The Disruptive Technology of Unmanned Systems

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What is Disruptive Technology?

Disruptive technologies create new markets. In doing so, they may replace existing markets.
What is an Unmanned System?

• Vehicle or platform to include its payload and control mechanism(s)

• No human onboard

• May operate in any domain from space to undersea

• Remotely controlled

• Fully-autonomous

• Semi-autonomous
Unmanned System Components

- Platform and Capability
- Communications Link(s)
- Control Segment
Modern unmanned systems are made possible by the recent emergence of key technologies.

- Computing systems; processing and data storage
- Sensors and payloads
- Digital wireless communications
- Navigational aids
- Software to enable control, autonomy, and integration
- Miniaturization
Key Technologies - Processing Power

Number of Transistors Per Square Inch on Integrated Circuits

Source: University of Wisconsin-Madison

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IBM and allies find a way to make chips even tinier and faster

by Stephen Shankland July 8, 2015 9:01 PM PDT

A prototype chip has quadruple the circuitry and double the performance of today's cutting-edge chips. This kind of work keeping Moore's Law ticking hastens the day your smartwatch has a lot more brains…

Source: CNET.com
Key Technologies - Digital Storage

Source: A History of Storage Cost by Matthew Komorowski
Seagate Expansion 5TB Desktop External Hard Drive USB 3.0 (STEB5000100)
by Seagate
$129.99
Get it by Wednesday, Jul 8
Key Technologies - Sensors and Payloads

- EO/IR
- LIDAR
- SAR
- Hyperspectral
- Wide Area Surveillance
- SIGINT/COMINT
- Communications
- Laser Designators
- Electronic Warefare
- CBNR
Key Technologies - Digital Wireless Comms

- Bandwidth
- Latency
- Availability
- Security
- Management
Key Technologies - Navigational Aids

- Inertial Navigation
- TERCOM
- Celestial Navigation
- GNSS (GPS et al)
- VOR, DME, and eLORAN
Key Technologies - Autonomy and Control
Key Technologies - Autonomy and Safety
Key Technologies - Autonomy and Cost
Key Technologies - Autonomy and Culture
Key Technologies - Miniaturization
Commoditization in Computers

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Commoditization in Unmanned Systems

Common user interfaces, data links, and networks ...
Cumulative % Growth Since 9/11

Source: House Select Committee on Intelligence April 2012
National Security Market Demand

Pentagon spending on procurement of UAVs (millions of dollars)

Source: Game of Drones by Paul Waldman, February 14, 2013 in TheAmerican Prospect

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Market Growth Projected for UAS

AUVSI’s 2013 Economic Report

- The UAS global market is currently $11.3 billion
- Over the next 10 years, the UAS global market will total $140 billion
- The economic impact of US airspace integration will total over $13.6 billion in the first three years and will grow sustainably for the foreseeable future, cumulating to over $82.1 billion between 2015 and 2025

“Every year that airspace integration is delayed will cost the U.S. over $10 billion in lost potential economic impact, which translates to $27 million per day.”
Market is Dominated by National Security
## Commercial Applications Emerging

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Source: AUVSI

And a thousand other things that haven’t been thought of yet...
Applications - Powerline Inspection
Regulatory Pressure

- Privacy

- Safety
Recommended Privacy Guidelines from ASA

• Enforcement of existing laws regarding nuisance to people or property
• Require warrants for government surveillance of specific individuals without their permission
• Warrants for the repurposing of data
• Permission for commercial platforms to surveil specific individuals
• Prohibit weapons carriage
• Local adoption of the International Association of Chiefs of Police Aviation Committee (IACP) “Recommended Guidelines for the use of Unmanned Aircraft”
FAA UAS Test Sites for Airspace Integration

• Legislation
  • National Defense Authorization Act (December 31, 2011)
  • FAA Modernization and Reform Act (February 14, 2012)

• FAA Test Sites
  • FAA Issued SIR (aka RFP)
  • 50 Applicants from 37 States
  • 6 Test Sites Selected

• FAA Center of Excellence
  • Mississippi State Heads Team
  • Cooperative Agreements
  • Matching Grants for UAS Related
    • Research and Development
    • Education
    • Training
The Future of Unmanned Systems
Observations

• Unmanned systems will displace traditional methods and disrupt markets wherever they add value or mitigate risk.

• Unmanned systems will continue to proliferate in all domains, with growth in the commercial sector outpacing that of national security applications.

• Autonomous behavior will evolve rapidly as systems are deployed.

• Machine to machine collaboration will become more common.

• Labor unions and government regulators will oppose implementation and delay commercial growth.

• Advances will happen sooner outside the United States.
Conclusion

Opportunities have never been more abundant for integrators and IT professionals

• Software integration
• Network management
• Spectrum management
• Data management
• Data analysis
• Cyber security
Questions?

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