

INTRODUCTION TO UNMANNED AERIAL VEHICLES



LEARNING OBJECTIVES:

1. Brief History of aerial photography
2. Type of Drones available
3. IAA Regulations
4. Data Quality
5. Civilian Applications

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WHO AM I?



Established Baseline Surveys Ltd
in 1990

Very active in geospatial industry
for over 20 years

Now Offering:

- Low Altitude Ortho
photography
- Aerial Inspection photos
- 3d modelling
- IR and NIR Imaging
- Accurate to +/-3cm RMSE

HISTORY OF AERIAL PHOTOGRAPHY



San Francisco 1906



Charles Fort 2012

1906: RUINS OF SAN FRANCISCO



In 1906, George Lawrence used a kite to take a panoramic view of the ruins of San Francisco after the earthquake. He sold the prints for \$125 each and made a total of \$15,000 from only one photograph

WORLD WAR 1, 1918, PALESTINE



In January 1918, general Allenby used 5 pilots to photograph a 1620 km² area in Palestine as an aid to improving and correcting maps of the Turkish front

1935, COMMERCIAL AERIAL PHOTOGRAPHY



Sherman Fairchild's first government contract was an aerial survey of New Mexico to study soil erosion in 1935

WWII 1939-1945



Auschwitz

During World War Two, aerial reconnaissance was one of the key methods of obtaining intelligence about the enemy and their activities. Photographs provided concrete evidence - fast. Within hours of a reconnaissance sortie, the film could be developed, printed and interpreted.

COLD WAR



In the 40s and 50s secret surveys were undertaken by the US, UK and Russian Military because of security issues and the onset of the cold war

1960- 1980 CIVIL ENGINEERING PROJECTS



Aerial photo surveys carried out on behalf of local and central government, utilities and for large civil engineering projects became routine as well as essential

Site of Hoover Dam

1980 – 1990 ARRIVAL OF COLOUR FILM



During the Eighties the transition was made from black & white to colour film

Washington DC

DIGITAL AERIAL PHOTOGRAPHY



During the 90's aerial photography had entered the digital age. It was now possible to scan the photos and distribute them as large seamless mosaics, thus paving the way for GIS

Scanned air photo of Ottawa

2004 LARGE FORMAT CAMERAS AVAILABLE



These large format aerial survey cameras are often fitted with GPS and inertial Measurement units, which improved on the accuracy and time to create orthophotos.

1:25000 scale

2004 UNMANNED AERIAL VEHICLES

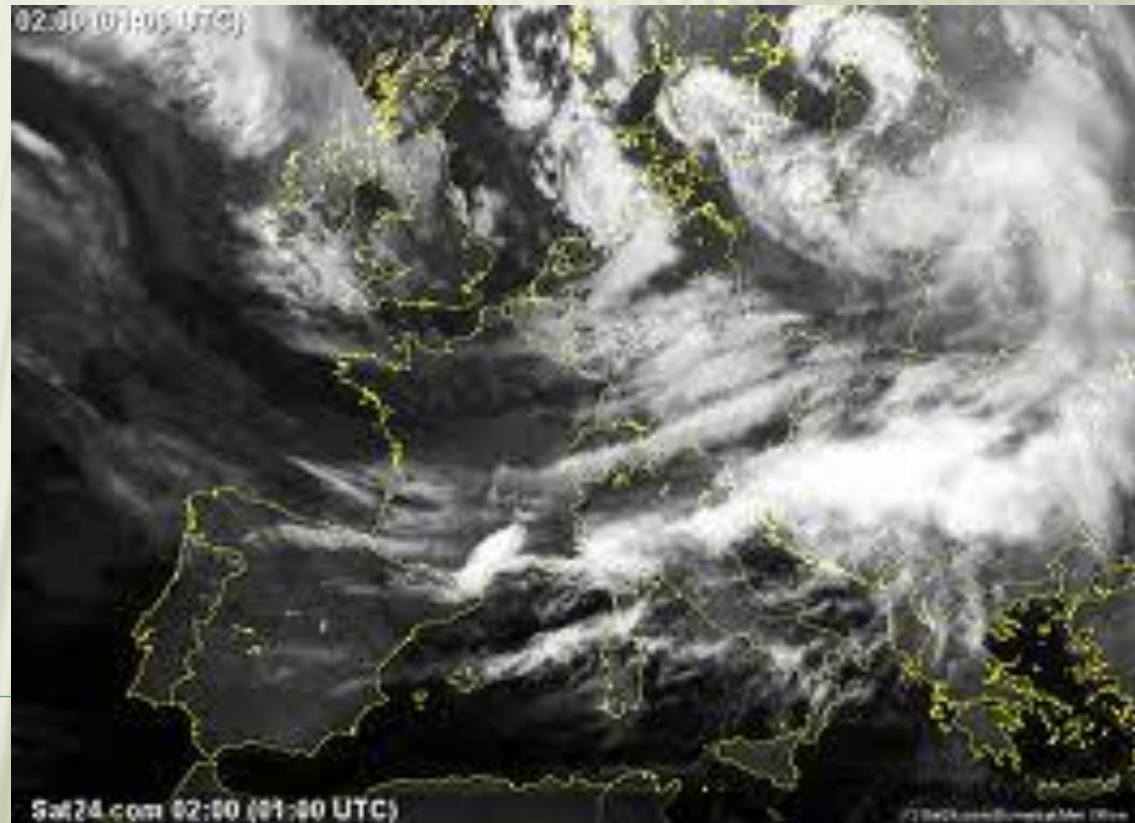


Falcon F8
Octocopter

“Since the development of digital cameras, low cost GPS/INS systems and other sensors have meant, the technology has now advanced toward the automation of the aerial unmanned vehicle operations and the acquisition of high resolution images using off-the-shelf cameras”

GOING TO DISCUSS

- Various UAVs
- UAVs and Irish law
- Practical applications
- UAV Accuracy
- UAV Qualification and training requirements





Ireland is very cloudy
making traditional aerial
data capture slow and
expensive.

UAVs can be easily deployed under the cloud base at a much
lower cost.

TYPES OF UNMANNED AERIAL VEHICLES



THE SOLUTION....



Drones are typically model aircraft with GPS, Autopilot @ IMU



TRAINING REQUIREMENTS

Complete the skills matrix as set out by IAA

- (a) aerodynamics, including effects of control;
- (b) aircraft technical systems, specific to the system to be operated;
- (c) aircraft performance, specific to the system to be operated;
- (d) aircraft limitations, specific to the system to be operated;
- (e) navigation;
- (f) meteorology;
- (g) airspace;
- (h) rules of the air and air law;



APPLICATION FOR PERMIT

Manufacturers Training Certificate
Pilot qualifications or exemption via BNUK-C
Operations manual
Insurance details
Aerial works application form
Cheque for €1096



REGULATIONS

- Must have IAA permit to operate
- Must have 3rd party UAV insurance
- 120m operational ceiling
- 500m horizontal VLOS (no BLOS operations)
- 150m distance from 3rd parties in flight
- 50m separation when take off and landing
- IAA permission when operating inside an ATZ



Can detect change in recently added resurfacing section of car park, see where the Osi map follows the old kerb line.?

photogrammetry is far richer than points, lines and text at representing what is happening on the ground.

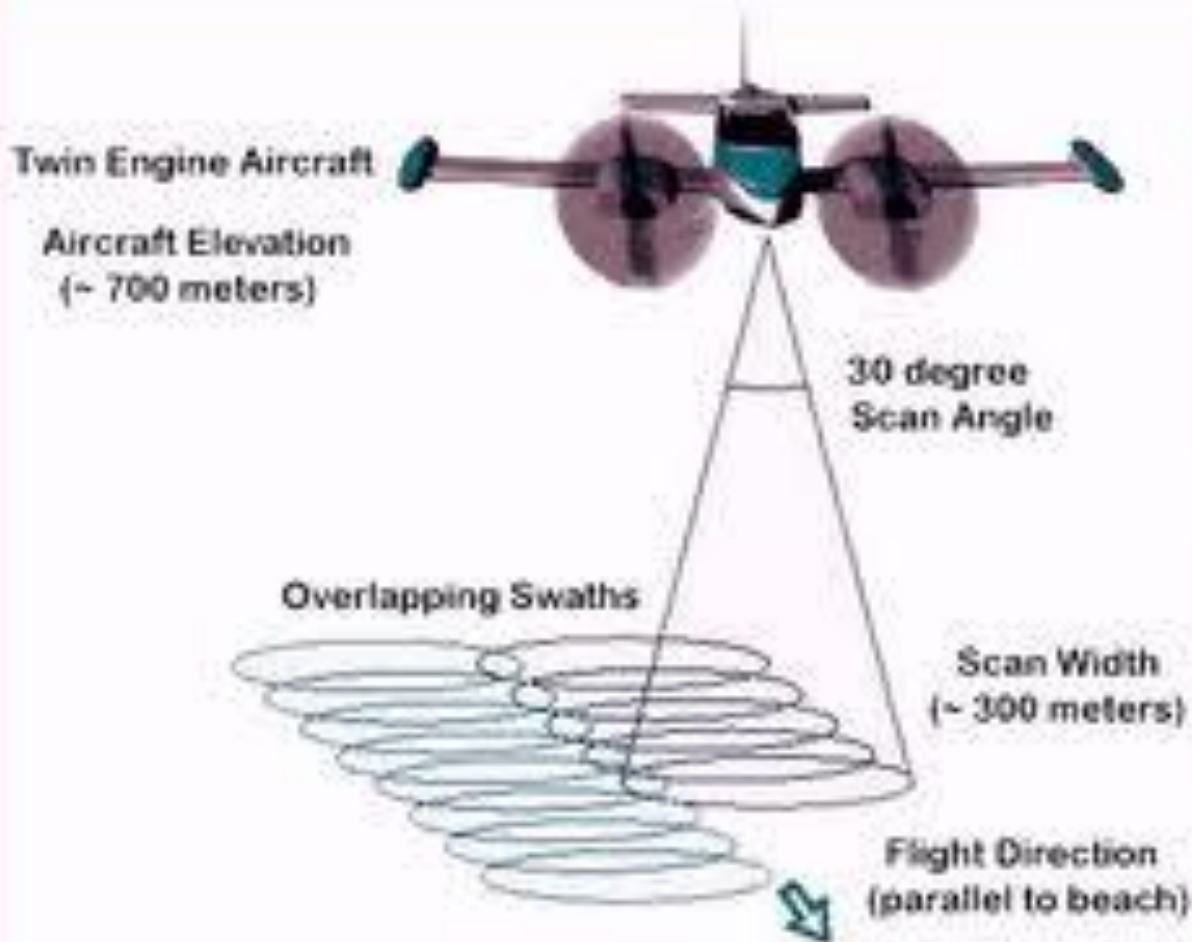
UP TO DATE - TEMPORALLY SENSITIVE



STN E563422.617
N571825.126
Z5.876

WE carried out an accuracy test comparing line intersections surveyed using Network RTK GPS, represented as yellow crosses and white lines on the photography. They was so closely matched to the GPS we have to test again with a total Station.

Accuracy: Drone aerial photography = land surveying



Baseline Surveys can carry out most spatially accurate aerial photogrammetry in the world!

The spatial accuracy of our data is within
+/- 3cm RMSE

Typical UAV data is
+/- 250mm RMSE

COMPARABLE WITH TYPICAL LAND SURVEY DATA ACCURACY

CIVILIAN UAV APPLICATIONS

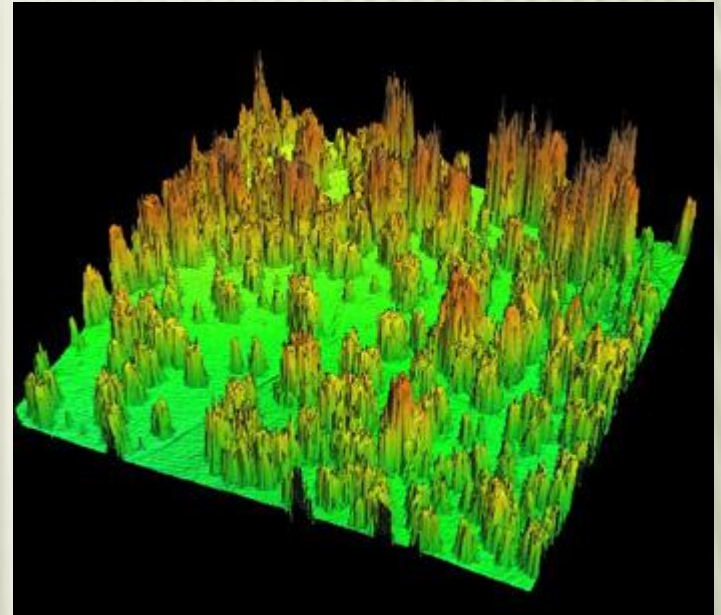
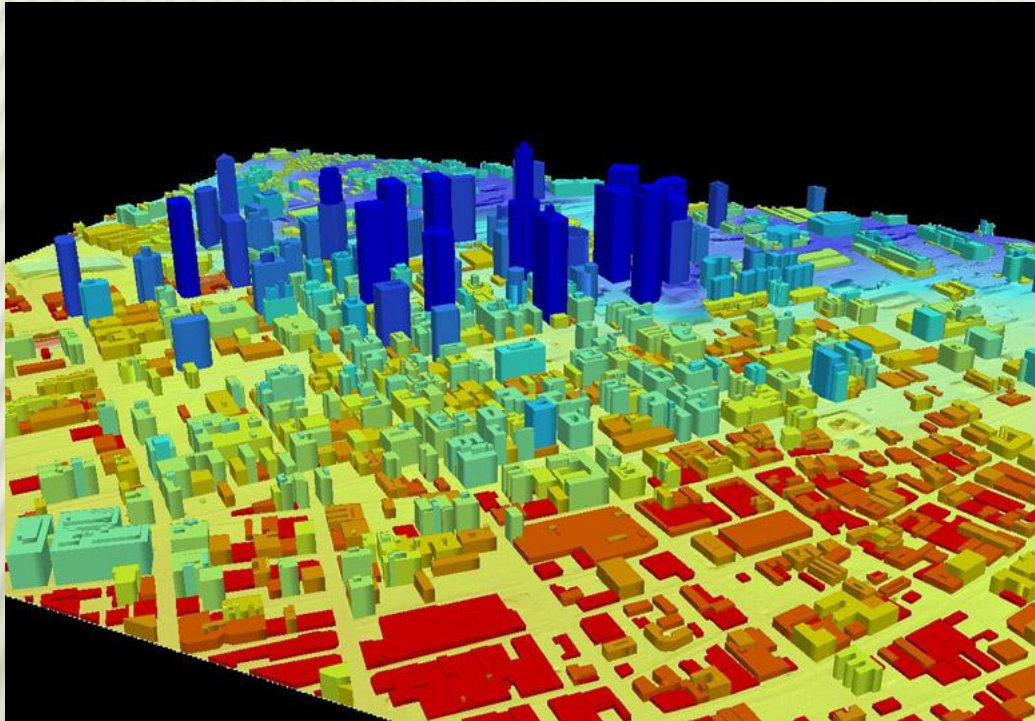


Infra Red

Near Infra red

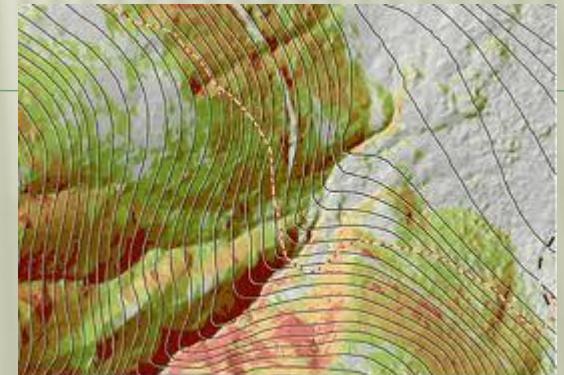
Applications include precision agriculture, Disaster management, Oil and Gas Pipeline monitoring, Construction work, Earth movement and excavation. Laying of pipes and cables, erection of buildings, soil upheaval and erosion, water logged surfaces, plantation of shrubs and trees, discolouring of vegetation, forest fire detection / forest management, atmospheric sampling missions and landscape mining.

Digital elevation models can be created from 3d data extracted from ultra level aerial photography

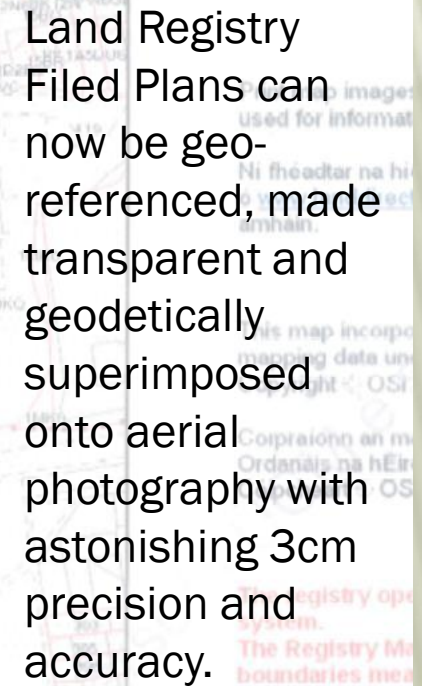


APPLICATIONS-

Military, Agriculture, Geology, Archeology...



GEO REFERENCED TRANSPARENT FOLIOS



Land Registry
Filed Plans can
now be geo-
referenced, made
transparent and
geodetically
superimposed
onto aerial
photography with
astonishing 3cm
precision and
accuracy.



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