

Remote Sensing and the Military

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Remote Sensing and the Military

Introduction

From its beginning remote sensing has served for military purposes and has always been attractive to the military field while taking different configurations throughout History. Starting by aerial photograph on a balloon, remote sensing in the military has evolved to being today “*satellised*”.

Technology has changed not only the way the real world is represented, but also the relationship between a state and its own people as well as the inter-relationships between states. This literature review will give a brief history of remote sensing in the military area.

The regulation will be mentioned in the same part. Also, a second part will deal with the main issue of remote sensing in the military, which are the high resolution imagery and the security. Lastly, the struggle for space control will be the object of the third part.

1. History and Regulation

1.1 A brief history of Remote Sensing and the Military

The use of remote sensing in the military area can be traced back to 1858, when Gaspar Felix Tournachon, nicknamed “Nadar”, took the first aerial photograph on a balloon. Nadar had patented the idea for taking aerial photographs for surveying.

In the beginning of the 20th century pigeons, with a photograph attached to their breast, were used for military surveillance (*Figure 1 and 2*), (*Professional Aerial Photographers Association (PAPA) International History of Aerial Photography.mht*).

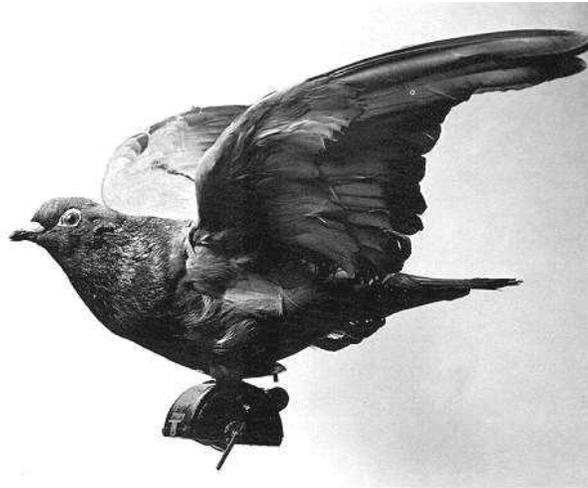


Figure 1. Bird used for military surveillance



Figure 2. Photograph taken by a bird

Wilbur Wright took the first aerial photography taken from an airplane, in 1909. He had carried a passenger with him who took pictures of military fields, (Figure 3); (*Professional Aerial Photographers Association (PAPA) International History of Aerial Photography.mht*).

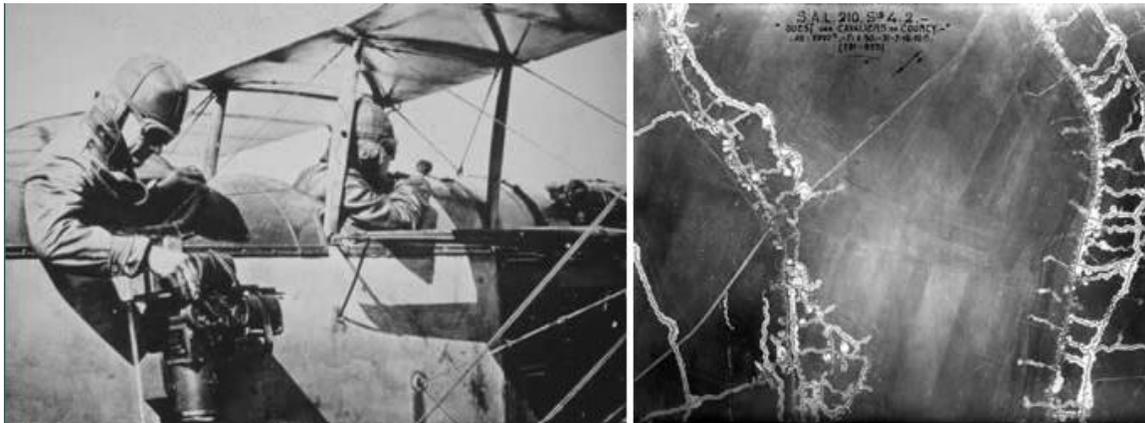


Figure 3. Aerial photograph taken by airplane

In 1912, Albert Maul in Germany, suggested to the Austrian Army to use rockets mounted with camera for aerial photograph, (Figure 4);(*Professional Aerial Photographers Association (PAPA) International History of Aerial Photography.mht*). However, airplanes came out to be more efficient.



Figure 4. Aerial photograph taken by rocket

In World War 1, aerial photograph was used for reconnaissance and surveillance missions, replacing sketching and drawing. Later on, the first applications of photography using infrared and microwave radiation were used during World War II.

In 1960, when space based remote sensing started, except TIROS-1 (Television and Infrared Observation Satellite), all the space programs were classified military (*Read and Torrado, 2009*). Such as the U.S. military reconnaissance program, Corona (*Lillesand and Kiefer, 2000*).

During the Cold War, a large amount of “secret” imagery has been captured by spy satellites.

Over the last decade, geospatial surveillance systems are used in the “war against terror”. In 2001 the U.S. Department of Defense acquired exclusive rights to Space Imaging’s Ikonos (*Figure 5*) for the war in Afghanistan in order to influence the public policy debate.

With Gulf war II, imagery was used to provide visual proofs to support decision making for taking action towards war against Iraq. Also, another application involves locating eventual nuclear sites in Iran (*Figure 6*) and North Korea, seen as a threat by, mainly, the USA and Europe (*Perkins and Dodge, 2008*).



Figure 5. Ikonos Image of the Habbaniyah airbase in central Iraq, during the Gulf war
(From www.GlobalSecurity.org)



Figure 6. Nuclear Technology Centre of Esfahan (Iran)
(From www.GlobalSecurity.org)

Remote Sensing from the beginning seems to find its first and main domain of application in the military field (*Legault, 1988*). Obviously its proven efficiency is attractive to the Great Powers (e.g. USA, Russia, UK, France). As they need to have a knowledge of their geographical weaknesses and strength, as well as the ones of their adversaries, since states have understood the importance of the knowledge of geographical realities (*Strausz-Hupe, 1942*). Remote Sensing until today has been used for military strategies development (*Ade Abiodun, 1998*). It is essential for military purposes to have an accurate and actual representation of a specific zone of interest anywhere in the world (*Van Persie et al, 2000*).

1.2 Regulation

Remote sensing of the Earth from outer space is internationally regulated by the Outer Space Treaty (OST, 1967) and the UN Principles Resolution (1986). The problem is that the military area has not been addressed, and any attempt to regulate that vital area will encounter fierce oppositions from countries that need to develop their power; these countries can be sensing states and at the same time sensed states. However, emerging Powers like India or China might try to control the influx of sensed data estimated to be deleterious for their national security. Unfortunately one of the drawbacks for these countries is the impact of the internet on Remote Sensing. Because high-resolution digital photos are available online. It is hardly believable that security measures could be implemented in an efficient manner (*Von Kries, 2000*).

2. Overhead Imagery and Security, the key issue

2.1 The philosophy behind Remote Sensing in Military

The militaristic logic is that a state can watch, without the *surveilled* knowing that he is being watched. This is successful as long as the watcher has exclusive control of his data. (*Perkins and Dodge, 2008*).

Almost all state mapping agencies can trace their origin back to military needs (Parry and Perkins, 2000). Developments in cartography in the twentieth century were made for extending the diversity of the military visual capacity (Day *et al*, 1998). A well known example is the Global Positioning System (GPS); it was created by the U.S. department of Defence in early 1970's (www.gps.gov) to improve the targeting of weapon systems (Cloud, 2002). And it has been a success, for example the Israel Aerospace Industries (IAI) uses the GPS for its supersonic guided missile, Jumper (www.aviationweek.com).

All nation states have to protect their security from outside threats. That is why keeping critical information secret and hidden is vital. Whether they are military installations, sites relating to state security, nuclear facilities, they all must be secret spaces. The problem is that Remote Sensing by satellite, is a technology that facilitate states controlling their citizens and outsiders, but at the same time make the unseen available

for the first time to the civil society, through the internet. Therefore the definition of secrecy itself becomes contestable (*Perkins and Dodge, 2008*).

2.2 High resolution imagery and Security

Remote sensing using high-resolution sensors discloses the sensed country's military potential. In 1978, under Carter's presidency, the U.S. had decided to impose limitations in the quality of images (resolution of 10 meters) from the US Landsat satellite which could be spread in the open market. The polemic arose again when the French launched SPOT-1 spacecraft (1986) and the use of SPOT images by the news media. The issue of high resolution imagery is one of the main issues of overhead imagery and needs to be addressed; however, it is really barely expectable that the dissemination of high resolution images can be, one day, completely controlled (*Jasani and Larsson, 1988*).

This is why states deliberately falsifying or "omitting" information, from maps for civilian use. During the Cold war, Ordnance Survey in the U.K. had deliberately removed military bases, nuclear and civil defense infrastructure as well as security installations, from large-scale topographic maps (*Perkins and Dodge, 2008*). An example of how available data can be used by enemies and compromise military operational security is during the Gulf War II. Iraqi insurgents had used Google Earth to spy on British bases in Basra (Iraq). This had constrained Google to falsify its own data by publishing outdated imagery of the actual area (*Harding, 2007*).

After the terrorist act of 9/11, the USA took a firm stance against available data, they limited detailed geospatial availability, also a lot of information have been removed from the public domain by U.S. federal agencies (*Perkins and Dodge, 2008*). The frontier between civilian and military data is almost denuded, and that technology is also breaking the right of freedom of access to information for social interest, to favour national security. The latter added to states' constant paranoia of being under threat (*Lagarde, 2002*), make democratic Powers implement censor for military purposes. That is a paradox, as in a democracy people are supposed to rule (*Heywood, 2003*).



Figure 7. high resolution imagery from Quickbird
(From <http://faculty.ksu.edu.sa>)

3. Space control

What is Space control?

“Space Control describes the means to ensure U.S. forces have unhampered access to space-based services and to deny an enemy the advantages of space capabilities.”

By Fernandez, 2004

3.1 Navigation Systems

The Russian, after the American GPS, launched their own navigation system *GLONASS*, initiated in the mid-1970's, the first satellite launched in 1982. Europe launched its own positional global system, *GALILEO*, the first satellite, GIOVE-A was launched on the 25th December 2005, the Chinese have their *Beidou* system, two satellites were launched in October and December 2000. All these Positioning systems meet both civilian and military needs (*El Rabbany, 2006*). India is expected to achieve the *IRNSS* navigation system by 2012 (www.asmmag.com/).

3.2 Struggle for Space and Power

Military operations will have to be moved into space, as well as keeping updated about all activities in space (*Fernandez, 2004*). Some might argue that they are developing

space programs only for civilian use, like the European with *GALILEO* (http://ec.europa.eu/transport/galileo/index_en.htm), but it is hardly believable, as the military becomes considerably dependent on space for communications, positioning, navigation, and timing (Fernandez, 2004).

In 1996 the USA drew four space missions in their National Space Policy. Which are space control, space force enhancement, space support, and space force application. Space control is only one of the missions. Although it seems that what is at stake, is the *weaponization* of space, space control include a more complex variety of aspects, rather than only the military strike force. Some specialists are already talking about defending space (Fernandez, 2004).

The Americans are not the only one who strive to dominate space. Recently the French, with the cooperation of Spain, Italy, Greece and Belgium, have launched their European military satellite, Helios 2B on the 18th December 2009 (www.france24.com). Also, on the 15th of December 2009, Russia was launching another of their *GLONASS* satellite constellation (<http://www.glonass-ianc.rsa.ru>).

Conclusion

German geographer Ratzel (famous for coining the German term *Lebensraum* ("living space")), in early 20th century influenced by Darwinism, developed a theory comparing the state with the human body. His theory was that a state is like a human body, it has needs, and among those, the need of space (Strausz-Hupe, 1942). He is at the origin of what is known as Geopolitics.

This discipline deals with policies led by states taking into account elements of geography. The first thing that a state needs is to defend itself, by knowing its strength

and weaknesses as well as the ones of its enemies. Geography therefore becomes the mental awareness of a state.

This is why a strong military body is vital to a state, and this is why remote sensing has found an important place among the strategic priorities of Great and emergent Powers. On the other hand, it has created other problems, like the privacy, the security, or the limitations of distribution and free access to information. States are also trapped, as they are unable to regulate Remote sensing. Any attempt to impose limits will be applicable against them as well. Today the race for space control is still ongoing, new countries are launching satellites while others try to impose their power.

Remote sensing has become state's eyes in the sky; the irony of the story and the history, is that aerial photographs and satellites were supposed to give to states representations of the real world, but we will end up having, in the sky, a representation of the struggle for power between states, in the real world.

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