomously, perform its operation, not think, follow orders, then come back, report, and then go out and do it all over again—that's it. A drone is very much an autobot.

But we are not so interested in drones over here. The USAF earned the moniker drones in the way it employed these systems, in that the operators are told to go out and stare at the target until they are told otherwise, and then they come home. Accepting to do that is very much a drone mentality, hence it earned the nickname.

People are working very hard, especially at the Weapons school, to change that paradigm. They don't want to be drone operators; they want to be RPA *pilots*. RPA is therefore a very important distinction. The reason is that these airplanes don't do a thing unless they are told to do it—not one thing. They don't even come home right, unless they are told to come home right, which is very much unlike a drone. In some ways, an RPA is much dumber than a drone, but in other ways, it is much more dynamic, much more a force enabler, and much more capable when integrated properly with a pilot in the loop. This chapter therefore describes a pilot´s perspective about RPA. There will only be a brief mention about where we are today, because that is not nearly

as compelling as what we have learned. The chapter ends with a few remarks about where we are headed in the future.

## Current Operations

"Beyond line of sight operations" is how business is done today. Take, for example, that your place of work is in Nevada or, to be specific, Las Vegas, which is not nearly as glamorous as one might think. As long as you have a launch and recovery site within a couple hundred miles of where you want to do business, you can take that airplane from Nevada and employ it. Nevada is one of the most widely known RPA locations, but there are probably about 11 or 12 separate locations now in the United States.

Physically, you might be in the United States, but mentally in combat. What does that mean? It means that you get up in the morning and, as alluded to by Peter Singer, you drive about 30 minutes in your car up to Creech. When you get to Creech, a certain discipline is instilled among the aircrew, so that when you walk through the door of your squadron, you are no longer in Nevada. You therefore need to make a mental switch that you are in combat, and that is tough. It takes a little while for the crew to understand and internalize this, and to realize that this is not a video game. On the other end of the stick and throttle that you are working is a real live airplane with real live weapons, live lasers, and, more important than any of this, is the fact that there are real live people on the ground who need your help. The crew needs to know this when they walk through the door. Being able to make that switch is a challenge, and in many ways a different kind of stress—it's not like being mortared or shot at by SAMS.

## Lessons Learned

The largest growth area in terms of RPA use is at the tactical level, but there are also operational and strategic effects taking place simultaneously. The RPA can affect a target at the tactical level, but that does not mean it was simply a tactical-level engagement. There is an ability to bring in all the operational and strategic-level organizations to the tip of the spear through this airplane, which will now be discussed in terms of a lesson learned.

The Predator alone—not counting the RQ-170 Sentinel or the MQ-9 Reaper, which are becoming a growing industry for the USAF—has flown over a million combat hours. The fact that the RPA is the largest weapon sys-

tem in the USAF at the time being is a small indication of how the DNA is changing in the air force, for good and for bad.

Right now, the USAF is flying 57 24/7 CAPs, comprising a mix of MQ-1s and MQ-9s, although mostly MQ-1s. Currently, the MQ-1s cannot be crashed fast enough, and as they are, they will be replaced with MQ-9s. The future is therefore an all-MQ-9 fleet, which is both unfortunate and fortunate as the MQ-9 performs some operations better, but some worse as well, so it depends on what one really wants to do, but the switch to the Reaper is the decision the USAF has made.

Over the years, as the number of pilots has increased, there have been many hours flown and a great many mission supported in the RPA program. In a single year, RPA have flown almost a quarter of a million hours and supported 28,000 targets. Though this may not seem much, flying many RPA hours, and filling that insatiable need for "seeing what is really happening," does not necessarily equate to effectiveness. The flying hours are therefore measures of performance—many airplanes went up and most of them came back. But how much was effected? A lot of what is done is the so-called business of doing a "pattern of life"—constantly staring to see who's coming and going and building a high-fidelity situational awareness picture of the enemy, which takes several hours, and again, this does not necessarily equate to effectiveness, because this never ends. How does one know when one has enough information? How does one lower the risk bar enough to operate and execute? Where is that threshold? These are the decisions a commander needs to make and in the age of full-motion video, it gets easier and easier to kick that can down the road and say "I just need one more day." And before one knows it, the DNA of the air force has changed and all one knows is to put up many more hours of full-motion video. Eventually, one enters an operational pause, and that is something one needs to get one's arms around in the USAF.

What, then, are the main lessons learned? First, that this in many ways is *not* a revolution in military affairs. In many ways, an unmanned airplane is just another airplane; it just does not have a man or a woman in it. For example, in flying an F-16, if you push aileron right, the computer says "maybe, I'll give you some aileron right … let´s go that way now." In the MQ-9, you say aileron right and the signal shows 7,000 miles and the computer says "ok, I'll give you aileron right." So, in many ways—at the risk of F-16 pilots' discontentment—the only difference between an F-16 and an RPA is that the distance between the cockpit seat and the aileron actuator is 7,000 miles. The way in which the RPA has been employed and the way initial discipline has been instilled both in crew training and mentality, in how to develop tactics,

has been geared precisely along this concept. How should the air force employ this airplane so that it looks like every other airplane it has? Based on this, one could say that introducing the RPA has only meant saving in some areas, lowering risk, and doing some things with endurance that can only be done with unmanned airplanes.

So in many ways, the RPA is just an airplane. However, one must not fail to consider some things that come along with the introduction of an airplane. For example, the Federal Aviation Administration (FAA) hates this airplane. It took one base in New Mexico, which was 1.5 miles from the pattern to the airspace, a year and a half to get permission to leave the pattern and transit through those 1.5 miles into the airspace. It is difficult to move certain mountains of philosophy and entrenchment to make people understand that, although one cannot "see and avoid," there are other ways to operate safely so one can get to the airspace and start training. This has been a much-restricted area. The RPA is also susceptible to poor weather, but this aspect is getting better.

There is also a lot to be learned when it comes to diverting. In order to divert, one needs a certain infrastructure at that the particular airfield. One can't just go somewhere and land. One would need antennas, cockpits, and local crews on the ground to land the aircraft; one can´t just tell a pilot to land on another airstrip because of bad weather. All this has to be designed for RPA.

## RPA Manning Sources

RPAs are flown by pilots, and therefore the pilots need to be trained appropriately. If one wants a drone, it is in fact fairly easy to obtain one, but if one wants a living, breathing, decision-making, mission commander, one needs to train him or her appropriately, and this may not always be done. The USAF's promotion rate in the RPA community is 47% compared to the rest of the USAF, which is around 75%. This means that the USAF sent its miscreants to the RPA community. Many a time, the USAF used the RPA as a penal colony, saying, for example, that "if you can't get it done in a manned aircraft, then we're going to send you to RPA." But the USAF found, much to their chagrin, that the RPA became the cat's meow. All of a sudden, this was what the war fighter wanted more than anything else. But who is running the RPA community? There has been a steady stream of commanders coming from outside the community to lead the program who don't have a lot of credibility

because they didn't grow up in the community. Of the 24 squadrons, only 2 are commanded by former pilots who have actually flown the night shift in the past, who have been line flyers, and who know the business from the line pilot's perspective. Therefore, the USAF has to mature in its outlook because it did not treat the RPA like an airplane from the beginning and lead it appropriately.

One must also beware of the temptation to surge. When one has this capability and the training lines flying, one also has a real-world operational flying mission occurring at the same time. Therefore, it is very easy to take the training asset and swing it to combat operations. The desire to put all available assets into the real-world mission is tremendous. All one has to do is retype an IP address, reboot the computer, and the cockpit that was flying training can be flying an RPA launching into combat. But where is the red line that says at some point one needs to organize, train, and equip? It is not possible for personnel to give everything to combat all the time, which makes the temptation to switch from training to combat operations a very difficult decision for leaders.

Training is also very important when you look at where our pilots come from. You could be taken out of F-16 and put into RPA. There have also been a few pilot training graduates who went direct to RPA, but that manning source has been removed, and instead the USAF has started a whole new career field to fly just unmanned airplanes. They are "unmanned only" pilots, and are called 18Xers, which is their code. These pilots get about 6 months of training after which they're on the combat line flying live missions. They only get 6 months before they go into combat, with no training opportunities after their initial qualification training. This could pose a huge problem; however, the good news is that they are tremendously motivated, so one can hope for better results once they get some training in the field. Just like any wingman, if these pilots are given sufficient training, one can make something of them.

## RPA as a Force Multiplier

In some respects, however, the RPA is not just another airplane. Once you get it over the top of the target, it is more than just an airplane. In addition to the fact that it provides great situational awareness and one can have a full-motion video, which is fantastic, the RPA is a portal to capabilities that one would never have had access to before the tactical end. For example, a ground force commander may be interested in a certain target, but what he doesn't

know is that, through the so-called beyond the line of sight bridge, there might be someone in the intelligence network somewhere who understands something about that target that no one else knows anything about. Earlier, that intelligence analyst would read about the ground commander's actions a week later in a mission report and say: "Man, I wish I could have effected that action." Today, he sends a message to the RPA pilot in chat, who sees it in the cockpit, declassifies it, and gets on the radio to give this information to the ground force commander then and there. Today, the ground commander can bring the full weight of a national intelligence apparatus to the pointy end of decision-making. This could be a very powerful move in some cases, but can be very distracting in others. It is very important to make this distinction, sift through all that data, and figure out what the ground force commander really needs to know. This is not the function of a drone operator, but rather that of an RPA pilot, or a mission commander, and these are the people who should be trained to fly these aircraft. Through this portal, the strategic level of command and control can be fused into the tactical level.

The RPA can also be a force multiplier, because it can stay in the air for 20 hours, with the MQ-9 carrying about 6 weapons. The RPA pilot can then become what is called an on-scene commander. It is not as important that an RPA pilot shoot as it is for an on-scene commander; by training others to become better at shooting, the RPA pilot can become a force multiplier. But how can he do this? How can he make his endurance an example to those who do not have endurance? The first step is through LINK-16, which is a significant improvement for the USAF because it provides threat awareness and enables access to places that couldn't be explored earlier. For example, consider a combat search and rescue operation, involving an RPA over a target that has pristine communications with the national command apparatus. The RPA can protect the survivors, securely send a digital message to the A-10s that are waiting on the ground—without burning gas or exposing themselves to threats—and once the whole picture is created for the A-10s, they can launch. Then the helicopters can come in, rescue the survivor quickly, and get back out. While no other platform in the USAF has this fused capability, this system enables the air force to perform such operations. Therefore, it is a force multiplier: it is a portal to all the capabilities brought to the tactical echelon where the airplane is over the target.

## Future perspectives

Where are we going in the future? When the USAF chief asked his staff "what are you going to do with all these things when the fight is over in Afghanistan and Iraq?" they responded saying that they might be flying them in other areas of the world—a possibility that he had thought of as well. When all the USAF commanders around the world were asked "what would you do if you had this capability?" the top items in the poll were intelligence, surveillance, and reconnaissance (ISR) and full-motion video. However, there was also a litany of unexpected suggestions.

One such was the idea of RPA interdicting maritime targets. How this can be put into practice, though, will have to be learned from the Norwegian Air Force in order to understand how this can be done with an unmanned airplane? What is important, however, is that the use of RPA does not end with ISR. USAF is changing and is aware that in the next fight, when the horn goes off and the command "send air" is heard, airpower will not be dead—a B-1 will show up, as well as F-16s, but there will also be some MQ-9s that will appear. The big questions are: What is it going to be prepared to do with them? Will it just be a matter of putting up videos on a big screen so that a commander can feel more secure in his decisions? Or would he want to be a force multiplier, that portal the RPA system can represent, and thus make everyone more effective? This is where the RPA seems to be going in the future.

# RAAF experience of examining and selecting maritime ISR UAS options

Paper by Wing Commander Craig Stallard, Air Power Development Centre
Presented by Wing Commander Anthony O´Leary, RAAF

## Introduction

The oceans and seas influence our ways of life and our approaches to security. Therefore it is no surprise that maritime surveillance and response have been the cornerstone of Australian and Norwegian air power for almost as long as our Air Forces have been operational. We share long and proud traditions in the conduct of maritime operations, supporting our nations' domestic and international interests.

For the last few decades, various versions of the Lockheed P-3 Orion have served both Norway and Australia well across the maritime domain. And it is worth noting that 2012 saw the P-3 become only the second aircraft in the United States inventory to reach 50 years of continuous service after the B-52 Stratofortress. In Australia, we have upgraded the capabilities and extended the life of the Orion to keep it at the forefront of maritime patrol and anti--submarine warfare aircraft (MP/ASW). It is fair to say that our current AP-3C is closer to a new aircraft than to a spiral upgrade of the P-3C.

However, as good as the upgrades are, it has become obvious that the economical life of the platform will certainly expire by the year 2020, if not before. We have extended the P-3 to the limits of its feasible life. Thus, throughout the early 2000s, Australia turned its attention to seeking a solution that would meet our future maritime surveillance and response requirements.

Australia is not alone in this situation. P-3 operators around the world, including Norway, are faced with the same circumstances. The United Kingdom, which operated maritime response platforms such as the venerable

Hawker Siddeley Nimrod, is investigating replacement Maritime Patrol and Anti-Submarine/Surface Warfare capabilities.

The efforts of the United States Navy (USN) to develop a replacement for the P-3 have been of particular interest. The USN selected the Boeing P-8 Poseidon to take the place of the P-3 but also concluded that maximum effectiveness would be achieved by including an unmanned aerial system (UAS) as a "complementary" capability. The P-3 replacement project resolved that a UAS could perform a significant proportion of the maritime surveillance and reconnaissance roles that the P-3 had previously carried out.[1]

The late 1990s and the early years of the next decade saw significant developments in UAS technologies and an associated rise in the employment of UAS across a range of operations. The Royal Australian Air Force (RAAF) and our Defence Science and Technology Organisation (DSTO) identified the potential use of a UAS to meet some or all of Australia's future MP/ASW requirements. Our interest was especially focussed on the persistence promised by such platforms as the General Atomics Guardian (an earlier version was called the Mariner) and the Northrop Grumman Triton (a development of Global Hawk), which were being considered by the USN UAS team under their Broad Area Maritime Surveillance (BAMS) program. So what air power characteristic is the most important in the conduct of maritime surveillance operations? For Australia, that characteristic is, without doubt, persistence. Why? Because Australia is a big island that has lots of remote coastlines and huge amounts of oceans to cover. We need a maritime surveillance with the capability to cover these vast areas and stay around over areas of interest for a long time.

## Australian situation and requirement

Australia's Chief of Air Force, Air Marshal Geoff Brown has stated many times that for Australia, it is geography that has fundamentally shaped who we are as a nation and the nature of air power we need to deliver. It has shaped how we live, how we trade and how we interact with other states. It has shaped how we perceive our security needs today and into the future, and it has, likewise, shaped our military forces and strategic thinking. Geography has, in short, determined the sort of nation we are — and that nation is a maritime one.[2]

1 http://www.navair.navy.mil/index.cfm?fuseaction=home.display&key=7CD9F773-04D7-440F-AE35-653BBB7B288F (accessed January 31, 2013).

2 Royal Australian Air Force (2012): *CAF address to ASPI Dinner*. Canberra: Royal Australian Air Force.

Australia, whether we consciously acknowledge it or not, has more or less since federation in 1901 operated some form of maritime strategy — be it one premised upon our traditional affinity with Great Britain and Europe, or one that recognised the importance of our trans-Pacific alliance with the USA. Our ability to function as a maritime nation has been underpinned by the use of the oceans and airways surrounding our shores as a reliable means of engaging with our neighbours and trading partners.[3]

## Continental versus Maritime strategy?

There can be no escaping the fact that we are an island nation and while we have an uninterrupted connection to the global community, we are divided geographically from the rest of the world by the sea. It would be easy to suggest that to secure Australia we only have to ensure we are able to deter or deny any attempts to attack this country — or in the event of lodgement by an enemy — to defeat or repel them. In other words, it can be argued that Australia's defence strategy ought primarily, and perhaps solely, to be centred on the territorial defence of its national sovereignty. But this may very well be a short-sighted view given the global nature of security.[4]

Clearly, territorial defence can never be diminished or neglected; however, important as this view is, it misses the broader context that Australia's prosperity, and indeed our way of life, is based around our ability to trade, and more precisely, to be able to trade across the oceans and airways. Without belabouring the obvious, I think it is worth reiterating the fundamentals of our national circumstance, especially as they are so easily and perilously assumed away.[5]

The vast majority of this trade is conducted over the maritime and air divide between ourselves and our trading partners around the globe. Crucial trading routes and the presence of large and growing regional naval capabilities, as well as transnational security concerns such as piracy, drive Australia to put the Indian Ocean, alongside the Pacific Ocean, at the heart of our maritime strategic and defence planning. Unimpeded access through the maritime commons, stability within our region, the security of our trading partners and a continued preservation of international order are all conditions that influence our approach to security.[6]

3 Ibid.
4 Ibid.
5 Ibid.
6 Ibid.

In short, in the absence of an existential threat to our territory, anything that threatens our ability to conduct trade over the seas and through the air is the greatest and most consequential risk to our security and way of life. A peaceful, cooperative and stable maritime environment is the necessary precondition for our continued national prosperity.[7]

## Influence on ADF operations

To meet the challenges of our geography we must be able to operate at long ranges for extended periods, both onshore and offshore. However, our small population limits the financial and human resource base from which the ADF can draw. Rather than relying on mass, the ADF has to be able to sustain an edge through effectiveness, efficiency, innovation and professional mastery.[8]

### Current UAS experience.

While the Australian Air Force has no maritime UAS experience, it has been operating the Heron Remotely Piloted Aircraft (RPA) in Afghanistan since 2010. The Heron provides Australian and coalition ground forces with high resolution intelligence, surveillance and reconnaissance capability with real-time support to ground commanders to enhance force protection in the Middle East Area of Operations.

On average, the Air Force Heron flies between 400 to 500 hours each month of medium altitude, long endurance flights. It can conduct single missions in excess of 24 hours, with a maximum speed of more than 100 knots (180 km/h) at altitudes of up to 10,000 metres.

Unlike the small UAS, the 1.1 tonne Heron Remotely Piloted Aircraft is operated from an airfield runway in conjunction with other manned aircraft. The Australian Herons are based at Kandahar, which is anecdotally the busiest single-runway airfield in the world.

To ensure the safe and effective operation of the aircraft at such a busy airfield, the Air Force uses military pilots who have experience in the complex and dynamic airspace to pilot the Heron.

Pilots qualified to fly Army helicopters, F/A-18 Hornets, AP-3C Orion and

7 Ibid.

8 Royal Australian Air Force (2007): *The Future Air and Space Operating Concept*. Canberra: Royal Australian Air Force, p. 9–10.

C-130 Hercules have deployed and operated the UAS. The Heron pilot is supported by a Payload (Sensor) Operator who also acts as a co-pilot for the Heron.

In addition, up to seven operational staff process, analyse and disseminate information from the Heron's sensors. The operational staff may include aircrew, intelligence staff, operations officers, engineering staff, administration officers and logisticians.

We will leverage our experience from Heron operations into whatever UAS system that may be acquired in our AP-3C replacement program.

## Australian acquisition project.

Australia instigated Project AIR 7000 to replace the AP-3C capability. As with most defence agencies around the world, we can sometimes come up with some really interesting acronyms for our activities, but in this case I think we came up with a bit of a 'clunker' – to use an American expression. The Air 7000 requirement is to replace the AP-3C capability to undertake Maritime Intelligence, Surveillance, Reconnaissance and Response (MISRR) tasks.[9] While the project is focused on acquiring a capability centred on MISRR tasks, the capability will also support overland Intelligence, Surveillance and Reconnaissance (ISR) and Electronic Support (ES) roles.[10] It is anticipated that both the P-8 and the UAS will be capable of overland ISR and ES.

It is important to note that two systems — the P-8 Poseidon and a UAS — will undertake the missions currently conducted by the AP-3C. These two systems will operate to deliver the maritime surveillance and response capability. As they work in synergy to provide this capability, if any changes occur to the P-8 specifications, the UAS requirement will also change, and vice versa. Broadly speaking, the two systems are designed to work together with the P-8 to provide anti-submarine, anti-surface and search-and-rescue response capabilities, with the UAS providing the persistence for traditional ISR tasks. The P-8, of course, can conduct ISR tasks but cannot deliver the degree of persistence that is a signature of the UAS, as I will describe later.

9 http://intranet.defence.gov.au/dmoweb/sites/AIR7000/ComWeb.asp?page=65453 (accessed January 31, 2013).

10 Department of Defence (2012a): *Defence Capability Plan Public Version 2012*. Canberra: Defence Publishing Service, p. 62.

## History

During the late 1990s, the focus of research and, indeed, operation employment of UAS was in overland ISR. However, the RAAF's primary interest in UAS was for maritime operations, an area that lacked much depth of research.

To partially address this situation, on 24 April 2001, a Global Hawk flew non-stop from Edwards Air Force Base (AFB), California, to RAAF Base Edinburgh, South Australia, making history by being the first pilotless aircraft to cross the Pacific Ocean. The flight took 22 hours, and set a world record for absolute distance flown by a UAV — 13,219 kilometres or 8,214 miles for our non-metric colleagues.[11] This deployment was a culmination of the two years' of collaboration between US and Australian officials that included modifications to the radar sensor, system control and exploitation to support a surveillance focus.[12] During the six-week deployment, Global Hawk conducted 11 missions that evaluated UAS performance and future military potential in the land–sea environment.[13]

The promising results from the trial strengthened Australian interest in a UAS component of the AP-3C replacement, and Project Air 7000 was officially established in 2004. While the ability of a UAS to perform ISR tasks in the maritime environment appeared to have been settled, a new set of questions arose as to the mix of manned and UAS needed to meet the capability requirement. Would all ISR be performed by the UAS? Would a mix of UAS and manned platforms provide a better outcome? If so, what was the optimal mix of UAS and manned aircraft? To answer these questions, DSTO was engaged to study the problem and the project established connections with the USN, UK and Canada, who were looking at similar capability decisions.[14]

In addition to the mix of systems, the project looked at acquisition strategies for the UAS and by 2006, they had developed three options: buy Global Hawk, join the USN BAMS project during capability analysis and design, or develop an indigenous UAS.[15] During 2006, the project was approved by

11 http://en.wikipedia.org/wiki/Northrop_Grumman_RQ-4_Global_Hawk (accessed January 29, 2013).

12 http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=1025623&url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F7969%2F22037%2F01025623.pdf%3Ftp%3D%26isnumber%3D%26arnumber%3D1025623 (accessed January 31, 2013).

13 http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=1025623&url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F7969%2F22037%2F01025623.pdf%3Ftp%3D%26isnumber%3D%26arnumber%3D1025623 (accessed January 31, 2013).

14 Department of Defence (2013): Interview with Project Air 7000 staff, January 25, 2013.

15 Ibid.

the government to join BAMS and participate in developing the requirement specification.[16]

## North West Shelf UAS trial

In response to a government policy announcement issued during the lead-up to the 2004 federal election, Defence invited General Atomics and Northrop Grumman to participate in a UAS trial over the North West Shelf (NWS) region of Australia.[17] The real-world trial of the General Atomics Mariner (a Predator-B derivative) was conducted in August and September 2006 and a virtual trial of the Northrop Grumman Global Hawk took place in October. Project Air 7000 was the funding source for both trials.[18]

The objective of the trials was to demonstrate the maritime surveillance potential of UAS technology, investigate how UAS could operate with patrol boats as a contribution to the protection of maritime environments and provide data to support the acquisition of a multi-mission UAS under Defence Project AIR 7000 Phase 1. The real-world trial involved the employment of the Mariner in conjunction with an Armidale Class Patrol Boat (HMAS Pirie), Coastwatch maritime surveillance aircraft and units of the Australian Army (the Pilbara Regiment). The virtual trial involved similar NWS scenarios and participants with the Global Hawk UAS.[19] In addition, the virtual simulation allowed further investigations of operating conditions that could not be addressed by the real-world trial, such as extreme weather conditions and high sea states.[20]

The trials provided direct experience in supporting and employing a UAS of the Mariner and Global Hawk types within Australia, and gave insight into a range of technical performance and capability effectiveness aspects.[21] Important information was also gained in understanding interagency interactions, which is of importance as the ADF continues to move towards future modes of operation that have an increasingly distributed and networked character.[22] A good appreciation was developed for the level of effort and the technical

16 Ibid.
17 Craig, Duncan (2007): *North West Shelf Unmanned Aerial System Trial*. Edinburgh SA: Intelligence, Surveillance And Reconnaissance Division DSTO.
18 Department of Defence (2012b): QTB: Air 7000 Phase 1b – Multi Mission Unmanned Aircraft System.
19 http://www.ga-asi.com/news_events/index.php?read=1&id=59 (accessed January 29, 2013).
20 Craig (2007).
21 Department of Defence (2012b).
22 Craig (2007).

challenges associated with establishing a distributed ground environment construct and integrating specific data feeds from a UAS.

## Broad Area Maritime Surveillance

In 2007, the USN released a tender request for BAMS that was based upon the requirement specification that Australia had assisted in developing. The request for tender generated responses from; Northrop Grumman who offered the MQ-4C Triton, General Atomics with the MQ-9 Mariner, and Boeing who submitted a Gulfstream G550 converted to a UAS and designated RQ-37.[23] In 2008, the Triton was selected by the USN as the preferred tender on the basis that it best met the BAMS tender requirements.[24]

Air 7000 continued its association with BAMS and was involved in a pre-System Demonstration and Development (SDD) activity to gain visibility of the BAMS SDD requirements schedule, costs and risk.[25] The information gained from our involvement in BAMS combined with the research findings from DSTO resulted in an Australian government decision to acquire a fleet of eight Poseidon P-8A aircraft through a Government to Government program with the USN and seven UAS platforms that would operate as a complementary 'system of systems'.[26]

In 2008, program delays to the BAMS project resulted in a situation where the RAAF were faced with the possibility of having to introduce both the P-8 and the BAMS UAS into service while still maintaining some of the P-3 fleet in serviceable condition.[27] In early 2009, the Australian government agreed that the introduction of both the manned and unmanned systems in similar timeframes would create unmanageable workforce pressures. Defence Minister Joel Fitzgibbon announced that "pushing on with the program would have placed a huge and unnecessary strain on our personnel in trying to potentially manage three separate airframes at the one time, and I was not prepared to place this unnecessary burden on our men and women in uniform".[28]

As a consequence, Australia decided to withdraw from BAMS and delay the

23 Department of Defence (2013).
24 http://en.wikipedia.org/wiki/Northrop_Grumman_RQ-4_Global_Hawk (accessed January 29, 2013).
25 http://intranet.defence.gov.au/dmoweb/sites/AIR7000/comweb.asp?page=66797&Title=AIR7000%20PH%201B (accessed January 29, 2013)
26 Department of Defence (2012a), p. 64.
27 Department of Defence (2013).
28 http://www.asiapacificdefencereporter.com/articles/89/AIR-7000-ISR-FOR-THE-21ST-CENTURY (accessed January 31, 2013).

introduction of the UAS until after the P-8 Poseidon was introduced into service.[29] The decision to delay the UAS and not the P-8 was made on the basis of the P-8 being a higher priority for the ADF because of the greater number of maritime surveillance and response roles that it could perform.[30] The P-8 could perform all the roles, albeit without the persistence of the UAS in the ISR role, whereas the UAS could perform only the ISR and ES roles and could not provide a response capability.

Australia's involvement in the USN BAMS program has provided it with a range of benefits. Our participation in the requirement specification and SDD has refined our own requirements, understanding and expectations. The tender process has given us a good understanding of the costs, capabilities, risks and development schedules of each of the three tendered proposals and we continue to monitor developments of the Mariner, now called Guardian, and Triton. It needs to be said that no acquisition decision has yet been made in relation to the UAS.

## The Current situation

The Australian government has decided to acquire the P-8 as the manned component of the AP-3C replacement project and plans to introduce the aircraft into ADF service in 2017.[31] The 2012 Defence Capability Plan has brought forward the introduction of the complementary UAS element by three years to better align with the introduction of the P-8 and deliver the full MISRR capability according to the following schedule:

- Intermediate Pass approval will be sought between financial year 2013-14 and financial year 2015-16;
- The Year of Decision will be between financial year 2015-16 and financial year 2016-17; and
- Initial Operating Capability will be achieved between financial year 2019-20 and financial year 2021-22.[32]

The planned Air 7000 UAS acquisition cost is A$2 billion to A$3 billion (lower end of band).[33]

29 Department of Defence (2012b).
30 Ibid.
31 Department of Defence (2012a), p. 64.
32 Department of Defence (2012a), p. 62.
33 Department of Defence (2012b).

As has been mentioned throughout this paper, no decision has yet been made as to which UAS Australia will acquire, but our experience in the trials conducted with Global Hawk and Mariner and our involvement in the BAMS program has directed our attention to the General Atomics Guardian and the Northrop Grumman Triton and they continue to be analysed by Air 7000. However, since a government decision on this project is not scheduled until between 2015-16 and 2016-17 — a time frame that possibly includes two federal elections — other options may present themselves.[34]

## Multi-mission UAS decisional data

The acquisition of any new capability requires a detailed examination of the costs that the new capability will involve and the benefits it will provide in comparison with the system being withdrawn. The analysis of potential UAS options is still commercial-in-confidence. However, what can be discussed is the broad cost expectations we have developed through Air 7000's experience.

*Crew aspects.* The current crew concept for the UAS is for each UAS platform to have four operators whilst in the maritime environment, two air vehicle operators and two sensor operators working in four-hour shifts.[35] For missions that could last up to 36 hours, multiple crews will be required. As the UAS will be on-task for longer periods than a manned aircraft, larger numbers of operators are required to run the same number of platforms. Our expectation is that the UAS will increase our manpower requirement per platform compared with a manned aircraft.

In the overland ISR role, our experience with P-3s in Iraq and Afghanistan suggests that crew numbers will be larger on account of the higher density of potential targets and greater coordination role with external agencies.[36] If extra crew are required to undertake this role, it will only exacerbate the increased manpower requirement.

Crew training for UAS is expected to be less than that for a manned platform as a number of training requirements will either not exist or have limited application. Examples include the use of emergency equipment, emergency egress, ditching procedures, and manual undercarriage operation.[37]

34 Ibid.
35 Department of Defence (2013).
36 Ibid.
37 Ibid.

## On-task time and maintenance.

UAS is on-task 95% of its life, which is much higher than for a manned platform.[38]

A recent paper published by an independent Australian research organisation, The Richard Williams Foundation, also highlights how UAS adds persistence to the list of air power attributes. The two tables that follow show the estimated time on station (ETOS) (Table 1) and the number of missions required to maintain a 24-hour on-station presence (Table 2) for a manned platform (12-hour endurance and 400-knot transit speed) and a UAS (24-hour endurance and 300-knot transit speed).[39]

| Distance to on-station (nm) | ETOS (hours) Manned | ETOS (hours) UAS |
|---|---|---|
| 600 | 9 | 20 |
| 1200 | 6 | 16 |
| 1800 | 3 | 12 |

Table 1 – ETOS Comparisons: Manned vs. Unmanned[40]

| Distance to on-station (nm) | No of missions Manned | No of missions UAS |
|---|---|---|
| 600 | 2.22 | 1.2 |
| 1200 | 4 | 1.5 |
| 1800 | 8 | 2 |

Table 2 – Total Missions Required: Manned vs. Unmanned[41]

Maintenance of a UAS is much cheaper than that of a manned platform. Indicative numbers are as follows:

4 man hours per UAS flight hour

9 man hours per manned aircraft flight hour[42]

38 Ibid.

39 Weston, Brian (2012). *Unmanned Aerial Systems: Their Future as Australian Defence Force Capabilities*. Canberra: The Richard Williams Foundation, p. 6.

40 Ibid.

41 Ibid.

42 Department of Defence (2013).

## Communications.

The key to long-range maritime operations is communications. When one considers the distances from the operating and controlling bases, it is easy to appreciate how essential satellite communication is to operate a UAS in the maritime environment. If one is considering a UAS as an element of one's maritime surveillance capability, one must ensure that one has comprehensive satellite communication coverage across one's entire area of operations. This can be one of the largest through-life costs. The costs associated with satellite communications at the bandwidth required for both flight and sensor data and their associated controls are significantly greater than the costs for a manned platform.

## Through-life costs.

Analysis has indicated that the through-life costs for a UAS are significantly less than those for a manned platform.[43] Australia wants to be in a 'long game' for the multi-mission UAS (MUAS). We do not want to get into changing UAS types every 10 years as there will be significant sunk costs in aircrew and technical training as well as in logistics and through-life support. We want these UASs to last.[44]

This means we need a UAS that has a robust through-life support program that provides for capability upgrades, manages obsolescence, and has a mature training system that will improve over the systems' life.[45]

## Other issues.

ATC integration. This can be a significant issue, particularly for civilian air traffic organisations and regulators. It may be just a national issue, but with the range and operating altitudes at which these UAS can fly, it is easy for them to cross into other nations or international airspace.

Operators. For many large UAS, the norm is for a rated pilot to control the flight of the aircraft. This may be a cultural issue, but it may be the only way to overcome the restrictions likely to be imposed if operations are over or in the vicinity of populated areas.[46]

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43 Ibid.

44 'Small Air Forces in Difficult Times'. Presentation by Group Captain Peter Wood, Air Force Adviser London, 2011.

45 Ibid.

46 Department of Defence (2013).

| Cost area | Cost movement |
|---|---|
| Crewing | ↑ |
| On task | ↑ |
| Maintenance | ↓ |
| Satellite communications | ↑ |
| Through life costs | ↓ |
| ATC | ↗ |
| Forward basing | ↘ |
| Training | ↓ |

## Continued development of UAS

A benefit of delaying the introduction of the Air 7000 UAS has been the continued development of most of the platforms that were available at the time of the original BAMS tender. For example, the Triton has been further developed and the enhancements over the base model include the following:

- increased reliability
- improved systems engineering
- improved software
- increased wing strength for gust loading
- improved anti-ice and de-ice equipment
- enhanced resilience to bird strike
- true altitude agility (can operate effectively from 10–55,000 ft)[47]

47 Department of Defence (2013).

## Summary

Australia has yet to operate a MUAS, but the huge amount of analysis conducted over many years has positioned the RAAF well to introduce a new capability into our order of battle.

The acquisition of a UAS to complement our P-8s will herald a new age for the Royal Australian Air Force. At face value, the acquisition of a MUAS may seem a relatively easy proposition. But Australia's experience, and I daresay the experience of many others who are investigating the merits of acquiring a MUAS, is that complexity is no stranger to such a venture.

But the benefits that a MUAS offers are worthy of consideration: persistence, range, coverage, all can be provided in greater degree than by a manned platform. But should the UAS be considered, it is our opinion and that of our USN partner, that they be operated to provide complementary support to their manned companions.

But be cautioned that while UAS's may be cost-effective and efficient, they are not cheap.

We stand at the beginning of a new era of maritime surveillance and response, one that promises much, but only if we take the path wisely.

# Alliance Ground Surveillance

Lt Col Scott Coon (US Air Force), SHAPE/J3/AGS Implementation Office

The North Atlantic Treaty Organization's (NATO) alliance ground surveillance (AGS) program was established following the initial Gulf War in the early 1990s. The Alliance was eager for a ground surveillance capability similar to that of the US Air Force Joint Stars system. For more than two decades, the AGS program lingered in political turmoil as nations sought consensus on the procurement of a suitable system. After several considerations, the RQ-4B Global Hawk was chosen as the "airframe of choice" to provide NATO with the long awaited capability. In May 2012, it became official, as the €1.2 billion AGS procurement contract was signed at the NATO Summit in Chicago.

The AGS procurement contract accounts for the purchase of an "AGS Core" system consisting of five RQ-4B Block 40 aircraft with a multiplatform radar technology insertion program (MP-RTIP) sensor and the necessary ground control stations to control all five aircraft simultaneously. However, "AGS Core" is a "system of systems" and is comprised of much more than aircraft alone. The program also includes a deployable exploitation capability including two transportable general ground stations (TGGS) and six mobile general ground stations (MGGS). These assets will be acquired to augment the exploitation capability that will reside at the main operating base (MOB) at Sigonella AB, Italy.[1] The MOB will be set up to host mission support, training, maintenance, and logistics functions. Additionally, all required AGS facilities at Sigonella will be owned and operated by NATO. All in all, Sigonella will host an AGS program that can be described as a "one stop shop for NATO intelligence, surveillance, and reconnaissance (ISR)"—from training to exploitation and dissemination of data.

With the AGS program under way, there is an accompanying shift in mindset toward implementation. There are many challenges that lie ahead, including long-term sustainment issues, infrastructure buildup at the MOB at Sigonella, and the approval of the AGS peacetime establishment (PE). However,

1 SHJ3/AGSIO/08/02-203772, "Options for Effective Employment of the NATO AGS Core." Paragraph 20, page 5. February 2008.

there is no greater challenge for the Alliance than effectively training the multinational personnel that will comprise the NATO AGS Force (NAGSF). Training is closely aligned with PE development and staff officers must ask three questions: (1) How many personnel are required to field and operate the system across all career fields? (2) Will nations fill these required positions? And (3) Will the personnel that the nations send to AGS duty meet all prerequisites and be qualified for the positions that they intend to fill? The AGS Implementation Office (AGSIO) at the Supreme Headquarters Allied Powers Europe (SHAPE) is currently in the process of answering all three questions.

## How Many Personnel Are Required to Field and Operate the System?

Conservative estimates say that the AGS PE won't be approved until approximately February 2014. However, extensive analysis and planning have occurred over the past 18 months to assure required functions are accounted for. The AGSIO can answer, for example, the following question: How many pilots, sensor operators, imagery analysts, or communication technicians, etc. will comprise the NAGSF? As of December 2012, the AGS PE package contains 600 personnel. It was submitted to the NATO headquarters (HQ) for approval in January 2013.

## Will Nations Fill the Required Positions?

At this stage of the program, NATO staff officers and analysts alike must assume that nations intend to fill the AGS PE positions once approved. The exact number of personnel that it takes to field and operate the system and the national intent to fill the required positions are two separate arguments, and it is important not to combine the two issues. AGS manning projections in 2008 contained 832 personnel.[2] These projections were subsequently reduced to 632 personnel in the May 2011 capability package submittal,[3] and finally capped at 600 by the "AGS Proposed Practical Funding Solution" document.[4] The latest reduction to 600 has come with an associated cost of critical ISR personnel in the MOB's Field ISR Squadron. This will result in the inability to maximize the use of equipment that has already been purchased in the procurement contract. The program has been in constant "drawdown"

2 Ibid.

3 Draft MC 0597, BI-SC Capability Package (CP) 0A0201 "Alliance Ground Surveillance (AGS).» Paragraph 12, page 4. May 26, 2011.

4 PO(2012)0049, "Annex 1, Alliance Ground Surveillance Proposed Practical Funding Solution.» Paragraph 33, pages 1–6. February 1, 2012.

for years now—long before the capability package was approved and the procurement contract was signed. Therefore, if additional manpower reductions are allowed to occur, a significant curtailment in capability can be expected. In the coming months, personnel experts at SHAPE and the NATO HQ will engage all 28 NATO nations in an effort to justify and gain support for the AGS PE package. The hope is that this "engagement" will be successful and that it will occur in time to influence the AGS PE package approval.

## Will Personnel Be Qualified for the Positions that They Fill?

Once the AGS PE package is approved by the member nations, the AGSIO will still have to contend with the qualification levels of the NAGSF. In other words, it remains to be seen whether incoming personnel are qualified for the positions that they will occupy. Historically, this has been a problem for various organizations throughout the Alliance. If incoming personnel do not meet the established prerequisites, the overall success of the AGS program could be jeopardized. According to the existing policy,[5] NATO does not provide "basic training," but depends on nations to accomplish it. However, the policy does allow for nations to ask NATO for this type of training if they cannot manage it on their own. Out of the 183 ISR personnel within the proposed AGS PE, 95 are imagery analysts (IAs). The IAs represent the largest AGS career field and are least likely to arrive at Sigonella with sufficient basic skills to perform their duties. Therefore, the idea of creating an "Imagery Analyst Basic Training Course" has been proposed to NATO's intelligence community. The AGSIO is prepared to fund the courseware development for this proposed course. For all other AGS career fields, courseware will be further developed from the contractor-provided materials that are included within the AGS procurement contract. Therefore, it has been determined that relatively low risks are associated with training pilots, sensor operators, surveillance operators, communications technicians, and so on. IA courseware or training is not included in the AGS procurement contract, so a critical gap has been identified that must be closed.

Overall, the NAGSF will be divided into three main groups as they arrive at Sigonella: a test team, an initial cadre, and pipeline personnel (normal rotational tours of duty). The first two groups (test team and initial cadre) will be trained with materials and the help of instructors who are included within the

5 MC 0458/2 (Final), "NATO Education, Training, Exercise and Evaluation (ETEE) Policy.» Paragraphs 22a and 22b, page 6. October 12, 2009.

procurement contract. However, the pipeline personnel will be the first to be trained by the AGS Training Branch at Sigonella. Training Branch instructors will further develop courseware and materials provided through the procurement contract in order to train the multinational crew force across all required career fields at Sigonella.

Training is considered a critical area, and as such has been identified as a key work strand in ANNEX 1 of the "Delivering the Alliance Ground Surveillance Capability-10 Point Paper".[6] Additionally, an AGS Training Integrated Project Team has been established and is cochaired by members of the AGSIO and NATO AGS Management Agency (NAGSMA). Their task is to articulate, coordinate, and staff the overarching training strategy for the AGS program.[7] By sending personnel to Sigonella for an "AGS tour of duty," nations can be sure that their overall ISR expertise will grow over time. Nations with little or no real ISR capability can begin to expand their national expertise through personnel they send to the AGS program, and work has already started in this critical training area. The combat effectiveness of the AGS program depends upon a successful outcome.

The last point is to articulate that the AGSIO is reviewing past lessons learned to identify future focus areas that must be addressed. NATO AGS is much more than aircraft alone. The program must be viewed holistically. It is a "system of systems," each with its own set of challenges. In past work, the areas of intelligence and "command and control" have been placed at the top of many future focus areas for US research and development efforts. AGSIO argues that the same focus areas rank at the top of AGS risk areas.

In summary, the NATO AGS procuring nations[8] have agreed to procure a "NATO owned and operated," end-to-end ISR system that will be part of the overarching Joint Intelligence Surveillance and Reconnaissance (JISR) initiative. This procurement comes with the understanding that the operations and support (O&S) costs for the program's life cycle will be commonly funded, as described in the AGS practical funding solution document.[9] In addition to funding, the success of the AGS program boils down to its personnel, and the Alliance's ability to train them to proficiently perform their jobs.

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6 Annex 1, DI(AAC)(2012)0200, "Delivering the Alliance Ground Surveillance Capability-10 Point Paper.» Paragraph 6, pages 1–3. September 27, 2012.

7 NATO Alliance Ground Surveillance, "Training Implementation, Planning and Sourcing Integrated Project Team (TIPS IPT), Terms of Reference. August 10, 2011.

8 Bulgaria, Czech Republic, Denmark, Estonia, Germany, Italy, Latvia, Lithuania, Luxembourg, Norway, Romania, Slovakia, Slovenia, United States.

9 MC 0458/2 (Final), "NATO Education, Training, Exercise and Evaluation (ETEE) Policy." Paragraphs 22a and 22b, page 6. October 12, 2009.

# III. Just another Airplane?

# Drone Pilots, Humanitarians and the Video Game Analogy: Unpacking the Conversation

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## Introduction

The public conversation about "unmanned warfare" and about the role of drone pilots is relatively new, and as such characterized by hype, misinformation and exaggerations.[1] Some are produced by the media and the unmanned aerial vehicle (UAV) industry/lobby, some by the military and a good number by the humanitarian community itself.[2]

In 2012, the humanitarian cost of the drone wars rose to international attention.[3] From the viewpoint of the humanitarian community, the so-cal-

1 The author is aware of the military/industry preference for avoiding the term "drone». However, this chapter is concerned with an ongoing public conversation where "drone» is the accepted terminology. As a scholar, the author's contribution to the Norwegian UAV debate has so far focused on the need for developing a critical, public conversation. See Sandvik, Kristin Bergtora (2011): "Morgendagens Kriger», Op-ed in *Aftenposten*, June 20, 2011; Sandvik, Kristin Bergtora (2012): "Droner Truer Demokratiet», Op-ed in *Klassekampen*, February 2012. See also Sandvik, Kristin Bergtora and Kjersti Lohne (2012a): "Robot Technology and the Drone Stare: Seeing or Unseeing Humanitarian Suffering?», the Symposium Political Theatres of Suffering, Humanitarian Politics and Representation of Distant Suffering, Finnish Institute of International Affairs, March 15 2012., and Sandvik, Kristin Bergtora and Kjersti Lohne (2012b): "Technology Transfers from the Military to the Humanitarian Field: the Rise of the Humanitarian Drone », "Humanitarianism: Past, Present, Future», Humanitarian and Conflict Response Institute, University of Manchester, November 08-10 2012..

2 This chapter adopts a broad conception of the "humanitarian community», including humanitarian and human rights organizations, as well as international human rights and humanitarian law lawyers.

3 See Stanford Law School Human Rights and Conflict Resolution Clinic and NYU School of Law Global Justice Clinic (2012): *Living under Drones: Death, Injury, and Trauma to Civilians from US Drone Practices in Pakistan available at* http://www.livingunderdrones.org/report/; Center for Civilians in Conflict and Columbia Law School Human Rights Clinic (2012): *The Civilian Impact of Drones: Unexamined Costs, Unanswered Questions, available at* http://civiliansinconflict.org/resources/pub/the-civilian-impact-of-drones; Human Rights Watch and Harvard Law School Human Rights Clinic (2012): *Loosing Humanity: The Case against Killer Robots*, available at http://www.hrw.org/sites/default/files/reports/arms1112ForUpload_0_0.pdf.

led drone wars are deeply problematic for reasons ranging from accountability and transparency issues to inadequate protection of civilians and the question of whether the barriers for the use of force are being lowered. From this perspective, the deployment of intelligence, surveillance, and reconnaissance (ISR) UAV and unmanned combat aerial vehicle (UCAV) in military operations amounts to "war by remote control". Moreover, the pilots of these U(C)AVs, the "drone pilots", assume an ambiguous status, vacillating between that of a soldier not quite fulfilling traditional military expectations of bravery, honor and strength and that of a gamer free of the cultural and disciplinary constraints the military imposes on its troops. The analogy made between war and gaming, and the ambiguity surrounding the drone pilot are the starting points for this chapter.

This chapter aims to improve the humanitarian contribution to the conversation by pursuing a twofold objective: first, to understand more about who the drone pilots are and what they do; and second, to unpack the notion of ISR and targeting as forms of gaming. The video game analogy is called upon in the literature, in media reports and by practitioners themselves, but what are the basic assumptions and premises of this analogy? While the aim of this chapter is to say something more general, albeit preliminary, about a particular cultural construction of drone pilots, and by extension, contemporary warfare, the sources used for this chapter are mainly focused on the US context. The idea is that a conceptual approach can be useful for thinking about the emergence of UAVs/UCAVs in other national contexts.

On the basis of media reports, scholarly literature, and reports and surveys published by the US military, this chapter sets out to do three things: first, to offer a brief biography of the drone pilot. To that end, the chapter looks at issues such as recruitment profiles, personal attributes, professional identity and career development. It examines various elements of the drone pilot's workday and the key stress factors. In the second part, the chapter explores the video game analogy. It points to the cultural, technological and commercial factors that underpin this turn to unmanned aircraft flown by a new type of pilots. Then two key theoretical ideas of the analogy are explored: The imagery of surgical precision and de facto accuracy is contrasted with the reality of civilian and friendly fire casualties, and persistent technological challenges. The chapter then considers assumptions about the nexus between distance, intimacy and killing. Turning towards the empirical, it discusses how drone pilots respond to the video game metaphor. The third part turns the focus towards the humanitarian's use of this analogy: first, by discussing the origins and current use of the "Bugsplat" metaphor; and second, by point-

ing to limitations of this analogy in the context of an accelerating need for humanitarians to understand "more about algorithms", as autonomy increases and as developments such as wide area aerial surveillance (WAAS) make processing, exploitation, dissemination (PED) cells central to contemporary warfare.

## I. The Drone Pilot: A Biography

### A Snapshot of a New Professional Field

The "drone pilot" occupies a particular cultural and political role in contemporary discussions of war. The drone pilot is commonly described as someone "waging war by remote control" or engaging in a video game–like activity. Intermittently, public attention is given to the occurrence of post-traumatic stress disorder (PSTD) among drone pilots, usually by way of testimonies from former pilots. The drone pilot is portrayed as caught in a dual crisis of masculinity: looked down upon by "real pilots" for *not* flying real airplanes in war zones, but also engaged in a suspect and potentially illegal activity where *playing* war engenders *real* killing. On the basis of recent studies of recruitment and work life experience, this section summarizes the key issues pertaining to recruitment, personal attributes, professional identity and career trajectories. Thereafter, the chapter provides an overview of the workday and work environment of the drone pilot, including the most significant stressors faced by this group of pilots.

### Piloting: The Work of a Small, Global Army

Operating larger UAVs such as Predator, Reaper and Global Hawk requires a large group of personnel—so-called combat air patrols (CAPs) —including commanders, pilots (who control the movement of the vehicle), sensor operators (in charge of reconnaissance and targeting), mission intelligence coordinators (for communicating and relaying key sources of information), training instructors and military lawyers. In total, it takes an estimated 82 people to fly a Predator.[4] Organizing a drone fleet is a complex task: CAPs work

4 Marra, William and Sonia McNeil (2013): "Understanding 'The Loop': Regulating the Next Generation of War Machines», forthcoming in *Harvard Journal of Law and Public Policy*, Vol. 36, No. 3 (2013). Available at SSRN: http://ssrn.com/abstract=2043131

together over long distances to get their weapons delivered at the other side of the globe; and multiple CAPs are needed to keep a vehicle airborne round the clock.[5]

Predator pilots are drawn from three sources: (1) pilots who cross-train from a manned airframe (aged late twenties to mid-thirties), (2) recent pilot graduates from undergraduate pilot training (aged mid- to late twenties), and (3) non-pilot commissioned officers (navigators from manned airframes and officers in non-flying career fields). Reaper pilots are drawn from experienced pilots within Predator squadrons as piloting a Reaper (which is faster, heavier and has a much larger payload) requires more advanced manoeuvring and flying skills.[6]

## Looking for the "Right Stuff" in 2013

High job dissatisfaction, boredom, anxiety and stress can combine with individual traits such as personality experience and age to compromise performance. Drone pilots are recruited from distinct career paths, with a low retention rate: According to the US Air Force, only 25% of the 244 pilots who were ordered to fly drones after basic flight training have indicated they want to remain.[7] Thus, selection programs that identify the cognitive attributes, personality traits and moral motivation constitutive of successful training and operational performance assume key importance.[8]

The high demand for drone pilots has generated the term "UAV pilot crunch", which postulates that "the solution has been to lower the bar".[9] In reality, the military is faced with the same work force transformation as society

5 Bakx, Gwendolyn C.H. and James M. Nyce (2012): "Social Construction of Safety in UAS Technology in Concrete Settings: Some Military Cases Studied», *International Journal of Safety and Security Engineering* , 2.3: 227–241. Available at http://works.bepress.com/gwendolyn_bakx/5

6 Chappelle, Wayne, Kent McDonald and Katharine McMillan (2011): *Important and Critical Psychological Attributes of USAF MQ-1 Predator and MQ-9 Reaper Pilots According to Subject Matter Experts*, AFRL-SA-WP-TR-2011-0002. Available at http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA545552

7 Michaels, Jim (2012): "Drones Change 'Top Gun' Culture of Air Force», *USA Today*, December 1, 2012. Available at http://www.usatoday.com/story/news/world/2012/11/30/drone-wars/1737991/

8 Bradley T. Hoagland (2013): *Manning the Next Unmanned Air Force: Developing RPA Pilots of the Future*. Brookings, Federal Executive Fellows Policy Papers Number 17. Available at http://www.brookings.edu/~/media/Research/Files/Papers/2013/08/06%20Air%20Force%20Drone%20-Pilot%20Development%20Hoagland/Manning%20Unmanned%20Force_FINAL_08052013.pdf

9 Bumiller, Elisabeth (2012): "A Day Job Waiting for a Kill Shot a World Away», *New York Times*, July 29, 2012. Available at http://www.nytimes.com/2012/07/30/us/drone-pilots-waiting-for-a-kill-shot-7000-miles-away.html?pagewanted=all&_r=0

in general. The cognitive aptitudes (intelligence, coordination), personality traits (high levels of courage, self-discipline, aggressiveness, self-confidence and a strong interest in high-risk activities) and forms of moral motivation desired in traditional fighter pilots are not the same that make a drone pilot successful: instead, stress tolerance, social skills and the ability to quickly process and analyse a large amount of information are considered crucial capabilities. However, knowledge about this transition remains limited.[10]

## Top Guns No More? Career Trajectory and Professional Identity

In the US Air Force, cross-trained pilots and recent pilot graduates were initially told that they were going to return to flying manned aircraft after a temporary 3–4-year assignment (voluntary or involuntary). Due to the surge in demand for drone pilots, this has been feasible for very few pilots.[11] Further dissatisfaction has been caused by low promotion rates.[12] Complaints have been raised that "the Air Force isn't welcoming".[13] This animosity has a generational subtext to it. In the words of a former Air Force officer and the author of a memoir about his exploits as a fighter pilot: "I guarantee you there is not a fighter pilot around who wants to fly a drone. … I don't want to orbit over a point for 12 hours and take pictures."[14] There are also clear gendered connotations to the move from manned to "unmanned" aircraft: It is difficult to demonstrate "core masculine traits" such as courage, strength and mastery of emotions.[15] Notably, implicit in this type of gender identity analysis is an assumption that the drone pilot is a "he".

These factors are clearly reflected in the controversy surrounding the plans to award a "Distinguished Warfare Medal" for drone pilots. Interestingly, both Air Force veterans[16] and leftist critics of the military point to the lack

10 Chapelle et al. (2011).

11 Chapelle et al. (2011).

12 Schogol, Jeff (2012): "AF Told to Study Rate of UAV Pilots' Promotions», *AirForce Times*, December 29, 2012. Available at http://www.airforcetimes.com/prime/2012/08/PRIMEair-force-rpa-pilots-promotions-082112/

13 Blair, Dave (2012): "Ten Thousand Feet and Ten Thousand Miles», *Air & Space Power Journal* , May and June 2012. Available at http://www.airpower.au.af.mil/digital/pdf/articles/May-Jun-2012/V-Blair.pdf. Also Thompson, Mark (2012): "Drone Pilots: We Don't Get No Respect», May 2, 2012. Available at http://nation.time.com/2012/05/02/drone-pilots-we-dont-get-no-respect/

14 Bumiller (2012).

15 Lorraine Bayard de Volo (2013): *Unmanned?: Gender, Drones, and War*. At the European Conference on Politics and Gender. Available at http://www.ecpg-barcelona.com/unmanned-gender-drones-and-war

16 Astore, William (2012): "The Drone Medal», *The Huffington Post*, July 13, 2012. Available at http://www.huffingtonpost.com/william-astore/the-drone-medal_b_1671481.html

of "bravery" and "honor" involved in piloting drones as an argument for why there should be no medals. For example, an article in the *Salon* argues that "[c]ollectively venerating it as an act of 'bravery' (of all things), deserving of war medals, is only likely to shield it even further from critical scrutiny and challenge". At the same time, drone pilots have begun to strike back. The *Salon* article cited quotes a Predator pilot stating: "I firmly believe it takes bravery to fly a U.A.V. … particularly when you're called upon to take someone's life. In some cases, you are watching it play out live and in color."[17] Air Force Major Blair goes further, suggesting that the requirement of threat to physical safety is actually fulfilled: "I do n*ot believe that RPA operators are in less danger than their manned counterparts. In fact, I assert that it may well be the other way around, comparing the 9/11 attack on the Pentagon to a possible attack on RPA operators in the US.*[18]After massive protests, the idea of a separate medal for drone pilots and cyber warriors were abandoned in April 2013.[19]

In sum, a *drone pilot* appears to still be a problematic professional identity. At the same time as representatives of the Air Force may describe drone pilots as "100% accepted and integrated",[20] others emphasize that "the biggest needs for UAV operators is a ground station that makes pilots and operators feel like they are flying a manned plane".[21] In response, drone pilots are called pilots, they wear the same green flight suits as fighter pilots and they get call names. Also, their operating stations look like dashboards in the cockpit.[22]

## The Workday

Media coverage habitually refers to the social identity of drone pilots as a group of individuals who have "grown up with computers and video games", and who are situated in a habitat where "the work environment consists of

17 Greenwald, Glenn (2012): "Bravery and Drone Pilots», *Salon*, July 10, 2012. Available at http://www.salon.com/2012/07/10/bravery_and_drone_pilots/

18 Blair (2012).

19 Vanden Brook, Tom (2013): «Hagel proposes change to medal for drone pilots», *USA Today*, April 15, 2013. Available at http://www.usatoday.com/story/news/politics/2013/04/15/hagel-drone-pilot-medal-change/2085035/

20 Michaels (2012).

21 «MIT Professor: No Need for Traditional Pilots to Fly USAF UAV Fleet», *Inside the Air Force*, Vol. 20, No. 13, (April 3, 2009). Available at http://web.mit.edu/aeroastro/labs/halab/papers/ITAF%204-3-09.pdf

22 Martin, Rachel (2011): "Drone Pilots: The Future of Aerial Warfare», *NPR*, November 29, 2011. Available at http://www.npr.org/2011/11/29/142858358/drone-pilots-the-future-of-aerial-warfare

computer monitors, video screens and joysticks for controlling the aircraft and camera".[23] More abstractly, the activities of a drone pilot are carried out in a confined environment with specific rules of engagement, tactics and techniques. The ability to multitask is central: In periods of high intensity activity, the drone pilot must be able to combine effective identification, surveillance, targeting, weapons deployment and battle damage assessment of enemy combatants and assets. The pilot must process data while maintaining situational and spatial awareness. At the same time, the pilots perform a wide range of manual and computer-based tasks to actively and/or passively control, maneuver and fly the aircraft.[24]

## What Are the Stressors: Traumatized, Busy or Just Bored?

Considerable attention has been given to the effects the emergence of this new career path and this type of work have on the pilots themselves. In reports about drone pilots and stress, combat stressors are usually emphasized[25]:

> *Bryant remembers the first time he fired a missile, killing two men instantly. As Bryant looked on, he could see a third man in mortal agony. The man's leg was missing and he was holding his hands over the stump as his warm blood flowed onto the ground—for two long minutes. He cried on his way home, says Bryant, and he called his mother.*[26]

Combat stressors are defined as those directly involved in the ISR and weapon deployment missions that involve direct support to combat-related operations. This includes (a) precision targeting and destroying enemy combatants and assets in which mistakes may come at a high price (e.g. inadvertently killing friendly ground forces and civilians), (b) exposure to live video feed and images of destruction to ensure combatants have been effectively destroyed or neutralized, (c) making critical decisions regarding the identification of enemy combatants and providing effective force protection to ground troops to reduce casualties of friendly forces and civilian bystanders, and lastly (d) the

23 Michaels (2012).
24 Chappelle et al. (2011).
25 Martin, Rachel (2011): "Report: High Levels of 'Burnout' in US Drone Pilots», *NPR*, December 19, 2011.
26 Abé, Nicola (2012): " Dreams in Infrared: The Woes of an American Drone Operator», *Der Spiegel* , December 14, 2012. Available at http://www.spiegel.de/international/world/pain-continues-after-war-for-american-drone-pilot-a-872726.html

unique demand for RPA operators to simultaneously juggle their war fighter role while having to sustain their domestic roles and responsibilities.[27]

Nevertheless, research finds that the majority of occupational stress was reported to stem from operational stress and not from exposure to combat.[28] According to a recent survey study on the occupational burnout of UAV operators in which 600 Predator/Reaper operators and 264 Global Hawk operators participated, 27% and 15% of the Predator/Reaper group responded that they were "stressed" and "very to extremely stressed", respectively; 31% and 19% of the Global Hawk Group did so.[29]

Reasons included long hours, frequent shift work and shift changes, making it difficult to maintain domestic life routines, geographically undesirable locations and restricted or highly limited opportunities to fly manned airframes to maintain flight hours necessary for flight pay or promotion for those who cross-trained from a manned airframe; restricted working environment, poor ergonomics of seating and poor temperature control of work stations; and sustaining vigilance to a high monitoring visual and auditory workload and multitasking with time-limited suspense. The authors of this study suggest that this problem is likely to be exacerbated, as the military seeks future operators to simultaneously control multiple UAVs from a single ground station, and to multitask more.[30] In sum, this can also elevate the potential for mishap.

Another significant but possibly underestimated factor is boredom, as illustrated by the following chat room exchange. In response to the question "What is the lifestyle like for an RPA (UAV) pilot?" a user replies:

> *I had a friend who just deployed to Afghanistan for 6 months flying RPVs. He lives in a wall-tent with a wood floor, is more or less bored to tears when not working, will not see his family until Christmas and he eats extremely well. Can't say if that's normal or not.*[31]

27 Ouma, Joseph A., Wayne L. Chappelle and Amber Salinas (2011): *Facets of Occupational Burnout Among US Air Force Active Duty and National Guard/Reserve MQ-1 Predator and MQ-9 Reaper Operators*, AFRL-SA-WP-TR-2011-0003, 2011. Available at http://www.dtic.mil/dtic/tr/fulltext/u2/a548103.pdf

28 Ouma et al. (2011).

29 Chappelle, W., A. Salinas and K. McDonald (2011): "Psychological Health Screening of USAF Remotely Piloted Aircraft (RPA) Operators and Supporting Units», in *Symposium on Mental Health and Well-Being across the Military Spectrum*, Bergen, Norway, April 2011.

30 Ouma et al. (2011), also Murray, C.C. and W. Park (2013): "Incorporating Human Factors Considerations in Unmanned Aerial Vehicle Routing», working paper. Available at http://www.eng.auburn.edu/users/ccm0022/publications/UAV_optimization_with_human_factors.pdf

31 Available at http://answers.yahoo.com/question/index?qid=20100418085943AA9zgrA

One U.S Air Force Drone pilot described himself as " overpaid, underworked and bored",[32] confirming the findings of a recent MIT study: in the study, 30 men and women who flew simulated UAV missions while their actions were chronicled and videotaped, it was observed that humans are effectively babysitting the automation, leading to a problem of boredom. Reference is made to a previous Predator operations study, where 92% of pilots reported "moderate" to "total" boredom. The study describes "the 90% of the time that's sheer boredom—12 hours sitting on a house trying to stay awake until someone walks out". The result may be lack of sustained attention, leading to boredom with ultimately negative performance consequences such as missed alerts. (Interestingly, the report notes that for pilots with significant gaming experience, there is a tendency to experience more monotony and boredom, causing poorer performance.)[33]

## II. Is Killing like Gaming, or Gaming like Killing? Unpacking the Video Game Analogy

### Cultural Acceptance and Technical Preparedness Meets Commercial Logic

The following premises are central to the video game analogy: that training for combat is done through computer simulation while combat itself increasingly resembles computer games,[34] and that the general public now accepts this analogy. According to *New York Times*: "If those same soldiers can operate a video game as well as they can use a rifle … they can fly a drone, and use that to kill people, too." The article then describes a recent recruitment advertisement for the British army featuring a soldier explaining UAV function using an unbranded Microsoft Xbox controller to fly his drone over a troop of patrolling soldiers.[35]

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32 Elijah Solomon Hurwitz (2013): «Drone Pilots: «Overpaid, Underworked, and Bored"", June 18 2013, available at http://www.motherjones.com/politics/2013/06/drone-pilots-reaper-photo-essay

33 Cummings, M.L., C. Mastracchio, K.M. Thornburg, and A. Mkrtchyan (2012): *Boredom and Distraction in Multiple Unmanned Vehicle Supervisory Control*, Boston: MIT. Available at http://web.mit.edu/aeroastro/labs/halab/papers/BoredomDistraction_SEP2012.pdf

34 Macedonia, Michael, U.S. Army Simulation Training and Instrumentation Command (2002): "The Games Soldiers Play», *IEEE Spectrum*, March 2002. Available at http://gscfall09.pbworks.com/f/Virtual+War+Article.pdf

35 Bumiller (2012).

Along with this broad cultural acceptance is a technical and commercial readiness. A whole training simulation industry has emerged, including traditional defense contractors as well as the entertainment industry:[36] *Topscene* (tactical operational scene) is delivered to the US Department of Defense and combines aerial photos, satellite images and intelligence data to create high-resolution three-dimensional databases of a region through a battlespace. The Microsoft Xbox and Sony Playstation 2 game consoles are being adapted for distributed and networked military gaming. The next generation of simulations is being developed under the auspices of the Joint Simulation System (JSIMS) program, which attempts to combine disparate war-gaming systems into a Joint Synthetic Battlespace (JSB), which encompasses the tactical, operational and strategic levels of war.[37]

## "Surgical Precision" and De Facto Accuracy

The dominant politico-military rationale for drone wars is the notion that the "drone stare" enables operators to see, strike or reach everything with "surgical precision", thus lessening human suffering.[38]As described in a report in *USA Today*: "The smallish aircraft, fitted with powerful cameras for surveillance and sometimes missiles for airstrikes, *play a critical* role in Afghanistan. They provide *24/7 surveillance of the battlefield* and have the *ability to hit precise targets*."[39] The idea is that the near real-time video feeds enable an unparalleled degree of accuracy, response and precision which not only minimizes civilian casualties but also completely abstracts the risk of one's own soldiers. It characterizes what has been referred to as "virtuous war" by James Der Derian, whose centrality lies in its "technical ability and ethical imperative to threaten and, if necessary, actualize violence from a distance—*with no or minimal casualties*".[40]

Nevertheless, the drone stare is rendered irrelevant where radio contact is not functional. In an example from Iraq, the Predator pilot on ISR could see an improvised explosive device (IED) in the asphalt, but was unable to alert the soldiers by radio because they were using a jamming transmitter. Five Ameri-

36 See Visiongain reports (2012): *The UAV Flight Training and Simulation Market 2012–2022*, May 17, 2012. Available at http://www.visiongain.com/Report/823/The-UAV-Flight-Training-Simulation-Market-2012-2022

37 Available at http://gscfall09.pbworks.com/f/Virtual+War+Article.pdf

38 Sandvik and Lohne (2012b).

39 Michaels (2012).

40 Der Derian, James (2009):*Virtuous War: Mapping the Military–Industrial–Media–Entertainment Network*. New York: Routledge, p. xxxi.

can soldiers were killed.[41] Furthermore, both casualties[42] and lethal friendly fire incidents have occurred due to the low quality of target representation. As reported by the *Houston Chronicle*, in 2011, two US servicemen were killed in the first (publicly acknowledged) such incident, after a Predator crew mistook the soldiers heat signatures on the drone's sensors for those of enemy forces. According to the newspaper, the soldiers appeared as "fuzzy blobs on a screen".[43] Moreover, however "accurate" or "exact" the technology is, the surveillance systems, with their agents, *interpret* ambiguous data.[44] Group communication is also a challenge: Doubts may not be expressed clearly enough in the chat-like language employed in the CAP patrol, and vital information may not be relayed. Thus, as pointed out by Gregory, despite rhetoric of surgical precision and accuracy through better technology, much can and does go wrong throughout the "kill chain",[45] "for reasons ranging from pilot error and bad weather to mechanical failure".[46] In fact, the US Air Force has recorded more than 70 drone accidents since 2000, some of which, in addition to considerable costs of property damages and loss of aircrafts, have cost human life.[47]

## Distance, Intimacy and Killing

In Grossman's seminal work *On killing* (2009 [1995]), distance is recognized as fundamental to the "dehumanizing" processes necessary for killing. Grossman points to the dehumanizing effects of video games and, in particular, the "mechanical distance": "the screen that separates the gamer from the game".[48]

41 Abé (2012).

42 Numbers are uncertain, and there is considerable discrepancy between the number provided by *The Long War Journal*, the New America foundation and the Bureau of Investigative Journalism. In January 2013, Ben Emmerson, the UN special rapporteur on counter-terrorism and human rights, launched an inquiry into the civilian impact and human rights implications of the use of drones and other forms of targeted killing for the purpose of counter-terrorism and counter-insurgency. See Press Release dated January 24, 2013. Available at http://www.foreignpolicy.com/files/fp_uploaded_documents/130124_SRCTBenEmmersonQCStatement.pdf

43 Bakx and Nyce (2012).

44 Wall, Tyler and Torin Monahan (2011): "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-scapes", *Theoretical Criminology*, no. 15, 240.

45 Gregory, Derek (2011): "From a View to a Kill: Drones and Late Modern War», *Theory, Culture & Society*, no. 28 (7–8):188–215.

46 Turse, Nick (2012): "The Crash and Burn Future of Robot Warfare», *Huffington Post*, January 16, 2012.

47 The activist group "Dronewars UK» have an interesting drone crash database. Available at http://dronewarsuk.wordpress.com/drone-crash-database/

48 Grossman, Dave (2009 [1995]): *On Killing: The Psychological Cost of Learning to Kill in War and Society*, Rev. ed. New York: Little, Brown & Co., p. 119.

Grossman's idea has become foundational to "critical drone studies", and taken up by many scholars, as illustrated, for example, by Wall and Monahan (2011): "The ongoing informatization of warfare leads to increased mediation of combat experiences and this is definitely the case for many UAV 'pilots' who 'sit at 1990s-style computer banks filled with screens, inside dimly lit trailers'."[49]

In an important critique of the premises of this distance metaphor, Gregory (2011) identifies three important areas separating the games from the video feeds of armed surveillance drones: (i) while games are essentially discontinuous, enabling resets and pauses, the UAV's video feeds entail a continuous immersion to a much greater extent; (ii) contrary to real-life situations, distinctions and identification of "terrorists" and so on are self-evident in video games; and, fundamentally, (iii) the legal and moral implications of "collateral damage" separate the game from the bottom line. Gregory suggests that, in contrast to the physical and psychological distance invoked by the video game analogy, "these new visibilities produce a special kind of intimacy that consistently privileges the view of the hunter-killer, and whose implications are far more deadly".[50]

This concept of intimacy is important: When media takes up the idea of intimacy as an antidote to the remote control metaphor, attention is given to the "powerful cameras that bring war straight into a pilot's face",[51] emphasizing that war is "a child killed in error or a close-up of a Marine shot in a raid gone wrong", where "[y]ou might gain a level of familiarity that makes it a little difficult to pull the trigger".[52] However, the kind intimacy Gregory refers to is that of comradeship, where "pilots speak glowingly of the good days, when they can look at a video feed and warn a ground patrol in Afghanistan about an ambush ahead".[53] Force protection and a desire for professional belonging are central to this intimacy, whether it is through firing missiles or conducting ISR:

> *Ted, an Air Force major and an F-16 pilot who flew Reapers from Creech, recalled how troops on an extended patrol away from their base in Afghanistan were grateful when he flew a Reaper above them for five hours so they could get some sleep one night. They*

49 Wall and Monahan (2011), p. 246.
50 Gregory (2011).
51 Abé (2012).
52 Michaels (2012).
53 Ibid.

*told him, "We're keeping one guy awake to talk to you, but if you can, just watch over and make sure nobody's sneaking up on us."*[54]

For others, the intimacy is grounded in a desire for combat experience, whereby, for example, drone pilots who flew cargo planes switch "to feel closer to the war": "You definitely feel more connected to the guys, the battle", said Dave, the Air Force major, who flew C-130 transport planes in Iraq and Afghanistan.[55]

### Responding to the Metaphor

While drone pilots might use gaming as a metaphor for what they do, various aspects of "realness" are emphasized: a frequently cited example is Matt J. Martins, who in his book *Predator*, describes operating a drone as "a surreal experience. Almost like playing the computer game *Civilization* … [e]xcept with real consequences."[56] However, they also contest the video game analogy as such: for example, by insisting that flying drones are "real combat" by reference to the "unique stress" pilots experience because "they see the enemy in a more personal way" than traditional pilots: this includes "watching a target for days, seeing him interact with his family and go about the routine of his daily life, before launching a missile to kill him" before the pilot may watch the funeral for the target.[57] Others reject the analogy for more prosaic reasons. As explained by a sensor operator and trainer: "I don't have any video games that ask me to sit in one seat for six hours and look at the same target."[58]

## III. The Video Game as Discursive Arsenal: Some Challenges for Humanitarians

### The Bugsplat: Who's Problem of Terminology?

The third part turns the focus towards the humanitarians as participants in this conversation: first, by discussing the origins and current use of the "Bugsplat"

54 Bumiller (2012).
55 Ibid.
56 Martins, Matt J. (2010): *Predator: The Remote-Control Air War over Iraq and Afghanistan: A Pilot's Story*. Minneapolis: Zenith Press, p. 31.
57 Michaels (2012).
58 Bumiller (2012).

metaphor. The controversies over casualty counts are well known. Less focus has been given to the use of terminology by humanitarian critics.

A staple feature of the coverage of drone strikes is the reference to the so-called *Bugsplat* as a "form of military slang for a man killed by a drone strike" (since viewing the body through a grainy-green video image gives the sense of an insect being crushed);[59] as "the official term used by US authorities when humans are killed by drone missiles";[60] or as "a collateral damage estimate methodology".[61] Commentators frequently describe this as an example of perverted potential of the video game analogy, noting that "there is a children's computer game of the same name"[62] (or "bug splat, which happens to be the name of a children's video game").[63] Allusions are made to a whole panoply of evils, in particular between the Bugsplat, the Hutu extremists' description of the Tutsi as "cockroaches" and earlier Nazi propaganda referring to Jews as "harmful pests" that deserve to die.[64]

This discursive practice is problematic: As noted by Sharkey (2008), Bugsplat software and its successors have been used to help calculate the correct bomb to use to destroy a target and calculate the impact.[65] According to a 2003 *Washington Post* article on the then recently approved Bugsplat program,

> *In devising the targeting plan for a possible war against Iraq, U.S. military planners are hoping to reduce the potential for civilian casualties by using a new computer program … the program represents a significant departure from the traditional method of drawing a simple circle around a target to show a bomb's estimated blast effect and determine what civilians might be at risk nearby. … Instead, Bugsplat generates bloblike images—resembling squashed insects—that military officials say more precisely model potential damage by a particular type and size of bomb dropped by a particular aircraft flying at a given altitude.*[66]

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59 Greenwald (2012).

60 Robinson, Jennifer (2011): "'Bugsplat': The Ugly US Drone War in Pakistan», November 29, 2011. Available at http://www.aljazeera.com/indepth/opinion/2011/11/201111278839153400.html

61 Zenko, Micah (2013):" Reforming US Drone Strike Policies», Council on Foreign Relations, January 2013, p. 12. Available at http://www.cfr.org/wars-and-warfare/reforming-us-drone-strike-policies/p29736

62 Robinson (2011).

63 Greenwald (2012).

64 Robinson (2011).

65 Sharkey, Noel (2008): "Grounds for Discrimination: Autonomous Robot Weapons», *RUSI Defence Systems*, October 2008. Available at http://rusi.org/downloads/assets/23sharkey.pdf

66 Bugsplat's computer program aims to limit civilian deaths at targets. See *The Washington Post*, February 26, 2003. Available at http://community.seattletimes.nwsource.com/archive/?date=20030226&slug=collateral26

The formal name of Bugsplat is FAST-CD, which stands for Fast Assessment Strike Tool—Collateral Damage.[67]

While it is legitimate to dismiss these kinds of programs as an attempt to "clean up combat", the humanitarian community should ask itself whether this persistent misunderstanding and misuse of the metaphor is necessary and productive.[68]

## Beyond the Drone Pilot

The final section of this chapter points to the need for humanitarians and the lawyers among them to understand more about algorithms as technological developments such as WAAS and the emergence of PED cells becomes increasingly crucial to contemporary warfare. The continued utility of the video game analogy needs to be considered in light of these developments.

It is by now a well-rehearsed fact that the ever-increasing amount of available information known as big data is changing contemporary warfare. Single sensor platforms with names such as the Gorgon Stare, ARGUS and the Constant Hawk can replace armadas of UAVs. For example, the new autonomous real-time ground ubiquitous surveillance (ARGUS) imaging system allows the collection of six petabytes of video in a single day, which roughly equals 80 years of high-definition (HD) video.[69] Instead of the Predator soda-straw view of the world,[70] this technology can track people, vehicles and objects in areas

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67 Bugsplat is also a bug-reporting system used, for example, by League of Legends to inform about emerging issues (League of Legends is a player support site). Available at https://support.leagueoflegends.com/entries/20739888-bug-splat

68 Nevertheless, who gets to say what about suffering is complicated: In a recent contribution, McNeal (2012) asserts that "critics also frequently make arguments that display an utter lack of familiarity with the US military's targeting and strike practices». McNeal then proceeds to criticize an article in the Pakistani newspaper *The Nation* (without making clear to the reader that he is not referring to the American left wing magazine *The Nation*), where the author describes the "bugsplat» as "the splotch of blood, bones, and viscera that marks the site of a successful drone strike». McNeal, Gregory S. (2012): "Are Targeted Killings Unlawful? A Case Study in Empirical Claims Without Empirical Evidence», in Claire Finkelstein, Jens David Ohlin and Andrew Altman (eds.), *Targeted Killings, Law and Morality in an Asymmetrical World*. Oxford: Oxford University Press. Available at http://ssrn.com/abstract=1954795. For a link to *The Nation* article, see: http://www.nation.com.pk/pakistan-news-newspaper-daily-english-online/International/31-Jul-2011/Fighting-back-against-the-CIA-drone-war

69 Ackerman, Spencer (2012): "Every Day, Army's Panopticon Drone Will Collect 80 Years' Worth of HDVideo», *Wired*, January 17.

70 For an extended argument, see Rogoway, Ty (2012): "Skynet Coming to a City Near You?: Wide Area Airborne Surveillance Will Be a Game Changer over the War Zone and the Home Front.» Available at http://aviationintel.com/2012/12/04/skynet-coming-to-a-city-near-you-wide-area-airborne-surveillance-will-be-a-game-changer-over-the-war-zone-and-the-home-front/

of 5–10 km$^2$ (and up). WAAS becomes wide area *persistent* surveillance (WAPS) with the integration of long-endurance platforms.

The ever-increasing generation of terrabytes presents an unprecedented challenge to users.[71] It is reported that while WAPS has been used successfully in Iraq and Afghanistan, "[t]he ISR challenge has been to pick up specific nuggets of information from activities taking place across a large area that are indicators of hostile action".[72] Hence, the emerging importance of PED processes, which are required to convert raw motion imagery into intelligence useful to the war fighter: A PED cell is a special group of war fighters and analysts who work to produce intelligence products from a steady stream of imagery delivered from in-theater collection assets. Their products are used in near-real time to conduct tactical operations that maximize force effectiveness and minimize risk of life.[73] A single Predator or Reaper CAP can have a crew of up to 192, including 30 intelligence analysts dedicated to the exploitation of motion imagery alone (innovations like the Gorgon Stare will keep exacerbating the requirement for manpower).[74] As the job of the drone pilot continues to change in light of these developments, to effectively engage in ethical and legal debates about ISR and targeting, a more sophisticated angle than the video game analogy will be needed.

## Conclusion

This chapter has explored a facet of the humanitarian conversation about the drone wars; namely the assumptions underpinning the video game analogy, whereby drones are seen as causing a mediation of combat experience which engenders "dehumanizing effects". A couple of critical points have been noted: As the Bugsplat discussion illustrates, to have a conversation about the ethics of drone strikes and the role of drone pilots, critics also have a responsibility

71 Colucci, Frank (2012): "Wide Area Surveillance Technologies Evolve for Homeland Security and Other Applications», December 4, 2012. Available at http://www.defensemedianetwork.com/stories/wide-area-aerial-surveillance-technologies-evolve-for-homeland-security-and-other-applications/3/

72 Lexington Institute (2012): "Wide Area Persistence Surveillance Revolutionizes Tactical ISR», November 30, 2012. Available at http://www.defencetalk.com/wide-area-persistent-surveillance-revolutionizes-tactical-isr-45745/#ixzz2JIYycbCI

73 "What Makes a PED, a PED?», June 5, 2012. Available at http://imageryspeaks.com/2012/06/05/what-makes-a-ped-a-ped/

74 Menthe, Lance et al. (2012): *The Future of Air Force Motion Imagery Exploitation Lessons from the Commercial World*. Santa Monica/Arlington/Pittsburgh: RAND Corporation. Available at http://www.rand.org/content/dam/rand/pubs/technical_reports/2012/RAND_TR1133.pdf

to be as familiar as possible with the terminology and strategies. A related concern is the propensity to construe the contrast between drones and manned aircraft as morally significant per se: "Unlike traditional pilots, who *physically* fly *their* payloads to a target, drone operators kill at the touch of a button, without ever leaving their base—a remove that only serves to further desensitize the taking of human life."[75] In conclusion, the chapter argues that this points the attention to a deeper issue, namely the seemingly instinctive preference for portraying human emotions as "better" when thinking about the future development of drones.[76] We will inevitably be moving "beyond" the drone pilot and the video game analogy, as exemplified by the newly launched campaign to stop killer robots.[77] As we do, issues of accountability, transparency and protection of civilians will remain acute. The humanitarian community needs discursive strategies and technical and legal knowhow to effectively address these issues.

75 Greenwald (2012).

76 The influential conservative blog Lawfare makes an interesting point when criticizing the 2012 Human Rights Watch Report on autonomous warfare for its "remarkably self-confident factual assertions on the superiority of human emotions in controlling targeting and firing of weapons». Anderson, Kenneth (2012): "Autonomous Weapon Systems and Regulation – A Brief Bibliography», December 12, 2012. Available at http://opiniojuris.org/2012/12/11/autonomous-weapon-systems-and-regulation-a-brief-bibliography/

77 See http://www.stopkillerrobots.org/.

# Unmanned Aerial Vehicles: Closer at a Distance

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## Introduction[1]

Flight and squadron commanders wore bunches of long ribbons which flew back from their helmets in the slipstream and looked for all the world like bannerets of the knights of old. ... In their helmets, gauntlets and flying goggles, the pilots were truly romantic figures, and every small boy used to dream, in those days, of how *he* would look in the garb of his heroes.[2]

With a few evocative words, John Harris has captured some of the sense, some of the stereotype perhaps, of the first knights of the air. Therein lie romantic notions of duelling men of honour, trusty steeds on boggy fields replaced by soaring contraptions framed with fabric and wood. Almost a century after World War I, these partial conceptions of the soaring warriors and their self-sacrificial actions above the trenches are embedded in our history, an oft-repeated cultural memory that has taken on a reality of its own.

From that era of dog-fighting biplanes to the age of fly-by-wire, twin-engine fast-jets with stealth technology and satellite-guided weaponry, each iteration of technological advancement has seen its associated Royal Air Force (RAF)[3] aircrew – especially the pilots – construct their ethos in the shadows of those early pioneers. The heritage and heroics of their forebears have been claimed and selectively incorporated in the ethos of each new generation who would apply the increasing utility of air power in combat operations. However, the advent of the unmanned aerial vehicle[4] (UAV) in recent years has brought

1 At the request of the conference organizers, this chapter is extracted in large part, with Copyright permission, from the author's article 'Remoteness, Risk and Aircrew Ethos', *Air Power Review*, Vol. 15, No. 1 (Spring 2012), pp. 1–20.

2 Harris, John Norman (1958): *Knights of the Air*. London: Macmillan, p. 12.

3 This observation clearly applies to other air forces as well, but this chapter will focus on the RAF.

4 The term unmanned aerial vehicle (UAV) is the conference's preferred term. The RAF, which operates the Reaper, opts for remotely piloted aircraft system (RPAS). Other terms currently used in wider debate include remotely piloted vehicle (RPV) and 'drone'. These labels have been

a new dynamic to the aircrew/aircraft nexus, with the former being removed from both the cockpit and the battle space. Understandably, given the rapid technological advances that are being made and the nature of counter-insurgency operations in Afghanistan in particular, debate is dominated by the art of what is technically and militarily possible, both today and in the future. Correspondingly, and encouragingly, debate is already taking place about the associated moral issues that are raised by the remote operation of the Reaper[5] today, as well as the moral challenges that increased autonomy might bring in the future.[6] Further, research is already under way on both sides of the Atlantic to monitor and assess the psychological impact of remote operations on UAV pilots and sensor operators,[7] given the unique juxtaposition of engaging in battle for hours on end and a 'normal' domestic life outside of the working environment.

Three strands of thought will be explored in the following discussion: the place of personal risk in the formation of aircrew ethos and both the utility and morality of air power in some of the ways it has been deployed in the past and continues to be deployed in the present. The first part of this chapter will explore aspects of the historical emergence of aircrew ethos since World War I, paying particular attention to the physical location of aircrew to their targets, before going on to look at some of the ways in which the ethos of Reaper pilots and sensor operators still utilizes aspects of those historical discourses. In the process, there will be references to personal interviews and written exchanges with current and previous British UAV crews. The chapter concludes with the following points: first, that while the use of UAVs presents us with new variations on old ethical concerns – such as non-combatant immunity – they

avoided as far as possible – especially the latter – because they connote higher degrees of autonomy and de-humanization than may be the case with the currently operated Reaper and because they are often used to describe small and micro (including battlefield) aerial vehicles.

5 In the author's research, he has been assisted by both Reaper pilots and sensors and Predator pilots. To make it easier for the reader, the reference will be to the Reaper throughout.

6 See, for example, Arkin, Ronald C. (2010): 'The Case for Ethical Autonomy in Unmanned Systems.' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 332–341; Lin, Patrick (2010): 'Ethical Blowback from Emerging Technologies.' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 313–331; Dipert, Randall R. (2010): 'The Ethics of Cyberwarfare.' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 384–410; Singer, P.W. (2010): 'The Ethics of Killer Applications: Why Is It So Hard to Talk About Morality When It Comes to New Military Technology?' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 299–312; Strawser, Bradley Jay (2010): 'Moral Predators: The Duty to Employ Uninhabited Aerial Vehicles.' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 342–368; Sharkey, Noel (2010): 'Saying 'No!' to Lethal Autonomous Targeting.' *Journal of Military Ethics*, Vol. 9, No. 4, pp. 369–383.

7 'Sensor operators' are responsible for operating surveillance and weapon systems on remotely piloted aircraft systems such as the Reaper.

should not be deemed as somehow inherently evil or insurmountable; second, though geographic separation from the battle space all but removes the need for physical courage (for now) in UAV crews, the need for moral courage may well be greater than ever; because, third, extended loiter time, pattern-of-life observation and post-strike assessments can bring *greater*, not lesser, visual and emotional engagement with an enemy target.

## Knights of the Air

Paul Robinson, in *Military Honour and the Conduct of War*, says of modern war: 'One area in which people did feel that the old ideals [about honour in battle] did survive was air warfare.'[8] He was referring specifically to the rise of aerial combat in World War I as the benefits of using aircraft for artillery spotting and reconnaissance inevitably led to the fight for control of the air. Robinson's observation is not a twenty-first–century idealization of the role of pilots from almost a hundred years earlier. He cites Bennett Molter, an American pilot, who wrote in 1918: 'In many ways the fighting aviators are living much like the lives of the heroes of chivalry. Their warfare is that of man to man.'[9] According to Molter, pilots would occasionally invite an enemy into single combat, a romantic notion that he compared with knights of old.

As the war progressed, the German, French and British authorities were keen to publicly exploit the growing legend of the noble fighter ace in the terms that Molter set out. Newspapers were complicit in the romanticizing of the Knights of the Air. In a book of that title years later, John Harris used similar discursive constructs in capturing the exploits of World War I Canadian fighter aces: 'Rain and intense cold often added discomfort to the dangers of flight, but on the other hand there was a grand sensation in handling the light responsive biplanes. ... In their helmets, gauntlets and flying goggles, the pilots were truly romantic figures.'[10] However, the figures were much less romantic than Harris's description of them. Starkly contrasting and more realistic was British pilot – and ace – James McCudden's recollections of aerial combat.

Taking into account his understated writing style and his preference for factual detail over displays of personal emotion or reflection, McCudden's

8 Robinson, Paul (2006): *Military Honour and the Conduct of War*. Oxford: Routledge, p. 155.
9 Molter, Bennett A. (1918): *Knights of the Air*. New York and London: D. Appleton & Company, p. 121, cited in Robinson (2006), p. 155.
10 Harris (1958), p. 12.

effective and at times distinctly unchivalrous approach to the enemy shines through. Along with all other pilots, he was required to give himself the greatest possibility of killing his opponent in the air while maximizing his own chances of survival. He described an encounter on January 13, 1918, when he was flying at 17,000 feet, 10 miles beyond his own lines over German-occupied territory. He spotted an enemy two-seater aircraft several thousand feet below heading west and set out to ambush it. He set his engine to idle to reduce noise and kept his own aircraft 'in between the sun and the Hun'[11] to reduce his chances of being seen while gliding down to make his attack. McCudden recalls:

> [S]o when I got within good close range, about 100 yards, I pressed both triggers; my two guns responded well, and I saw pieces of three-ply wood fall off the side of the Hun's fuselage. Then the L.V.G. went into a flat, right-hand spiral glide until it hit the ground a mass of flying wreckage. ... I hate to shoot the Hun down without him seeing me, for although this method is in accordance with my doctrine, it is against what little sporting instincts I have left.[12]

McCudden, in keeping with much military practice throughout history, typically depersonalized his aerial opponents: referring to them by the generic name of 'Hun', accompanied by the type of aircraft the 'Hun' was flying. However, he did grant exceptions to this general rule. In his memoir, *Flying Fury*, he wrote almost warmly when he referred to the German fighter aces he encountered: 'The marvellous fight which Voss put up against my formation will ever leave in my mind a most profound admiration for him, and the other instances in which I have witnessed the skill and bravery of German pilots.'[13] Yet, despite his admiration for German bravery and some level of desire for a sporting fight, military efficiency in the successful application of air power took priority. McCudden was certainly aware of his own ethos as a pilot and perhaps even still retained a desire for some idealized version of it as he physically and mentally deteriorated towards the end of the war. This desire took second place, increasingly so, to his effectiveness in killing the enemy. If romance endured anywhere it was not in the minds of those pilots who achieved fame through their proficiency: they had seen, heard and experienced enough of the human cost of their military art.

11 McCudden, James T. B. (2009): *Flying Fury*. Newbury: Casemate, p. 253.
12 Ibid.
13 Ibid., p. 282.

Consider the following three questions with regard to the emergence of aircrew ethos, with reference to those early pilots: How does the personal identity of a pilot emerge? What does a pilot do? How does the pilot do it? Clearly, these three elements of ethos are interlinked, but the first – identity – has two further aspects to it: how pilots saw themselves and how others saw them. McCudden typified a self-deprecating understatedness that has become a hallmark of aircrew ethos in the RAF; in *Flying Fury*, his descriptions of his own actions are heavily factual and almost devoid of emotion or drama. On the privations of war and the mental and physical toll of combat, he wrote: 'There are times while flying when one experiences such hardship and suffering [especially from the cold] that one is inclined to say, "No more flying for me," but after passing that state one becomes keen again and the fascination of the whole thing begins afresh.'[14] In stark contrast to McCudden's mundane self-analysis, the perception of some of those soldiers and officers who looked upwards from the squalor of the trenches was that of a self-aggrandizing elite who were separated from the harsh realities of the front lines. Such a view was probably reinforced by the rising curiosity of a public that, as the war progressed, wanted to hear more and more about the pilots whose freedom of the skies was often enjoyed for the briefest period before their untimely deaths.

Major 'Mick' Mannock was accredited with destroying 50 German aircraft and was posthumously awarded the Victoria Cross (VC) on July 18, 1919. Marking the occasion, the *London Gazette* summed up his flying career and character: 'This highly distinguished officer, during the whole of his career in the Royal Air Force, was an outstanding example of fearless courage, remarkable skill, devotion to duty and self-sacrifice, which has never been surpassed.'[15] McCudden's VC citation referred to his 'utmost gallantry and skill, not only in the manner in which he has attacked and destroyed the enemy, but in the way he has during several aerial fights protected the newer members of his flight'.[16] The characteristics and skills that were attributed to Mannock, McCudden and others acknowledged the gallantry for which their VCs were conferred. The citations also created and reinforced in the eyes of fellow combatants of all branches of the armed forces and the general public the discourse of the pilot as a form of ideal warrior. Even where the dangers of combat were shared in two-seat aircraft, with very few exceptions, it was the pilot alone who was given the publicity and awards.

14 Ibid., p. 270.
15 *The London Gazette*, July 18, 1919, p. 9136.
16 *The Times*, April 3, 1918, p. 9.

No matter how many gallantry citations are read, the same characteristics are called upon repeatedly in the descriptions of the pilots and their actions: skill, duty, courage, perseverance, self-sacrifice. The common thread that connected these qualities and abilities in the eyes of the public was risk: physical danger from a combination of the enemy, the elements or the aircraft that were flown at and beyond the extremes of their technical specifications. Ferdinand West's award was not given because he attacked a large number of enemy fighters; pilots on both sides regularly carried out such actions. West was recognized because he fought on in extreme pain, overcoming the limitations placed upon him by the wounds he sustained.[17] Similarly, George Barker was awarded the VC for sustained attacks against the enemy despite being shot in both legs and having his left arm shattered.[18] Skill was essential in every pilot. Maintaining that skill level in spite of grave injuries and the threat of death gave rise to the myth of the pilot as some kind of demi-god, not only physically separated from those who looked up from the fields below but somehow morally transcendent as well. On such foundations was aircrew ethos built.

Reinforcing the public perception of pilots as somehow possessing extraordinary characteristics and capabilities was the disproportionately high number of awards they received, in contrast to the number given to the vast armies of soldiers who battled on the ground. The immense, anonymous wholesale slaughter that took place in trench warfare is difficult to comprehend but provides an important backdrop to the recognition given to those who flew overhead. From a twenty-first–century viewpoint, where individual losses in Afghanistan feature regularly in both broadcast and print media, the numbers involved in World War I are almost too great to imagine. In one week in the Ypres Salient, only one element of the Ypres land campaign, two million artillery shells were fired by the British Army, 3,000 soldiers died and 14,000 were wounded.[19] The scale of the losses and the nature of the fighting, as well as provoking questions about tactics, morality, morale and leadership, caused problems when it came to the award of decorations. How could one or two individuals out of 500 be set apart from those who shared their risks, privations and horrors?

The war in the air, in contrast, provided the canvas upon which reputations and legend could be written. Even Trenchard publicly declared (against his

17 *The London Gazette* (Seventh Supplement), November 5, 1918, p. 13190.
18 *The London Gazette* (Second Supplement), November 30, 1918, p. 14203.
19 Winter, Denis (1982): *The First of the Few*. London: Allen Lane, p. 132.

private disregard for the aces): 'Albert Ball was the most audacious, the most skilful and most marvellous pilot in the RFC. Every pilot in the corps considered him the perfect model and strove to imitate him.'[20] Lord Rothermere, the Air Minister, on the day the RAF came into existence, went much further in extolling aircrew, enhancing and endorsing their already burgeoning and unrealistic legend. He wrote an article entitled 'British Airmen's Daring', where he eulogized the outstanding bravery of 'the British flying man', going as far as to say that the pilots of the Royal Flying Corps (RFC) and Royal Naval Air Service (RNAS) had rewritten the definitions of bravery and daring.[21] Going further, the remarkable deeds of these airmen and their successful attacks on 'the Hun' were attributed to a combination of 'perfect physique, of matchless bravery, [and] of extraordinary quickness of brain'.[22]

Lord Rothermere's short article used the word 'bravery' four times and referred to the airmen as 'supermen'. The breathless tones in his description of aerial derring-do would appear more at home in a romantic novel than in a ministerial message published in *The Times*. Airmen were not only physically set apart from their fellow combatants by their ability to take to the skies, but they were metaphorically set apart as being somewhat extraordinary. The emergence of aircrew ethos took on a dynamic that was beyond the control or the desire of those who flew in battle. Public perception and the shaping of public perception in political and military discourse resulted in a 'reality' that did not match the experience of the aircrew in the war in the air. Since millions of people vicariously shared in the public 'reality' and only thousands knew what it was like to fly in combat, the perceived reality morphed into actual 'reality' over time. This process was helped by a wilful determination to maintain the myth, the legend of the supermen. Politicians and military leaders increasingly wanted it, the public wanted it and at least some proportion of flyers revelled in it.

How could anyone live up to the words of the Air Minister? For all the lack of realism in the tone of his article – it should be borne in mind that he was also fighting a propaganda war at the time – the foundation of aircrew ethos was set by the end of World War I and it would prove remarkably durable. Perhaps more interestingly, since Lord Rothermere was writing on April 1, 1918, aircrew ethos was already clearly established *by the time the RAF was*

20 Ibid., p. 133.
21 *The Times*, April 1, 1918, p. 8.
22 Ibid.

*formed*, being brought into the new organization from the RFC and RNAS. The essential elements of ethos that were set out previously – What is the identity of the pilot? What did he do? How did he do it? – were all present in Rothermere's statement. The pilot's identity as the brave superman of extraordinary physique and intelligence brought him affection from the public and envy from the trench-bound Tommy. He 'strafed the Hun', contested aerial duelling, reconnoitred enemy territory and dropped bombs, all with remarkable skill, endurance in the face of physical and mental injury, determination and cunning – usually until he died doing so.

## Fighters and Bombers

After the Great War ended, aircrew ethos altered little over the decades, fliers and adoring public alike still preferring the legends to the harsh realities of policing the empire with scarce resources. If there was any risk of pilots in particular falling from public favour as the most adored and romantic of combatants, then World War II confirmed their places, *in perpetuity*, in the pantheon of military heroes. Over the summer of 1940, another generation of young men took to the skies in their Hurricanes and Spitfires to stave off the German quest for air superiority that was intended as a prelude to an invasion of the United Kingdom. Early in World War II, Churchill and the government sought to use any means to boost public confidence and morale at a time when a country under siege needed both hope and heroes. Fighter pilots provided an ideal point of focus and optimism. Gallantry awards continued to be publicized as public perception of the pilots slipped straight into the stereotypes of the past. The VC citation of Flight Lieutenant James Nicolson captures his efforts as the Battle of Britain approached its most intense period:

On 16th August, 1940, Flight Lieutenant Nicolson's aircraft was hit by four cannon shells, two of which wounded him whilst another set fire to the gravity tank. When about to abandon his aircraft owing to flames in the cockpit he sighted an enemy fighter. This he attacked and shot down, although as a result of staying in his burning aircraft he sustained serious burns to his hands, face, neck and legs ... this incident shows that he possesses courage and determination of the highest order ... he displayed exceptional gallantry and disregard for the safety of his own life.[23]

23 *The London Gazette*, November 15, 1940, p. 6569.

Aircrew ethos was perpetuated on the basis of the same characteristics and actions upon which it had been founded almost three decades earlier: skill, duty, courage, perseverance and self-sacrifice in the context of extreme physical risk. Seventy years after those immortalized aerial duels, Geoffrey Wellum, a former World War II Spitfire pilot, recalled the challenge they faced. "The effort that was being put in by the Germans and the Luftwaffe – they weren't doing it for fun and we had to stop them. That was the important thing. Not whether Jim shot down ten and Bill shot down one and poor old Sid didn't get any. It didn't matter who shot down what. It never worried me, these Germans were up to no good and they HAD to be stopped."[24]

Wellum's stark account dispensed with the romantic notions that meant so much to those who observed the pilots' actions from afar, his realism encapsulated in a single imperative: "they had to be stopped." As a combatant his emphasis was on repelling wave after wave of attack with consideration of the individual personalities or opinions of the pilots almost irrelevant. There was certainly no place for gentleman duelers. Patrick Bishop sums up the seriousness of the situation early in the war: 'Of the 2,917 men who fought in Fighter Command in the air battles of the summer of 1940, 544 were killed.'[25] On September 15, 1940, as the period commonly recognized as the Battle of Britain came to a close, Churchill reinforced the legend of the fighter pilot even further with his immortalized words: "Never in the field of human conflict has so much been owed by so many to so few."[26]

While the pilots of Fighter Command took their plaudits, the war progressed on multiple fronts, with Bomber Command aircraft able to strike directly against Germany. The dangers faced by the bomber crews took a different form to those faced by their fighter counterparts. Instead of repeated, short, intense high-speed encounters, they had to endure up to eight hours' flying over occupied territory and Germany. The constant threats posed by mechanical failure, icing, anti-aircraft batteries and interception by Luftwaffe fighters led to its aircrew suffering the highest attrition rates of any arm of the British forces. The comparative dangers also resulted in 23 VCs being awarded to Bomber Command and only one to Fighter Command. However, the extreme dangers and the associated high possibility of death or forced landing

24 Wellum, Geoffrey (2011), Interview with John Sergeant in 'The Spitfire: Britain's Flying Past', BBC2 September 22, 2011.
25 Bishop, Patrick, *Fighter Boys: The Battle of Britain, 1940*. New York and London: Viking, p. 398.
26 Churchill, Winston, September 15, 1940, quoted in Hart, Liddell, *History of the Second World War*. London: Pan Books Ltd, p. 107.

and imprisonment were not sufficient to deter those who waited to sign up for the riskiest of duties. What the Bomber Command offensives contributed to aircrew ethos was an emphasis on duty, the bearing of personal danger and a willingness to project air power with extreme prejudice in support of military and political ends: to do what needed to be done as proficiently as possible. Any thoughts of romance were firmly quelled by the deadly realities of bomber operations, whether they were called precision bombing, area bombing, carpet bombing, saturation bombing or any of the other euphemisms that were used.

What the bombers did – try to defeat Germany and its Nazi regime – took priority over the personal feelings of the aircrew and whatever preconceived notions of what it was to be an aviator. It also took precedence over their views of the means they used: the destruction of large swathes of German cities with the associated burning and death of child, shopkeeper, firefighter and munitions maker alike. Mark Wells summed up the character and achievements of the bomber crews: 'British airmen of Bomber Command ... faced a daily routine that pointed to the inevitability of combat death. Their response, which was to cling together, overcome their fears and to go on, is a tribute to man's ability to survive almost any hardship.'[27] Having explored a number of historical aspects of the emergence of aircrew ethos, the chapter now turns to examine how the ethos of UAV crew has emerged in recent years as they have operated the Reaper in combat operations.

## Closer at a Distance

In an era of instant global communications via the Internet, 24-hour scrolling TV news and an increasingly sensationalist print media, the line between perception and reality in the domain of war is as blurred as it has ever been. Once a 'narrative' has been established in public discourse and a widespread degree of acceptance achieved, it becomes almost impossible to subvert or change it. On the one hand, this means that no matter how many revisionist books are published about the Battle of Britain, they are unlikely at this stage to cause any major shift in the public's view of what took place. On the other, it is very difficult to transform negative impressions, and much of the public discourse

27 Wells, Mark, K. (2000): *Courage and Air Warfare: The Allied Aircrew Experience in the Second World War*. London and Oregon: Frank Cass & Co Ltd, p. 132.

surrounding the use of the Reaper in Afghanistan has negative connotations. Consider these contrasting newspaper stories concerning two events that took place in March 2011:

'RAF Top Guns launch Libya raids'

– BRITISH Top Guns last night launched a series of precision bombing raids on Colonel Gaddafi's armoured vehicles as they were poised to attack civilians.[28]

'Afghan civilians killed by RAF drone'

– Four Afghan civilians were mistakenly killed and two others injured in an attack by a remotely controlled RAF 'drone' targeting insurgent leaders in Helmand province.[29]

The first story was illustrated by a photograph of an RAF Tornado GR4 and went on to discuss 'guided Brimstone missiles', describing how they were used in 'precision bombing raids' against military targets, all with the aim of saving civilian lives. The article referred to 'the "herculean" efforts of our brave crews', a reference that could have come from a government description of aircrew in either of the world wars. The piece concluded by highlighting the risk to the personnel involved, mentioning 'the wreckage of a US F-15 fighter that crash-landed in Libya'.[30]

The second story appeared alongside a photograph of a US Air Force (USAF) Reaper taken in a hangar at Creech Air Force Base, Nevada. The accompanying article referred to Afghan civilians being mistakenly killed as a result of poor intelligence on the ground. The basing of the crew in Nevada was discussed before a journalistic link was made to the Central Intelligence Agency (CIA) operating 'drones' in Pakistan. The repeated use of words like 'drone', 'unmanned drone' and 'remote-controlled aircraft' implied the de-humanizing or de-personalizing of combat operations and the taking of life. The

28 *The Sun*, March 24, 2011, p. 1, located at http://www.thesun.co.uk/sol/homepage/news/3487789/RAF-jets-launch-raids-in-Libya.html, accessed September 28, 2011.

29 *The Guardian*, July 5, 2011, p. 1, referring to an incident on March 25, 2011, located at http://www.guardian.co.uk/uk/2011/jul/05/afghanistan-raf-drone-civilian-deaths, accessed September 28, 2011.

30 *The Sun*, March 24, 2011, p. 1.

article quoted Chris Cole, from the Drone Wars UK website, who stated: 'The secrecy and lack of accountability surrounding the use of British armed drones is a matter of great concern.' Perhaps not surprisingly, given that the deaths of four civilians were being reported, the tone of the item was sombre. Notably, however, in contrast to the description of the Tornado strike, the Reaper, its *modus operandi* and its aircrew were described in an almost entirely negative light.

When these stories are juxtaposed in this way, the difficulty of developing a UAV aircrew ethos with which the pilots and sensor operators can identify *and to which the public can relate* becomes clearer. The consistently negative tone applied to remotely piloted aircraft systems and those who operate them also has implications for the way this particular capability is viewed both by other branches of the armed forces and by the crew themselves. The most commonly identified feature of Reaper operations in current public discourse is that they are operated from Nevada (though with the addition of No. 13 Reaper Squadron at RAF Waddington in the United Kingdom), with an emphasis on the physical separation of the operators from the battlefield in Afghanistan. The implication is that they are not sharing the operational risks that are being faced by those on the battlefield below or the inherent risks involved in flying a fast-jet low and fast over hostile territory.

The nature of remote operations highlights one problematic area for the ethos of pilots and sensor operators: aircrew ethos, as described earlier, has always been built on the bedrock of courage in the face of danger or death and the capacity to perform at a high skill level under great pressure or whilst injured. Therefore, what is UAV aircrew ethos built upon in the face of only minimal, irregular threat from the enemy? In addition, the generalization about the absence of risk cannot be extended to those pilots who carry out the visual take-offs and landings of UAVs within an area of combat operations such as Afghanistan.

I have explored this issue at length with a number of UAV pilots and sensor operators, some of whom previously operated the Predator or Reaper and some of whom continue to do so. The opening question that I have asked every one of them is: 'When asked, how do you describe what you do in the RAF?' Those who transferred from piloting another aircraft type – Tornado, Harrier, Hercules – gave almost identical answers that can be summarized thus: 'I am a pilot who now flies the Reaper', as opposed to 'I am a Reaper pilot'. (In contrast, one of their colleagues was very clear in his identification with the UAV type: 'I describe myself as a Reaper Sensor Operator.')

The emphasis of the replies was on 'pilot', with Predator or Reaper added

on as appropriate. The reasons given for this emphasis varied and included the following: the kudos associated with being an RAF pilot, a preference for manned flight and not having a real choice about transferring to Reaper when another aircraft type was taken out of service. All the exchanges also addressed the preconceptions of the pilots themselves as they moved into this new and rapidly developing field, some of which were initially very negative. Interestingly, they also spoke of being 'convinced by' the capabilities of the Reaper and its role once they started to engage in combat operations. A key motivator for this was outlined: 'In the Tornado we trained for most of the year and deployed on active operations for a few weeks each year. On the Reaper every sortie is a combat sortie.' For some, there was a clear disjuncture between how they viewed themselves ('I am a pilot [as opposed to a UAV pilot] at heart') and their enthusiasm for what the Reaper could achieve on the battlefield. Those without prior operational experience as a pilot appeared more comfortable with and confident about their identity as a Reaper pilot or sensor operator.

In *Wired for War*, Peter W. Singer explored a number of aspects of what it means to belong to a UAV squadron. On the relationship between the combatant, risk and bravery, he wrote: 'The courage of a warrior, then, is about victory over fear. It is not about the absence of fear. By removing warriors completely from risk and fear, unmanned systems create the first complete break in the ancient connection that defines warriors from their soldierly values.'[31] As far as Singer is concerned, the UAV crew is 'now fully disconnected from war'.[32] On a physical level, his argument appears unassailable. Even if a small-arms round or shoulder-launched rocket-propelled grenade happened to strike and bring down a Reaper, the immediate physical response from its pilot will be visual and limited, an acknowledgement of a blank screen where previously there had been moving images. However, while there is no danger of that round or grenade hitting the Reaper pilot or sensor operator thousands of miles away, the individuals cannot fully be said to be without a physical response. Adrenaline, the body's fuel for 'fight or flight', still surges when a Reaper crew is tasked to provide close air support to allied soldiers or marines on the ground. An overabundance of adrenaline experienced over an extended period can have a debilitating physical affect on the human body – including the brain – regardless of its proximity to war.

Peter Olsthoorn explores respect as a crucial dimension of military ethics

31 Singer, P.W. (2009): *Wired for War*. New York: Penguin, p. 332.
32 Ibid.

and makes a bold point about remote pilots and the psychological impact of physical separation from the battlefield. He writes: 'It's hard to imagine how one can respect the local population, as said a vital element of the hearts and minds approach, from, for instance, a control room in Nevada (where pilots of Predators and Reapers mostly work from). With such a distance – physical, but also psychological – between soldiers and the horrors of war, it has to be feared that killing might get a lot easier.'[33] Like Singer's similar claim about UAV crews being fully disconnected from war, intuitively, Olsthoorn's argument appears sound. How can someone thousands of miles away in a temperature-controlled environment properly engage – physically, psychologically or emotionally – with a battle in Afghanistan when they cannot feel for themselves the searing heat, taste the impenetrable dust and smell the stench of sweat and fear? When they cannot 'sense' the hostility of local tribesmen and their guts are not doing somersaults waiting for the first incoming sniper round or the deadly thump of an IED?

When I put this question to Reaper crews, including individuals who have flown missions from Nevada and also carried out take-offs and landings during operations in Iraq and Afghanistan, the consistent answer was not what I expected. While Olsthoorn's point has some merit, it should be generalized with great caution because it overlooks the counter-intuitive point. Far from providing only disadvantages, the emotional and physical separation of the remote pilot from events on the ground brings the benefit of increased objectivity. The number of available visual inputs through multiple screens provides a breadth of perspective not available to a crew travelling in a fast-jet at high speed and having to be continually rotating their heads to carry out checks, maintain spatial awareness and stay safe in the air. Furthermore, if fatigue sets in for the Reaper crew, there is always the option of being temporarily relieved and coming back to the situation rested and with renewed concentration.

Singer's and Olsthoorn's assumptions about the disconnection of UAV crews from war should be qualified further. Physical separation from the combat zone does not, for example, automatically lead to emotional disconnection. The crew of a Tornado flying at low level above an enemy contact may be *more* emotionally disengaged than the Reaper crew depending on the personalities of the pilot and weapons systems officer (WSO) and the intensity of the tasks they are carrying out in the air. This point was stressed by a Reaper

33 Olsthoorn, Peter (2011): *Military Ethics and Virtues: An interdisciplinary Approach for the 21st Century*. New York: Routledge, p. 126.

pilot who had previously flown the Tornado GR4 in combat operations. Let us consider some of the actions of the crews of these respective types of aircraft.

Many fast-jet targets are pre-planned and as long as the necessary legal authorization is granted, attacks will be carried out under the relevant rules of engagement unless a forward air controller or some other individual in the 'kill chain' highlights a change of strike parameters. However, whether it is a planned strike or a response to an in-air tasking, the fast-moving Tornado crew has only a few seconds to acquire and attack a target. Then, having hit the intended target, the aircraft will depart the scene as rapidly as it arrived, some 800–900 feet per second. Consequently, the results of the strike are not immediately seen by the pilot or WSO, sparing them the instant emotional impact of the physical destruction of life and materiel below.

In contrast, a Reaper crew can spend hours or even days confirming the identity of an enemy combatant. Long loiter times enable a pattern of life to be established in considerable and mundane detail, with meal times, prayer times, toilet habits, friends and even relatives being identified. A much greater degree of emotional engagement with an intended target becomes possible when aspects of his personality and lifestyle become familiar, in contrast to the high-speed interventions of a manned fast-jet. Consequently, as one Reaper, former fast-jet, pilot summed it up: '[UAV] targets are much more personal.' Numerous studies have been and are being undertaken to examine physical, emotional and psychological factors involved in the operation of UAVs and only the passing of time will reveal how many of their crews will develop symptoms associated with combat stress or post-traumatic stress disorder/syndrome.[34] These will eventually be compared and contrasted with the experience of their fast-jet counterparts.

The relationship between courage and risk at the heart of the emergence and maintenance of aircrew ethos since the advent of air combat in World War I has been discussed at length, and for the most part, the emphasis has been on

34 See the following examples from a large and growing body of literature: Barnes, M.J. and Matz, M.F. (1998): 'Crew Simulations for Unmanned Aerial Vehicle (UAV) Applications: Sustained Effects, Shift Factors, Interface Issues, and Crew Size.' *Proceedings of the Human Factors and Ergonomics Society 42nd Annual Meeting*, pp. 143–147; McCarley, J. S. and Wickens, C. D. (2004): 'Human factors concerns in UAV flight', located at http://www.hf.faa.gov/docs/508/docs/ uav-FY04Planrpt.pdf, accessed October 14, 2011; Trimble, Stephen (2008): 'Flying Predators Bad for Pilot's Health', *The DEW Line: 'Distant Early Warning' for the Defense Industry*, April 15, 2008, located at http://www.flightglobal.com, accessed October 14, 2011; Tvaryanas, A. P. (2006): 'Human Systems Integration in Remotely Piloted Aircraft Operations.' *Aviation, Space, and Environmental Medicine*, Vol. 77, No. 12, pp. 1278–1282.

what might be more specifically called physical courage: the ability to persevere with a high degree of skill in the face of mortal danger or physical injury. There can be little doubt that with regard to the need for physical courage, Singer, Olsthoorn and others are correct about the remoteness of Reaper crew rendering this aspect of their characters and ethos obsolete. However, there is and always has been more to the place of courage in aircrew ethos than the willingness to physically confront the dangers posed by an enemy, and that is having the *moral* courage to kill, or refrain from killing, as circumstances and rules of engagement dictate.

It is moral courage, combined with a determination to protect allied troops and kill enemy combatants while going to great lengths to avoid the unnecessary deaths of non-combatants that already provides, and will increasingly provide, the basis of the RAF's UAV aircrew ethos. An example of the seriousness with which Reaper pilots and sensor operators approach their operational art came in a candid submission to the author's research, part of which is reproduced here in full:

> I sleep soundly at night because every person that I have killed was a clearly identified enemy combatant engaged in hostile actions as described in the rules we work to. I utterly refute the concept that we are capable of reducing the taking of life to a 'play-station game' just because we are 12000 miles from the people we kill. I feel that the certain knowledge that everything we do is being watched by many others: general officers, legal advisors, operations officers, etc. in the command centre makes us more, rather than less, aware of the consequences of the actions we take. We have the capability to see (unlike in a fast-jet) the effect of our weapon strikes in relatively close-up detail. Also, if the troops on the ground take photos of the strike effects they often send them to us as feedback. No matter how explicit these photos are I personally look at them all. Not because of some voyeuristic tendency but because I believe that if you cannot face the reality of what you do in killing a human being then you should not be part of that process.[35]

The author of those words moved to the Reaper from the Tornado fast-jet, thereby giving credence to his comparison of the two roles. From the initial identification to the targeting and then the killing of enemy combatants there

35 In accordance with the assurance of anonymity that was given to those who assisted the author with his research, the quote will remain unattributed. The individual is currently serving on operations at Creech Air Force Base, Nevada.

is a clear dependence on rules of engagement, comprehensive oversight of the process and a highly developed sense of personal responsibility for the taking of life that was encountered in all the subjects of the interview. The importance of ethical conduct in personal ethos was consistently emphasized, usually in quite forceful terms: 'Ethics are paramount. To take a life when it is not necessary is an act of moral cowardice.' If that ethical standard is inculcated in every new remote pilot or sensor operator, then the ethos of that particular flying branch will be set on a sure footing for all future operations. The corollary of a general observation is that any ethos, in any armed force, which does not rest on the highest ethical standards will inexorably lead only to unconstrained violence, needless death and the moral degradation of the perpetrators.

Currently, and with a focus on the RAF, the disparate previous experience of Reaper crew members means that ethos can be more individualized than shared depending on how individuals form their own identities as aircrew. This could be especially true of pilots, with many – perhaps most – of them more closely associating themselves with aircraft that have been flown in the past than with the UAV they fly at present. This is not necessarily a bad thing, though it defers the time when remote aircrew ethos can be more commonly shared. The positive benefit is that operationally experienced aircrew, whether they are from fast-jet, multi-engined or helicopter squadrons, bring tremendous experience and air-mindedness. However, if UAVs are to provide a significant cornerstone of future RAF capability in the long term, financial strictures alone will prohibit the use of experienced aircrew from fast-jet and other squadrons. Directly recruited and trained pilots and sensor operators will probably identify more strongly with their remote airframe and an associated ethos, but they will lack the wider experience of those who pioneered this type of operational capability.

## Conclusion and Recommendations

The nature of military flight has changed greatly over the past century, with established and accepted aircrew ethos and ethics being fundamentally challenged with the advent of UAVs. The utility of weapon systems such as the Reaper should always be bounded by sufficiently stringent legal and moral frameworks – set out in Rules of Engagement, for example – to ensure the safety of non-combatants in their spheres of operations, as well as the physical and emotional well-being of their crews. In the midst of overcoming technological and operational challenges in the future, the importance of the con-

tinual embedding of ethos and ethical standards should never be overlooked. Part of this responsibility will fall on military recruitment agencies. The warnings of Singer, Olsthoorn and others cannot be conveniently ignored and air forces should consider the psychological screening of future UAV pilots and sensor operators to avoid selecting those with a stronger propensity to dissociate from the violence they observe or commit through the medium of a computer screen. Furthermore, military pilots have traditionally been recruited and trained at a young age, partly because of their propensity for risk-taking and partly for their dexterity and coordination. Consideration should be given to recruiting older pilots and sensor operators for UAVs, possibly in their late twenties or early thirties, offsetting a possible reduction in physical abilities against greater life experience and reduced capacity for risk-taking.

UAV pilots and sensor operators will never be seen as the new Knights of the Air, principally and obviously because they are not in the air. Similarly, they will not be associated with that part of aircrew ethos over the past century that was forged in battle through acts of daring, courage and self-sacrifice: the absence of risk will preclude it. However, there are aspects of historical, traditional aircrew ethos that remain highly relevant. Most of the personal aircrew characteristics highlighted earlier from World War I and World War II – skill, duty, courage, perseverance, self-sacrifice – are still relevant, albeit in modified form. The need for great skill is perhaps the most obvious, especially when fighting an asymmetric counter-insurgency where the line between combatant and non-combatant has long been blurred. In the absence of physical danger, the requirement for moral courage is as great as ever and possibly more so. Those who take life from a Reaper do so with a much more intimate sight and knowledge of their targets than others before them in combat aircraft, and with a detailed and prolonged exposure to the consequences of their actions. This was acknowledged by one Reaper pilot who wrote: 'Flying a [UAV] from across the world sounds obviously detached but, due to the nature of the targets and our persistence (we watch them for hours), I feel closer to the action than I did in a fast jet.' Others who were questioned prioritized the protecting of allied troops on the ground above the killing of the enemy, their unanimity suggesting that this 'protector' role plays a significant part in their individual and collective ethos.

UAV crews no longer face the extreme and extended exposure to the risk of death, burning or capture of their World War I or World War II airborne counterparts, but there is a deep sense amongst those who operate the Reaper that they are taking the fight to the enemy in an essential, though unglamorous, way. It is unlikely that UAV crew will be admired in the way that other

operational aircrew, particularly fast-jet aircrew, are admired today and will be in the future. However, from time to time a quiet word or the briefest email message will sum up the essence of what UAV crew do on a daily basis and an ethos built on moral courage, integrity, professionalism and ethical conduct. As one grateful Marine put it: 'Thanks guys, you got us out of trouble that time.'

# How the Use of Drones in the War on Terror Might Contribute to Violence in the Middle East

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## Introduction

When US Ambassador Christopher Stevens was killed in an attack on the US consulate in Benghazi on September 11, 2012 (what a symbolic date), President Obama's public relations people blamed a mob protesting against the film *Innocents of Muslims*. Angry Muslims were reported in the news media all over the world, and the killing of Ambassador Stevens was framed in this context.[1] However, the fact was that the killing of Ambassador Stevens was a result of a well-organized, heavily equipped al-Qaida attack on the US consulate. Pakistani media reported that it was a revenge for a drone attack in Pakistan that killed a top-ranking al-Qaida leader who went under the name "Al-Libi" (the Libyan). What then is the connection between a drone attack in remote areas in Pakistan and a well-organized al-Qaida attack on US property in Libya? The use of drones on a global scale in the war on terror is a likely connection.

Drone attacks are reported in Norwegian media as an "everyday routine". In a small news brief, it can typically look like this: "Eleven killed in Drone attack in Yemen." This was a small news article printed in *Aftenposten* on January 31, 2012. The story is based on a news item from The Norwegian News Agency (NTB). The short news brief is typical for other news stories with the main focus on al-Qaida as targets for the drones, without any mention of legal issues: "Eleven militants, among them several alleged al-Qaida leaders were killed in a drone attack in Yemen the night before Tuesday, local inhabitants

1 NRK *Dagsnytt*, September 12, 2012.

inform. (…) [I]t is not known who's behind the attacks, but U.S. is known to have used drones in earlier attacks."

In a comparative study I have done covering drones in *The New York Times* and *Aftenposten*, the same pattern of routine reports of drone attacks as an ordinary "everyday event" occurred in both *Aftenposten* and *The New York Times* on a regular basis.[2]

The framing of drones in *Aftenposten* and *The New York Times* is mainly seen from "our perspective".[3] As this can also be seen as part of the international war against terrorism where Norway's own security is involved, it seems fair enough. Who would argue against preventing new terrorism attack through preemptive attacks on these "evil-doers"? What is not asked in this and similar articles are questions like the following: Can we be sure that the victims are al-Qaida activists? Are these attacks legal? Are there any innocent civilians harmed by the attack? What are the long-term consequences of this kind of warfare? What do these attacks look like at the receiving end?

To approach these questions, let us start by looking at how the same event was reported in the media in Yemen. After all, the assumption from Oslo and Washington seems to be that the people of Yemen and the Western countries have a mutual interest in fighting terrorism. Therefore, the people of Yemen should be grateful, or are we missing something here? The headlines in *Yemen Times* covering the same event read thus: "American drone strikes provoke Yemenis against Interim Government."[4]

The lead goes like this: "ABYAN, Feb. 1 — Many Yemenis, and especially those in Abyan governorate, are blaming the new government for a loss of sovereignty after a US drone strike killed 11 Al-Qaeda members on Yemeni soil on Monday."

Why is this newspaper blaming the government? This may be partly because the national pride is hurt when the Yemini government allows an attack by foreign powers on its own soil, and partly because of what is referred to as "collateral damages". What if other than al-Qaida supporters are killed in the attack? What about innocent civilians? If we return to the article in *Yemen Times*, we might get some answers:

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2 The study covers the use of drones in *The New York Times* and *Aftenposten* in the period January 1–July 1, 2012, presented in Ottosen, Rune (2012): "Reporting on the legal aspects of the use of drones in international conflicts. A case study of covering the use of drones in *Aftenposten* and *The New York Times*.» Paper presented to International Peace Research Association, Mie University Japan, November 24–28, 2012.

3 Examples of exceptions are several critical letters to the editors in *The New York Times* and commentary articles in *Aftenposten* with the title "U.S. Criticized by UN», published on June 22, 2012 and an editorial with criticism on June 24, 2012.

4 *Yemen Times*, February 2, 2012.

> The drones fired four missiles; two exploded and the remaining two are still "active" and "may explode at any time", eyewitnesses – who have been present for such strikes in the past – told the *Yemen Times*. The missiles hit 50 meters away from the nearest village. (…) "Three Al-Qaeda leaders are confirmed to be dead, while another two were wounded" said Amr Al-Tammah, a cameraman who was working in the area at the time of the attack. He said that the other six were members of Al-Qaeda.[5]

But the main target seems to have escaped:

> The *Yemen Times* has learned that Naser Al-Wahaishi, the leader of Al-Qaeda in the Arabian Peninsula, was not among the dead. Al-Tammah told the *Yemen Times* that the first strike happened at 10:45 PM at Imkhader village. The strikes targeted a vehicle belonging to the group; the first attempt missed, while the second strike successfully struck the target.[6]

From this we learn that even though drones are regarded as weapons of precision, they do miss sometimes, and what do they hit then? According to *Yemen Times*: "[T]he attack took place in the desert where locals usually play football, said Al-Tammah, a cameraman who happened to be in the area." According to *Yemen Times*, one of the reasons there were massive protests against the government in Yemen last year was because of the government's record of allowing the United States to take military actions on Yemeni soil as part of their counter-terrorism strategy. A local leader talks of the humiliation because the government is unable to protect Yemen's sovereignty:

> "It's frustrating that the National Unity government could not keep Yemeni sovereignty on Yemeni air and land, but they do face big challenges (...) it is early to blame them", said Mohammed al-Said, Abyan local council member. Al-Said added however that the council can't offer any reassurances to Abyan citizens that such strikes won't hit them or that their lives are safe. "The local council has been marginalized for six months now as a result of the governorate's security situation. One of the threats in the area is these drone strikes", he said.[7]

5 Ibid.
6 Ibid.
7 Ibid.

As Al-Jumahi elaborates on the argument, he suggests that the drone attacks might have the opposite function of the intended fight against al-Qaida's influence:

> For his part, Al-Jumahi warned that American drone activity could allow terrorist groups to grab public sympathy fast, allowing them to recruit more members. The military attacks against these groups will help in eliminating two or three or even ten terrorists, but on the other hand will provide the militant groups with acceptable excuses for being in the area. This will make people stand on their side and picture the situation as an American invasion of Yemen.[8]

He explained that the groups will take advantage of public panic and will make recruitment efforts, convincing people that they will die anyway because of air strikes and that it's better to die as martyrs, fighting on their side. Then there is the issue of innocent people being hit by the drones: "They could easily convince people to fight with them, especially as the American drone strikes frequently hit civilian locations such as mosques", he added. Thus, seen from the ground in Yemen, this is not just an issue of fighting the al-Qaida.

## Living Under Drones

The most comprehensive documentation of the effect of drones came through the report "Living Under Drones", published by the Stanford University International Human Rights and Conflict Resolution Clinic at the University of Stanford and the Global Justice Clinic of the New York University School of Law. On several points, they underline the seriousness for the civilian population in those areas most affected by drones:

> First, while civilian casualties are rarely acknowledged by the US government, there is significant evidence that US drone strikes have injured and killed civilians. In public statements, the US states that there have been "no" or "single digit" civilian casualties. It is difficult to obtain data on strike casualties because of US efforts to shield the drone program from democratic accountability, compounded by the obstacles to independent investigation of strikes in North Waziristan. The best currently available public aggregate data on drone strikes are provided by *The Bureau of Investigative Journalism* (*TBIJ*), an independent journalist organisation. *TBIJ* reports that from June 2004 through mid-Septem-

8 Ibid.

> ber 2012, available data indicate that drone strikes killed 2,562–3,325 people in Pakistan, of whom 474–881 were civilians, including 176 children.[9]

While the press regularly reports on al-Qaida suspects being killed in drone attacks in Pakistan, Yemen or Somalia, the consequences for the civilian population are mostly ignored in the everyday news reporting. The Report "Living under drones" shows how innocent civilians pay the highest price:

> US drone strike policies cause considerable and under-accounted for harm to the daily lives of ordinary civilians, beyond death and physical injury. Drones hover twenty-four hours a day over communities in northwest Pakistan, striking homes, vehicles, and public spaces without warning. Their presence terrorizes men, women, and children, giving rise to anxiety and psychological trauma among civilian communities. Those living under drones have to face the constant worry that a deadly strike may be fired at any moment, and the knowledge that they are powerless to protect themselves. These fears have affected behavior. The US practice of striking one area multiple times, and evidence that it has killed rescuers, makes both community members and humanitarian workers afraid or unwilling to assist injured victims.[10]

While strategic theories are being debated, some important features of US strategy in the Indian Ocean are raised by David Brewster, who predicts there will be a change in the nature of US power projection in the region. This could involve much greater reliance on the US Navy and much less on ground forces. Perhaps the use of drones is meant to replace the military muscle traditionally upheld by ground forces. Another issue related to the United States–China rivalry is the case of whether the Chinese too will adapt the drone technology in the short run.[11]

In a recent report on the US drone policy, senior analyst Micah Zenko of the Council on Foreign Relations (CFR) wrote that America's monopoly in the use of drone attacks will be weakened in the course of the next decade. Earlier in January 2012, *The Guardian* wrote that border issues between China and Japan have stepped up a drone race between the two countries. China and

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9 International Human Rights and Conflict Resolution Clinic, Stanford Law School and Global Justice Clinic, NYU School of Law (2012): *Living Under Drones. Death, Injury, and Trauma to Civilians from US Drone Practices in Pakistan*, issued September 2012. See http:livingunderdrones.org, accessed October 4, 2012.

10 Ibid., p. vii.

11 Brewster, David (2012): *The Interpreter*, June 26: http://www.lowyinterpreter.org/post/2012/06/26/US-strategic-thinking-about-the-Indian-Ocean.aspx, accessed August 15, 2012.

Japan say the purpose is merely to conduct surveillance of the archipelago.[12] In November 2011, the Chinese on an arms exhibition turned up eight new drone models, but it is highly uncertain if they are operative. Two of the models that were showcased at the exhibition in Zhuhai, the CH-4 and the Wing Loong, should have emerged as clones of US Reaper and Predator drones, which are often used in attacks on al-Qaida targets. A model called Xianglong ("Floating Dragon") looks like the Global Hawk. A notorious drone that was displayed was Anjian ("Dark Sword"), which allegedly could carry weapons and possessed stealth features that made it difficult to detect on radar.

According to Chinese state media, there are plans to build eleven drone bases along the Chinese coast in 2015. Andrei Chang, editor in chief of the online magazine *Kanwar Defence Review*, asks whether China's goal is to conduct reconnaissance missions as far away as the Pacific Guam, one of the US military footholds in Obama's Asia strategy.[13] Of course, this brings up the issue of what the Pentagon's answer to this development might be. One question is whether the United States is losing the advantage of having a monopoly on the technology (shared with the United Kingdom and Israel). What if China in the future uses drones against "their terrorists" in other countries? Or even worse, what if terrorist groups like the al-Qaida could obtain the technology? David Wood in *The Huffington Post* put this issue on the table in a recent article. He referred to Retired Admiral Dennis Blair, who served as President Obama's first director of national intelligence, who told reporters that he was concerned that the proliferation of armed drones – a potential outgrowth of the US reliance on drones to attack and kill terrorists – could well backfire:

> "I do fear that if al-Qaeda can develop a drone, its first thought will be to use it to kill our president, and senior officials and senior officers", Blair said during a conference call with reporters. "It is possible without a great deal of intelligence to do something with a drone you cannot do with a high-powered rifle or driving a car full of explosives and other ways terrorists now use to try killing senior officials", he said.[14]

12 *Klassekampen*, January 24, 2012.
13 Ibid.
14 Wood, David (2013): "Armed Drones Could Target President: Former U.S. Intelligence Chief», *Huffington Post*, January 22: http://www.huffingtonpost.com/2013/01/22/armed-drones_n_2527242.html, accessed January 29, 2012.

## US Armed Forces and CIA

One of the concerns of the use of drones expressed by Greg Miller in *Washington Post* is the process that has partly removed the traditional border between the CIA and the US Armed Forces. Using Yemen as a case, Miller points out that the air strikes in Yemen in 2012 have been split fairly evenly between operations carried out by CIA Predators and those conducted by Joint Special Operations Command (JSOC) using drones as well as conventional aircraft. The CIA for a long time has pushed for an expansion of the targeting rules in Yemen, seeking to replicate aspects of its drone campaign against the al-Qaeda in Pakistan. According to Miller, President Obama gave in to the pressure and authorized the agency and JSOC to carry out strikes based on patterns of suspicious behavior, even when the identities of those who would be killed was not clear.[15]

## The Drones – Some Background

In 2001, the United States began arming unmanned aircraft systems (UAS) or drones with missiles. They were used in battle for the first time early in October 2001. One of the first known controversial uses of drones was in Yemen in 2002, when named individuals were killed. It has later been known that the US Air Force refused to carry out that operation and the CIA took over the operation in cooperation with the White House.[16] Drones have been used in Iraq and in Pakistan since 2004. The number of attacks on Pakistan increased dramatically in 2008 and continued to climb in 2009. The number of drone attacks doubled between 2009 and 2010 and became a key element in the warfare against the al-Qaeda and the Taliban. By May 2012, Obama had ordered 268 attacks with drones, three times as many as George W. Bush during his whole presidency. According to the researcher Micah Zenko, more than 3000 claimed terrorists have been killed by drones and as many as 400 civilians have been killed as "collateral damage" by January 2013.[17] In January 2012,

15 Miller, Greg (2012): "U.S. Drone Targets in Yemen Raise Questions», *Washington Post*, June 3: http://www.washingtonpost.com/world/national-security/us-drone-targets-in-yemen-raise-questions/2012/06/02/gJQAP0jz9U_story.html, accessed September 4, 2012.

16 US Congress (2010): *Rise of the drones: hearing before the Subcommittee on National Security and Foreign Affairs of the Committee on Oversight and Government Reform*. ONE HUNDRED AND ELEVENTH CONGRESS SECOND SESSION APRIL 28, 2010, Serial No. 111–120.

17 Zenko, Micah (2013): "Reforming U.S. Drone Strike Policies. Council of Foreign Relations», *Special report* No. 65, January 2013.

President Obama made a rare acknowledgement of the use of drones during a video chat on Google+. He said that the drone strikes were a "targeted focused effort at people who are on a list of active terrorists".[18] He also asserted that the strikes targeted the "al-Qaeda suspects who are up in very tough terrain along the border between Afghanistan and Pakistan".

A legal reference to the use of drones came when US State Department legal adviser Harold Koh, on March 25, 2010, stated that drone strikes were legal because of the United States' right to self-defence. The argument was much the same as was used to justify the attacks on Afghanistan in 2001. During a hearing in the US Congress in April 2010, several legal experts stated that the use of drones was illegal unless a war was declared against the country targeted. The official self-understanding in the US government is that since the country is involved in armed conflict with the al-Qaeda and Taliban, drones can be used as a means of force because of the right to self-defence under international law.[19]

## The Legal Dispute

Some US politicians have condemned the drone strikes, among whom is US Congressman Dennis Kucinich. He has used the argument that when attacking countries that have never attacked the United States, the drone attacks are violating international law.[20] Professor Rosa Brooks at Georgia University has argued that the use of drones makes it impossible to distinguish between legal and illegal warfare.[21]

Pakistan has repeatedly protested against the drone attacks and claims that the attacks are an infringement of Pakistan's sovereignty. It has angered the government in Pakistan that many civilians, including women and children, have been killed in the drone attacks.[22] The repeated drone attacks have created an atmosphere of fear and uncertainty in the countryside in parts of Pakistan. One example is from a village in Waziristan where the inhabitants

18 Quoted from Amnesty International (2012): "USA Urged to Clarify Basis for Drone Killings in Pakistan.» http://www.amnesty.org/en/news/usa-urged-clarify-basis-drone-killings-pakistan-2012-01-31, accessed August 15, 2012.

19 US Congress (2010), ibid.

20 Beer, Lydia de (ed.) (2011): *Unnamed Aircraft Systems (Drones) and Law*. Nijmegen: Wolf Legal Publishers.

21 *Aftenposten*, June 4, 2012.

22 *The New York Times*, April 29, 2012.

no longer meet in their traditional building for council meetings after March 17, 2011, when a group of people met to solve a local dispute. At eleven o'clock in the morning, the building was struck by a hellfire rocket fired from an unnamed drone, killing 50 people. Among the killed was Din Mohammed, a father of two who made a living by selling minerals from the mine. When his father came to the building, he saw bodies scattered around. These facts have been documented in a lawsuit from the Pakistani human rights organization "Foundation for Fundamental Rights". This and other human disasters might occur because CIA sometimes relies on false intelligence from informers who want to make some easy money.[23]

## Amnesty International Worried

In May 2005, Amnesty International (AI) called upon the United States to stop all operations aimed at killing suspects instead of arresting them and putting them on trial. In January 2006, AI referred to Israel's targeted killings by drones as "extrajudicial executions/assassinations" and expressed concern that the new practice of the United States would create a spiral of violence in the future.[24] In January 2012, after Obama's public statement, AI again expressed its concern and called for the United States to monitor civilian casualties inflicted by drone attacks in Pakistan.

"The US authorities must give a detailed explanation of how these strikes are lawful and what is being done to monitor civilian casualties and ensure proper accountability", said AI's Asia-Pacific director, Sam Zarifi.

"What are the rules of engagement? What proper legal justification exists for these attacks? While the President's confirmation of the use of drones in Pakistan is a welcome first step towards transparency, these and other questions need to be answered."[25]

23 Kibar, Osman (2012): "Dronene kommer», *Dagens Næringsliv*, July 7.

24 Quoted from de Beer (2011), p. 31.

25 Quoted from Amnesty International 2012. «USA urged to clarify basis for drone killings in Pakistan». http://www.amnesty.org/en/news/usa-urged-clarify-basis-drone-killings-pakistan-2012-01-31 accessed August 15, 2012.

## United Nations Concerned

In May 2010, Philip Alston, professor in law at New York University, serving as the United Nations' (UN) Special Rapporteur on Extrajudicial Summary or Arbitrary Execution, published a report for the UN General Assembly. Here the issue of drones is discussed. It is not stated clearly that the use of drones to target individuals is illegal, but that he finds it a "highly problematic blurring and expansion of the boundaries of the applicable legal framework – human rights law, the laws of war, and the law applicable to the use of inter--state force".[26] In his report, Alston concludes that states using drones have a commitment to specify the legal basis for them every time they are used. This transparency is a key point to his conclusion where he states the following:

> They (these states that the authors remark) should specify the bases for decisions to kill rather than capture. They should specify the procedural safeguards in place to ensure in advantage of targeted killings that they comply with international law, and the measures taken after any such killing to ensure that its legal and factual analysis was accurate and if not, the remedial measures they would take. If a State commits a targeted killing in the territory of another State, the second State should publicly indicate whether it gave consent, and on what basis.[27]

Obviously, this has not been respected in the case of the United States' use of drones in Pakistan.

The report also concludes that it should be documented publicly how many civilian people have been killed in each attack and that measures should be taken to avoid such casualties.[28] Ben Emmerson, a UN special rapporteur, said in a speech to Harvard law school during the president's campaign in 2012 that the UN will set up a dedicated investigations unit in Geneva early in 2013 to examine the legality of drone attacks in cases where civilians are killed in so-called targeted counter-terrorism operations. He also condemned secret rendition and water-boarding as crimes under international law. His forthright comments, directed at both US presidential candidates, will be seen as

26 Beer (2011), p. 34.
27 Ibid.
28 Alston, Philip (2010): *Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions. Report to UN*. Available at: http://www.ohchr.org/EN/Issues/Executions/Pages/SRExecutionsIndex.aspx, accessed January 5, 2012.

an explicit challenge to the methods used by the United States in the global war on terror.[29]

## United States–Pakistan Relations

Several drone attacks which have caused civilian casualties have damaged the relation between the United States and Pakistan. The drone attacks are deeply unpopular in Pakistan, where it is estimated that as many as 3000 people have been killed. In May 2012, drone attacks demolished a mosque in Mir Ai Bazar, a village in the North Waziristan tribal area bordering Afghanistan. Local officials reported that the unmanned plane fired two missiles demolishing the building, leaving 10 dead and several others wounded. Many people have been killed in attempts to rescue others from hit buildings, thus becoming casualties of a second attack.

Pakistan's Foreign Office condemned these drone strikes, describing them as a "total violation" of Pakistani territory and sovereignty. Foreign Office spokesman Moazzam Khan characterized the US attacks as "illegal violations of international law and unacceptable". Asked by a reporter why Pakistan did not bring the matter to the UN, Moazzam stressed that Islamabad wants "to resolve the issue bilaterally". He described US–Pakistani ties as "an important relationship" and stressed that there is "a mutual desire" to reach an agreement between the two countries. While the Zardari government has long issued public condemnations of the drone strikes, it has previously offered its tacit collaboration, going so far as to allow the CIA to launch the pilotless aircraft from a landing strip inside Pakistan. Following the strikes of November 2012 on the Pakistani border posts, it forced the closure of this facility.[30]

The very idea that the drones are efficient weapons in the so-called global war on terror (GWOT) has been challenged both by opposition groups and politicians in Pakistan because of all the civilian casualties. Pakistan's UN ambassador Zamir Akram put it thus: "[Drones] are working against the purpose (to kill terrorists)".[31] Akram also said that "[w]e find the use of drones to be totally counterproductive in terms of succeeding in the 'war against terror'. It leads to greater levels of terror rather than reducing them".

29 *The Guardian*, October 25, 2012.
30 Alston (2010).
31 Siddique, Qandel (2012): "Våre diskre krigsforbrytelser», *Klassekampen*, September 8.

## US Congress Debate on Drones

In a report from a hearing in US Congress on April 28, 2010, several of the principle issues involved in the use of drones were discussed. The hearing was lead by Congressman John F. Tierney, representing the Democrats from Massachusetts from the subcommittee on national security and foreign affairs

The minutes of the congress hearings picked up on legal issues. One of the guest speakers was Kenneth Anderson, Professor of law at American University in Washington, who criticized the administration and its senior lawyers for not having expressed any views as to the legality of the use of drones and targeted killing practices. Anderson addressed the question of whether this is extrajudicial execution, and hence in violation of international treaties and covenants and the role of CIA:

> So let me bring this to a close by saying that the discussion that we are having is really the discussion about the lawfulness of the CIA using this kind of weapons outside of traditional battlefields. And that if for any reason that is considered not to be OK, that is considered to be criminal, that is considered to be a war crime, somebody had better tell the CIA about it, somebody had better tell the President about it, somebody had better tell the Vice President about it. Because they are all enthusiastic participants in this.[32]

Although there were disagreements on several issues most of the legal experts seemed to agree that there was no legal basis for CIA to operate the drones. The professors Mary Ellen O'Connell, David Glazier and Kenneth Anderson all agreed that the international law regulating the battlefield does not give the combatants privilege to kill without warning and not face prosecution to persons who are not members of the regular armed forces of a country, who are not under military discipline in a chain of command and who are not trained in the law of armed conflict.

## Conclusion

In the debate on the use of drones in the international community, there seems to be a large degree of consensus that the way the United States uses drones in the GWOT represents a violation of international law and human rights. This article started with a discussion of the similarities in everyday reporting

32 Ibid.

on drones in *The New York Times* and *Aftenposten* as routine events. There is one big difference between the two of them. *The New York Times* during the period of investigation printed several critical letters to the editor. In one of them, former US President, Jimmy Carter, claims that the use of drones represents a violation of the UN declaration of Human Rights.[33]

He argues that the US government, instead of strengthening the principles in the declaration, is by using drones "clearly violating at least 10 of the declaration's 30 articles, including the prohibition against 'cruel, inhuman or degrading treatment or punishment'". Carter refers to the ongoing practice of the use of drones in Pakistan, Somalia and Yemen. He then expresses his concern about the many civilians suffering from these attacks:

> These policies clearly affect American foreign policy. Top intelligence and military officials, as well as rights defenders in targeted areas, affirm that the great escalation in drone attacks has turned aggrieved families toward terrorist organizations, aroused civilian populations against us and permitted repressive governments to cite such actions to justify their own despotic behavior.[34]

The experts invited to speak in the US Congress quoted earlier seem to agree with Jimmy Carter that the present use of drones cannot be justified. Eventually, the Obama administration has responded to the criticism by announcing that a new set of guidelines will be implemented after criticism from Micah Zenko, the author of *Reforming US Drone Policies*. Zenko warned that not to address the legal and moral issues by using drones would backfire at the US policy. Among Zenko's recommendations were the following:

The relevant Senate and House committees in the US Congress should

> Demand regular White House briefings on drone strikes and how such operations are coordinated with broader foreign policy objectives, in order to hold the executive branch accountable for its actions. Further:
> Hold hearings with government officials and non-governmental experts on the short- and long-term effects of U.S. targeted killings.[35]

If these and some other recommendations were not respected, Zenko suggested that the US Congress should "withhold funding and/or subpoena the executive branch if cooperation is not forthcoming".

33 Carter, Jimmy (2012): "A Cruel and Unusual Record», *The New York Times*, June 24.
34 Ibid.
35 Quoted from Zenko (2013), pp. 26–27.

# IV. Det norske perspektiv

# Droner – muligheter og begrensninger

Forsvarsminister Anne-Grete Strøm-Erichsen

## Innledning

I februar 2009 sto jeg på denne talerstolen, da «Luftmakt og teknologi – realisme eller overmot?» var temaet for Luftmaktseminaret. Jeg snakket da om hvordan politikk og teknologi påvirkes av hverandre, at teknologisk kunnskap og innovasjon er en ressurs i politikken, og at teknologien på sitt beste kan angi rammer eller tegne yttergrenser som politiske beslutningstakere kan forholde seg til.

Dette er ikke mindre aktuelt i dag. Realisme eller overmot hører også med når vi snakker om droner. Vi må se etter mulighetene, og vi må forstå begrensningene.

For meg handler politikk om verdier og om å ta hensyn. Politikk krever at vi ser ulike deler og sektorer i samfunnet i sammenheng. Det var kanskje enklere for forsvarsplanleggerne i 1814, den gangen forsvarsbudsjettet utgjorde nesten 50 prosent av statens samlede utgifter.

Dagens politikk handler om å kunne tenke strategisk og prioritere. Ikke alt kan prioriteres opp samtidig. Noe må også prioriteres ned. Her kan teknologien gi oss gode råd.

Det gjelder å sikre løsninger som gir oss et balansert og fremtidsrettet forsvar. Løsninger som står seg i tid, slik tilfellet var med våre F-16-fly.

Derfor er politikkens vesen også det å tørre å ta noen avgjørende valg. F-35 som vårt nestegenerasjons kampfly er et slikt valg. Og det er et valg hvor ny og fremtidsrettet teknologi og politikk finner hverandre, et valg til beste for vår fremtidige sikkerhets- og forsvarspolitikk.

Nå er vi akkurat der vi skal være. En plan for anskaffelsen er lagt, og vi har tatt avgjørelsen om en ny basestruktur. Ørland skal huse vår nye kampflybase. I dag bygges det et lokalsamfunn med mange nye arbeidsplasser og fastboende. Det er bra for Forsvaret, for Trøndelag og for Norge.

Dette fratar oss imidlertid ikke muligheten til å forstå og analysere utviklin-

gen. Vi må heller aldri være likegyldig til at nye teknologiske løsninger vinner terreng. I vår bransje er dette en selvfølge. Et teknologisk forsprang er blant de tingene som gjør oss i stand til å bygge en terskel mot ytre press og risiko. Her hjelper det ikke å være nest best.

Det er flott å konstatere at Luftforsvaret retter blikket fremover. Droner, eller ulike typer UAV-er, har vært med oss lenge. Utviklingen rundt oss er likevel mer dynamisk enn på lenge. Det skaper nye muligheter samt noen utfordringer eller dilemmaer.

Her følger noen perspektiver på droner og fremtidige trender, og noen synspunkter på hvordan droner kan tjene våre fremtidige sikkerhets- og forsvarspolitiske interesser.

## Dilemmaer og noen viktige trender

Ny teknologi kan ved første øyekast virke saliggjørende. Den synliggjør menneskenes skaperkraft. Den gir økonomien ben å stå på, gir løsninger som forenkler livet vårt, og gir oss et bedre forsvar. Samtidig vet vi også at historien er full av eksempler på at viktige oppfinnelser fikk andre utfall enn planlagt.

Internett og GPS er begge eksempler på ny og viktig teknologi som har sin opprinnelse i det amerikanske forsvaret. I dag er dette allemannseie i vår globale landsby og har omfattende ringvirkninger innenfor kommunikasjon og handel. Imidlertid var det trolig bare et fåtall som forutså at dette en dag kom til å utgjøre en reell trussel i cyberspace.

«Teknologiens fremskritt har bare gitt oss bedre muligheter til tilbakeskritt», er det hevdet. Forfatteren Aldous Huxley har muligens rett. Dette gjelder også historien om militærteknologien. Derfor trenger vi grundige diskusjoner.

Bruk av væpnede droner til militære angrep reiser etter mitt syn en rekke krevende problemstillinger. Vi må forstå og analysere hvilken innvirkning dette har på krigføringen. Dette er regjeringen svært opptatt av. Derfor er jeg glad for at FN har tatt et særlig initiativ på dette området. Det er også positivt at slike spørsmål er satt på dagsorden gjennom Luftmaktseminaret.

Dronene er strengt tatt ikke problemet. Det er beslutningstakerne som velger å anvende våpenbærende droner som møter jussen og etikken i døren. Kan avstanden senke terskelen for bruk av militær makt? Kan det bli mer fristende å bruke militær makt utenfor de klare rettsreglene humanitærretten setter? Det er slike spørsmål vi må stille oss.

Som ved all annen militær maktbruk, gjelder folkeretten også her. Alle har plikt til å sikre at militære angrep kun rettes mot lovlige militære mål, og at sivile ikke skal utsettes for uforholdsmessig stor fare.

Vi har derfor ved flere anledninger uttrykt bekymring over deler av den dronebruken som gjennomføres i dagens konflikter. Dette har vi gjort både i internasjonale fora og bilateralt med USA, og vi vil fortsette med slike henvendelser.

Vi skal likevel ikke gå med ryggen inn i fremtiden, og derfor tror jeg det er riktig å legge følgende til grunn:

For det første må vi slå fast at droner er en del av fremtidig krigføring. De er også kommet for å bli i det norske Forsvaret.

For det andre vil droner på kort og mellomlang sikt primært utgjøre et viktig supplement til eksisterende plattformer.

Og for det tredje må vi være åpne for at denne teknologien på enda lenger sikt – og på avgrensede områder – kan komme til å erstatte noen av dagens strukturelementer. Vi skal derfor følge utviklingen nøye.

Vi vurderer løpende bruken av droner i det norske Forsvaret, innenfor ulike tidshorisonter og opp mot ulike behov. Når eksisterende kapasiteter nærmer seg slutten av sin levetid, vil også droner kunne bli vurdert som alternativ. Det er særlig aktuelt dersom teknologien til å utføre oppgavene er minst like tilgjengelig. Vi har flere pågående aktiviteter som nettopp tar for seg dette.

Det er viktig at de enkelte materiellanskaffelsene utgjør en del av den helhetlige strukturutviklingen for Forsvaret. De må baseres på de utfordringene vi står overfor og er ment å skulle løse, noe som gjelder all ny teknologi.

Det er ingenting som tilsier at droneteknologien vil revolusjonere militær strategi og tenkning. Dette er så langt ikke det paradigmeskiftet som stigbøylen var for krigeren til hest. Derimot er det veldig opplagt at droner i økende grad vil bidra til å forme strategi, operasjoner og taktikk.

Økningen vi har sett internasjonalt, bekrefter denne trenden. Og den forteller oss at de aller fleste NATO-land baserer seg på samme teknologi og samme type mindre droner som vi gjør. Det vil trolig være situasjonen i lang tid fremover. Vi er derfor godt på linje med utviklingen i andre land.

Selv USA, som er i front, har tilkjennegitt tilsvarende synspunkter. Både når det gjelder overvåking og våpenbærende droner, er dette å anse som nisjekapasiteter. Heller ikke her erstatter droner nåværende teknologi. Det er riktig at USA satser stort på droner både med tanke på utvikling, anskaffelse og utdanning. Planene for kampflyanskaffelsen står likevel fast. Intensjonen er fortsatt 2443 F-35 kampfly.

Selv ikke den gamle arbeidshesten U2 blir satt til side på grunn av nye, avan-

serte overvåkingsdroner, i hvert fall ikke med det første. Flyene som ble satt i produksjon da Eisenhower var president, fortsetter å gjøre jobben sin den dag i dag, med droner som et viktig supplement.

Uttalelsene fra USAs utenriksminister John Kerry er interessante, men ikke oppsiktsvekkende. USAs utenrikspolitikk defineres ikke av oversjøiske deployeringer og droner, slo han nylig fast.

Ifølge Kerry handler amerikansk utenrikspolitikk vel så mye om mat- og energisikkerhet, humanitær bistand og utviklingsstøtte. Han bekrefter dermed den tendensen vi har sett den senere tid – et USA som søker orden i eget hus og egne budsjetter.

Krig og konflikt har alltid fremskyndet teknologiske fremskritt. Slik har det også vært etter 11. september 2001. Anvendelsen og utviklingen av ulike typer droner har de siste årene skjedd med utgangspunkt i dette konfliktbildet. For mange allierte har de siste ti årene handlet om å bekjempe en motstander som har vært teknologisk underlegen.

Med en ny geopolitisk virkelighet kan dette komme til å endre seg. Utviklingen internasjonalt er godt kjent. Et USA som i økende grad dreier sin sikkerhetspolitiske tyngde mot Asia og Stillehavet. Det legges større vekt på havenes og luftens domener, og terskelen for å gå inn i store, landtunge operasjoner er høyere.

Økende stormaktsrivalisering kan dessuten vekke til live klassiske militære utfordringer. Dette kan også omfatte konflikter mellom stater som er moderne og avanserte. Vår tenkning må derfor rettes mot hva som kommer etter Afghanistan. Vi må legge til grunn en motstander som er teknologisk jevnbyrdig.

I et slikt perspektiv ser vi derfor ikke droner som et reelt alternativ til moderne kampfly frem mot 2050. Vi er ikke alene om å tenke slik. Også andre land med et avansert forsvar fornyer kampflyparken nå.

## Våre omgivelser – våre fremtidige behov

Droner er samtidig en del av et fremtidig forsvar, også for oss. Vi ser hvordan operasjonene i Afghanistan har gjort denne teknologien relevant og nyttig. Hærens taktiske droner gir et bedre oversiktsbilde i et krevende terreng. Slik har de sørget for økt sikkerhet både for våre soldater og for sivilbefolkningen.

Gjennom AGS-samarbeidet i NATO tar vi utviklingen et betydelig steg videre. Gjennom disse langtrekkende overvåkingsdronene vil vi dekke helt

andre behov. Jeg vil si det enda tydeligere: Vi tar et seg i retning de behov vi ventelig vil ha post-Afghanistan knyttet til overvåking av eget territorium.

Det er ingen hemmelighet at dette er en viktig del av arbeidet med å gjøre NATO mer synlig og relevant her hjemme. Vi trenger økt kapasitet til å følge med i NATOs nærområder.

AGS er ikke alene et svar på dette, men det kan bli et viktig bidrag. Vi oppnår en kapasitet som ikke bare dekker militære overvåkingsbehov. Den kan også bidra til overvåking av store havområder, transportveier, olje-/gassinstallasjoner og miljøovervåking.

Her er et annet viktig punkt: I en tid der mange lands forsvarsbudsjetter reduseres, er det god politikk å kjøpe inn felles kapasiteter. Det viser at alliansen evner å tenke sammen om å få mest mulig forsvar ut av hver krone.

Dette er altså overvåkingsdroner vi deler med andre. Som AWACS vil det være en plattform som kun er tilgjengelig for oss av og til. Derfor er det våre nasjonale kapasiteter som fortsatt vil stå for den daglige informasjonsinnhentingen.

Jeg tror samtidig etableringen av AGS kan lære oss mye. Den kan fortelle oss en god del om de teknologiske mulighetene samt vise oss begrensningene som finnes. Albert Einstein sa det slik: «Bare når vi aksepterer våre grenser, kan vi gå ut over dem.»

I nordområdene skjer det fundamentale endringer. Iskappen krymper, og en ny geografi oppstår. Grenser for hva som er mulig, flyttes. Vår politikk må følge etter.

Denne regjeringen har derfor vært tydelig på at det er i nordområdene våre langsiktige strategiske interesser ligger. Det er også primært mot utviklingen her at vi må vurdere fremtidige kapasitetsbehov innen norsk luftmakt.

Utviklingen av Forsvaret har vært en viktig del av nordområdesatsingen. Vi har lagt grunnlaget for et solid og forutsigbart militært nærvær, og vi har utviklet et forsvar med evne til å ivareta våre suverene rettigheter og internasjonale forpliktelser.

Den politiske dagsorden i nord preges av endringer i klima, ressurser og ny teknologi. Endringene er omfattende. Vi ser en tiltakende issmelting. I sommermånedene er isen i Arktis på det laveste nivået på over 2000 år.

Samtidig anslås det at mer enn 20 prosent av jordens olje- og gassreserver befinner seg i de arktiske områdene. Petroleumsvirksomheten vil ventelig trekke seg ytterligere nordover.

Issmeltingen i nord bringer oss dessuten nærmere Asia og økonomiske stormakter som Kina og Japan. Det betyr mye for oss, og det betyr mye for våre asiatiske handelspartnere.

Klimaendringene, nye sjøruter, energiknapphet globalt og teknologiutvikling gjør at interessen for nordområdene øker sterkt. Vi står overfor et sårbart område med mange kryssende interesser og hensyn, og med betydelige norske eierinteresser.

Vi tror ikke det går mot rivalisering og konflikt. Nordområdene står på trygg folkerettslig grunn. Havretten står sterkt fordi samtlige land rundt Arktis respekterer denne.

Likevel gjør dette at ansvarlig forvaltning og internasjonalt samarbeid er påkrevd. Økt aktivitet i Arktis berører oss, som polarstat og med egne interesser i regionen, og det berører ikke minst Forsvaret.

Behovet for god og tidsmessig overvåking og etterretning blir ikke mindre viktig. Vi må følge utviklingen nøye. Den økte aktiviteten vil kreve en høy oppløsning og detaljgrad på informasjonen.

Vi må vite hva som foregår, og vi må være i stand til håndtere uforutsette situasjoner. Det handler om å sikre et best mulig nasjonalt beslutningsgrunnlag.

Luftmakt – med sine fortrinn i høyde, hastighet og rekkevidde – vil bety stadig mer. På sikt kan også overvåkingsdroner få en viktig rolle. Vi skal se på hvilke muligheter og fordeler dette gir.

Utholdenhet er opplagt en slik fordel. Her er det i dag ingen plattformer som når opp. En annen er at førerløse droner ikke må ta samme hensyn som bemannende fartøy. De kan operere i krevende atmosfæriske forhold, og de har mulighet til å dekke langt større områder.

Samtidig ser jeg flere begrensninger. Alle land som opererer langs våre breddegrader, vet at kommer man langt nok nord, er satellittkommunikasjon spesielt krevende. Dette vil påvirke dronenes rekkevidde. Fortrinnet med å operere over store områder faller dermed bort eller blir kraftig redusert. Dette har Canada allerede erfart i forsøk med større droner. Styring av dronene via satellitt var utfordrende når man kom nord for polarsirkelen.

På sikt vil den økte aktiviteten i Arktis kreve bedre løsninger for satellittkommunikasjon. Dette vet vi er teknologisk utfordrende, og det har ikke minst en betydelig kostnadsside.

Droner har også en kostnadsside. Kostnadene med å utvikle og drifte de virkelig store dronene er formidable. Forsvarsmateriell er dyrt å anskaffe, og høyteknologisk materiell er også stadig dyrere å drifte og vedlikeholde. En sunn og bærekraftig forsvarsøkonomi krever derfor grundige avveininger.

Personellsiden skal vi heller ikke glemme. Vi må ikke forledes til å tro at førerløse plattformer gir en drastisk reduksjon i behovet for personell. Snarere tvert om. Droner krever fortsatt operatører, og mange funksjoner skal fylles.

Vi skal huske på de enorme mengdene data store droner samler inn, og disse må behandles – både av maskiner og av mennesker. Det er derfor behov for en omfattende analysekapasitet.

Når USA i dag utdanner flere til å betjene droner enn kampfly, er forklaringen ikke at droner overtar for kampfly. Det er snarere en erkjennelse av de betydelige personellressursene som kreves.

Vi har et moderne forsvar med strukturelementer som kan operere effektivt i nordområdene. Sammen med våre andre luftsystemer, sjø- og hærstyrker, vil kampflyene gi oss et teknologisk meget avansert forsvar. Det vil gjøre det mulig å iverksette høyteknologiske og nettverksbaserte operasjoner når det er påkrevd.

Dagens droner, med sine begrensninger, kan ikke erstatte noen av strukturelementene i et slikt forsvar. De nåværende plattformene vil dekke våre behov i lang tid fremover, men droner kan bli et stadig viktigere supplement.

## Et relevant og tidsriktig forsvar

Det sies at altfor mye stabilitet forhindrer fremskritt. I en verden preget av store omveltninger og utfordringer har vi ikke noe valg. Nye utfordringer må møtes med nye og bedre verktøy.

Den fremtidige utviklingen i nordområdene er viktig for Norge, og den er viktig for Forsvaret. Derfor utvikler vi et forsvar med en effektiv og troverdig kapasitet for tilstedeværelse, suverenitetshåndheving og overvåking, og derfor har vi valgt å utvikle et balansert forsvar med et bredt spekter av kapasiteter.

For noen av Forsvarets systemer er vi avhengige av å anskaffe det ypperste av teknologi for å være relevante. På andre områder må vi nok heller søke etter det som er godt nok.

For nordområdene er kun det beste godt nok. I dag har vi de beste plattformene. Med de nye kampflyene på plass sikrer vi et forsvar for kommende generasjoner.

Samtidig skal vi hele tiden vurdere nye løsninger og ny teknologi. Vi skal utnytte teknologien optimalt og på en kosteffektiv måte. Det er det god forsvarsplanlegging handler om.

# Tanker rundt UAV-bruk i fremtiden

Kadett Jens Henrik Paulke, Luftkrigsskolen

Siden UAV-er de siste årene har spilt en stadig større rolle i bruken av militær luftmakt, er det behov for en avklaring rundt Norges satsing på dette området. I denne artikkelen vil jeg presentere mine synspunkter på hvordan vi best kan utnytte UAV-er i fremtiden.

I dag fokuserer Luftforsvaret på store og viktige prosesser som står for døren i nær fremtid. Luftforsvaret står overfor sin hittil største omstilling, og nye kampfly skal kjøpes inn og innfases i løpet av de neste to tiårene. Likevel er det viktig at vi klarer å ha flere tanker i hodet samtidig. Hvis ikke, risikerer vi at utviklingen løper fra oss. Jeg vil først presentere fem caser som tar for seg mulige situasjoner hvor UAV-er vil kunne spille en viktig rolle for Norge i fremtiden, samt noen generelle tanker rundt prosessen vi står overfor.

## UAV som styrkemultiplikator

At Norge bruker UAV-er som styrkemultiplikator er ingen nyhet. Hæren har brukt Raven[1] i over to år, og med stor suksess. Bak anskaffelsen lå det ti år med hardt arbeid og utvikling. Dette beviser at dersom Luftforsvaret skal innfase et nytt flysystem, må vi starte arbeidet allerede nå for å lykkes i fremtiden.

Raven har sine klare fordeler. De leverer sanntidsinformasjon til operatører som gjør at norske bakkestyrker får et langt større informasjonsgrunnlag. De kan se hva som skjer over den neste åsryggen, en mur eller rundt det neste hjørnet. Dette sikrer at styrkene kan flytte seg raskere og tryggere, og dermed være mer effektive.

UAV-er har med stort hell blitt brukt av amerikanerne de siste årene – både i Irak og Afghanistan – til å forhindre angrep ved hjelp av IED-er.[2] 70–75 prosent av tapene som allierte styrker går på, skyldes IED-er. Bruken av UAV-er

1 Se http://forsvaret.no/om-forsvaret/utstyrsfakta/utrustning/Sider/Mini-UAV-Raven-B.aspx (lastet ned 05. september 2013)

2 Se http://www.wpafb.af.mil/news/story_print.asp?id=123300255 (lastet ned 05. september 2013)

sparer altså både ressurser i form av at utstyr ikke blir ødelagt, men ikke minst redder det liv på bakken.

UAV-er som styrkemultiplikator er altså ikke noe nytt. Vi må imidlertid være forberedt på at dagens bruk av UAV-er også vil spille en rolle i fremtiden. Her er Hæren allerede godt i gang, og når vi skal innfase denne flytypen, vil vi med stor fordel kunne dra nytte av Hærens erfaringer. Både når det gjelder de politiske prosessene knyttet til en innfasing av nytt utstyr, men også hvordan UAV-ene opereres og operatører trenes.

## Naturkatastrofer

Vi er heldige som har det landet vi har. I Norge er det storslått natur som strekker seg over lange områder, og det sikrer oss olje og gass som danner grunnlaget for dagens velferdssamfunn. Men å tilby sikkerhet til et slikt land koster penger. For å sikre disse områdene vil UAV-er kunne spille en viktig rolle som et effektivt og nyttig verktøy. Dette gjelder både tradisjonelle utfordringer som jordras og lignende, men også som et bidrag til oljevernberedskapen. Særlig dersom vi åpner nye leteområder langs kysten. Her vil UAV-ene kunne bruke noen av sine fordeler til å gi oss en mer kostnadseffektiv og effektiv oljevernberedskap. Egenskaper som tilstedeværelse over tid og tilgang til områder som er avgrenset fra tradisjonell bruk av luftenheter, blir her essensielle. De vil også kunne skaffe oss kommunikasjonsmuligheter inn i områdene dersom det skulle bli aktuelt. Operasjoner som går inn under 3D-konseptet (Dirty, Dull and Dangerous[3]) er sentrale når UAV-er viser sine komplementære evner i forhold til bemannede flysystemer.

## Forsvar mot terroristangrep

Enten det er 22. juli eller In Amenas i Algerie, må vi se på hva som er essensielt når en slik situasjon oppstår. En enkel formel for dette er OODA (Observe-Orient-Decide-Act)-loopen, som er allment kjent i Forsvaret. UAV-er vil kunne utnytte elementene fra denne. Det handler om å gi beslutningstakerne et godt beslutningsgrunnlag. Det handler om å de-eskalere situasjonen til man har tilstrekkelig oversikt. Man må også ha kapasiteter som kan tilpasses situasjonen. På den måten slipper man å tilpasse situasjonen etter begrensnin-

3 Se http://www.haaretz.com/weekend/week-s-end/death-by-remote-1.394968 (lastet ned 05. september 2013)

gene i kapasitetene. UAV-er i alle størrelser og fasonger vil kunne gi nettopp dette. De vil kunne skaffe oversikt. Dette kan de til og med gjøre uten å være synlig for terroristene, men de kan også være synlig dersom man ønsker å sende signaler til terroristene om hva man er villig til å gjøre. På denne måten kan man eskalere og de-eskalere situasjonen slik som man selv ønsker,

Særlig evnen til å være til stede over tid er viktig. Her fyller UAV-en en rolle som luftmakten tidligere har hatt utfordringer med. Likevel er ikke UAVer noe nytt. Det er en videreutvikling av dagens flymaskiner, men sikrer oss at når vi velger å bruke eksempelvis F-16 eller F-35, kan vi bruke disse mer effektivt.

## Nordområdene

Nordområdene er ifølge regjeringen vårt viktigste strategiske område.[4] Man antar at de vil spille en sentral rolle i årene som kommer. Hvordan vi skal ha kontroll over disse områdene vil derfor bli et viktig spørsmål i fremtiden.

I tillegg til *Luftkrigsskolens skriftserie* har Luftkrigsskolen en stor akademisk produksjon. En del av dette står vi kadetter for. Kadett Anders Berge har skrevet en meget god oppgave om UAV-er i nord. Under en diskusjon rundt UAV-er og nordområdene fortalte han om USAs plan om å bruke en P-8 Poseidon sammen med en UAV kalt «Triton». En ting er nemlig viktig å slå fast: Dette er ikke en kamp mellom bemannede og ubemannede fly. Det er snakk om hvordan vi kan få det beste forsvaret som helhet. Derfor kan vi bruke en «Triton» øverst som sikrer oversiktsbildet, mens P-8 gjør jobben sin i lavere luftlag og kan bedrive ubåtjakt og lignende oppdrag. Dette er bare et eksempel, og ikke noe vi nødvendigvis må gå for, men vi må ikke begrense oss til å se bort fra slike løsninger. Vi trenger ikke å låse oss til enten–eller-forslag. Vi må holde muligheten åpen for at bemannede og ubemannede fly vil operere sammen i fremtiden, slik de allerede har gjort i en rekke internasjonale operasjoner.

4 Se http://www.regjeringen.no/nb/dep/ud/kampanjer/nordomradeportalen.html?id=450629 (lastet ned 05. september 2013)

## Hva hvis andre bruker UAV-er mot oss?

Da daværende forsvarsminister Espen Barth Eide besøkte Luftkrigsskolen og holdt et foredrag til oss kadetter om Forsvaret og Luftforsvarets oppgaver, understreket han betydningen av aldri å glemme at Forsvarets viktigste oppdrag er å beskytte Norge og norske landområder. Derfor er det essensielt at vi nå begynner å tenke på hva vi vil med UAV-er. Som nevnt brukte Hæren ti år på å fase inn ett enkelt flysystem. Og selv om vi ikke velger å innfase et UAV-system, må vi å tenke på hvordan UAV-er vil påvirke oss allerede nå. Dette gjelder ikke minst defensivt. Vi må ha et bevisst forhold til hvordan vi skal forsvare oss mot UAV-er.

Under UAV-utstillingen på årets Luftmaktsseminar viste kadett Bjørklund og kadett Sørmoen en UAV som de – ved siden av å skrive en meget god bachelor-oppgave – har produsert på egenhånd. Arbeidet deres er en suksesshistorie, men det er også litt skremmende. For når to kadetter kan gjøre dette ved siden av å levere varene som kreves på Luftkrigsskolen, kan man jo bare tenke seg til hva de som har som mål å kjempe mot norske interesser, kan være i stand til. Når kadett Bjørklund informerte om hva dette hadde kostet, ble det enda mer skremmende: Selve farkosten kostet 1000 kroner, og selv med joystick, batterier og ladere ble totalprisen bare 2000 kroner. Da får man en UAV som kan ta bilder av områder, men som også har en løfteevne på oppunder ett kilo. En slik ressurs i feil hender vil kunne skape mye ødeleggelse. Nå som teknologien er blitt allemannseie, må vi være forberedt på at UAV-er vil kunne bli brukt imot oss.

Hvor godt forberedt er vi egentlig? Er det norske luftvernet forberedt på at andre kan bruke UAV-er mot oss, i kombinasjon med tradisjonelle jagerfly? Er Force Protection forberedt på hva vi gjør hvis et militært område blir angrepet av UAV-er? Er Kontroll og Varsling forberedt på hva utstrakt bruk av denne flytypen vil kunne gjøre med luftbildet vi produserer? Er vi i forkant? Jeg skal ikke påstå at jeg kjenner til hvor forberedt hver enkelt bransje er, men å tenke i disse baner er viktig for å sikre Norge også i fremtiden. For i bunn og grunn er det jo det som er det viktige. Når du jobber i Forsvaret, er du leverandør av sikkerhet og må derfor alltid tilstrebe å være i forkant.

## Økonomiske betraktninger

Naturligvis må vi forholde oss til den økonomiske virkeligheten. Og når vi skal implementere noe nytt, må vi være forberedt på at det vil koste penger. Skal vi lykkes med innføringen, mener jeg at dette må gjøres over tid.

Det er antakelig like mange typer UAV-er som det er kaffekopper ved Luftforsvarets avdelinger, noe som er ganske imponerende i seg selv. Dette antallet gjør at vi kan velge akkurat den typen som passer vårt fremtidige behov og våre kostnadsrammer. Vi må dessuten understreke at utbyttet av en eventuell bruk av UAV-er ikke bare kommer Luftforsvaret til gode, men også de andre forsvarsgrenene. Det vil også kreve mye samarbeid med Cyberforsvaret for å forsikre oss om at vi opererer UAV-ene trygt og sikkert. Etter min mening er fellesoperasjoner fremtiden, og da kan UAV-en fungere meget godt som en del av det nettverksbaserte forsvaret og knytte forsvarsgrenene enda sterkere sammen.

Vi må imidlertid ikke glemme samarbeidet med instanser utenfor Forsvaret. Både politi, ambulanse og brannvesen vil ha utbytte av å bruke UAV-er. En eventuell innføring vil derfor kreve at vi trener sammen med disse instansene. På den måten vil ansvaret være fordelt når en eventuell situasjon oppstår, og Norge som nasjon vil ha økt utbytte av en satsing.

Skal vi optimalisere en satsing, må også norsk forsvarsindustri på banen. Dersom vi ser på landene rundt oss, er disse allerede i gang med dette arbeidet. Sverige er for eksempel i et nEUROn-samarbeid[5] med enkelte andre europeiske land om å utvikle en UCAV. Et av disse landene er Hellas. Og når Hellas tar seg råd til å bidra, burde også Norge være i stand til det. Finanskrisen i Europa gir en ypperlig mulighet for norsk forsvarsindustri. Ikke bare til å skape arbeidsplasser og tjene penger, men Luftforsvaret vil dermed kunne sikre seg at UAV-ene vi kjøper, er tilpasset norske forhold.

## Hva skal vi diskutere?

Vi har mye å lære av andre land, men i bunn og grunn er det våre egne behov vi må definere og handle etter. Det holder ikke bare å duplisere en løsning som andre land har brukt, ettersom de ikke har de samme utfordringene som oss. Jeg nevnte tidligere USA, men en rekke andre land ser også på samvirket mellom UAV-er og bemannede fly. La oss se nærmere på hvordan disse tenker, men aldri glemme av Norges særegenheter når vi skal avgjøre fremtidens kapasiteter i Luftforsvaret.

Hvilken rolle skal så Luftforsvaret spille? Den største utfordringen mener

5 Se http://www.spacewar.com/reports/First_Flight_of_nEUROn_Unmanned_Combat_Aerial_Vehicle_Demonstrator_Conducted_999.html (lastet ned 05. september 2013)

jeg ligger i at vi for tiden ikke spiller noen rolle. Luftforsvaret burde være premissleverandør for debatten. Et eksempel her kan vi finne i kullet mitt. Det består av kadetter med svært ulik bakgrunn. Både forskjellig fartstid i Forsvaret, men også forskjellig bakgrunn. Vi kommer fra forskjellige bransjer i Luftforsvaret, og noen er også fra andre forsvarsgrener. Felles for oss alle er det at ingen av oss har hørt noe særlig prat om UAV-er på våre tidligere tjenestesteder. På Rygge har det riktignok vært en avdeling som jobber med temaet, men med tanke på det oppdraget de burde løse, mistenker jeg at de er underbemannet. Det første vi må gjøre, er derfor å skape en diskusjon. Her spiller Luftmaktseminaret 2013 en viktig rolle, men vi må også satse på fagpersonell som jobber med dette til daglig og som kan gi en UAV-avdeling støtte og midler slik at vi kan ta denne diskusjonen. Det er nemlig ikke slik at en UAV-avdeling trenger å være ubemannet.

Vi må også være innstilt på å handle. Noe er nødt til å skje. På min forrige arbeidsplass hadde jeg en stasjonssjef som jeg tror vi kan lære en god del av. Under en samtale nevnte jeg ordet problem. Reaksjonen fikk meg til å tro at jeg hadde bannet i kirken. Han snakket så lavt at han nesten hvisket det frem: «Her sier vi ikke problemer, vi sier utfordringer.» Og det er akkurat slik vi må se på UAV-er og fremtiden. Det er utfordringer, ikke problemer! Ny teknologi vil bli møtt med motstand. Jeg tror imidlertid at dersom vi ser mulighetene, vil også begrensningene komme, men hvis vi da utfordrer begrensningene, så skaper vi et mye større handlingsrom. Det betyr ikke at vi fjerner begrensningene, men vi tenker kreativt og nytt. På den måten kommer vi lenger enn om vi bare ser begrensningene og legger planene om anskaffelse til side når den første motgangen kommer. For selv om Norge ikke har behov for UAV-er her og nå, viser tidligere erfaringer at når vi er i en kritisk situasjon hvor vi trenger å kjøpe nytt utstyr, er dette blitt svært dyrt og vanskelig å få tak i. Dermed blir det mindre tid til trening, noe som igjen genererer mindre effekt. Og da er det nok en gang viktig å tenke på fremtiden.

I tillegg er det en felle vi ikke må gå i, som jeg nevnte tidligere: Dette handler ikke om bemannede eller ubemannede fly. Vi får om noen år F-35, som er et fly med kjempemuligheter. På mange felt representerer det forbedringer av muligheter vi allerede har, men samtidig også noen muligheter og egenskaper vi ikke er i besittelse av. UAV-er kan på sin side sørge for at vi får mest mulig igjen av pengene, noe jeg ikke tror det er så vanskelig å forklare til politikerne. Dersom vi forklarer dem at de får 20 prosent økt utbytte av å investere 10 prosent mer, så burde det være som musikk i ørene for enhver forsvarspolitiker.

For å underbygge viktigheten av at vi vil kunne møte motstand, vil jeg trekke frem noen eksempler. I *Dagens Næringsliv* 20. august 1996 kunne man

for eksempel lese et innlegg fra en person som skrev at Internett var en flopp.[6] Andre eksempler er personer som ikke trodde at flygende maskiner kunne realiseres, eller at disse ikke hadde noen som helst militær verdi. Historien er full av eksempler på at alt nytt blir møtt med motstand. Men som vi ser, tar man i en god del tilfeller helt feil. Det sentrale er at man ser mulighetene.

## Skal vi satse?

I fjor feiret vi hundre år med norsk luftmakt. Det har ikke kommet av seg selv. Det har kommet av personer som har ofret mye og tatt dristige sjanser. På den første skoledagen vår sa skolesjefen til oss kadetter: «Det er bedre å være løve for en dag enn sau hele livet.» Slik må vi også tenke når det gjelder UAV-er. Som jeg har vist, kan hvem som helst bygge og bruke UAV-er, og derfor må vi begynne å vurdere problemstillinger knyttet til disse allerede i dag. Om vi kjøper eller ikke kjøper, er ikke det kritiske. La oss sørge for at vi gjør de vurderingene som kan gjøres allerede nå, og at vi tar den diskusjonen som er nødvendig. Penger til en eventuell anskaffelse ligger noen år fram i tid, men det å starte å tenke på hvordan vi skal operere med og mot UAV-er i fremtiden kan gjøres allerede i dag. Det er slik vi skaper et bedre Luftforsvar – et Luftforsvar som fortsetter å være aktuelt og som bidrar også i fremtiden. Og skal vi skape et godt Luftforsvar for fremtiden, kommer vi ikke utenom UAV-er.

6 Osvold, Leif (1996): «Internett en flopp!» Leserinnlegg i *Dagens Næringsliv*, 20. august 1996.

# Norsk anvendelse av UAV

Seniorforsker Lorns Harald Bakstad, FFI

## Innledning

UAV, UAS, droner eller RPA – det er noe som heter «kjært barn har mange navn». Eller er de mange navnene et tegn på usikkerhet? Vi definerer dette ubemannede flyet ut fra hva det ikke er, og ikke ut fra hva det er. I så fall trengs det en modningsprosess. Ettersom det er tydelig at det finnes mange forskjellige betegnelser, må jeg presisere mitt valg i denne artikkelen. Jeg vil prøve å bruke Unmanned Aerial Vehicle (UAV) når det gjelder selve flyet, og Unmanned Aircraft System (UAS) når det er snakk om hele systemet.

Innholdet i denne artikkelen består av fire hoveddeler. Først litt historie, da det gjerne er slik at dersom man ønsker å vite hvor man er på vei, trenger man å vite hvor man er og hvor man kom fra. Del to er en rask oversikt over hva UAV – Remotely Piloted Aircraft (RPA), eller UAS – er. Deretter vil jeg si noe om hvilke erfaringer Norge har gjort innen temaet, før jeg avslutter med noen tanker om fremtiden.

## Historien

Det blir sagt at ubemannede fly både er noe nytt og samtidig ikke noe nytt. Når startet egentlig UAS-historien? Nedenfor gis en kort oppsummering av de viktigste hendelsene i den forbindelse.[1]

- 1804: Første flytur med seilflymodell, utført av George Cayley.
- 1848: Første flytur med motorisert ubemannet fly, ved John Stringfellow.
- 1918: Første flytur med motorisert, full-størrelse, ubemannet flymaskin, Curtiss Sperry Aerial Torpedo i mars og Liberty Eagle i oktober.
- 1924: Første vellykkede radiostyrte flytur, varighet 39 min, RAE 1921 Target.

1 Newcome, Lawrence R. (2004): *Unmanned Aviation: A brief history of unmanned aerial vehicles*. Reston, VA.: American Institute of Aeronautics and Astronautics, Inc.

- 1933: Første bruk av måldrone, Royal Navy.
- 1944: Første bombelevering mot bakkemål, japanske kanonstillinger, U.S. Navy TDR-1 attack drone.
- 1946: Første bruk av UAV til innsamling av forskningsdata.
- 1955: Første UAV designet for rekognosering, MQM-57 Falconer.

Som et tillegg til historien kan det nevnes at Joseph Kennedy, storebroren til den senere amerikanske presidenten John F. Kennedy, ble drept i en ulykke med et Unmanned Combat Aerial Vehicle (UCAV) i 1944. De gjennomførte da angrep fra baser i England ved hjelp av fjernstyrte B-17 bombefly. Disse var fullastet med bomber og ble styrt rett inn i målene for å slå ut V-2 og V-3-installasjoner på kontinentet. Operasjonskonseptet var å ta av med besetning, som etter take-off armerte bombene om bord, før de hoppet ut i fallskjerm. Her skjedde det en feil, slik at flyet eksploderte før de fikk hoppet ut.

## Hva er et Unmanned Aircraft System (UAS)

Hva består så et Unmanned Aircraft System av? De fleste UAS, uavhengig av størrelse, har følgende hovedkomponenter: flymaskin, sensorer, kommunikasjonssystemer, kontrollstasjon, analysesystemer og planleggingskapasitet. Størrelsen og kapabilitetene på systemene varierer mye, avhengig av de forskjellige bruksområdene. På det strategiske og operasjonelle nivået benyttes normalt de større UAS-ene av typene High Altitude Long Endurance (HALE) og Medium Altitude Long Endurance (MALE). Disse kan operere fra baser langt unna operasjonsområdet, de flyr høyt og samler inn informasjon over lange perioder. NATOs Alliance Ground Surveilance (AGS), som Norge bidrar til å anskaffe, vil gi NATO en slik operasjonell innsamlingskapasitet.

Men også på det taktiske nivået, og helt ned til stridsteknisk nivå, bidrar UAS-er til å øke situasjonsforståelsen hos militære ledere og avdelinger. Dette er ofte mindre systemer som gir mulighet for en lokalt kontrollert elevert sensor. De forskjellige størrelsene dekker forskjellige behov. De større UAS-ene gir ofte bedre oversikt, mens de mindre gir mer detaljer, eller som det også heter: «One size doesn't fit all.» Det eneste alle disse systemene har til felles, er at de ikke har besetningen fysisk om bord i flyet, og at GIL har fagmyndighet.

## UAS-erfaringer i Norge

Hvilke erfaringer har Norge så langt fått med UAS? UAV omtales for første gang i Forsvarsstudie 2000. På NATO-toppmøtet i Praha høsten 2002 forpliktet Norge seg blant annet til å forbedre støttefunksjonene for deployerbare hærstyrker. Dette inkluderte anskaffelse av taktiske ubemannede luftfartøyer til overvåkning. I den påfølgende St.prp. nr. 42 (2003–2004) stod det: «UAV-kapasiteten integreres i ISTAR-enheten, men vil også kunne nyttes utenfor rammen av ISTAR. Det tas sikte på raskt å kunne anskaffe en slik kapasitet i perioden 2005–2008, ...»[2] Dette resulterte i etableringen av Prosjekt 7802: UAV til ISTAR. Formålet med prosjektet var å fremskaffe et taktisk UAV-system organisert i en Taktisk UAV-avdeling (718 skv.). Avdelingen skulle vært operativt tilknyttet NOR ISTAR. Prosjekt 7802 ble terminert i forbindelse med Forsvarsstudie 07.

Selv om det ikke ble noe taktisk UAS gjennom prosjekt 7802, avdekket Norges engasjement i Afghanistan et udekket behov for en elevert sensorkapasitet for styrkebeskyttelse der. Dette gjorde at Prosjekt 2046: Mini UAV-system, ble etablert. I 2011 fikk vi dermed Norges første UAS i form av RQ-11B Raven, operativ fra og med PRT 17. Dette relativt lille systemet har bidratt til å redde liv i disse operasjonene. Det innføringen av Raven også har bidratt til, er å få på plass deler av de funksjonene som trengs i en UAS-organisasjon. Selv om ikke alt er på plass, begynner ting likevel å skje. Som kjent utdanner U.S. Air Force nå flere RPA-piloter enn jager- og bombeflypiloter. I Norge har vi også de to siste årene utdannet flere UAS-operatører enn piloter til bemannede fly.

Fremover er det allerede planlagt flere nye UAS-kapasiteter som vil bidra til Forsvaret. I Prosjekt 5436: Kampvognprosjektet er UAS en del av løsningen. Dette vil bli et mini-UAS, beregnet på å gi manøverbataljonene i Hæren en elevert sensorkapasitet. Denne leveransen vil bli den neste UAS-anskaffelsen i Norge, og vi er dessuten med på å anskaffe NATO AGS.

Men i tillegg til Raven har Norge også en god del erfaringer med UAS fra diverse aktiviteter og tester. Dronetjenesten ble opprettet i 1973 og har derfor 40-års jubileum i år. Den opererer diverse ubemannede systemer, blant annet Banshee måldrone som størrelsesmessig tilsvarer et taktisk UAS. De har gjennomgått tester med tanke på ising, noe som er en utfordring for taktiske UAV-er i typisk observasjonshøyde.

2 St.prp. nr. 42 (2003–2004), *Den videre moderniseringen av Forsvaret i perioden 2005–2008*, pkt. 5.6.1 «Felleskapasiteter», lastet ned 05. september 2013, fra: http://www.regjeringen.no/nb/dep/fd/dok/regpubl/stprp/20032004/stprp-nr-42-2003-2004-/5/6/1.html?id=290282

På begynnelsen av 2000-tallet utstyrte Luftforsvaret og Norwegian Battlelab and Experimentation (NOBLE) en SAAB SAFARI (MFI-15) med sensor og linksystem for video og sensorstyring fra bakken. Vi fikk da en elevert sensor som kunne styres fra bakken og som fikk lov til å fly fritt i luftrommet. Det ble en ypperlig mulighet til å finne ut hvordan man egentlig kan benytte den kapabiliteten som for eksempel et UAS representerer. I tillegg var det en effektiv metode for å teste hvordan alle sensordataene kan omdannes til informasjon og videredistribueres til de som trenger dem. Det var nok et fåtall i Forsvaret som forstod hvor viktig en slik demonstratorplattform egentlig er når det gjelder å få på plass konsept, organisasjon og infrastruktur.

De senere årene har det også foregått mye aktivitet rundt mini-UAS i Norge. Dette startet i 2006, da Luftforsvaret, Hæren, NOBLE og Forsvarets Forskningsinstitutt (FFI) sammen begynte å gjennomføre tester med Mini-UAS. Etter anskaffelsen av RQ-11B Raven har FFI, sammen med Forsvaret, gjennomført konseptuelle tester for å definere kravene til neste type system som skal fremskaffes gjennom Prosjekt 5436: Kampvognprosjektet. Det pågår stadig aktiviteter på FFI for å kunne rådgi Forsvaret, men også for å bistå med å utvikle nye kapasiteter. FFI har siden 2009 samarbeidet med norsk industri for å utvikle det som nå har blitt det første tilgjengelige personlige UAS i verden.

Men i tillegg til alt dette, må vi ikke glemme erfaringer fra operasjoner i utlandet. Mange norske soldater har høstet erfaringer fra UAS-er både på bakken og i lufta. Dette gjelder både store, middels og små systemer. Det som har kommet frem i utlandet, er at nytten av støtte fra eleverte sensorer på taktisk nivå er gunstig, og at egne nasjonale systemer er viktige. Når man driver med direkte støtte for kompani, tropper og lag, må UAS-operatørene kjenne til målsettingene for operasjonen og forstå operasjonsmønsteret til støttet avdeling. Blod er fortsatt tykkere enn vann.

## Fremtiden for UAS i Norge

Hva skal vi så gjøre med UAS i Norge? For å besvare dette, må vi se på spørsmålet om hvorfor UAS, utfordringene med bruk av UAS og samtidig også hvilke utviklingstrender vi kan forvente. Motivasjonen for bruk av UAS kan oppsummeres i følgende punkter:

- Redusere faren for tap av, og skade på operatører.
- Redusere faren for menneskelige feil, særlig under stressende og langvarige oppdrag.
- Øke plattformytelser, fortrinnsvis utholdenhet og manøvrerbarhet.
- Øke tilgjengeligheten av, og lokal kontroll over, luftbårne ressurser.
- Muliggjøre nye operasjonskonsepter.
- Redusere kostnader, noe som også er mulig med enkle og små design.

En kortform av dette – som ofte brukes internasjonalt for å beskrive de oppdragstypene hvor man ønsker å fjerne mennesket fra flyet – er «Dull, Dirty and Dangerous». Men de 3-D-ene beskriver ikke på samme måte hvilke nye muligheter man får når mennesket fjernes fra flyet.

Utfordringene ved bruk av UAS kan videre oppsummeres i fem hovedpunkter: For det første er tilgang til luftrom en utfordring. Det arbeides med å få på plass løsninger for dette. I USA forventer man at dette er på plass i 2015, mens EU planlegger å kunne begynne med UAS-operasjoner i 2016. Dette vil bli sivile løsninger for sivile operasjoner med UAS. Men militæret må samtidig få på plass systemer for hvordan dette skal gjøres i de militære luftromsboblene. Hvordan skal UAS koordineres som en del av komplekse luftoperasjoner sammen med andre plattformer? For det andre er det manglende kunnskap om UAS i folkeopinionen. Det er en frykt i befolkningen for autonome drapssystemer. De som har kunnskap om UAS, må bli mer aktive til å informere, selv om «droner» trolig er begrepet som har satt seg i befolkningen. Likevel må vi prøve å komme på offensiven igjen. For det tredje har mange av dagens kjente UAS-er slitt med påliteligheten og blitt betegnet som sårbare. Det har blant annet vært pålitelighetsutfordringer med det flytekniske. Dette skyldes delvis at det har vært en del garasjefirmaer som har bygget systemene, men ikke minst ble mange av de første designene tatt rett ut fra laboratoriene og sendt i kamp. MQ-1 Predator A var for eksempel et Advanced Concept Technolgy Demonstration (ACTD)-program som ble satt tilnærmet rett i serieproduksjon. Sårbarheten til de UAS-ene som brukes mye i dag, er stor, og disse har tilnærmet ingen sannsynlighet for å klare seg mot en kvalifisert motstander. Likevel er det grunn til å tro at situasjonen er i ferd med å bedres for nye design som er under utvikling. For det fjerde er ubemannede systemer avhengige av kommunikasjon. Økene grad av automatisering om bord vil bidra til å redusere avhengigheten av bredbåndslinker. Kommunikasjon er samtidig en utfordring for alle plattformer i et nettverksbasert forsvar. Det femte punktet som ofte tas frem som en utfordring for ubemannede systemer, er behovet for behandling av sensordata, noe jeg ikke er enig i. Jeg får ofte

høre at det trengs mye personell for å analysere data fra en UAS. Behovet for informasjonsbehandling er ikke noe spesielt for ubemannede plattformer, men en utfordring for alle eleverte sensorer. Det kan ikke være slik at når vi har en god sensor i et bemannet fly, så skal vi ikke analysere dataene som samles inn, bare fordi det sitter en person foran og holder i en stikke.

Utviklingstrender vi ser innen UAS, er at det blir større variasjon og forbedrede ytelser på plattformer og sensorer. Det legges mer vekt på kostnader, spesielt når det gjelder drift og personell. Det er tydelig at også mindre plattformer får multi-sensorkapasitet. Samtidig er det en økende grad av automatisering og økt systemfokus. Med dette mener jeg at det fokuseres på hele systemet, ikke bare selve flyet. Man ser på helheten, fra tasking til informasjon levert hos mottaker, på samme måte som NATO-AGS gjør.

Hvor bør så Norge gå? For å svare på dette kan det være lurt å se på hvilke behov vi har. Vi har et behov for å øke situasjonsforståelsen for de aller laveste nivåene i Forsvaret på lags- og troppsnivå. Muligheten for å kunne ta med en egen elevert kikkert er noe soldater har drømt om siden tidenes morgen. Det er behov for en elevert sensorkapasitet med kort responstid på stridsteknisk nivå opp til bataljonsnivå. Dette adresseres gjennom Prosjekt 5436: Kampvognprosjektet, og er i løypa. Brigade Nord og NORTG har behov for en taktisk elevert sensorkapasitet som kan gi dem mulighet til å bygge situasjonsbilde rundt seg selv under mobile operasjoner. Det kreves også operasjonelle og strategiske løsninger for å kunne gjennomføre fellesoperasjoner.

I fredstid har Norge ikke ubetydelige interesser i store havområder. I tillegg ville det vært interessant å ha kapasitet til å detektere og monitorere ulike typer utslipp (NRBC). Ved brannen i Fukushima-kjernekraftverket i Japan ble det brukt UAS-er for å samle informasjon om stråling og for å estimere hvor det radioaktive nedfallet ville komme.

## Hva må vi gjøre?

Vi har som kjent noen utfordringer rundt organisering og bruk av en slik elevert sensor som et UAS representerer. Dette krever en organisasjon og en bakkeinfrastruktur for å utnytte informasjonen fra eleverte sensorer, slik at de gir en operativ effekt.

Vi må derfor ha minst fire tanker i hodet samtidig:

Først må alle involverte parter lese en NOBLE-rapport som heter *Fleksibel sensoranvendelse*. Den beskriver hvordan man kan utnytte eksisterende sensorer og plattformer slik at de gir en operativ gevinst.

For det andre må vi få på plass en organisasjon for å lære hva vi trenger av UAS-er og hvordan dette skal gjennomføres. Derfor bør Forsvaret reetablere en tilsvarende demonstrator og eksperimentplattform som den vi hadde i Safari Sensor System.

For det tredje må vi bygge stein på stein med tanke på UAS. Norge har innført Raven, vi har deler av en organisasjon, og vi har lært svært mye. Kompetansen rundt UAS må ikke forsvinne, men utvikles. Modenhets- og kunnskapsnivået hos personell i Forsvaret – med hensyn til eventuelt å innføre systemer for å dekke taktiske behov for eleverte sensorer – er i dag betydelig større enn for seks år siden. Det er på tide å ta neste steg mot litt større systemer.

Og sist, men ikke minst, må Norge utnytte den muligheten innføringen av NATO-AGS gir oss. Her har vi en unik anledning til å lære og forstå hva slike typer systemer gir og krever. Personell som kommer hjem etter en periode i AGS-organisasjonen, vil besitte svært verdifull kompetanse for en norsk UAS-organisasjon.

# Communication and Navigation Challenges in the High North

Fritz Bekkadal, Senior Research Scientist, MARINTEK

## Preface

The vast geographic distances and the economic importance of activities in remote areas like the High North demand new innovative radio-based solutions. There are numerous unsolved research challenges pertaining to (broadband) radio communication coverage and satellite navigation reliability throughout the large region comprising the Norwegian Exclusive Economic Zone (EEZ) and the Arctic waters.

This chapter outlines these challenges and the current situation, in addition to identifying future systems capable of mitigating the crucial lack of adequate e-com[1] infrastructure in the High North.

## Background

### Early Radio Developments

The infancy and youth of radio technology was primarily linked to maritime applications. Following his invention of the first operating radio transceiver in 1895, Guglielmo Marconi performed transmission experiments between two Italian warships outside the port of Spezia in 1897, where he managed to exchange radio messages at a distance of 22 km. Later he continued his experiments in England, where on Christmas Eve in 1898 he established radio telegraphic contact between the *East Goodwin* lightship and South Foreland Lighthouse in South East England. On March 3, 1899, the steamship *R F Matthews* collided with this lightship, which alarmed the lighthouse ashore to obtain assistance. This was the first time ever that a distress call was transmitted by radio from a ship at sea.

1 e-com: 'electronic communications'.

Norway was an early bird with radio technology, mainly focusing on maritime applications. Following Marconi's first transatlantic radio transmission in 1901, Norway established the second radio telegraphic link in the world on May 1, 1906, connecting Røst and Sørvågen in Lofoten. It was the vital fisheries in the area that prompted this action, and shortly after that, radio telegraphy to ships in open seas commenced.

On May 3, 1911, the Norwegian Parliament instructed Norwegian Telecom and Post Office (NTPO) to build a radio station at Svalbard. Already on November 22 that year the first radio telegraphy signals from Spitsbergen Radio were received at Ingøy near Hammerfest, and the first telecommunications between Svalbard and the mainland were established. The Spitsbergen station played a vital role when the Norwegian industry and habitation made headway in the years to follow, and particularly in the great polar years of the 1920s, when the radio station was in the focus of the entire world press.

However, despite the tremendous developments in radio technologies since that time, advancements in maritime networks are severely lagging behind their land counterparts, and novel solutions are needed to meet the imminent user requirements.

## The Northern Challenges

The overall backdrop of the maritime communications market pull is demonstrated in Figure 1 portraying the 'Northern Challenges', exemplified by Norway's geographical extension and economic dependability of an ocean area about six times the size of our mainland.

The vast geographic distances and the economic importance of activities at sea in remote areas demand new innovative radio-based solutions. There are numerous unsolved research challenges of (broadband) radio communications coverage throughout the large region comprising the Norwegian EEZ and Arctic waters, as depicted in Figure 1.[2]

The fragile environment of the High North is decidedly dependent on a sustainable ecosystem balance. Safeguarding this balance calls for a highly developed communication infrastructure and sophisticated surveillance systems, which are currently unavailable. Reliable broadband radiocommunication in the northern and Arctic region is vital for fast reporting of status and evolution of the environment, and early warning of pollution threats. Addi-

2 Bekkadal, F. (2009):"Future Maritime Communication", OCEANS'09, Bremen, 11.–14.05.2009.

tionally, these technologies are decisive for efficient handling of hazards and accidents intimidating people and/or the environment.

The overall interests in the Arctic include energy, transport, environment and fisheries, as well as security and the indigenous peoples, and the European Union (EU) has expressed its clear priority to protect the Arctic environment and its interest in the region under three broad areas:[3]

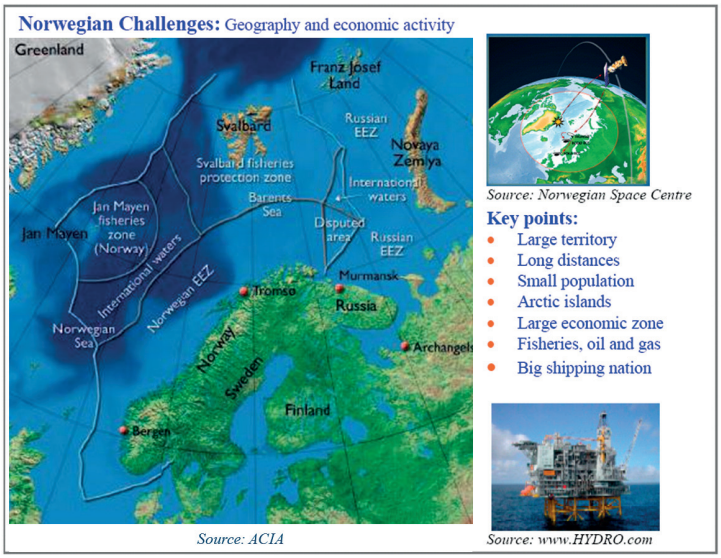



*Figure 1 The 'Northern Challenges'; Norway's geography and economic activity*

1. Protecting and preserving the Arctic in unison with its population
2. Promoting sustainable exploitation of resources
3. Improving Arctic multilateral governance

It is also recognized that exploitation of Arctic hydrocarbon resources and the opening of new navigation routes can be of benefit, provided it is done in full respect of the highest environmental standards. It is believed that the Arctic Ocean will be free of ice during summertime in 5–15 years,[4] which also means easing of transportation constraints as a result of more convenient navigation through the melting polar sea ice and the prospect of greater physical

3 EU Press Release, Arctic Communication, Memo, Brussels 20. Nov. 2008, and Commission of The European Communities, COM(2008) 763, Brussels.

4 Fenge, T. and Penikett, T. (2009): "The Arctic Vacuum in Canada's Foreign Policy". Policy Options, April 2009.

linkages between Arctic communities and the rest of the world, particularly through the North East Passage.

Numerous Arctic users are dependent upon reliable communication links, either for operational or safety purposes. As the traffic and activities will increase in the High North, more advanced applications will emerge. The number of accidents will increase, and prompt emergency response will be crucial to save lives and protect the environment.

Shared situational awareness will become particularly important in these areas, where, for example, weather conditions suddenly changes and ice conditions need to be carefully monitored. Ad hoc communications and advanced sensor networks are examples of technologies that can contribute to improved situational awareness in the future. However, this requires communication solutions with sufficient bandwidth and reliability to transfer the information between the different actors in an emergency situation.

With environmental, energy, security and sovereignty issues focusing increased attention on the Arctic region, the availability of suitable, reliable and versatile telecommunication platforms becomes increasingly important for government and institutional entities, as well as for Arctic residents and businesses, where the most notable areas are the following:

- Offshore oil and gas exploitations, including safeguarding of operations, installations and associated ports
- Fisheries, including resource investigations and protection
- Fishfarming, aquaculture installations and associated activities
- Homeland security and defence operations; territorial control, including security and national sovereignty
- Coast guard's law enforcement of illegal activities environmental crime
- Maritime traffic and environmental safety monitoring
- Maritime operations, for example, loading/unloading, maintenance and emergency operations; search and rescue (SAR)
- Distribution of navigational data, for example, navigational warnings, Maritime Safety Information (MSI), position reporting, etc.
- Distribution of weather and ice information, for example, meteorological and hydrological data
- Research activities; ice studies, meteorological and hydrological research and monitoring, etc.

Investigations performed for the European Space Agency by the ArctiCOM project[5] have analysed the expected demands from the energy and maritime segment (including offshore and marine operations), and compared them to projected communication capacity[6] supply in the Arctic in 2020 – the results from an additional survey being depicted in Figure 2.[7]

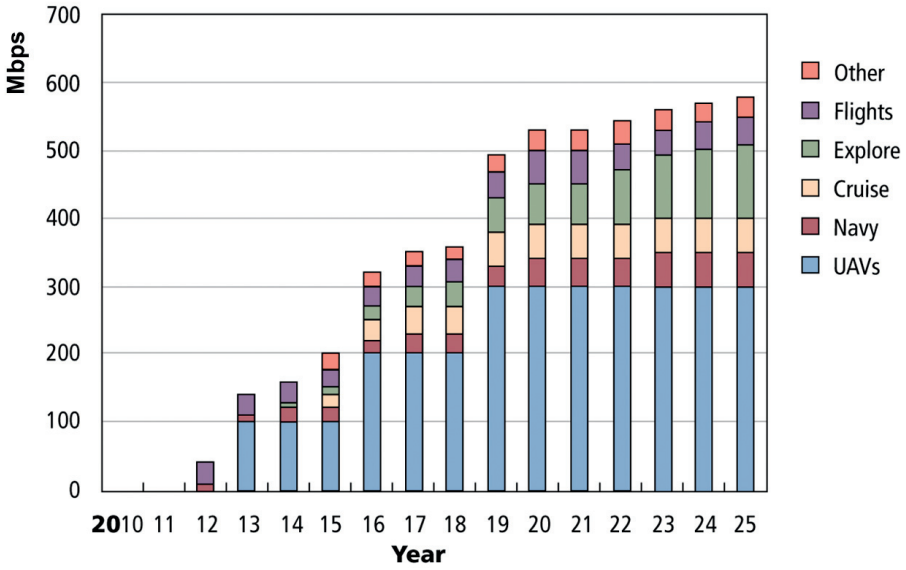



*Figure 2 Potential communication capacity requirements in the Arctic region over the next 15 years [4]*

## Maritime Communications

Telecommunication at sea differs significantly from its land-based counterpart, with regard to (the number of) users and their requirements, the physical surroundings resulting in divergent signal propagation phenomena, and appropriate equipment and available infrastructure to adequately support the maritime users.

Obviously, only wireless solutions are applicable to mobile platforms/vessels, while fibre cables represent a highly desirable alternative for fixed offshore installations. Fixed installations in southern areas are normally equipped

5 http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=30581
6 Communication capacity is most frequently measured as data rate in bits per second (bps).
7 The Aerospace Corporation Crosslink Magazine, Summer 2011.

with high-capacity fibre links, and may thus be utilized for wireless base stations or relay facilities to cover their surroundings. Likewise, maritime coastal installations (lighthouses etc.) could be equipped for similar coverage of the coastal waters.

Due to substantial cost/benefit advantages and access to the rapid proliferation of advancements in broadband services, terrestrial wireless technologies are decidedly preferred in coastal waters and in the vicinity of offshore base stations (~20–100 km, depending on capacity requirements), for example:

- WiFi/WLAN (extremely short range; harbours and similar structures)
- GSM/3G LTE/4G
- WiMAX, CDMA450
- Digital VHF (low bandwidth)

However, satellite communication (SatCom) is the sole alternative at deep sea operations out of range from any terrestrial solution and/or unfit for fixed fibre links.

Based on these observations, MARINTEK has developed the WiCAN© ('Wireless Coastal Area Network') concept illustrated in Figure 3, characterized by the following aspects:[8]

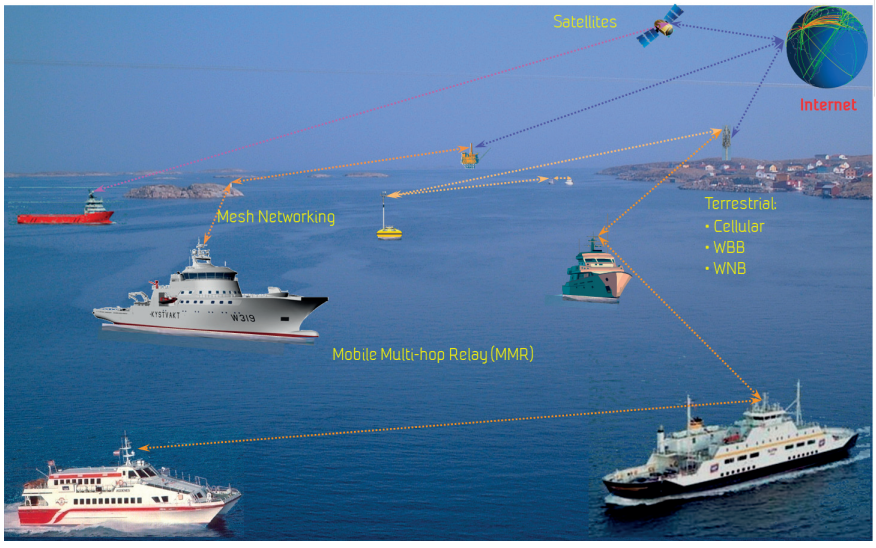



*Figure 3 The MARINTEK Wireless Coastal Area Network (WiCAN©) concept*

8 Bekkadal, F. (2010): 'Novel Maritime Technologies', MARINTEK Report MT28 F10-039, 17.02.2010.

- Extended coverage terrestrial systems 'illuminating' the coastal waters by utilizing all appropriate and available technologies
- Base stations or relay facilities at fixed and floating offshore installations to expand the coverage area
- Mesh networking; utilizing other vessels, lighthouses and similar installations for Mobile Multi-hop Relay, primarily to service shadowed areas
- Appropriate SatCom solutions to complement/supplement terrestrial systems, mainly beyond their coverage

To use the WiCAN concept to its full advantage requires a 'Heterogeneous Wireless Multi-Carrier Communication System' ('HeWiMuCS') facility on board, as exemplified by a recent installation at four Norwegian Coastal Administration (NCA) vessels for advanced surveillance applications, wherein an 'intelligent' switch/router (ISR) decides which carrier to be used (based on selected performance criteria) and facilitates handover between the communication carriers, as depicted in Figure 4.

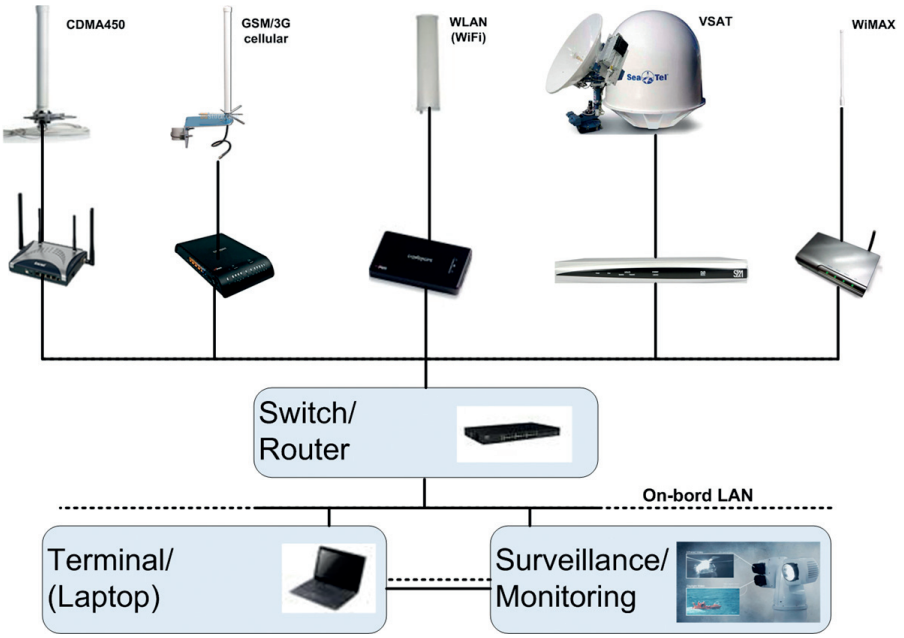



*Figure 4 A recently installed on-board 'Heterogeneous Wireless Multi-Carrier Communication System' ('HeWiMuCS')*

## Arctic Communication and Navigation Challenges

Although the WiCAN concept may readily be adapted in the High North, the SatCom will be the predominant element, due to the vast areas of open sea without currently noteworthy offshore installations or terrestrial infrastructure on the surrounding coastal areas.

Considering the usually harsh and remote environment of the Arctic region and the impracticality and/or overbearing costs of building high-capacity terrestrial infrastructure, major communication systems solutions would need to be satellite-based, most likely hybrid with a wireless terrestrial component to spread communication coverage further out to locations that are either unreachable or which are uneconomical to serve individually by direct satellite signal.

In the hybrid model, the terrestrial network handles local communications, while a satellite link backhauls to the Internet core network through a gateway. With clustered users, this solution is typically more cost-effective than if each user connects directly to a satellite.

### SatCom and SatNav System Orbits and Frequency Bands

Satellite orbits currently utilized for SatCom and satellite navigation (SatNav) are portrayed in Figure 5, along with their major orbital characteristics.

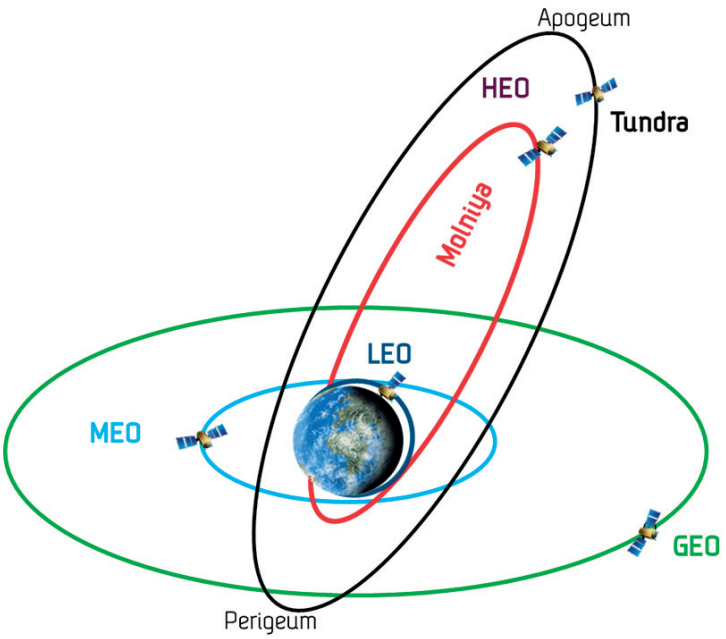
During the early 1960s, the Soviet Union's aerospace engineers devised a high elliptical orbit (HEO) with high eccentricity ($e$ = 0,7) that would simulate the convenience of a geostationary orbit (GEO) at its apogeum, while simultaneously servicing the extreme northern regions. The first Molniya satellite was launched in 1964, and to date more than 150 have been deployed, together with several others in Tundra orbits.

Although the system supports the Russian Orbita Television network, its principal function has been (and is) to service government and military communication traffic, mainly in Siberia and northern Russia.

In general:

- SatNav systems use medium earth orbit (MEO) (e.g. global positioning satellite (GPS): 24 satellites at altitude: 22 200 km)
- Inmarsat and VSAT SatCom systems use GEO (altitude: 35 786 km)
- The only noteworthy low earth orbit (LEO) SatCom system is Iridium (66 satellites at altitude: 780 km)

Inmarsat, Iridium and the pertinent SatNav systems operate in L-band (1–2 GHz), while VSAT systems operate both in C-band (2–4 GHz) and increasingly in $K_u$-band (12–18 GHz), and future applications are being projected for $K_a$-band (27–40 GHz).




| Orbit | | Altitude [km] | |
|---|---|---|---|
| | | Apogeum | Perigeum |
| LEO: Low Earth Orbit | | 200 – 2 000; normally: 600-1 000 | |
| MEO: Medium Earth Orbit | | 2 000-GEO; normally: 10 000-20 000 | |
| GEO: Geostationary Orbit | | 35.786 | |
| HEO: High Elliptical Orbit | Molniya (12 hr) | ~500 | ~40 000 |
| | Tundra (24 hr) | ~24 000 | ~48 000 |

*Figure 5 Satellite orbits and major characteristics*

## Current SatCom System Shortcomings in the High North

### GEO Satellites

A user terminal needs line-of-sight (LOS) with a communicating satellite, the angle between LOS and the plane tangential to the earth's surface at the user position being denoted by the *elevation angle* ($\varepsilon$), that is 'the angle above horizon'.

At high latitudes, GEO satellites can only be seen very low on the horizon, and as demonstrated in Figure 6, the elevation angle $\varepsilon = 0$ at ~ 81°N with the satellite due south of the user terminal (i.e. at the same longitude, the most favourable constellation), beyond which latitude GEO satellites are invisible for the user. When the satellite and the user terminal are not at the same longitude, which is most commonly the case (see, for example, the Inmarsat I-3 satellites constellation in Figure 6), the satellite will be invisible for the user at significantly lower altitudes.

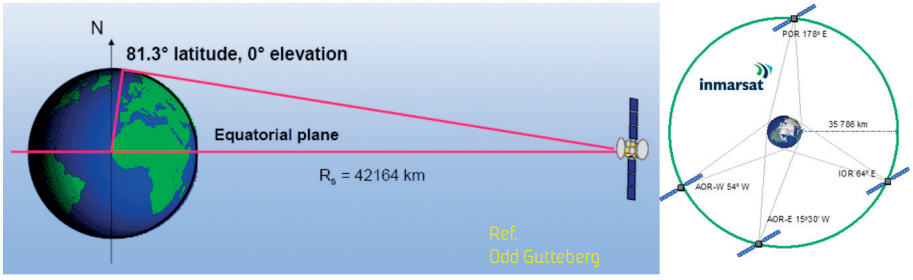



*Figure 6 Grazing altitude for a GEO satellite due south of the user terminal and the Inmarsat I-3 satellites constellation*

Additionally, even relatively advanced maritime SatCom terminals with stabilized antennas require an elevation angle $\varepsilon > 5°$, which in the most favourable constellation renders them inadequate at latitudes exceeding about 76°N, thus leaving most of the Arctic area uncovered, as illustrated in Figure 7.

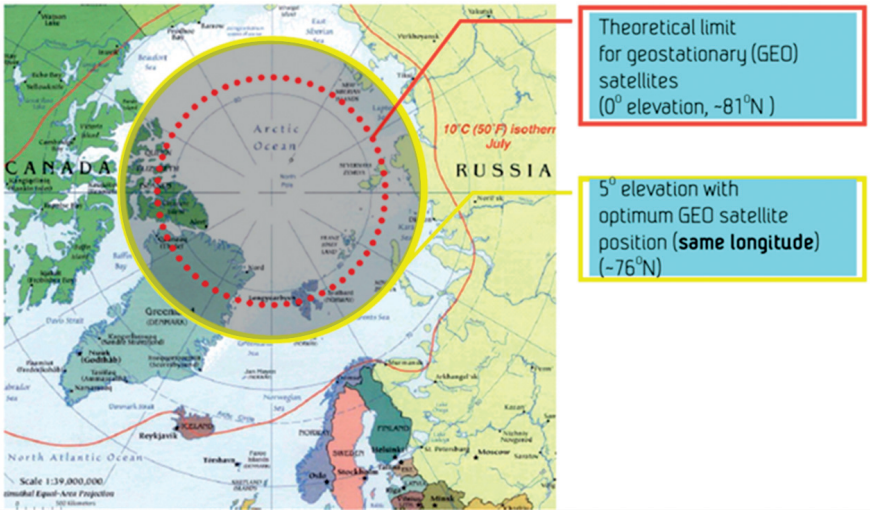



*Figure 7 Absence of GEO satellite coverage in the High North*

### Iridium

The only notable LEO SatCom alternative is Iridium, but although it allegedly provides a global pole-to-pole coverage, its current low capacity (maximum: Iridium OpenPort < 128 kbps) and dubious latency[9] make it inadequate for numerous applications in the High North.

### Ionospheric and Atmospheric Disturbances

The earth's atmosphere has significant impact on radio wave propagation; however, depending on the frequency, different phenomena are predominant. In general:

- Lower frequencies, for example L-band (1–2 GHz), are mainly influenced by the ionosphere, the effects decreasing with increasing frequency. Ionospheric effects are highly dependent on solar activity.
- Higher frequencies, for example $K_u$-band (12–18 GHz) and $K_a$-band (27–40 GHz), are mainly impaired by the troposphere (gases, clouds, rain, hail, snow, sleet, dust, etc.), the effects increasing with increasing frequency.

The signal path length through the atmosphere between a user terminal and a GEO satellite is highly dependent on the terminal's elevation angle, increasing dramatically at higher latitudes, thus causing the deteriorating signal – due to the effects mentioned earlier – to escalate accordingly.[10]

Ionospheric effects on a.o. L-band SatCom and SatNav signals comprise a.o. varying time delays and scintillations, while the atmospheric impacts on $K_u$- and $K_a$-band signals are caused mainly through scattering and attenuation, hence deteriorating the signal-to-noise ratio (SNR, S/N). This may cause loss of vital data, and under severe conditions lead to radio link outages.

Precise SatNav positioning relies on correction signals obtained from fixed stations at known positions (so-called differential SatNav), and augmenta-

9 Iridium has a multi-hop topology with onboard switching/routing, and latencies are thus quite random as they depend a.o. on the number of necessary hops. Examples of delays that are estimated and measured are around 300 ms for voice and from 500 ms up to 10–20 s for data. McMahon, M. M. & Rathburn, R. (2005): "MEASURING LATENCY IN IRIDIUM SATELLITE CONSTELLATION DATA SERVICES", US Naval Academy Report no: A291464, June 2005.

10 Assuming, for example, that the vertical extension of the lower troposphere is ~12 km, the referenced path length is ~35 km at Oslo (~60°N), amounting to about 10 times that distance (~350 km) at the northern rim of Spitsbergen (~80°N).

tion of a global navigation satellite system (GNSS) is a method of improving the system's attributes, such as accuracy, reliability, and availability, through the integration of external information from such reference stations into the receiver's calculation process. Due to the vast open sea areas in the Arctic, adequate ground-based augmentation systems (GBAS) are hardly realizable, and satellite-based augmentation systems (SBAS) utilizing GEO satellites suffer from the very same shortcomings as mentioned earlier (e.g. the devised European Geostationary Navigation Overlay Service (EGNOS) system for future Galileo applications).

Consequently, novel SBAS/GBAS solutions need careful attention to accommodate user requirements on accurate and reliable GNSS positioning in the High North.

### Signal Blocking, Reflections and Multipath Effects

At low elevation angles, both natural and artificial obstacles in the vicinity of a user terminal may easily block the LOS to its communicating counterpart. Figure 8 illustrates LOS blocking for GEO satellites which occurs when the distance ($L$) to an obstacle between the user and the satellite is $L < H \cdot cotan(\varepsilon)$, where $H$ is the obstacle's height and $\varepsilon$ the elevation angle.

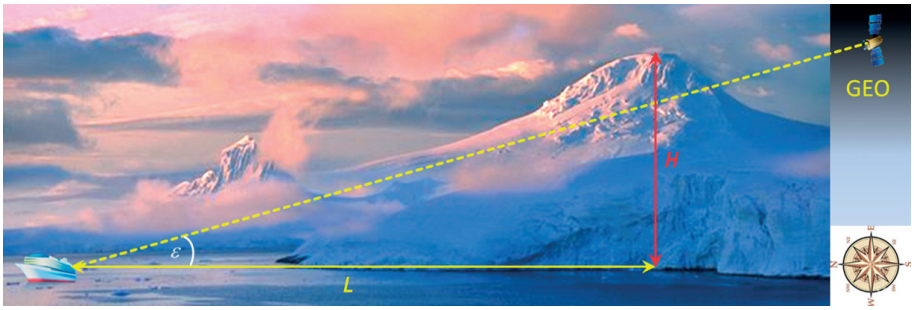



*Figure 8 LOS blocking for GEO satellite*

At the northern rim of Norway's mainland, $\varepsilon = 10°$, and LOS blocking occurs within a distance from the obstacle of $6 \cdot H$, while $\varepsilon = 1°$ at the northern rim of Spitsbergen, resulting in LOS blocking within a distance from the obstacle of $60 \cdot H$.

Furthermore, (multiple) reflections from/between similar obstacles and sea/ice surfaces can cause multipath interference, which may deteriorate the signals considerably.

### Weather and Icing

The harsh, unpredictable and rapidly changing weather conditions in the Arctic frequently causes icing on outdoor equipment, both so-called atmospheric icing due to precipitation and icing created by sea spray (salty ice).

Antennas enable any radio system contact with the outside world, and thus represent the most crucial elements regarding system performance. Icing is one of the most serious problems for antenna installations, whether they are radome-protected or not. Ice build-up not only increases antenna wind load and weight, but often deteriorates the antenna's performance to a point where it is no longer usable for any radio system that is exposed to adverse climate conditions.

When ice first forms on an antenna, it is usually wet and conductive, particularly if it is due to saltwater spray, which is frequently experienced in maritime environments. This is the most destructive condition for electrically detuning and deterioration of antenna performance. Subsequently, ice build-up increases and will eventually freeze to solid, causing the antenna wind load to escalate to a level where it may be stressed to its breaking point.

Both the ice build-up and (later) melting most frequently occur in an asymmetrical fashion, so one side of the antenna may be more affected than the other. Antennas can also be damaged by flying ice from nearby structures often found on ships and offshore installations. This can often cause catastrophic failures since ice is heavy and large ice sheets often break loose with wind or melting.

Consequently, novel robust antenna designs are required for reliable operations of radio systems under adverse weather conditions in the High North. Currently, MARINTEK and its associated scientific experts are studying a.o. the super-hydrophobic property of lotus leaves to gain insight into how particle–polymer coatings may prevent ice formation on antenna exteriors.

### Vessel Movements

Stabilized antennas must lock onto the intended satellite for proper operation, but several conditions, including the vessel's unpredictable gyrations, can instigate a stabilized antenna to drift from the intended satellite and cause signal blackout and/or harmful interference to adjacent satellites.

Due to rather severe roll, pitch and yaw movements of a vessel during adverse weather conditions, larger nominal elevation angles than 5° are required, and thus practical problems with less advanced SatCom terminals may be expected to arise at latitudes as low as about 70° N.

## Conclusion on Current Situation

- GEO satellites are (theoretically) invisible at latitudes >81°N.
- Even relatively advanced maritime SatCom terminals with stabilized antennas require an elevation angle $\varepsilon > 5°$, which in the most favourable constellation renders them inadequate at latitudes >76°N.
- Unstable GEO performance due to inadequate antenna performance, atmospheric disturbances and weather conditions as outlined earlier may be experienced as far south as 70°N, thus rendering the Arctic with only low-data rate (<128 kbps) Iridium SatCom, additionally suffering from dubious latency and unsteady performance experienced in the High North, despite its claim for global gap-free coverage (Figure 9).

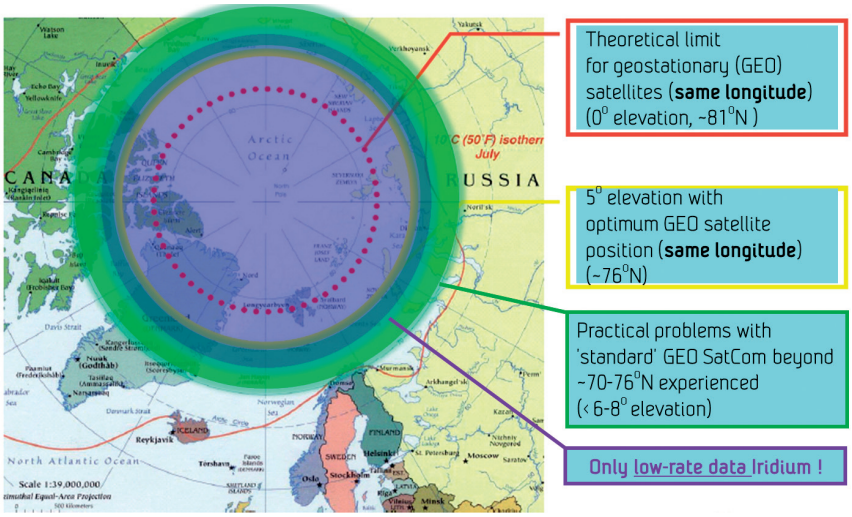



*Figure 9 SatCom shortcomings in the High North*

## HEO SatCom – The Ultimate Solution?

Assessments conducted as part of the ArctiCOM project for the European Space Agency point to an HEO satellite constellation as the best alternative for long-term all-encompassing telecommunication gap-filling at the Arctic polar cap area, additionally offering some very interesting prospects. While a detailed trade-off may be a solution,[11] the major justifications for utilizing such orbits are as follows:

11 Smith, P. L. et al (2009): "Future Space System Support to U.S. Military Operations in an Ice-Free Arctic: Broadband Satellite Communications Considerations." Reston, VA: AIAA Space.

- HEOs provide a quasi-stationary perspective. Apogee height is approximately the GEO height, and thus GEO technologies can be reused (slightly modified), resulting in
  - Cost savings
  - Risk reduction
- Best possible high-latitude coverage per satellite:
  - Fully complements geostationary data; no LEO-like latitudinal coverage gaps
  - Little time 'wasted' over lower latitudes adequately seen from GEO
- Simple ground segment; real-time dissemination can be achieved with a single primary ground station, as for GEO
- More cost-effective than GEO systems for the delivery of satellite-based mobile multimedia in Europe[12]

Figure 10 displays the view of the earth from a GEO and an HEO-Molniya satellite in its apogeum, respectively, illustrating the advantages of the latter solution for the High North.

However, launching satellites comprise significant resource- and time-consuming processes, and though a couple of interesting projects are currently under way with estimated launching around 2016 (e.g. the Canadian 'PCW'[13] and the Russian 'Arktika'[14]), HEO coverage of the Arctic is hardly foreseen to be realized before around 2020.

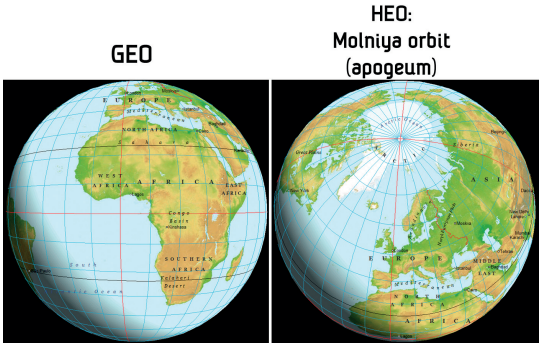



*Figure 10 The Earth as seen from a GEO and an HEO-Molniya satellite in its apogeum*

12 Hoeher, P.; Woerz, T.; Schmidbauer, A.; Schweikert, R.; Frank, J.; Grosskopf, R.; Schramm, R.; Gale, F.C.T.; Harris, R.A. (1996):" Digital audio broadcasting (DAB) via satellite: results of an Archimedes measurement campaign." *Satellite Systems for Mobile Communications and Navigation. Fifth International Conference on Satellite Systems for Mobile Communications and Navigation, 13?15 May 1996*, pages 55–58.

13 PCW: 'Polar Communication and Weather mission'.

14 http://www.oceansadvance.net/press-releases/russia-develop-arctic-information-satellite-system

## Intermediate Alternatives

Amongst the intermediate (years ~2015–2020) alternatives, the most likely to succeed is believed to be a hybrid concept utilizing, for example, high altitude platforms (HAPs – see Figure 11) as 'relay stations' for both GEO SatCom and terrestrial links, a topic currently being investigated by a.o. MARINTEK.

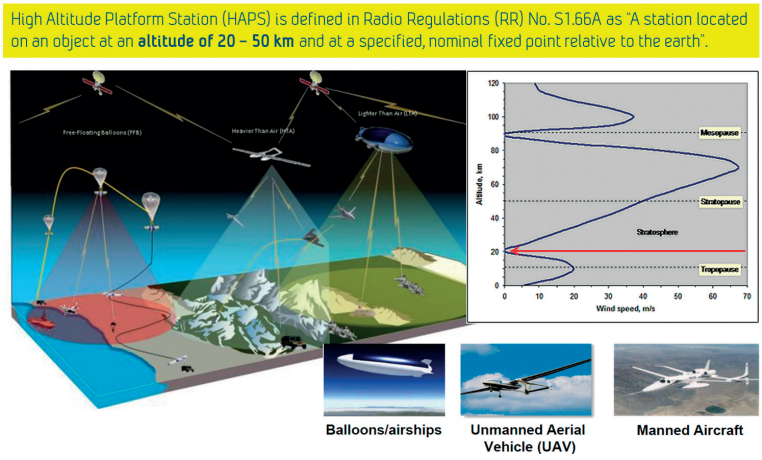
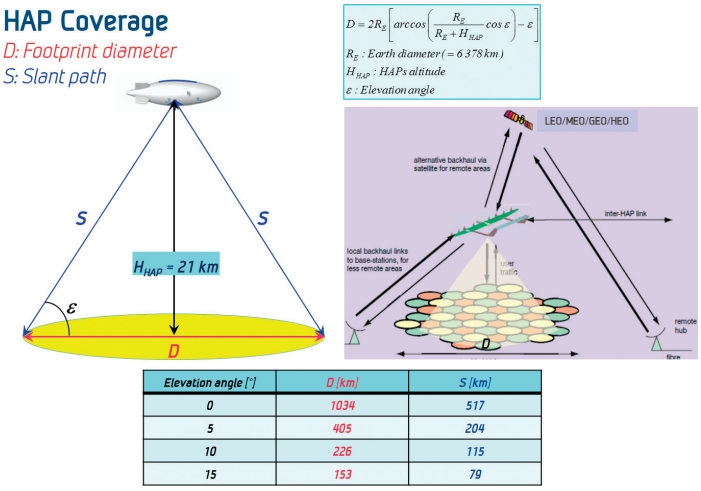



*Figure 11 Definition and categories of high altitude platforms (HAPs)*

As can be seen from the nominal atmospheric wind profile in Figure 11, the most preferential HAP altitude would be around 20 km, where its coverage area dependence on the minimum elevation angle required is illustrated in Figure 12.




| Elevation angle [°] | D [km] | S [km] |
|---|---|---|
| 0 | 1034 | 517 |
| 5 | 405 | 204 |
| 10 | 226 | 115 |
| 15 | 153 | 79 |

*Figure 12 HAP coverage's dependence on minimum elevation angle (ε) required*

A minimum elevation angle of about 5° is assumed sufficient for most applications, in which case the circular coverage footprint diameter of an HAP at 21 km altitude is around 400 km.

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# How I Would Plan and Execute a Drone Attack on Norway in 2050: A Scenario

Eirik Newth, M. Sc.

## Introduction

This chapter presents a scenario of how an unmanned aerial vehicle (UAV) attack might take place in the future. To clarify, a scenario is not a prediction but rather a description of one of many possible futures. It is a plausible story, based on extrapolations of our current knowledge of science and technology, as well as demographic, political and economical trends that seem stable enough to have an influence on the year 2050.

In this scenario, several assumptions are made. First, this is a future in which UAV technology and information technology (IT) have coevolved for decades, resulting in autonomous, semi-intelligent aircraft. Second, it is assumed that current population trends in Russia and Norway will continue for the foreseeable future, with grave consequences in the case of Russia. Third, it is assumed that global warming is a fact which will change living conditions and influence international relations in the Arctic in 2050.

## Deciding on the Attack

It is the year 2050, and Siberia is the Wild East. The central government in Moscow, weakened by decades of falling population, corruption and separatism, has lost control over a huge expanse of its territory. What used to be the Siberian Federal District is now an independent region larger than theUnited States, with a population comparable to New York City. Thanks to global warming, Siberia is becoming more habitable and attractive to immigrants from East Asia, most notably China. They are drawn by the promise of virtual lawlessness and access to vast natural resources, and as a result a new form of

government emerges in the region. From Novosibirsk to Vladivostok, Siberia is ruled by an alliance of Russian and Chinese criminal gangs and warlords – the Siberian Cartel.

Although not a nation state in our sense of the word, Siberia wants economic and diplomatic relationswith the governments of neighbouring nations. Of special importance are the northern rim countries (NORCs) – nations that can claim sovereignty over Arctic waters. These include the United States, Canada, Russia and Norway. Siberia wants its share of the energy resources hiding beneath the remaining sea ice, but has so far had limited success in making the NORCs see its position. After having tried conventional avenues for several years, the leaders of the Cartel conclude that a new strategy is necessary. In a series of secret meetings held in 2048, they decide to take action against the most vulnerable of the NORCs – Norway.

Norway in 2050 continues to be ranked among the world's wealthiest, most stable societies, thanks largely to the fact that the oil age lasted for much longer than expected. It has a population of 7.5 million and a small but professional and well-equipped army and air force. Norway is a member of the North Atlantic Treaty Organization (NATO), by now an aging but still functioning alliance. The leaders of the Cartel know that they cannot defeat Norway in a conventional attack. But then, defeat is not their aim. What the Cartel is after is recognition as the de facto government of Siberia. It wants Norway's support in gaining access to the oil and gas fields in the East Arctic Sea, as well as control over the eastern section of the North East passage, fast becoming a major shipping lane.

Norway still has close ties with Moscow, which discourages all communication with what it terms "criminal insurgents". It is this fact that the Cartel wants to change. It wants to force Norway to accept the new reality in the North with a short, sharp and massive show of force.

## The Black Cloud

The manner of attack is determined, as always, by demographics, geography and economics. Russia is an effective barrier to ground-based attacks from Siberia, and economics rule out a large-scale operation by sea. By a process of elimination, the Cartel settles on an air strike.

In 2050, UAVs have evolved into a wide range of aircraft, from hypersonic strike craft to microdrones the size of an insect. However, what really separates modern drones from their distant ancestors in the early twenty-first century

is their mental capacity. Larger drones are able to reason at a higher level than birds of prey, and often emulate bird behaviour when necessary. This also includes interdrone communication. In stark contrast to the early twenty-first century, when UAVs were heavily dependent on a ground-based communications infrastructure, in 2050 most of the data exchange is between the various craft. The old vertical line of communication is now mainly horizontal.

This has given rise to one of the most feared sights of the age – the so-called black cloud, a flock consisting of thousands of drones reminiscent of the clouds of starlings that can still be observed in nature. The black cloud launched by the United States against Lagos, the capital of Nigeria, during the West African conflict of 2047 is generally regarded as the textbook case.

On the morning of 3 June 2047, more than 10 000 drones descended on Lagos. Within hours, the entire infrastructure was paralysed and the population was subjected to psychological warfare of unprecedented ferocity. This was accomplished with nonlethal weapons such as electromagnetic pulse beams, sound cannons, chemical irritants and – most notably – neuroprojectors. The latter is the unintentional result of research done in the 2030s, when engineers were trying to develop the ultimate home entertainment system by stimulating the brain to generate sounds and images. But rather than seeing the latest action movie with eyes closed, most test subjects reacted to the projector with an overwhelming sense of fear. This ruled it out as entertainment, but the research was quickly picked up by military contractors.

In 2050, there are a range of weapons capable of influencing human emotions at a distance. They work best when the targets are at rest, and usually form the core of a class of weapons known as sleep deprivation systems (SDS). In Lagos in 2047, SDS drones carrying neuroprojectors effectively blanketed large parts of the city with fear. A combination of isolation, relentless noise, a horrible smell and no power for air conditioning made sleep impossible. After 2 days, the citizens of Lagos were exhausted. After 5 days, they were hallucinating and ready to do anything to get some peace and quiet. So was the rebel government that was the real target of the black cloud, and it capitulated in short order. It is this effect that the Siberian Cartel wants to create, for the very first time in an advanced economy.

## Building the Cloud

To accomplish this, the Cartel needs thousands of drones. There are restrictions on the sale of advanced military drones, but civilian craft are powerful enough to do the job with some modification. What the Cartel doesn't know is that it can outsource. What it can't buy on the black market, it can build.

In 2050, robotic production lines and three-dimensional printing technology has evolved to the point where anyone with the funds can erect a factory complex in a matter of weeks. Theses factories are modular, based on standard shipping containers. Depending on what you want to produce, you buy the modules you need and assemble them on site, LEGO style. Space technology is used to gather and process raw materials for production. In the 2030s, exploitation of the mineral resources of asteroids became commercially viable, and autonomous mining robots were developed to keep costs down. These systems turned out to be well suited for the harsh Siberian environment. So, although the Cartel started out with limited technical capacity, it is able to assemble an industrial complex in the depths of the Siberian forest. Within half a year, the factories are churning out UAVs and weapons systems.

## Preparing for the Attack

For the following phases of the attack, surveillance and planning, the Cartel depends on a completely different technology. In 2050, what was once called big data has fully realized its potential. Decision assistance systems, software that can analyse complex data sets and advise humans, is now used in all walks of life.

This includes the preparation, planning and conduct of war. The Siberian Cartel does not have access to military-grade software, and relies upon a civilian system modified with the help of hackers with terrorist connections. With this, it can pinpoint targets using images from commercial satellites, and publicly available information such as government statistics and data from social media.

What remains when the software has done its work is to develop a plan of attack. The obvious target for a black cloud is Oslo. The capital city has not been subjected to a military attack for over a hundred years, and its distance from all global centres of unrest has created a sense of security which the Cartel aims to shatter. But attacking Oslo instead of a closer target such as Kirkenes in the North East does present the Cartel with logistical challenges. Large, commercial surveillance drones are able to stay aloft for weeks at a time

and fly from their take-off points in Siberia, but the majority of smaller drones are short-range and need refuelling.

In the case of Lagos, the black cloud launched by the United States was supported by two carrier groups in the Gulf of Guinea. The Cartel settles on a different approach, using modified civilian ships as stand-ins for military drone carriers. It determines that three ships are enough to carry the drones and the fuel necessary for creating the black cloud.

The Cartel is involved in commercial shipping in the North East passage. In early 2050, three large container ships carrying 5000 drones, ranging in size from 3 m in wing span to 5 cm, are being readied in a small harbour on the East Siberian Sea. The ships also carry fuel enough for a week-long campaign, launch and refuelling systems, an autonomous command and control centre as well as advanced communications equipment. Like so many commercial vessels at the time, the cargo ships are crewless. This serves the dual purpose of making it easier to conceal the ship's true origin – deniability is crucial to the Siberian strategy – and simplifying the cloud's attack algorithms. Every human-shaped object on the ground in Oslo will be regarded as a foe.

## The Cartel Strikes

Under normal circumstances, Norway's air force is capable of defeating a black cloud. Consequently, the Cartel has to wait for a chance to strike while the armed forces are otherwise engaged – which they frequently are in this turbulent, conflicting age.

An opportunity presents itself in the fall of 2050, when civil war breaks out in Brazil and NATO is called upon for peace-keeping operations. Norway pledges half of its aging F35s for air patrol duties. But when the situation in Brazil spirals out of control in October, NATO and Norway are pulled deeper into the conflict. The government in Oslo decides to deploy the majority of the country's drone force to Brazil, and the Cartel seizes the moment. Three ships set sail from Siberia and reach Oslo on the morning of November 15.

Hours later, a flotilla of stratospheric drones classified as research aircraft unexpectedly deviate from their course along the Norwegian coast. When called by ground control, the drones reply with a message that implies a software glitch. This creates confusion on the ground, and the drones are allowed to cross Norwegian airspace without being intercepted. The drones reach

Oslo in the late afternoon, at the peak of rush hour, and enter a circling pattern 25 km above the city.

Now, the three attack ships in Oslo harbour make their move. Shipping containers on deck fall apart and reveal stacks of drones that quickly unfold their wings and are hurled into the air on launch rails. Within minutes, the skies above Oslo are buzzing with drones of all sizes. The public perception that this is some sort of advertising stunt is cut brutally short by the first volley of surgical strikes from the drones. All electrical power is shut down, and drones carrying electromagnetic pulse (EMP) weapons disable electric cars at junctions across Oslo, creating a city-wide gridlock.

Then, the EMP drones start taking out mobile communication towers and IT services. The oft-repeated claim that our increased dependency on IT makes us more vulnerable is now put to the test – and proven beyond a doubt. For the first time in a generation, the city goes dark, quiet and cold on this wintry November evening.

As this is happening, the cloud broadcasts a message to receivers outside the radio-silenced city: "Do not attack us, or we will bombard Oslo." Despite this, a squadron of F35s is dispatched from the closest air base. But the planes are quickly pulled back when rocket fire from the cloud reduces a bridge in central Oslo to rubble. The government, which by now is as isolated and terrified as the population in general, orders a stand-off while "further avenues of negotiation are explored". There is only one problem: with whom do they negotiate? Nobody claims responsibility for the attack. The drones bear no identifying marks. In fact, the first warning message is the only message ever received from the black cloud.

While the attack is ongoing, Norwegian intelligence can only say with certainty that the stratospheric drones and baseships came from somewhere in the east. This makes it difficult to predict the next move, and the city is taken completely by surprise when psychological warfare begins in full. Drones carrying neuroprojectors cruise above the city, leaving gloom behind them. In addition, there are constant loud detonations, the air has a sickening smell, and there is isolation and cold and darkness. Few people are able to sleep. On the second day of the cloud, the government strikes back. Special forces have walked into town during the night and attacked the base ships from the ground. But they are only able to take out one ship before being overwhelmed by a flock of pigeon-sized kamikaze drones.

In response, the cloud fires warning shots at the parliament. After it has been evacuated, the building is levelled to the ground by rockets. From its new headquarters in the city of Hamar, the government asks for a ceasefire,

to which the cloud responds with its standard message. In reality, the government is left with two options. The first is to wait until the cloud runs out of fuel. This is deemed morally – and perhaps more importantly – politically unacceptable. The second is to take out all the drones in one strike. NATO offers to launch a counter cloud, but the prime minister agrees to a more radical approach suggested by the Americans.

Late in the night on 18 November 2050, a tactical nuclear weapon is launched from the United States towards Oslo. Detonating high above the city, the weapon does no physical damage on the ground but instead delivers a powerful electromagnetic pulse. In the fraction of a second, the unprotected circuits of thousands of modified civilian drones are fired. Minutes later, the black cloud lies broken on the ground.

## Aftermath

The same blast that neutralized the drones also destroyed the remaining electronic infrastructure in Oslo, effectively bombing the population back a century. Repairing and replacing all damagedequipment is astronomically expensive, and it takes a decade for economic activity to return to the pre-cloud level.

Although the black cloud is directly responsible for fewer than a hundred casualties, this is the most damaging attack on Norwegian soil since the Second World War. Of course, the people of Oslo want to know who did this, why it was done and why – if the enemy was defeated – they still feel like they were on the losing side.

The Siberian Cartel went to great efforts to hide their tracks, and therefore the government is unable (or unwilling, some say) to provide a clear answer. This fuels rumours about a cover-up. Many point to the warming of Norwegian–Siberian relations from the mid 2050s onwards, which culminates in Norway being among the first countries to support the Siberian Republic's membership in the United Nations in 2060.

A historian of note suggests that the Norwegian government may have been inspired by the strategy chosen by the Americans after the Cuban Missile Crisis. In 1963, the United States withdrew its intermediate-range Jupiter missiles from Turkish soil, as the Soviet Union had demanded. But President Kennedy agreed to this on the condition that it be kept a secret, to avoid the impression that the Soviets had benefited from their actions. Only later was the real connection known. Likewise, the historian says, it is possible that Norway gave in to secret demands while maintaining a brave face.

The prime minister disagrees strongly, and in an interview broadcast in 2061 she denies the accusations and states: “This is not the Cold War. We live in an age of openness, where backroom deals such as this are impossible to hide in the long run. Even if we wanted to, we just don’t work that way any more.”

# Drone Wars – A "Nuclear Impact" on Strategic Thinking?

Professor Sir Hew Strachan, Oxford University

The purpose of this chapter is to discuss the relationship between unmanned aerial vehicles (UAVs) and strategic thought. It is one of whose importance I remain sceptical. The notion that there exists a relationship between UAVs and strategic thought comparable to that of the atomic bomb may only be a way to provoke debate. I therefore hope that this chapter will at least help clarify what are the implications of the use of UAVs for strategic thought. It will therefore pose more questions than it will provide answers, because if we don't have any sensible questions, we will not have any sensible answers either.

At bottom, it seems that UAVs are a technological response to a series of tactical and operational problems in warfare. Moreover, the solutions they present to those problems are not particularly new. The pursuit of unmanned flight is at least as old as the pursuit of manned flight. Indeed, the two have largely developed side by side, and in step with each other. Military forces have wanted to use unmanned flight for two principal reasons: first of all, for the purpose of reconnaissance to acquire intelligence, and, second, to deliver deadly fire at a target ideally situated at a considerable distance from that target. There is nothing striking or significantly different about those objectives, whether we are considering the whole sweep of the history of warfare, or whether we are looking only at the twentieth and early twenty-first centuries.

UAVs have therefore done little in war that is different from what manned aircraft and manned flight have also aspired to do. We have, indeed, used other devices which are also unmanned to achieve the same effects, from artillery shells to cruise missiles. Perhaps we should therefore think of both artillery shells and cruise missiles as UAVs, because surely they are. Finding out where the enemy is, who he is, what positions he has adopted and then trying to kill him have been imperative in war for a very long time. From that point of view, the UAVs in these respects are enablers, without direct strategic effects. They are designed to enhance the means to achieve the desired objectives, without necessarily directly affecting the relationships between means, ways and ends, which I would argue is the core of what strategy is all about.

All this, however, is relatively unsurprising. What technological change tends to do in warfare is to enhance the component parts of strategy, not to dominate it as a whole, and especially not to dominate it in the context of land warfare. Classical strategic thought, by which I mean Clausewitz and Jomini in relation to land warfare, or Mahan and Corbett in relation to war at sea, was not much influenced, at least not in the traditional senses, by material change. It was much more influenced by the geography and by social and political conditions. For the classical strategic thinkers, the dialogue in strategic thought was the dialogue between the present and the past. In their work there is much more attention to history than there is to the future.

However, since the First World War, and especially in the last part of the twentieth century, there has been a counter-school of strategic thought, which may be called a "materialist" school, which indeed is inspired by the advent of new technology, and where the dialogue between the past and the present is replaced by a dialogue between the present and a potentially perfectible future. That school of thought has flourished especially in the context of naval and air warfare, because both navies and air forces are built primarily around their equipment, and technological change to ships and aircraft have the capacity to change dramatically the correlation between time and space, a central relationship in strategy itself. So here, in the air and on the sea, new technologies, rather than being force multipliers, which is how armies tend to see them, can have the potential to become revolutionary in strategy.

Let us look at some obvious historical examples. In the nineteenth century, the steamship changed man's relationship to the physical constant – the sea, overcoming winds and tides, and enabling ships to fight not necessarily close to the shore or in narrow seas, but also on the open ocean. In the twentieth century, the manned aircraft spawned the ambition of what was called strategic bombing. In due course, the atomic bomb led to the hope that nuclear deterrence could go even further and could reshape international relations themselves.

If UAVs today bear comparison to the atomic bomb, it is not least in that sort of ambition, in that almost rhetorical political effect. That is to say, their claimed capacity to achieve the same sorts of effects as those to which advocates of the bomber and of nuclear weapons aspired for those two weapon systems follows from the belief that here is a weapon that can be perfected, and which can almost eliminate reaction from the enemy from strategic thought, and thereby remove the biggest complexity we have when we think about strategy – that it is not entirely under our control, but depends on our relationship with our adversaries.

UAVs are of course the centre of a great deal of press comment and public attention; so much so, that that fact is in itself, I would argue, a big part of the case for saying that UAVs have strategic effects. If the press and the public themselves debate the pros and cons of a weapons system, then that weapons systems has an effect on strategy almost by definition, because it has disseminated itself into a public and political discourse. The obvious recent comparison would be the effect that another tactical system – improvised explosive devices (IEDs) – had on the armed forces employed in Iraq and Afghanistan. They made the casualties they inflicted, which should simply have been a tactical effect, take on a wider political and public significance to the point where they influenced the debate on the deployment itself to these theatres of war.

Nevertheless, the reasons for the public debate are less to do with the strategic effects of UAVs than with the legal and moral implications of their use. If you open any newspaper, that of course is where the discussion is focused, for very obvious reasons. The argument that UAVs have changed the face of warfare rests not on that simple proposition in itself, but on the idea that the United States in particular has used them against those it identifies as actual or even only potential terrorists in a country not in the area of war, not in the area of operations, and in defiance of that country's state sovereignty. This is not to say that, because the debate has been primarily about international law, international law does not have strategic effects. Increasingly, both international law and just war theory do directly shape strategy, not least within the North Atlantic Treaty Organization (NATO) and within the West.

However, if the key issue is whether the United States is right to breach the state sovereignty of Pakistan in its pursuit of the Taliban or the leaders of al-Qaeda, then exactly the same questions would arise if it elected to strike the same targets with any other form of cross-border fire, whether it decided to situate an artillery battery on the Afghan side of the Pakistani border and fire shells across, whether it decided to send manned aircraft to drop bombs, or even whether it decided to use cruise missiles to take out those it deemed to be Taliban targets.

There are three principal lines of attack directed at UAVs on legal and moral grounds. The first criticism, and the most absurd, is the accusation that they kill the enemy at a distance, as if that is somehow improper, and that the real way to kill your enemy is in hand-to-hand combat. Nobody said that to Henry V at Agincourt in 1415, when he thought it more sensible to try to kill French knights with archers. Nobody said that to Lord Kitchener when he fought the battle of Omdurman in 1898 in Sudan; he managed to inflict roughly 10,000 casualties on the Sudanese dervishes, at the cost of 47 on his own side, largely

through the use of superior firepower. If one can kill at a distance, it seems not a bad thing to be able to do. There is, it seems, no inherent moral presumption that one must put oneself in harm's way in order to put the enemy in harm's way.

The second criticism that is levelled at UAVs is that they kill non-combatants through the collateral damage they inflict. This too seems to be an inherently absurd argument. It is not to say that it is not true, or that non-combatants have not been killed by UAVs, because self-evidently they have. But the whole point of using UAVs is that they are more precise than a gravity bomb. The argument of course is that fewer non-combatants are killed than would be the case if any other method of warfare was to be used. It is precisely the moral and legal pressures not to kill non-combatants that have led to the use of UAVs. Fewer non-combatants are killed in Pakistan using UAVs than were killed by, say, the Allied blockade of Germany during the First World War or by the strategic bombing campaign of the Second World War.

Moreover, if non-combatants are killed, the reason for them being killed probably lies less with the UAV itself – with the weapon – than with the intelligence being used to target that weapon in the first place.

Finally, and this seems to go to the heart of the strategic problem, following from the first two points – the third criticism levelled at UAVs on legal and moral grounds is that killing at a distance removes one of the cardinal aspects of the definition of war: that it is based on reciprocity. To that extent, the ideal of hand-to-hand warfare is an important part of our understanding of war. In the opening chapter of Clausewitz's *On War*, the first line reads: "War is a clash of wills." The essence of war is that it lies in the relationship between the two adversaries. The attraction, of course, of our current understanding of UAVs for those who use them is that it removes that element of reciprocity.

If this last point were genuinely true, and likely to be a permanently conditioning factor within warfare, then indeed the case for UAVs effecting a revolution in strategy would be much stronger. But I believe it is unlikely to be the case, and I am not even sure that it is the case today. The argument or presumption that UAVs somehow remove the element of reciprocity in war is generalized from the particular circumstances of their current use by the United States in Afghanistan and Pakistan, and in particular their use from Afghanistan into Pakistan, as though that were a rule for all time. It runs the risk that so many of us run, whatever we think of current warfare, which is our tendency to generalize from our current experience as though it were universally true.

UAVs do of course currently confer a unilateral advantage on the United

States and its allies, and that advantage is self-evident in the AfPak theatre of war. But the presumption that what is currently true will be permanently true is a besetting sin of strategic thought, and might already misrepresent the situation with regard to UAVs. First of all, there are extraordinarily simple responses to UAVs which are already effective. Sophisticated air defence systems can bring UAVs down, and on the commercial market there are sophisticated surface-to-air missiles advertised which precisely have that quality – that they are good at bringing down UAVs. UAV systems can be hacked, as Hezbollah has already done in the case of the Israel Defence Forces (IDF), and as Iraqi insurgents have done in the case of the United States. Iran claims that in December 2012 its electronic warfare unit took control of a US sentinel UAV and landed it safely, though the United States has disputed that claim.

The point is not that the UAV is invulnerable, it is rather the reverse – the point is that the UAV's vulnerability is a cost with which its operators can live because there is no pilot, and therefore no lives are lost when the UAV comes down. A UAV is expendable, but the cost will of course be less sustainable, the more sophisticated, capable and expensive the UAV becomes. The second point regarding reciprocity and whether it's there is that currently between 70 and 80 countries in the world have UAVs and have the capacity to operate them. In other words, what is extraordinary about the theatre of war with which we are currently most concerned – Afghanistan and Pakistan – is that it is exceptional. In almost every other part of the world, and particularly in terms of inter-state conflict, reciprocity would be inherent in UAV warfare, a trend only likely to increase rather than to diminish.

This seems to me to be a classic case of where an initial monopoly in a capability has generated exaggerated expectations of the strategic, as opposed to the tactical and operational, consequences of its procurement. There is indeed some sort of parallel here with the acquisition of atomic bombs. If we think back to the responses in 1945 and the dropping of atomic bombs on Hiroshima and Nagasaki, most of those responses tended to absorb the atomic bomb within existing strategic thought, to see it as part and a perfection of the notion of strategic bombing – the super-bomb that confirmed that doctrine. The technology, in other words, was applied without all that much of a change in strategic thought. Of course, that self-evidently was not universally true, most conspicuously when Bernhard Brodie in *The Absolute Weapon* in 1946 argued that things had changed irreversibly, and that the object of strategy was now to avoid war and not to wage it.

However, the fully developed nostrum of nuclear deterrence was not evident until the late 1950s or even the early 1960s. That sophisticated strategic

theory – the theory of deterrence that came out of the digesting of this new technology – now of course looks extraordinarily overblown and disproportionate to what is really a simple proposition, and which has very little relevance for many of our countries. UAVs, whose technological evolution has actually occurred over a much longer period than the 1940s equivalent of the atomic bombs, have today reached the point where strategic thought has suddenly woken up to something that has been around for rather a long time – just as strategic thought woke up to nuclear weapons in the late 1950s – and we are now struggling to catch up with that capability.

However, it is not enough just to say that "the dust will settle", which is the drift of the argument in this chapter so far, in that UAVs will simply be seen at some point in the future as enablers, as giving additional tactical and operational capabilities, for example. I think there are two aspects of the current debate which do have strategic effects and which are important for us to think about in a much broader context, and that may even simply be described as revolutionary in their effects on strategy.

The first is that it matters enormously that the country striking Pakistan with impunity, the country breaching Pakistan's state sovereignty with the use of UAVs, is the United States. It matters precisely because the United States, and particularly the Obama administration, has the capacity to set the international debate on strategy, which it is safe to say no other country is capable of. If it were not for the American use of UAVs, I suspect that this issue would have been much less debated. In other words, it requires America to do this for NATO and the wider world to begin to wake up.

Moreover, the United States itself sees the use of UAVs as a core in the strategy in waging what is now called the "Long War" rather than the "Global War on Terror". Obama, even more than George W. Bush, has ramped up drone strikes against terrorists, not only in Pakistan, but also of course in Somalia and Yemen. In doing so, he is achieving the corollary of that policy, which is the bringing down of troop numbers in Afghanistan, and meeting the commitment to withdraw from Afghanistan itself by 2014. Therefore, this is a key point. We are actually seeing a shift in strategy which does put UAVs at the centre of what the United States is trying to do. It sees UAVs as having the capacity to replace the manpower-intensive counterinsurgency doctrine, and as enabling the United States to fight its wars at a distance, with increasing levels of impunity, and without incurring the financial costs of deploying forces forward, or incurring the casualties that might result from such deployments.

Having troops on the ground has increasingly lost utility since Obama first

came to office in 2009. It has lost utility because the war the United States finds itself fighting in Afghanistan has lost its popularity. It has moved from being a war of necessity, which is what it seemed to be in 2002, to being a war of choice. UAVs are therefore a way to restore the utility to war – to make war useful, to make it once again an instrument of policy. But they do so at a significant risk. What they are doing is what German military historians looking at the Spring 1918 offensives would say of Ludendorff – that he was indulging in the "tacticization" of strategy. A horrible phrase perhaps, but one that captures what I am trying to say, which is that the tendency for those who should be exercising strategic authority, who should be trying to think about how you link war to policy, is instead to pursue tactical detail, to narrow the focus down and to lose the context. As an example, one could say that, when each Tuesday President Obama approves the list of targets to be taken out by UAVs for that week, he reduces the Long War to a series of individual tactical decisions.

Moreover, whether the use of UAVs will restore utility to war is, it seems, very much open to doubt. This is for one very practical reason – UAVs do not remove the need for people to be on the ground or to be in the theatre of war. Most UAVs are deployed in theatre, not at a distance, and of course UAVs themselves depend on human intelligence as much as other forms of intelligence in order to be discriminate in their use.

It could also be problematic for a much more serious reason. UAVs are currently achieving their destructive effects in the campaign on terror and in the war in Afghanistan by decapitating the leadership of the Taliban. In that respect, they are carrying through the ideas evident in war power theory advocated by John Warden in relation to the use of air power in the First Gulf War. But in case it hasn't been noticed, the effect of decapitation is to remove people's heads, which in this case means the heads of the Taliban. With whom is one going to negotiate if one wishes to bring war to an end? That was always recognized in traditional thinking about war as a reason for not targeting heads of state. One needed someone with whom to negotiate in order to establish the terms of peace.

Apparently, one of the problems at the moment is precisely to identify with whom one should negotiate in relation to the Taliban. Roughly 13 out of 20 of the most senior Taliban leaders have been killed, either by UAVs or by Special Forces, and without a leadership the Taliban cannot engage in peace talks. Indeed, we have an irony in that as the 2014 deadline approaches, negotiations with the Taliban have foundered. And without negotiations, what do we confront? We confront endless war, and endless war seems to be the very

negation of what strategy is about, another negation to go along the tacticization of strategy which UAVs might achieve.

This is a generic consequence of giving UAVs a role in shaping strategy. But the pressure, therefore, not to use UAVs because they may have strategic effects has to deal with another aspect of the case for their use. UAVs are of course enormously attractive to states like ours – the states of the Western world – which have abandoned the notion of the mass army, even if there is still conscription in, for example, Norway. Yet, we still have an appetite for intervention. Sustained counterinsurgency requires mass on the ground, but our armies no longer have mass. We no longer have the appetite to maintain that mass, either because it costs too much or because we are unwilling to conscript. What UAVs do is overcome a number of constraints which currently inhibit ground operations. They ensure that casualties to our own troops are low, if not non-existent. When the British army goes out on a patrol in Afghanistan today, its first requirement is its own security. If one of the members of its own patrol is hit, then the evacuation of the casualty takes priority over any other mission that patrol is assigned to achieve. The UAV gets over that problem.

Second, the UAV ensures what in the British Parliament are called "harmony guidelines". These are actually requirements, which are frequently breached of course, that British Armed Forces Service personnel should be at home with their families so many nights in the year. Clearly, if one can operate UAVs from the rear, one can be at home with one's family so many nights in the year. Harmony guidelines are going to be easier to observe. Third, UAVs overcome the disruption and loss of continuity in theatre which are created by the prevalence of 6-month or, in the American case, 12-month tours. These tours fail to produce persistence and continuity, because of a wholesale turnover in the personnel who are actually doing the fighting in the theatre. What UAVs allow for is the possibility of trickle posting rather than wholesale unit removal, and of course the UAVs themselves have a degree of persistence in their capacity to remain in the air.

Therefore, UAVs enable us, it would seem, to reshape war in the light of our own needs and expectations. With regard to the American programme, it is also interesting to ask whether the use of UAVs by, for example, the Central Intelligence Agency (CIA) marginalizes the traditional armed forces in favour of intelligence services and Special Forces. Clausewitz famously described war as being made up of three elements: passion, the play of probability and chance, and logic. He then went on to associate that trinity with the people, the armed forces and the government. The challenge for most states over the last decade has been to recognize the role of the people in making strategy. It

has always been very easy in the debates on civil–military relations to see strategy as a dialogue between generals and politicians. What has become evident in the last decade in Western societies is the need to incorporate the people. And I don't mean just "war among the people" as Rupert Smith has described it, that is the people that are in the theatre of war, but also the need to engage the people at home. When President Obama and Prime Minister David Cameron address the issue of strategy in Afghanistan, they are talking to a domestic audience, not to the people in Afghanistan or even to the government in that country. David Cameron memorably said a couple of years ago that "Britain will be out of Afghanistan by 2014 because the British people expect it", as though that was a strategic condition. Of course if he, as head of state, puts it that way, it effectively becomes a strategic condition.

What UAVs seem to permit is to allow governments to use force without having too much engagement with their people, and without having to explain what they are doing; and indeed, even more beautifully, without having too much engagement with their own armed forces, if the actual implementation and the application of UAVs are to lie with the CIA and its equivalents. So the whole business seems to be, from a politician's point of view, made in heaven. No inconvenient arguments with generals and no having to appease your own domestic public. It is a form of ideal warfare – almost, indeed, war by trial of single combat, a knightly duel.

However, the point remains that war is a reciprocal activity. And if war is a reciprocal activity, then just as the enemy's leaders can be targeted, so in due course, ours will be too. The problem of course will not stop there, because we are the electorate that put these people into power in the first place, and we will therefore be held accountable for our leaders' actions. So will that much really have changed when the dust settles? My argument is – in relation to strategic theory – not much. In relation to strategy in practice, perhaps there will be some change, but that is because strategy in practice is shaped by politicians and their imperatives, and not by generals and classical strategic theory.

# Om forfatterne

**Peter Warren Singer**
Peter Warren Singer is Director of the Center for 21st Century Security and Intelligence at the Brookings Institution, a policy research think tank in Washington DC. He is the author of three award-winning books, including the New York Times Bestseller *Wired for War: The Robotics Revolution and Conflict in the 21st Century*, which has been made an official reading of the US Air Force, US Navy, and the Royal Australian Navy. Singer has also worked at the US Office of the Secretary of Defense and the International Peace Institute. In his personal capacity, Singer coordinated the defense policy team for the 2008 Obama presidential campaign and has served as a consultant for the US military, intelligence community, and a range of technology and entertainment companies, including most recently the *Call of Duty* video game series, the best-selling entertainment franchise in history. Singer has an AB from Princeton University and a PhD in Government from Harvard University.

**Sigmund Simonsen**
Sigmund Simonsen er førsteamanuensis i rettsvitenskap ved Luftkrigsskolen. Hans undervisnings- og forskningsområder er folkerett, operativ militærrett og beredskapslovgivning, med vekt på når luftmakt kan brukes og hva den kan rettes mot (targeting). Simonsen er i tillegg tilknyttet NTNU og Universitetet i Stavanger. Han har utgitt flere publikasjoner fra sine forskningsområder. Simonsen er utdannet jurist og har tidligere bl.a. vært advokat med egen praksis. I tillegg har han avlagt en mastergrad i krigens folkerett samt juridisk doktorgrad. Simonsen har befalsutdanning fra Hæren.

**Martin van Creveld**
Martin van Creveld is an internationally recognized authority on military history and strategy. He is the author of 23 books, which have been translated into 20 languages; he has lectured or taught at most leading strategic institutes, military or civilian, from Washington DC to Singapore and from Moscow to Rio de Janeiro. He was the only non-American author on the US army's

required reading list for officers, and the only person—foreign or American—to have two books on that list. Born in the Netherlands, he holds degrees from the London School of Economics and from the Hebrew University of Jerusalem, where he was a faculty member from 1971 until his retirement in 2008.

**Bryan Callahan**
Lieutenant Colonel Bryan Callahan joined the US Air Force (USAF) in 1998 and earned his wings through the Euro–NATO Joint Jet Pilot Training program at Sheppard AFB, Texas. He was assigned to F-16s and has flown block 30s, 40s, and 50s in the United States, the Republic of Korea, and while deployed to Operation *Iraqi Freedom*. In 2005, he volunteered for the remotely piloted aircraft (RPA) program and was assigned to the 15th Reconnaissance Squadron. He has flown MQ-1 Predators and MQ-9 Reapers in numerous locations while supporting the Global War on Terror. He was part of the initial cadre for the USAF's first MQ-9 attack squadron and helped establish the 26th Weapons Squadron, the first RPA squadron in the USAF Weapons School. He is currently attending the USAF's School of Advanced Airpower Strategic Studies and, upon completion, will return to operational missions in Nevada, Las Vegas.

**Anthony O'Leary**
Wing Commander Anthony O'Leary joined the Royal Australian Air Force (RAAF) in 1987 and trained as a Ground Defence Officer. On graduation from the Royal Military College Duntroon, he served at No2 Airfield Defence Squadron. He has subsequently served at RAAF Bases Amberley, Edinburgh and Williams in ground defence, security, training, and staff roles. His career highlights include serving with the United Nations in East Timor, as the J5 in the Headquarters for the Australian Joint Task Force supporting the International Security Assistance Force in Afghanistan and International Coalition against Terrorism, and Commanding No1 Airfield Defence Squadron and RAAF Security and Fire School. Prior to taking up his current post as Assistant Defence Adviser (Strategy) in London he was Deputy Director Combat Support – Directorate of Policy and Plans in Air Force Headquarters. In 2003 he completed a Masters of Management and Defence Studies, and in 2008 was awarded the Order of Australia Medal for his contribution to Operational Support.

**Scott Coon**
Lieutenant Colonel Scott Coon is a 1992 graduate of the United States Air Force (USAF) Academy, holds two Master's degrees, and is a Command Pilot with more than 3,200 flying hours. He is currently the Chief of the NATO Alliance Ground Surveillance Operations Branch at SHAPE HQ in Belgium. He is the former Commander of Detachment 4, 9th Operations Group, at Sigonella AB, Italy, where he was responsible for establishing a USAF RQ-4B "Global Hawk" capability in Europe and Africa, which contributed greatly to operations *Odyssey Dawn* and *Unified Protector*. Prior to that, he was the Director of Operations at the 1st Reconnaissance Squadron at Beale AFB, California, where he led the USAF Global Hawk "Schoolhouse" and pioneered remotely piloted aircraft (RPA) flight in US national airspace. His other flying assignments include duty as an instructor pilot on the KC-135 Stratotanker and the T-37 TWEET.

**Kristin Bergtora Sandvik**
Kristin Sandvik er seniorforsker ved Fredsforskningsinstituttet PRIO, og leder for det nyopprettede Norwegian Centre for Humanitarian Studies. Hun er jurist og har en doktorgrad fra Harvard Law School. Sandvik forsker på humanitære kriser og nye militære teknologier, med cyberkrigføring og UAV som spesialområde.

**Peter Lee**
Dr Peter Lee is a Portsmouth University Principal Lecturer in Military and Leadership Ethics based at Royal Air Force College Cranwell, where he specializes in the politics and ethics of war and military intervention, the ethics and ethos of remotely piloted aircraft operations, and the politics and ethics of identity. In November 2012 Dr Lee transferred from King's College London after four years in the Air Power Studies Division and continues to lecture across a range of diverse subjects, from international relations to terrorism and insurgency. In 2012 he published his first book entitled *Blair's Just War: Iraq and the Illusion of Morality* and he is currently writing *Politics of Global Crises* for Palgrave Macmillan.

**Rune Ottosen**
Rune Ottosen (1950) er statsviter og journalist, og fra 1996 ansatt ved Journalistutdanningen, Høgskolen i Oslo, der han ble professor fra 1999. I perioden 1989–1993 var han ansatt som informasjonsleder og forsker ved PRIO. Han var engasjert av Norsk Journalistlag (NJ) fra 1993 til 1996 for å skrive

jubileumsboken til NJs 50-årsjubileum: *Fra Fjærpenn til Internett. Journalister i organisasjon og samfunn*. Ottosen er en aktiv faglitterær forfatter og var leder for Norsk faglitterær forfatter- og oversetterforening (2001–2005). Han er i dag leder for Norsk Pressehistorisk Forening. Ottosen har redigert en rekke bøker, og har bl.a. skrevet bøkene *Norsk pressehistorie* (2002, med Lars A. Røssland og Helge Østby), *I journalistikkens grenseland: journalistrollen mellom marked og idealer* (2004), og *VG, Saddam og vi. Et kritisk blikk på nyhetsdekning av krig og konflikt* (2009).

**Anne-Grete Strøm Erichsen**
Forsvarsminister Anne-Grete Strøm-Erichsen (Ap) ble utnevnt til forsvarsminister i september 2012. Hun satt også som forsvarsminister fra 2005 til 2009, og fra 2009 til 2012 var hun helseminister. Strøm-Erichsen har også en 15 år lang karriere fra lokalpolitikken i Bergen. Hun ble ordfører i 1999 og byrådsleder i 2000, da Bergen innførte byparlamentarismen. Dette vervet hadde hun fram til 2003. Strøm-Erichsen er utdannet EDB-ingeniør og har tjue års erfaring i informasjonsteknologi fra privat og offentlig sektor innen områdene systemutvikling og ledelse.

**Jens Henrik Paulke**
Kadett Jens Henrik Paulke ble født i Bodø i 1990 og begynte på Luftforsvarets befalsskole i 2009. Han har fullført den grunnleggende kontroll- og varslingsutdanningen, samt gjennomført spesialistutdanning. Etter å ha avsluttet Luftkrigsskolen skal han tilbake i sitt virke som jagerflykontrollør. Han er i dag kadett i tredjeavdeling, og tilhører kull 62 ved Luftkrigsskolen.

**Lorns Harald Bakstad**
Forsker Lorns Harald Bakstad ble uteksaminert som sivilingeniør fra NTNU i Trondheim i 2001 og ble ansatt ved Forsvarets forskningsinstitutt (FFI) i 2002. Ved FFI har Bakstad hovedsakelig arbeidet med problemstillinger rundt behovet for og bruken av Unmanned Aircraft Systems (UAS) i Forsvaret.

**Fritz Bekkadal**
Fritz Bekkadal er for tiden ansatt som seniorforsker ved MARINTEK, i tillegg til at han driver sitt eget firma (Gersemia – Bekkadal Consultancy & Engineering Services). Han innehar en MSc-grad i fysikalsk elektronikk og mikrobølgeteknikk fra NTNU, og har mer enn førti års erfaring fra akademia, forskningsinstitutter og industrien. Dette har primært vært innen IKT med hovedvekt på radio- og radarteknologi samt systemutvikling. Han innehar

flere internasjonale patenter innen mikrobølgebaserte sensor- og radarteknologier for maritime anvendelser, og er forfatter eller medforfatter av mer enn 130 publikasjoner.

**Eirik Newth**
Eirik Newth (f.1964) har en mastergrad i teoretisk astrofysikk fra Universitet i Oslo. Han har jobbet fulltid som forfatter, foredragsholder og konsulent innen vitenskap, teknologi og fremtidsforskning siden tidlig på 1990-tallet. I media er han etterspurt som kommentator innen et vidt spekter av emner. Samfunnseffekten av teknologiutviklingen i felt som fjernlagring, Big Data, 3D-skriving og autonome systemer er blant hans nåværende hovedinteresser.

**Hew Strachan**
Hew Strachan has been Chichele Professor of the History of War at the University of Oxford and a Fellow of All Souls College since 2002, and was Director of the Oxford Programme on the Changing Character of War between 2003 and 2012. He also serves on the Strategic Advisory Panel of the Chief of the Defence Staff and on the UK Defence Academy Advisory Board, as well as being a trustee of the Imperial War Museum, a Commonwealth War Graves Commissioner, and member of both the National Committee for the Centenary of the First World War and the Council of the International Institute for Strategic Studies. He is also a Fellow of Corpus Christi College, Cambridge, and Visiting Professor at the University of Glasgow. He was elected a Fellow of the Royal Society of Edinburgh in 2003 and awarded an Hon. D. Univ. by the University of Paisley in 2005. In 2010, he chaired a task force on the implementation of the Armed Forces Covenant for the Prime Minister. In 2011, he was the inaugural Humanitas Visiting Professor in War Studies at the University of Cambridge and became a specialist adviser to the Joint Committee on the National Security Strategy. He is a Deputy Lieutenant for Tweeddale, and a Brigadier in the Queen's Bodyguard for Scotland (Royal Company of Archers). In December 2012, *Foreign Policy* magazine included him in its list of top global thinkers for the year. He was knighted in the 2013 New Year's Honours.

# Tidligere seminartitler

Kontraluftoperasjoner (1994)

Anti-overflateoperasjoner (1995)

Luftstridsstøtte-operasjoner (1996)

Luftmaktsdoktriner – Manøverkrigføring og Prosjekt Føniks, bærende elementer i norsk luftmaktsdoktrine? (1997)

Kommando og kontroll, Informasjonskrig og situasjonsoversikt inn i det neste årtusen (1998)

Luftmakt i internasjonale operasjoner (1999)

Nytt NATO – nytt Luftforsvar? (2000)

Luftforsvaret i fremtiden: Nisjeverktøy for NATO, eller multiverktøy for Norge? (2001)

Luftmakt, Luftforsvaret og asymmetriens utfordringer (2002)

Luftmakt 2020, fremtidige konflikter og utfordringer (2003)

Luftforsvaret og militær transformasjon. Dagens valg – morgendagens tvangstrøye? (2004)

Luftmakt i Nord – nasjonale interesser og adekvate luftmilitære virkemidler for fremtiden (2005)

Luftmakt og Spesialoperasjoner – morgendagens normaloperasjoner? (2006)

Nytt kampfly – hvilket og til hva? (2007)

Norsk luftmakt – tilbake til fremtiden? (2008)

Luftmakt og teknologi – realisme eller overmot? Hvilken effekt har moderne teknologi i krig? (2009)

8 år i Afghanistan, Quo Vadis? Et seminar om militær maktanvendelse (2010)

Etter Afghanistan – Ny strategisk virkelighet? (2011)

Norsk luftmakt over Libya – suksess uten innflytelse? (2012)