Drones – Benefit Study

Key findings

28/8/2019

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Introduction

- Understand the potential benefits of drones
- MoT and MBIE

- Purpose
  - Process
  - Findings
  - Insights

Presentation structure

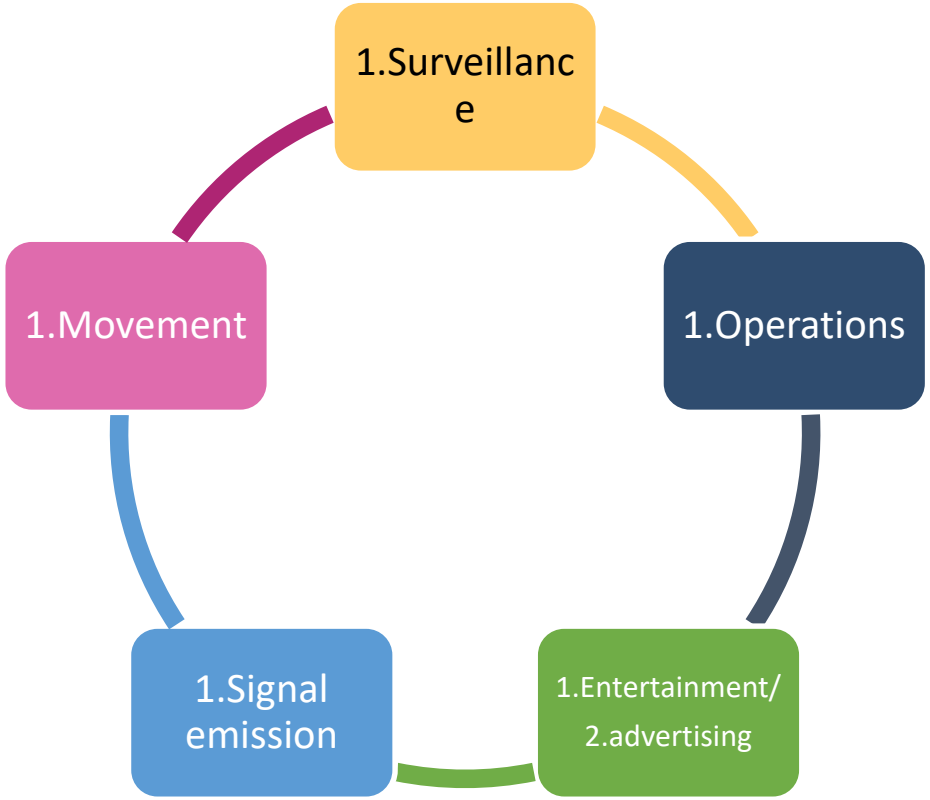
- Basic information and data
- Results
  - Sectoral findings
  - Two future scenarios
  - Interviews
- Concluding remarks

Limitations and caveats

- High level picture – several unknowns and data gaps
- Focus is on the ‘benefit side’
  - Net benefits
  - Risks
  - Trade offs and substitutions
  - Ecological considerations
- Technical considerations
  - Guidance, navigation and control
- Interviews, judgement and assumptions
- Broad vs deep focus

Not a new technology

- First used in a military context (100 years ago)
- Three user groups – Military, leisure, commercial/business



Valuable contribution - international

- Several studies on drones – different audiences
  - Government-focused studies tend to be more conservative

- Globally – positive outlook
  - Globally: addressable value US$127bn$_{2015}$
  - Europe: €10bn by 2035 growing to €15bn by 2050
  - Productivity gains in UK industries: £16bn by 2030
  - USA – impact of integrating drones into National Airspace System: US$82bn by 2025

- Large numbers!

Increased use

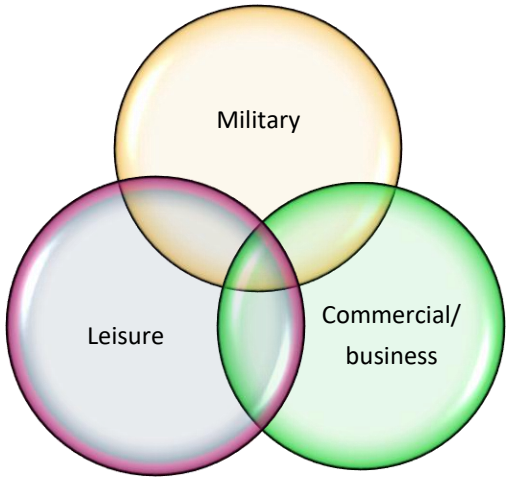
- Increase uptake of the opportunity
  - Lift in penetration (drones/10,000 people)*

Government and commercial

3.8 7.9 *2025 and 2035*

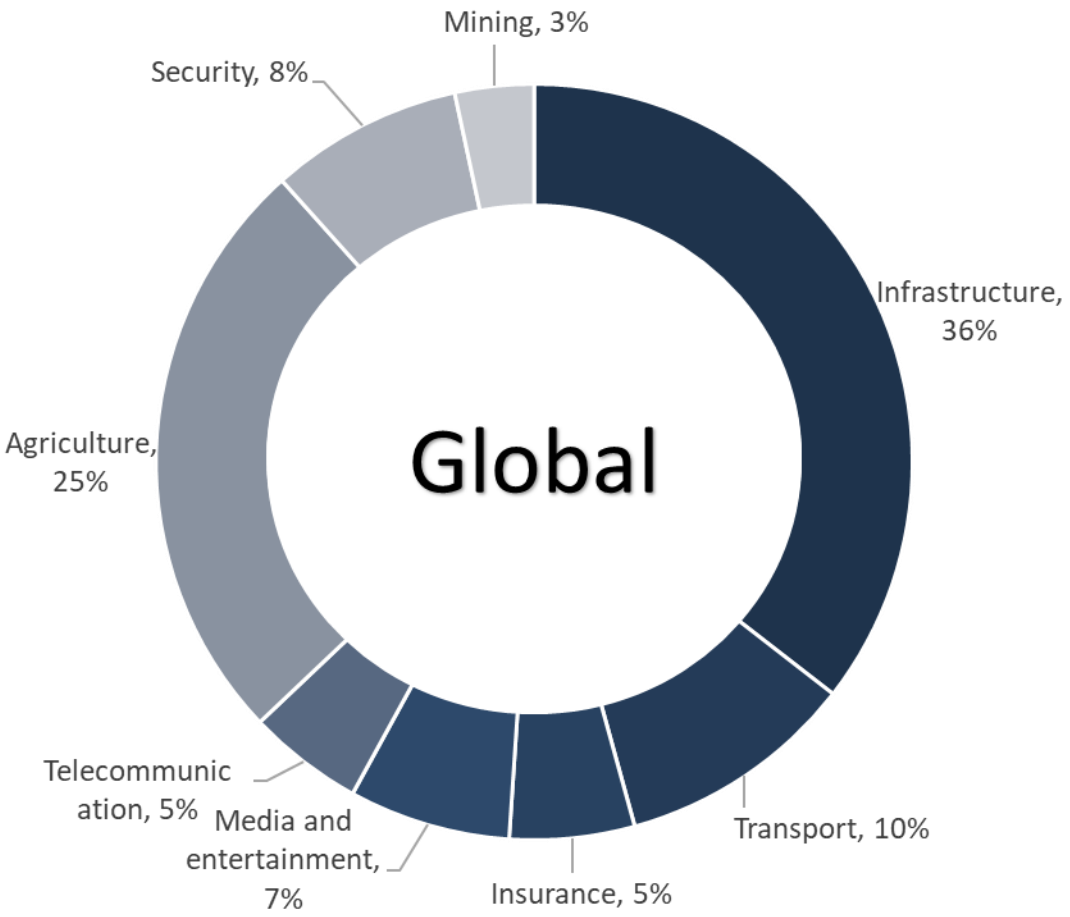
Leisure

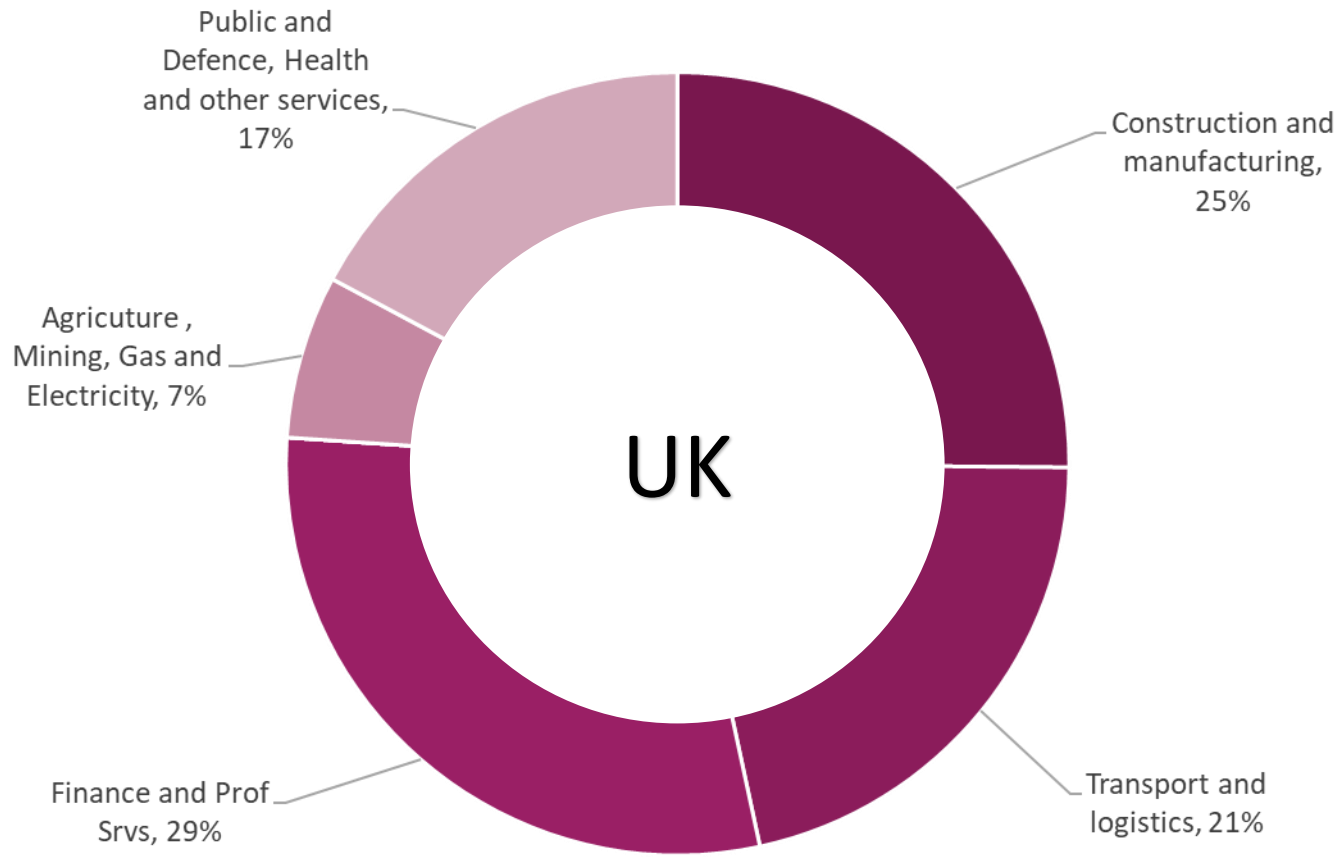
98.3 134.5 *2015 and 2025*



*Eurostat, 2018

Sectoral applications (% of benefit/impact)



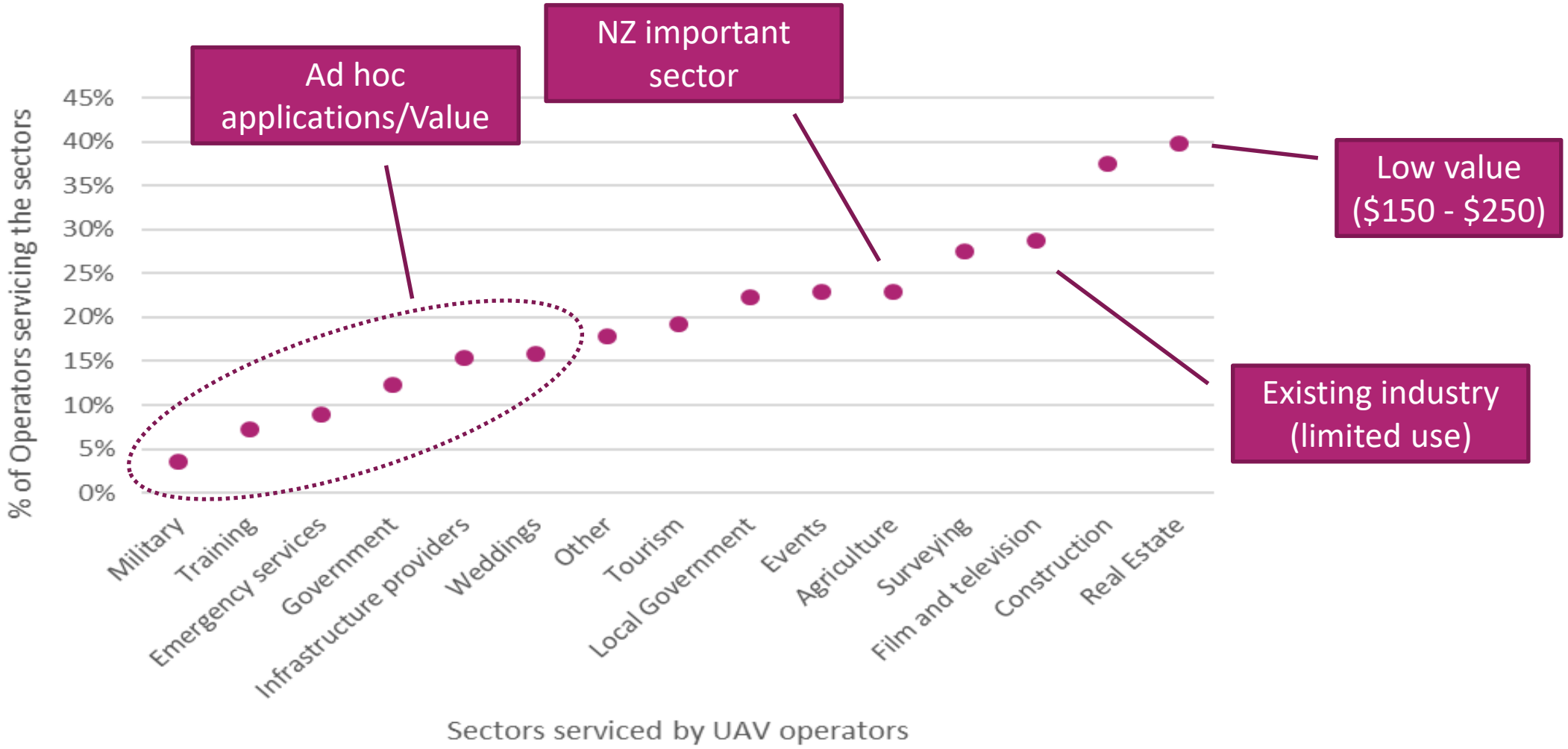


The benefits are distributed across the entire economy

Drones in New Zealand

- No official data
  - Different estimates and approaches
  - 77,600 drones (estimate)
- Commercial users
  - Estimated annual turnover $162m - $194m
  - Average sales - $108,000/year
  - R&D spend - $28,000/year
  - Mixed use
    - 1 in 7 operates UAVs as core business
    - 1 in 3 offer UAV as part of their operations
- Turnover over ten years (2% cagr, PV at 6%)
  - $1.3bn - $1.8bn

Current commercial users



Innovation, R&D

- Drones used as part of research: Endeavour Fund – two $1m each
  - Drone Flow: Aerial monitoring system for better river management
  - Reducing impact of LED streetlights on cultural and ecological values
  - Drones enable but are not critical to the processes

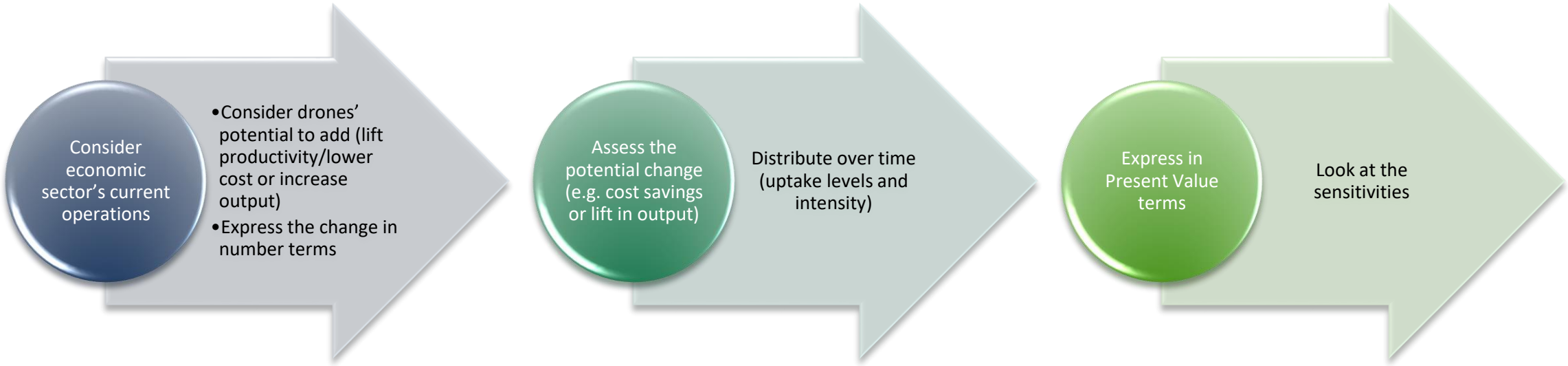
- Current users: $28,000/year

- Zephyr Airworks
  - Air-taxi

https://cora.aero/

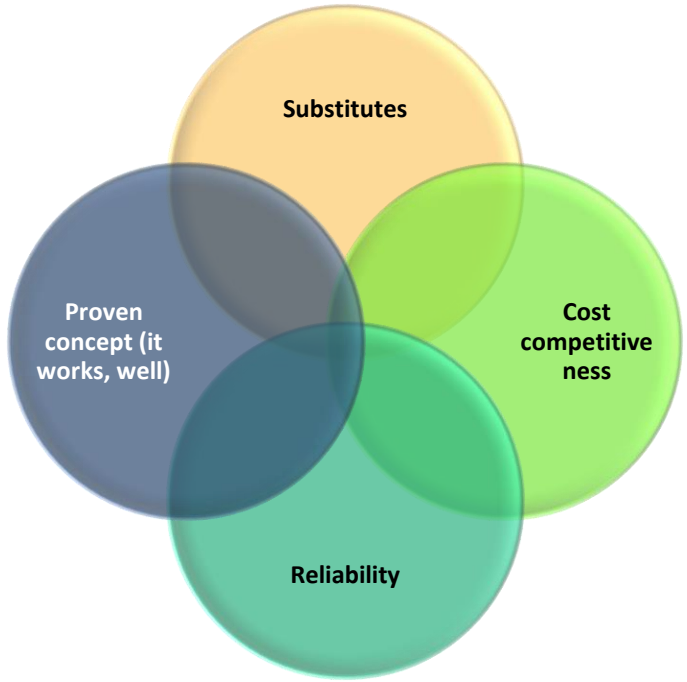
- Exciting landscape
- Many moving parts

Generic process



Important points

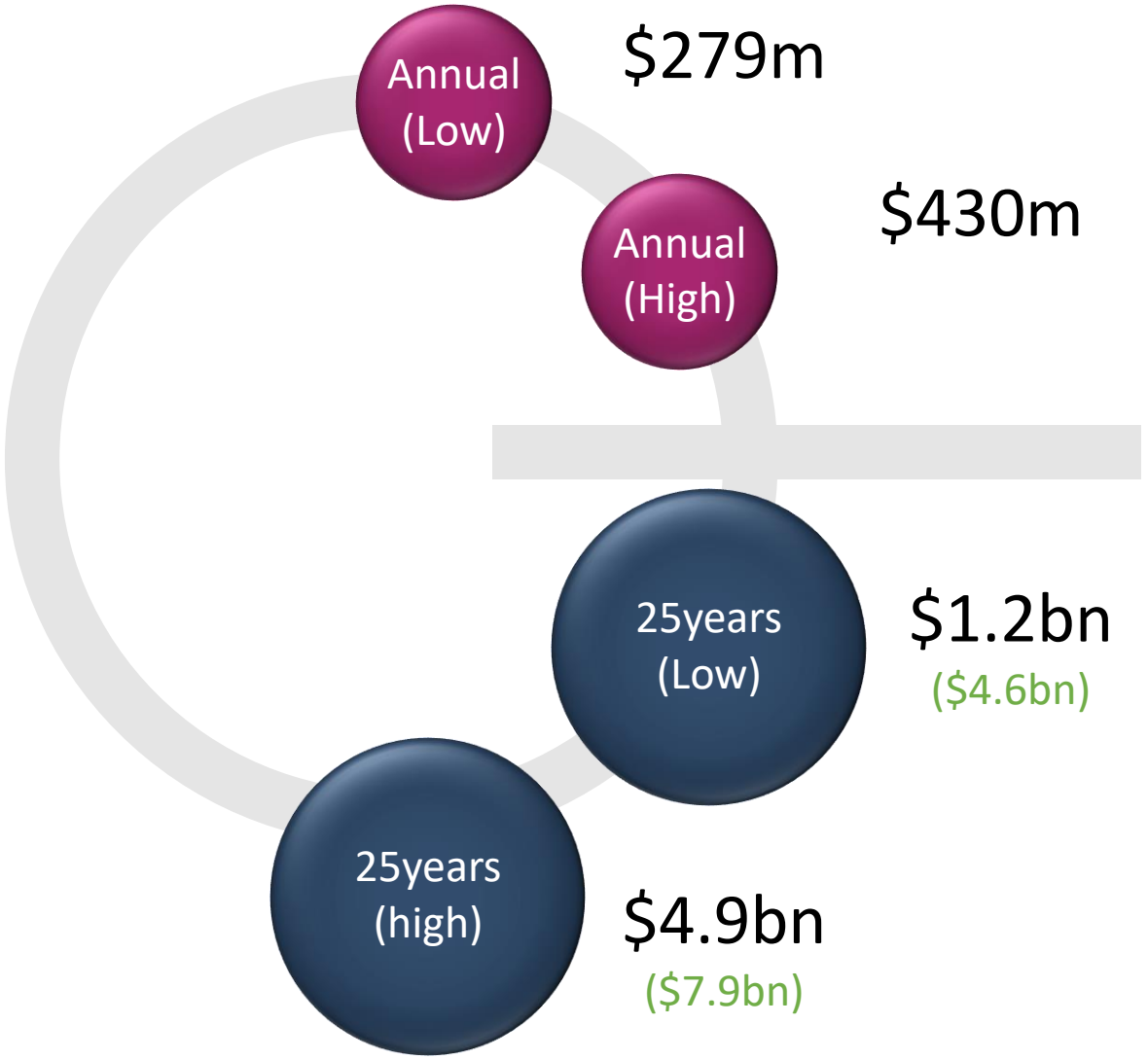
- Must be realistic
  - A degree of informed judgement
  - Scaled to take a conservative position
- Informed by the engagements and literature*
- Wide range
  - Uptakes and benefits/outcomes
- Considerations
- Net change (where possible)



* Special note is made of Shelly, A., & Andrews, H. (2015). *Economic benefits to New Zealand from Beyond-Line-of-Sight operation of UAVs.* Callaghan Innovation.

Findings

Drones touch many parts of the economy



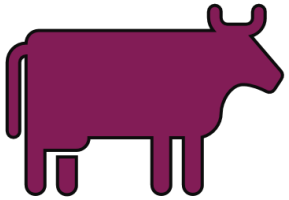
Wide reach across the economy

- 65% of NZ employees and 55% of businesses are in sectors that could use drones
- High profile ‘opportunities’
  - Parcels, pizzas and prescriptions
  - More about the technology than the benefits…

- Relative to:
  - Improve productivity
    - Lower costs
    - Better quality
  - Enhanced safety
  - Moving people – changing the economic geography

Sectors covered and considered

- Agriculture
  - Sheep and beef
  - Dairying
  - Other agriculture
  - Forestry
- Electricity
- Construction
- Other transport (postal)
- Airports
- Public safety (SLS, SAR, Fire)



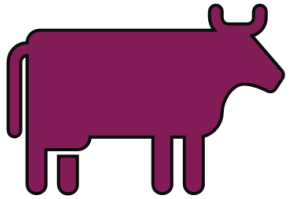


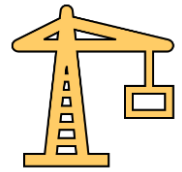



Examples of sectors not covered

Issue	Sector
Risk of double counting	Agriculture support services Professional services (included with other sectors)
Small sector or small effect	Mining and quarrying Oil and gas extraction Education Real estate
Limited immediate use	Manufacturing (e.g. good and beverage) Finance and insurance Accommodation
Terrestrial drones better suited	Water, drainage Some agriculture like viticulture Road transport (large goods)
Importing goods	Equipment manufacturing (drones and accessories imported)

Sectors





Findings - Dairying

- Dairying
  - Improved yields from better pasture management
  - Improved fertiliser use (precision agriculture)
  - Sectoral responses:
    - Several available alternatives – satellite imaging
    - “The issue is not getting good pasture information, it is making good decisions with that information”
    - Questions around uptake…

Extra product:	$1.3bn -$1.6bn
Fertiliser and chemicals:	$68m - $113m

* Over 25years

Findings - Forestry

- Space extensive with (some) drone use
- Improved disease control
  - *Dothisroma* and *Cyclaneusma* – improved yield
- Lag between improved treatment and benefits
  - Improves yields during different growth stages

Cost savings :	$99m*
Improved yields:	$12m*

* Over 25years

Findings - Utilities

- Transpower is already using drones
- Benefits arise from cost savings, improved reliability and reducing unplanned outages
- Network covers 105,000km and 82% is in rural areas
- Main benefits – reducing unplanned outages and cost savings
- Using Value of Lost Load and SAIDI

Cost savings :	$10m - $41m
Improved reliability:	$13m - $ 151m

* Over 25years

Findings – Construction

- Contribute towards lifting productivity
- Two impact layers – direct and indirect:
  - Direct: Surveyors, geologists, engineers – better information, faster and cheaper
  - Indirect: builders, drivers, operators - spill over gains from better resources
- Assist with large events e.g. Kaikoura earthquake

Gains : $690m - $1.1bn*

* Over 25years

Findings - Airports

- NZ aviation sector – VA $10bn (economic impact per year)
- Airport operation support high value assets to operate
- Immediate role of drones somewhat limited
  - Wild life management, runway checking and perimeter monitoring (alternatives)
  - Labour substitution

Cost savings : $1.5m - $2.5m

Over 25years

Findings – Public Safety: SAR

- Search and Rescue
- Surveillance and intelligence, assistance, → situational awareness
- Civil rights(?)
- Used to supplement activities, not displace
  - Human interface is still required
- Applied risk profile (incidents per 10,000 with assumed improvement 1%, 3% and 5%)

Lives saved, rescued or assisted:	$599m - $1.0bn
Avoided fatalities:	$10m - $16m

Over 25years (3% scenario)

Findings – Public Safety: Fire

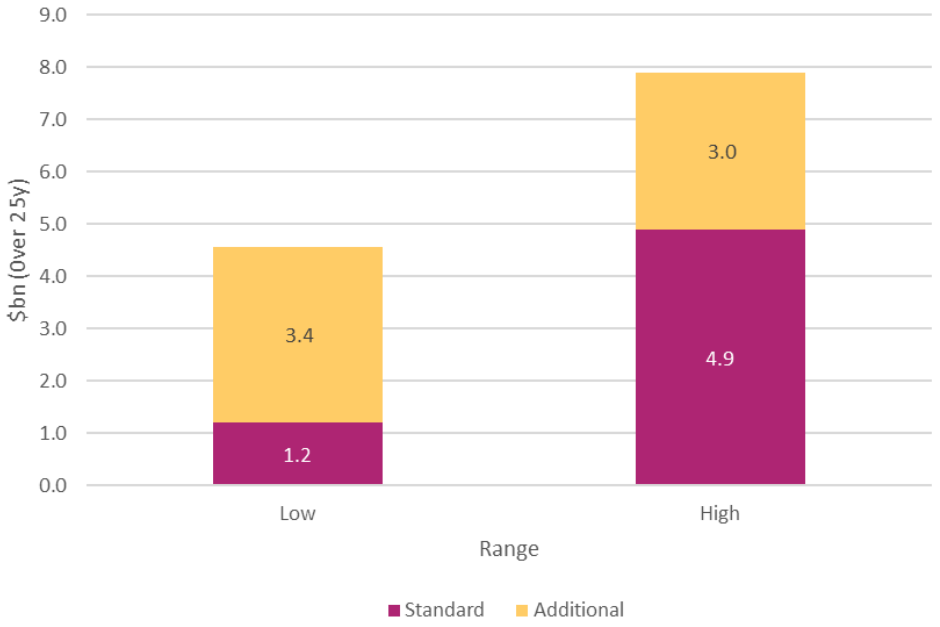
- Surveillance and intelligence – situational awareness
- Cost of fires:
  - Cost in anticipation
  - Cost or response ←
  - Cost as a consequence ←

In anticipation:	$42m - $73m
Response:	$58m - $102m
As a consequence:	$161m - $282m

Over 25years

Summary - Large potential

- Sizeable gains
  - $1.2bn to $4.9bn – 25 years
- Aspirational
  - $4.6bn to 7.9bn
- Compared to the IoT*
  - 16% to 22%



*NZ IoT Alliance

Part 2: Future Scenarios

- Improving regional connections
- Delivery of goods using drones

Improving regional connections

- Airports are important regional assets
- Facilitate connections, generating economic benefits
- Regional dynamics – ATR/Q300, Air Chathams, Whangarei Airport

- Potential change – assume drones change demand
  - Focus on rural population: +5% - 10%
  - Benefits: $40m/y and $58m/y

10 years*:	$236m - $519m
25 years*:	$641m - $1.4bn

*6% discount rate

Parcel delivery

- Often quoted area – weight x volume (payload)
- Lots of technical and practical issues
- Largest saving – substituting labour costs
- Using NZ Post information: labour costs $317m - $425m (incl contractors)
- Potential gains:

10 years*:	$140m - $213m
25 years*:	$282m - $529m

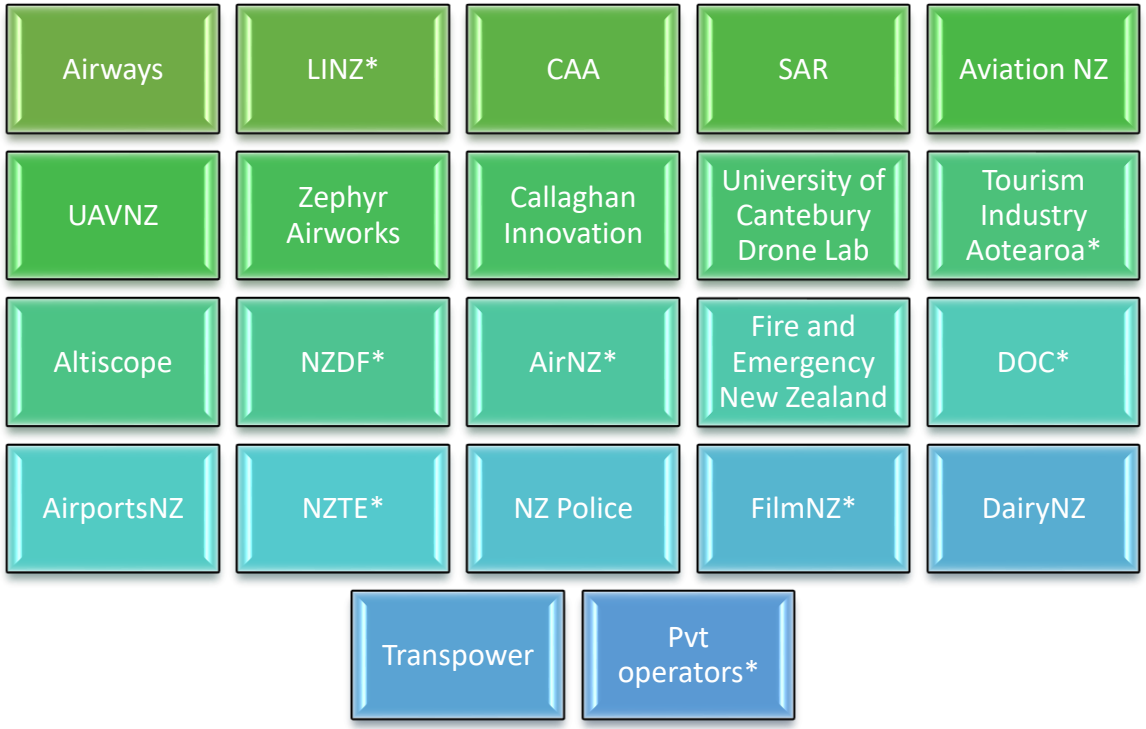
- Emissions?

*6% discount rate and 10% scenario

- Large upside potential!

Part 3: Insights

- Industry engagements
  - Mixed success
  - Wide coverage (20 entities contacted)
  - Mixed ‘messages’

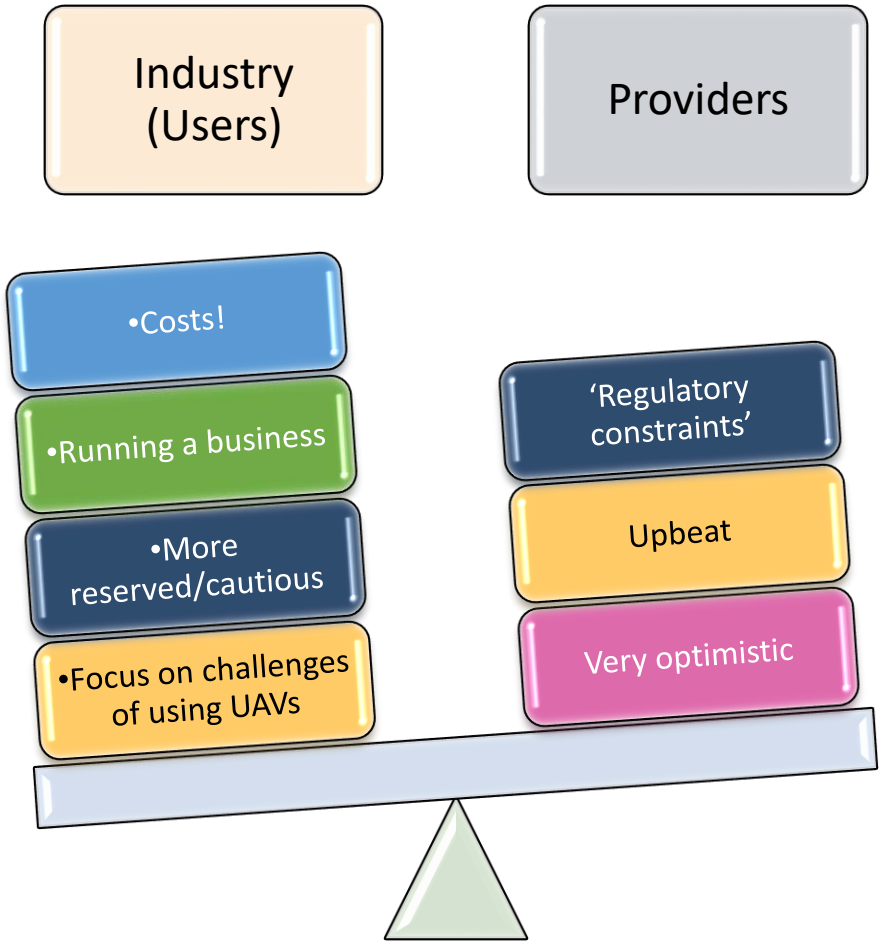


Interesting observation

- Tensions about outlook!

“Solution looking for a problem”

“Great technology”



Synthesis of the points raised

1. Combined technology
    1. Part of a solution
    2. Payload, range/endurance, stability and weather

2. Regulatory environment
    1. Safety vs enabling new activity
    2. Safety events (Heathrow; nuisance vs deliberate acts?)
    3. Cross-over between areas (flying/handling chemicals)

Points raised…

3. Markets/Industries want a proven solution
   - Existing relationships
     - Drone at periphery of ‘core business’
     - Incremental improvements (vs disruptions)
   - Willingness/ability to respond to drone products
     - Getting clients to pay for the service at an appropriate price point
     - Cost absorbed as part of wider business offering (vs drones as a service)
   - Generally low barriers to entry
     - Technical capability developed over 18 months
     - Getting scale is an issue

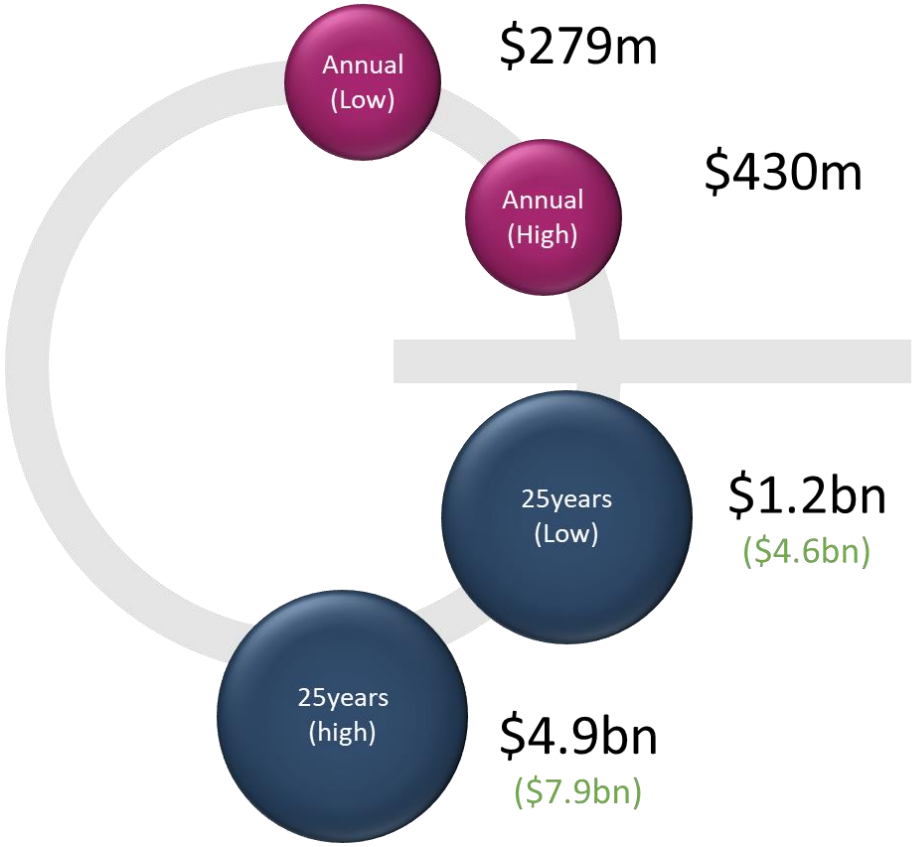
Points raised…

4. Competing against alternatives
   - Pressure/inconvenience to change not great enough
     - Reduce cost vs increase productivity/information
     - Substitutes (existing way of doing things)
   - Reliability (weather, robustness, durability)

5. Two-speed sector
   - Leisure and commercial
   - Commercial is small (in # terms; Airshare's database = 7,000)
   - Not operating in sectors with potential benefits.

Concluding remarks

- Large potential
- Not guaranteed



Thank you

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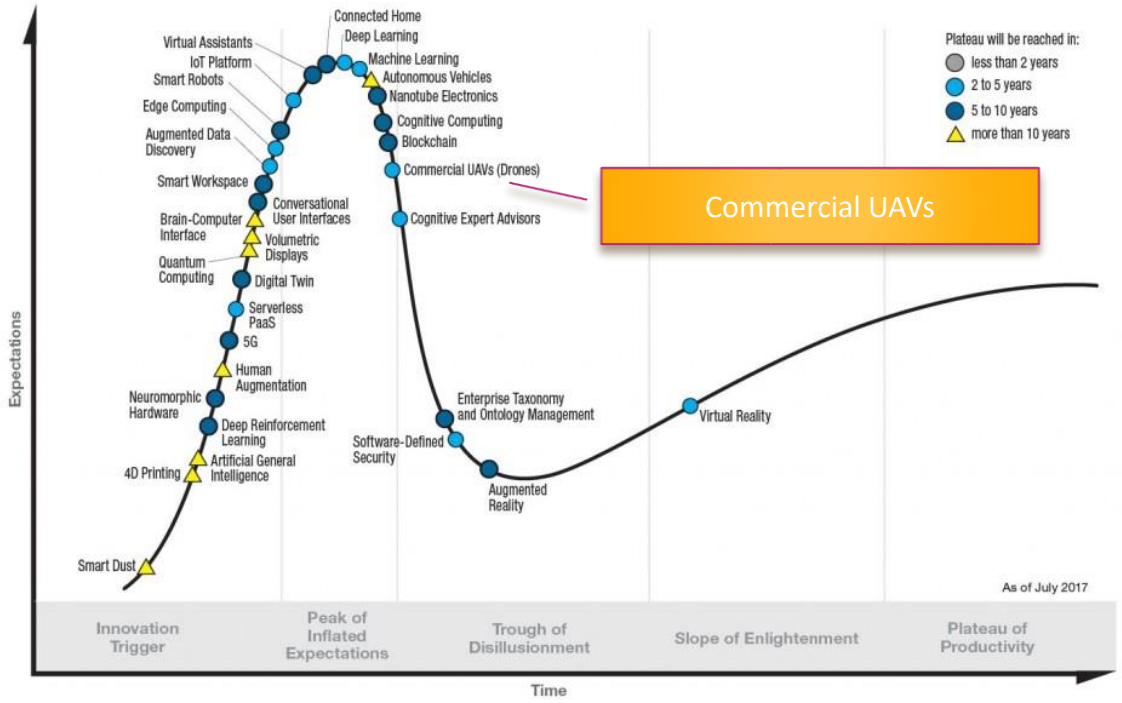
Hype Cycle

Gartner Hype Cycle for Emerging Technologies, 2017



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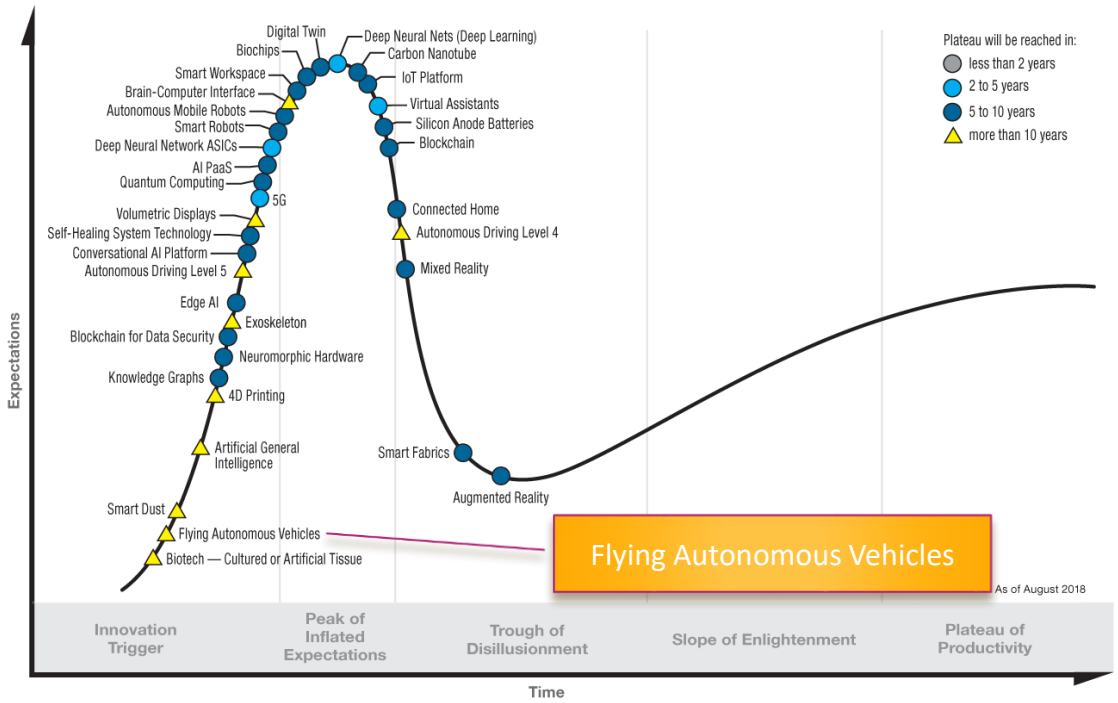
Hype Cycle for Emerging Technologies, 2018



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