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Creating the Equation for Growth

Growth Opportunity in Global UAV Market

Lucintel Brief

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Lucintel

1320 Greenway Dr., Suite 870, Las Colinas, TX 75038, USA.

Tel: +1-972-636-5056, E-mail: helpdesk@lucintel.com

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Executive Summary

- UAS (Unmanned Aircraft Systems) are an emerging sector of the aerospace industry with great opportunity and market demand that can be leveraged to high profitability in the near future
  - UAS market includes all unmanned vehicles such as UAVs, blimps and zeppelins
  - Approximately 70% of global growth and market share is in the US
- Unmanned Aerial Vehicles (UAVs) are the most predominant segment of the UAS market
  - UAV expenditures reached more than US$ 3 billion and constituted a growth of more than 12% in 2010
  - Half of the expenditures on UAVs are dedicated for Research and Development activities
  - Manufacturers remain concentrated in the US; followed by Israel, France and Germany
- Increase in awareness and mission capabilities of UAVs are driving innovations and new applications
- There will be significant growth in Unmanned Combat Aerial Vehicles (UCAVs) driven by low cost and its capability in undertaking high threat task.
- US Air Force contemplates “All – UAV Future” thus opening significant opportunities for UAVs.
- UAVs are opening up many new opportunities from pilots for UAVs to electronics, sensors and camera.
- Defense spending is growing more towards unmanned aircraft rather than manned aircraft.

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Overview: UAVs, Blimps, Zeppelins

UAV

- Unmanned Aerial Vehicles (UAVs) are remotely piloted or self-piloted aircraft that can carry cameras, sensors, communications equipment or other payloads
- UAVs are smaller than manned aircraft and therefore more easily and more cost-effectively stored and transported
- UAVs make significant contributions to the fighting capability of operational war forces

Blimps

- A blimp (technically called a "pressure airship") is a powered, steerable, lighter-than-air vehicle
- A blimp has no rigid internal structure; if a blimp deflates, it loses its shape
- Blimps are simply shaped balloons with fins and an engine
- Blimps are best known today for their role as advertising and promotional vehicles.
- Blimps' primary military use is for anti-submarine and reconnaissance roles

Zeppelins

- Zeppelins are rigid or semi-rigid airship
- Zeppelins have rigid metal skeleton, making them suitable for longer trips in a wider variety of weather conditions (which also makes them expensive)
- Zeppelins were used for passenger transport as well as for military purposes; after World War I, zeppelins were extensively used as bombers and scouts

Overview: UAS (Unmanned Aircraft Systems) Applications

Segments	Applications	UAV	Blimps	Zeppelins
Civil	Natural Disasters	◔	◑	◑
	Humanitarian Relief	◑	○	○
Commercial	Environment	◔	◑	◑
	Weather & Strom tracking	◔	◕	◑
	Advertisement	○	◕	◑
Military/ Security	Defense	◕	◑	◔
Science	Wireless Communications	◕	◑	◑
	Precision Agriculture	◔	◔	◔
	Cargo Transport	◔	◑	◑

Key Insight

UAVs

- Less effective in natural disasters
- Strong tactical applications
- Expensive relative to blimps

Blimps

- Low-tech and relatively low cost component

Zeppelins

- Equipped with powerful engines and capable to lift heavier loads

Key Scale	Participation
●	High
◕	Medium to High
◑	Medium
◔	Low
○	Least

Relative threat of Blimps/Zeppelins to established UAV applications

Segments	Applications	Strength of UAV	Strength of Blimps/Zeppelins	Conclusion for market potential of Blimps/Zeppelins
Civil	Natural Disasters/ Humanitarian Relief	• Data captured from disasters or crises area	• Sky lifters support combat operations	High use of Blimps and Zeppelins
Commercial	Environment/Weather & Storm tracking	• Outstanding for sensitive area such as hurricane • Used for precise data collection	• Excellent for constant access of data • Low operating cost	Usage of UAVs is positive but market share of Blimps/Zeppelins is high
	Advertisement	• UAVs are not used for advertisement activities	• Highly active • Low cost advertisement & promotions	Blimps/Zeppelins capture entire advertising market
Military/ Security	Defense	• Reconnaissance & surveillance • Missile capabilities	• Low operating cost • Keep eye on wide areas for very long periods of time	UAVs capture very large share relative to Blimps/ Zeppelins
Science	Wireless Communications	• Outstanding for sensitive areas	• Excellent for constant access for high-speed data and voice communications • Low operating cost	Usage of Blimps/ Zeppelins is positive but market share of UAV's is high
	Precision Agriculture/ Cargo Transport	• Used for precise data collection	• Higher cargo capacity • Capable to lift heavier loads	Adoption of Blimps/ Zeppelins is optimistic

Overview: UAV Classes

Unmanned Air Vehicle (UAV):

- Unpiloted aircraft
- Controlled from a remote location or automatically based on preprogrammed configuration
- Many applications for UAVs that range from recognizance to firefighting

UAV Classes

Classes	UAV-Close Range (UAV-CR)	UAV-Short Range (UAV-SR)	UAV-Endurance (UAV-E)
Range	Approx. 50 Km	200 KM	More than 200 KM
Endurance	30 min – 2 hours	8 to 10 hours	Minimum 24 hours
Weight	2 – 10 lbs	< 10,000 lbs	< 229000 lbs
Speed	-	< 300 mph	< 454 mph
Altitude	<1000 ft	<50, 000 ft	< 65000 ft
Pay load	-	< 3800 lb	< 1,900lb
Cost	$500 - $ 1500	< 8,000,000	< $ 123,000,000

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Opportunities in Civil and Commercial UAV market

Requirements/ Opportunities	Nature of Requirements	Future Requirement
• Forest fires • Wild life protections • Robbery, looting, snatching • Riots • Illegal cross border immigration • Asset and property protections • Natural disasters • Increasing traffic • Road accidents • Agricultural activities • Communication connectivity	• Small scale • Low intensity • Unidentified perpetrators • Uncertainty • Sporadic activity • Much wider area • Hidden activities • Among civilians	• Real Time Intelligence • Constant Uninterrupted Surveillance • Wider Area for Reconnaissance • Immediate and Precise Action

Opportunities in Defense UAV market

Traditional Warfare

- Large Scale
- War at main points only
- Centralized
- Formal attack
- Defined territory of war
- Limited war field
- Away from civilians
- Declared war

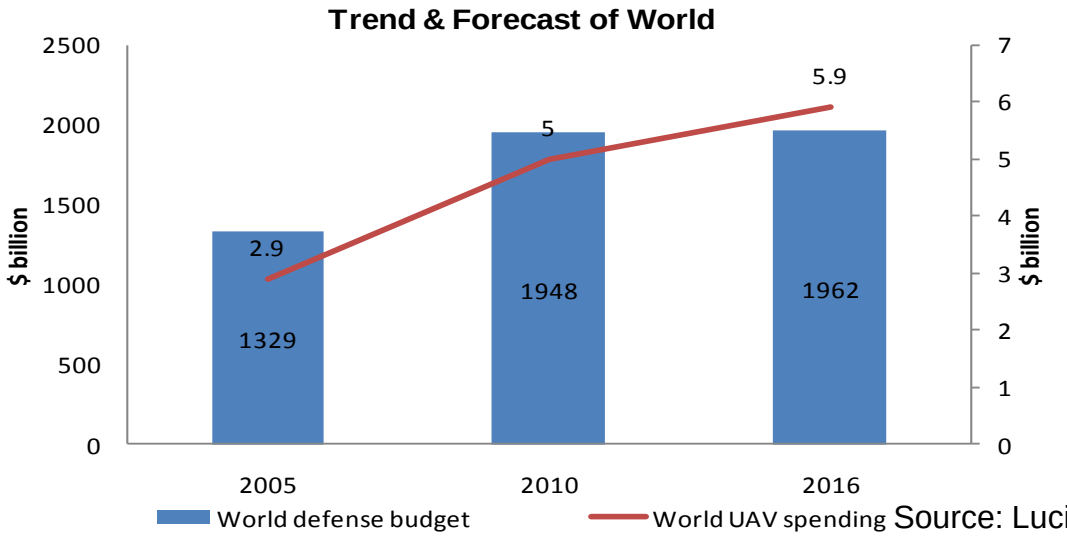
Modern Warfare Challenges

- Small Scale
- Low intensity
- Decentralization
- No formal declaration of attack
- Undefined territory
- Larger territory of activities
- Among civilians
- Espionage & other hidden activities

Future Requirement

- Real Time Intelligence
- Constant Uninterrupted Surveillance
- Wider Area for Reconnaissance
- Immediate and Precise Action

Trend & Forecast: Defense Budget & UAV Spending



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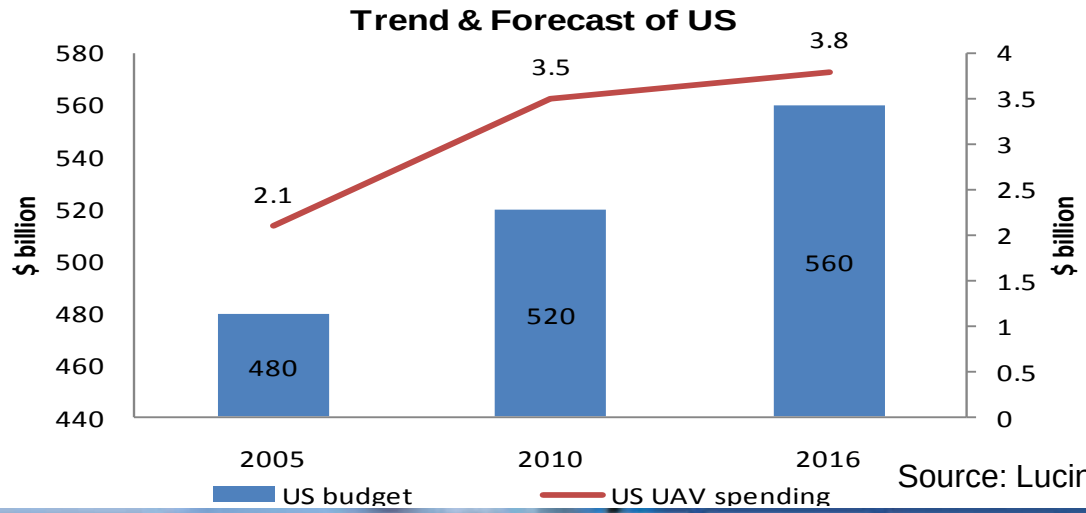

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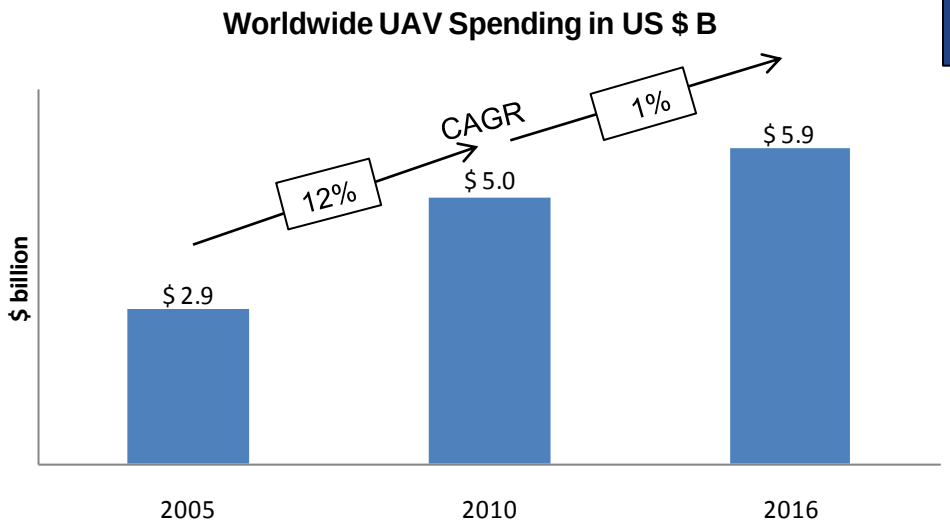
Key Insights

- Expected growth in world UAV market dominated by growth of US UAVs @ 2% per annum over the next 5 years
- UAV Market spending will increase from $5 billion in 2010 to $5.9 billion in 2016
- Approximately half of the expenditure of UAV market spent for procurement and another half spend for Research and Development activities
- US armed forces have placed greater emphasis on the development and deployment of strategic endurance UAVs than on tactical short-range UAVs

Trend & Forecast of UAV Market



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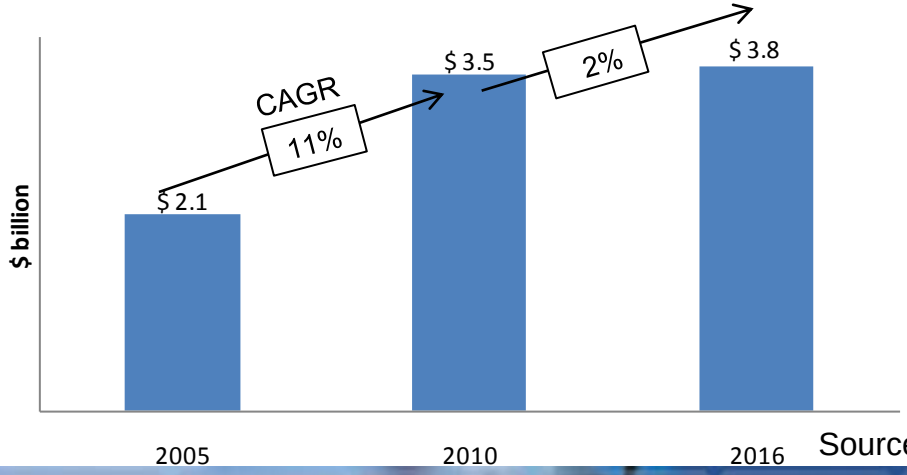

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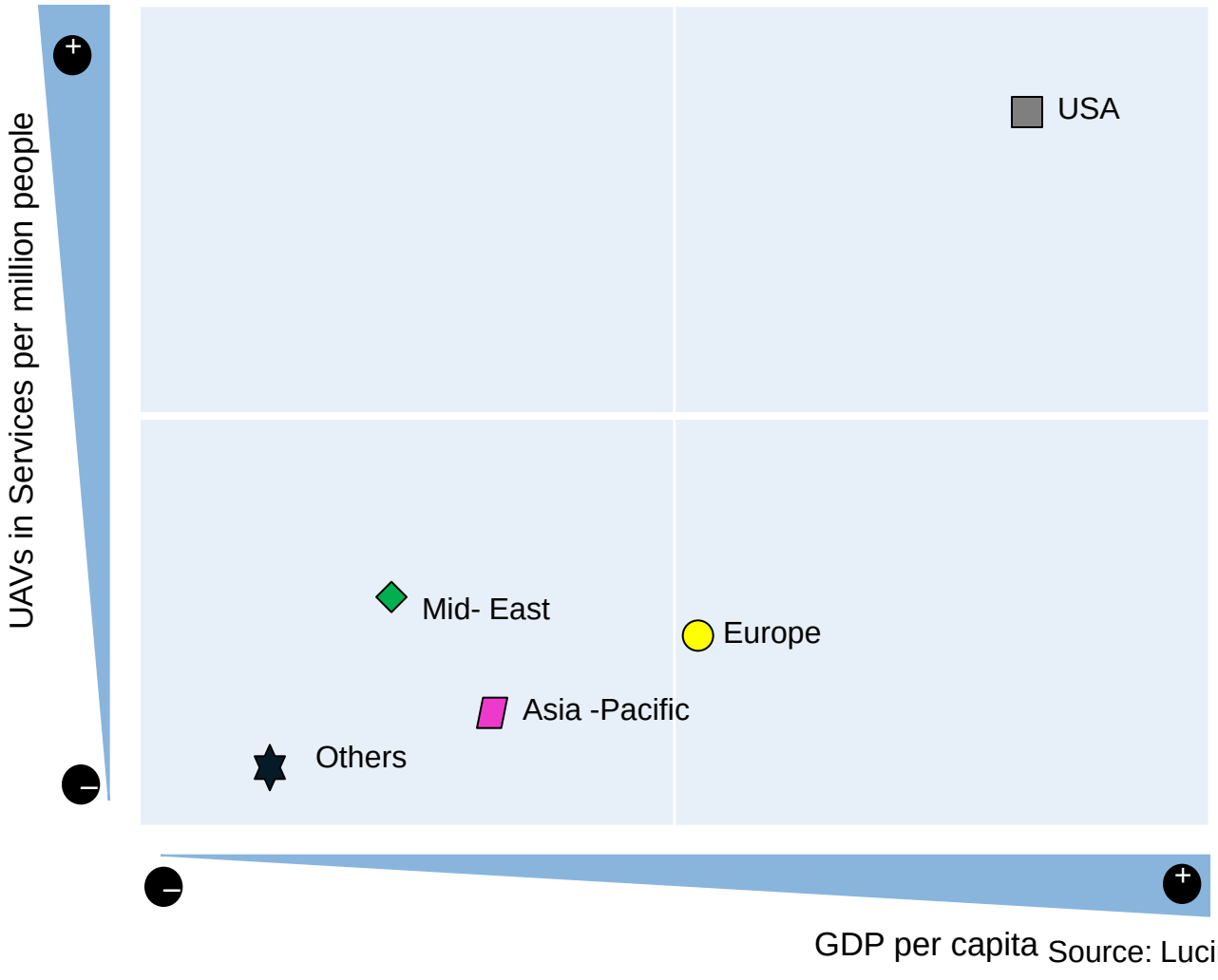
Key Insight

- UAV spending across the globe has received increased attention after the terrorist attack on World Trade Center in 2001
  - US Department of Defense increased its funding for UAV programs significantly after the attack
- Increase in UAV budget during the years 2009 to 2011
  - Growth during the period comes from the USA and Europe
- Spending for UAVs tends to come primarily from defense budgets
  - U.S. share in 2008 in the UAV market is 60%, whereas the U.S. share in total worldwide defense spending is about 48% in 2008.

Developing countries have significant potential in UAVs



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Key Insight

- The US is in the forefront of developing and deploying reconnaissance and strike UAVs
  - The US accounts for 73% of RDT&E spending & 59% of procurement
- France and Germany have set the pace for UAV deployment in Europe
- In Mid- East region Israel was the pioneer for many of the current tactical UAV efforts and major player in UAV sales to armed forces around the globe
- Asia-Pacific region has great potential in the coming years

Relative market attractiveness of UAVs in different regions

Segments	Application	USA	Europe	Mid East	Asia Pacific	Others
Civil	Natural Disasters/Humanitarian Relief	◑	◔	◔	◔	◔
Commercial	Environment / Weather & Strom tracking	◑	◔	◔	◔	◔
	Advertisement	○	○	○	○	○
Military/ Security	Defense	●	◕	◕	◕	◑
Science	Wireless Communications	●	◕	◕	◕	◑
	Precision Agriculture/ Cargo Transport	◔	◔	○	○	○

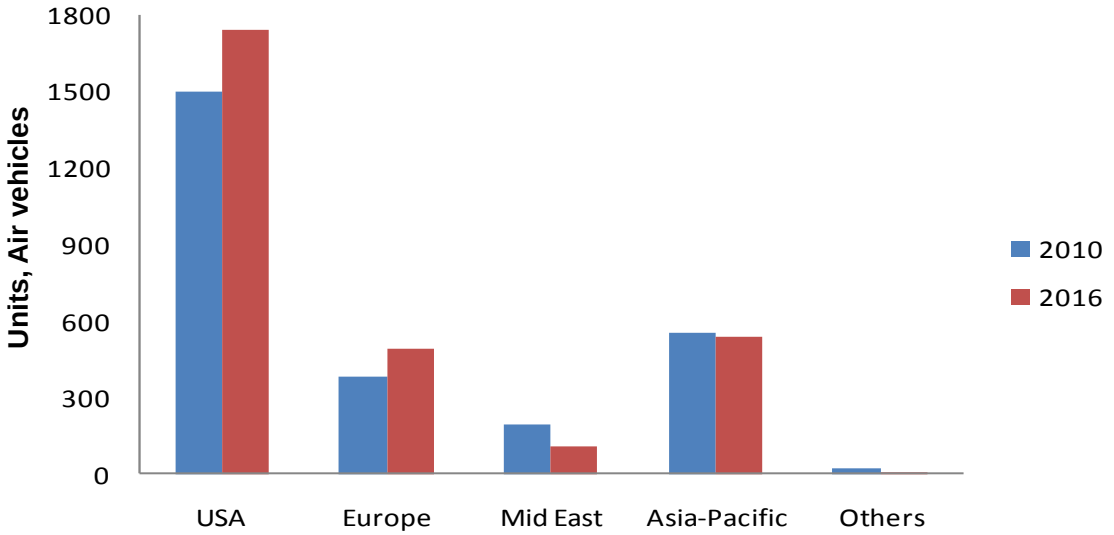
● High ◕ Medium to High ◑ Medium ◔ Low ○ Least

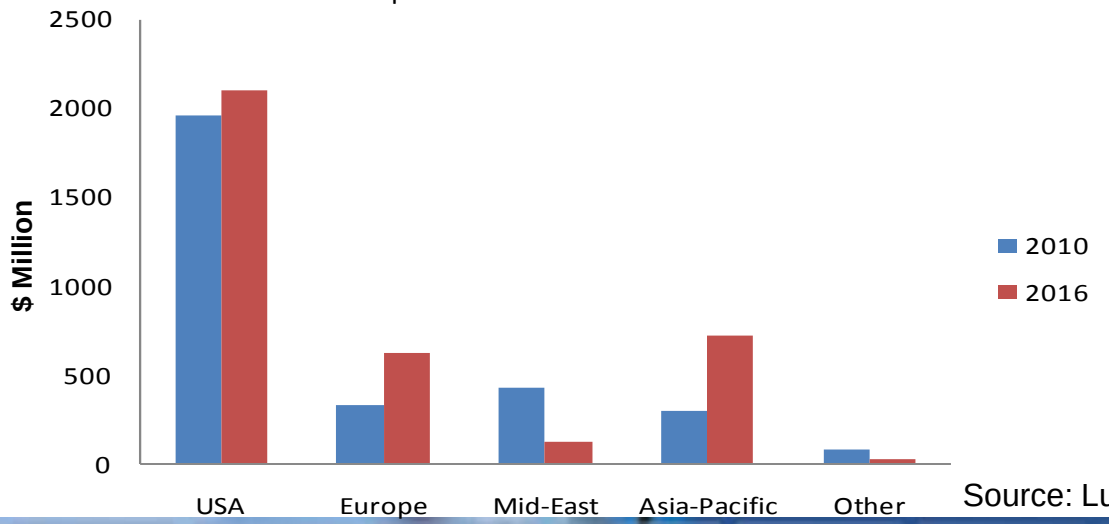
Relative market attractiveness of UAS (Unmanned Ariel Systems)

Parameters	UAV	Blimps	Zeppelins
Range	◕	◔	◑
Endurance	◑	◕	◕
Weight	◕	◔	◑
Speed	●	◔	◔
Altitude	◕	◑	◑
Pay load	◔	◔	◑
Cost	◔	◕	◕
Overall market attractiveness	◕	◔	◑

● High ◕ Medium to High ◑ Medium ◔ Low to Medium ○ Low

Investment in UAV's by major regions





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Key Insight

- UAVs market shows positive growth in coming five years
- USA region accounts for largest market share of UAVs
- In terms of production, Europe shows the highest growth in UAVs
  - European development of dual-use systems for military and civilian applications, broadening market demand of UAVs
- In terms of value, the Asia-Pacific region shows highest growth in UAVs
  - Asian countries have increased actives in UAV development

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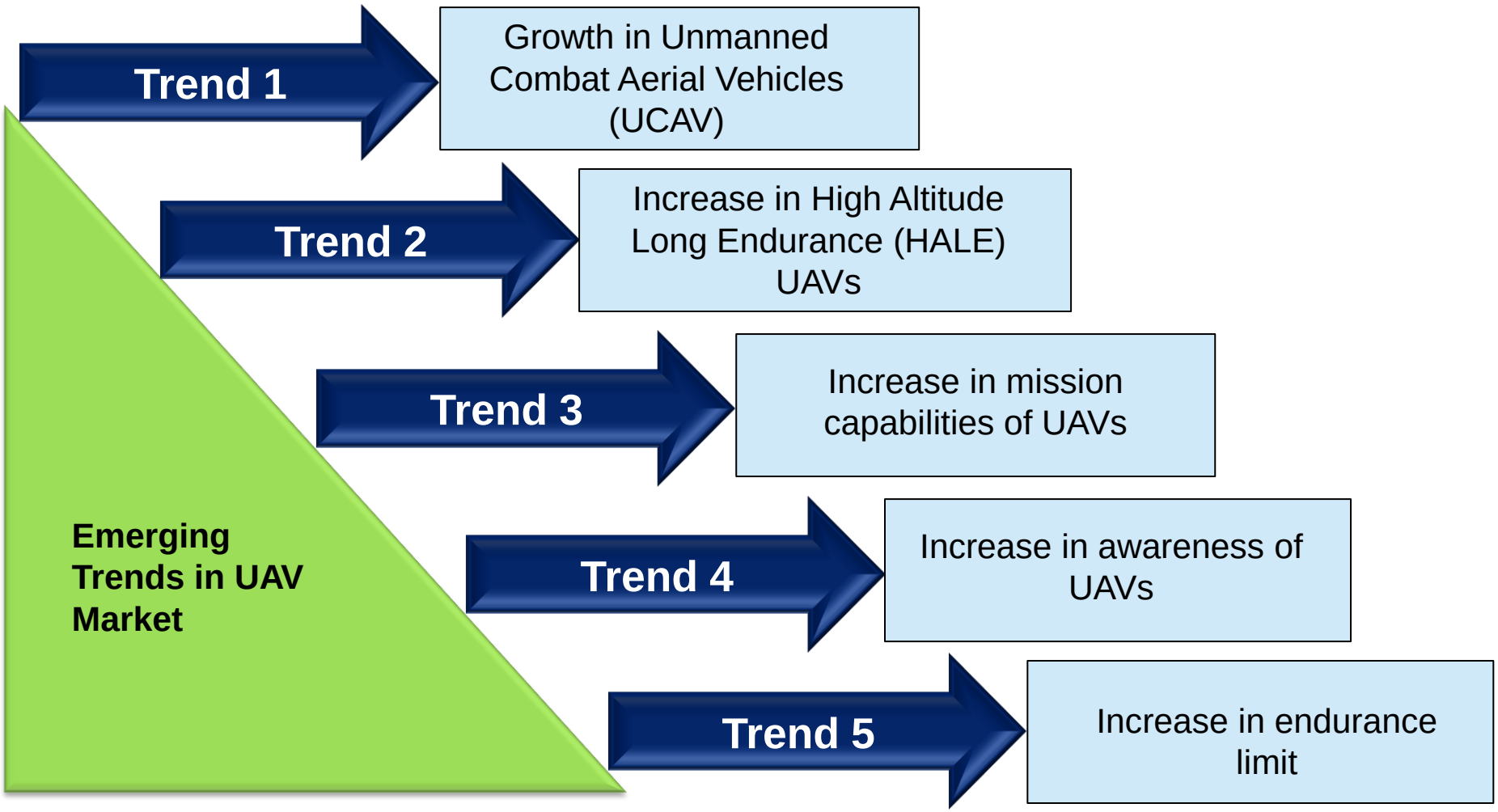
Emerging Trends in UAV Market

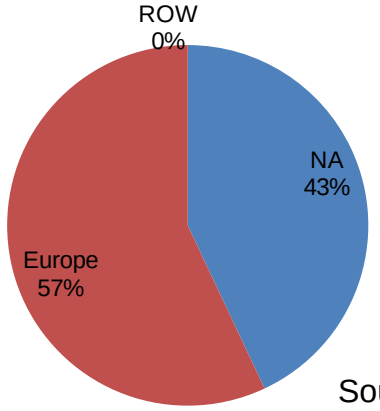


Trend 1: Growth in Unmanned Combat Aerial Vehicles (UCAV)

Key Insight

- UCAV is a new segment - products in UCAV segment are new and have a long way to go for further development
  - It is anticipated that a fully developed UCAV product will take another decade
- Global UCAV's market accounted for US $105 M in 2010
  - Total opportunity of $ 300 million with CAGR of 32% from 2011-2016
  - Prototypes are being developed in USA and Europe
  - Boeing (USAF (X-45)), Northrop Grumman (USN (X-47)), Alenia Aeronautica, BAE Systems and Dassault Aviation are major manufacturers of UCAV

Geographical distribution of UCAV manufacturers

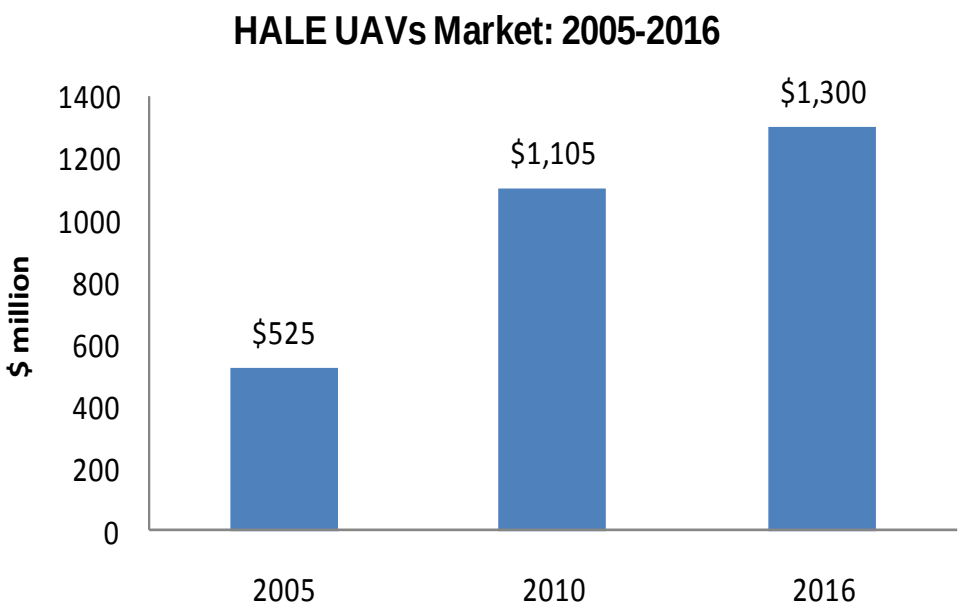


Source: Lucintel

Major UCAVs and its specifications

Name	Wingspan (m)	Length (m)	MTOM (kg)	Payload (kg)	Cruise Speed (kts)	Endurance (hrs)
Sky-X	5.8	7.8	1450	200	260	2
X-45C/D	14.94	11.89	16591	2046	530	7
nEUROn	12.5	9.3	6500	-	470	1
Taranis	11	11	6000	-	-	8
X47B	18	-	-	2045	460	-
Filur	2.5	2.17	55	-	190	0.33

Trend 2: Increase in High Altitude Long Endurance (HALE) UAVs segment in near future



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Key Insight

- Global HALE UAVs is an attractive market with total opportunity of US $1.1 Billion in 2010
  - It is accounted for 36% of the global UAV market
- Market growth was 16% (CAGR) during 2005-2010 and is expected to increase @ 9% CAGR from 2011-2016, to reach US $ 1.3 Billion in 2016
- Northrop Grumman, Gulfstream Aerospace and AeroVironment are major manufacturer of HALE UAVs
- North America is highest HALE UAVs producing region followed by Europe with 75% and 25% of global HALE UAVs respectively

Trends 3 & 4: Increase in awareness and mission capabilities of UAVs

Increase in awareness of novel use of UAVs

- UAVs used for civil and science purpose such as natural disasters, humanitarian relief, environment, weather & storm tracking
  - Data captured from disasters or crises areas
  - Outstanding for sensitive areas such as hurricanes
  - Used for precise data collection

UAVs can perform dangerous missions without risking human life

- Unmanned Aerial Vehicles (UAVs) are systems for intelligence, surveillance, and reconnaissance and weapon delivery
- They provide significant value in high-risk situations where the presence of a pilot in the aircraft is risky
- UAVs can be a smart and cost-effective complement to traditional manned aircraft

Trend 5: Increase in endurance limit

UAV Endurance	
UAV	**Flight time**
QinetiQ Zephyr Solar Electric (2010)	336 hours 22 minutes
QinetiQ Zephyr Solar Electric (2008)	82 hours 37 minutes
Boeing Condor	58 hours, 11 minutes
QinetiQ Zephyr Solar Electric (2007)	54 hours
IAI Heron	52 hours
AC Propulsion Solar Electric	48 hours, 11 minutes
MQ-1 Predator	40 hours, 5 minutes
GNAT-750	40 hours
TAM-5	38 hours, 52 minutes
Aerosonde	38 hours, 48 minutes
TAI Anka	24 hours

Key Insight

- In 1995, maximum loitering time was 24 hours. This grew to 36 hours in 2005 and reached more than 60 hours in 2010
- High Altitude Long Endurance (HALE) UAV provides a cost effective and persistent capability to collect and disseminate high quality data across wide areas
- Latest innovation: Solar powered UAVs have a demonstrated endurance of more than 300 hours

UAV Classes	
Classes	**Endurance**
UAV-Close Range (UAV-CR)	30 min – 2 hours
UAV-Short Range (UAV-SR)	8 to 10 hours
UAV-Endurance (UAV-E)	Minimum 24 hours

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Conclusions

- The total UAV opportunity is expected to surpass US $7 billion over the next 10 years, driven by increasing UAV demand and UAV procurement
- Increase in demand is expected in the HALE segment of UAV market
- Degree of technical change will be very high in the UAS market in the coming years
  - Latest innovation: Solar powered UAV have endurance of more than 300 hours
- UAVs are in development for a number of future roles that could greatly expand their numbers
  - Military uses will include the delivery of food, medicine and other supplies for troops
  - Short or vertical-takeoff & landing UAVs will prove useful in humanitarian aid missions
- North America continues to be leading global UAV market with ~ 60%-70% followed by Asia Pacific and Europe with 20% and 16% respectively
- There has been a significant increase in demand for UAVs from emerging countries, currently used in more than 50 countries
- A substantial increase of new entrants in the UAV supply chain will occur over the next decade
- UAS market is opening up many new opportunities from UAV pilots to electronics and cameras.

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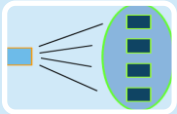
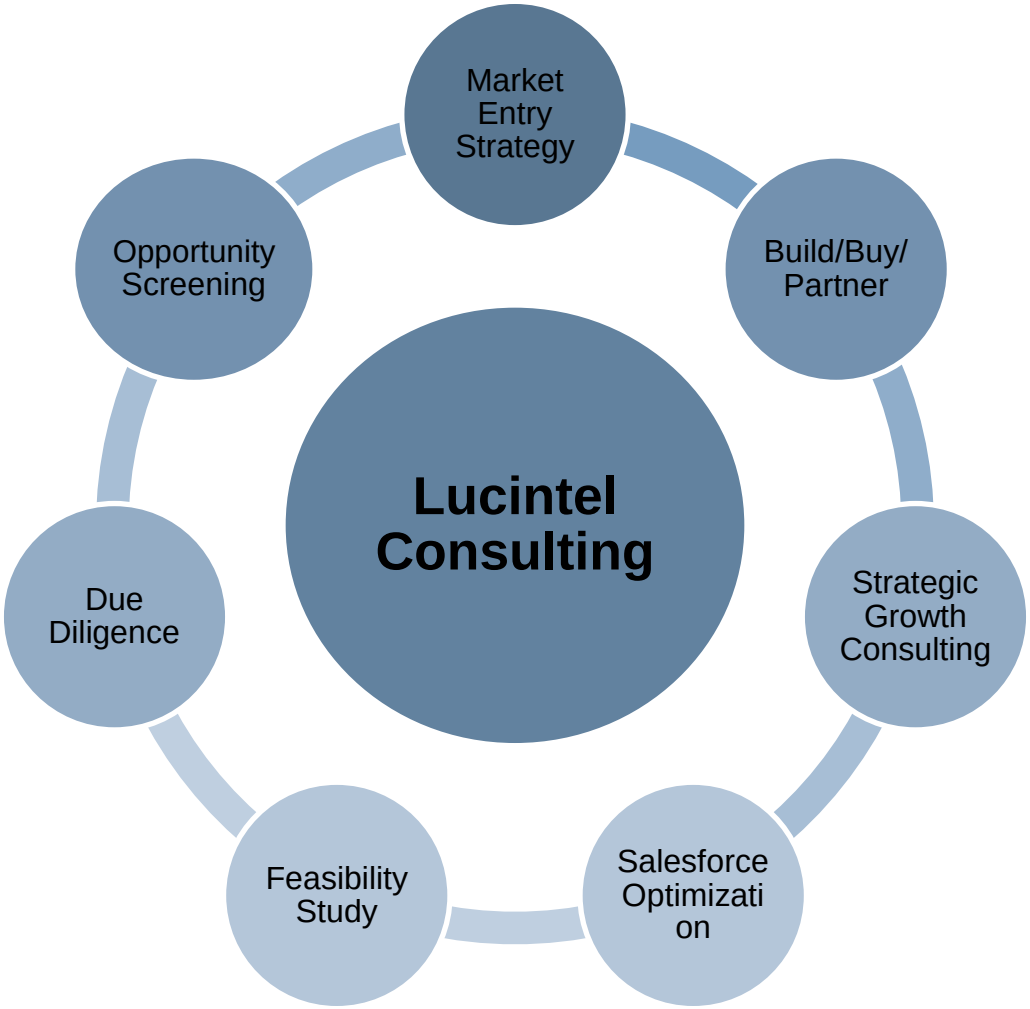

Opportunity Screening


Partner Search and Evaluation


Due Diligence and M&A


Market Entry Strategy

Lucintel has an extensive toolkit to address key strategic questions for increasing your company's profitability and market presence



Key Questions

- **Is market space / opportunity of current product offerings sufficiently robust?**
- **Markets are focus for many: how can my company profitably differentiate?**
- **Based on our core skills, where should we focus?**
- **Should we build or buy? Is build even an option?**
- **What game changer actions exist and/or is a more incremental approach best?**
- **What is the order sequence of market entry segments / products?**

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Steve Parker
VP, Sales (Market Reports)
Steve.parker@lucintel.com
Cell :+1-214-213-2491

Roy Almaguer
Global Sales Manager
Email: roy.almaguer@lucintel.com
Tel. : +1-210-878-7693 (Office)

Alan Clark
VP, Sales (Consulting)
Alan.clark@lucintel.com
Tel :+44 (0) 7875 708825

Nigel Odea
Business Development Manager
nigel.odea@lucintel.com
Cell : +44 (0) 207 558 8798