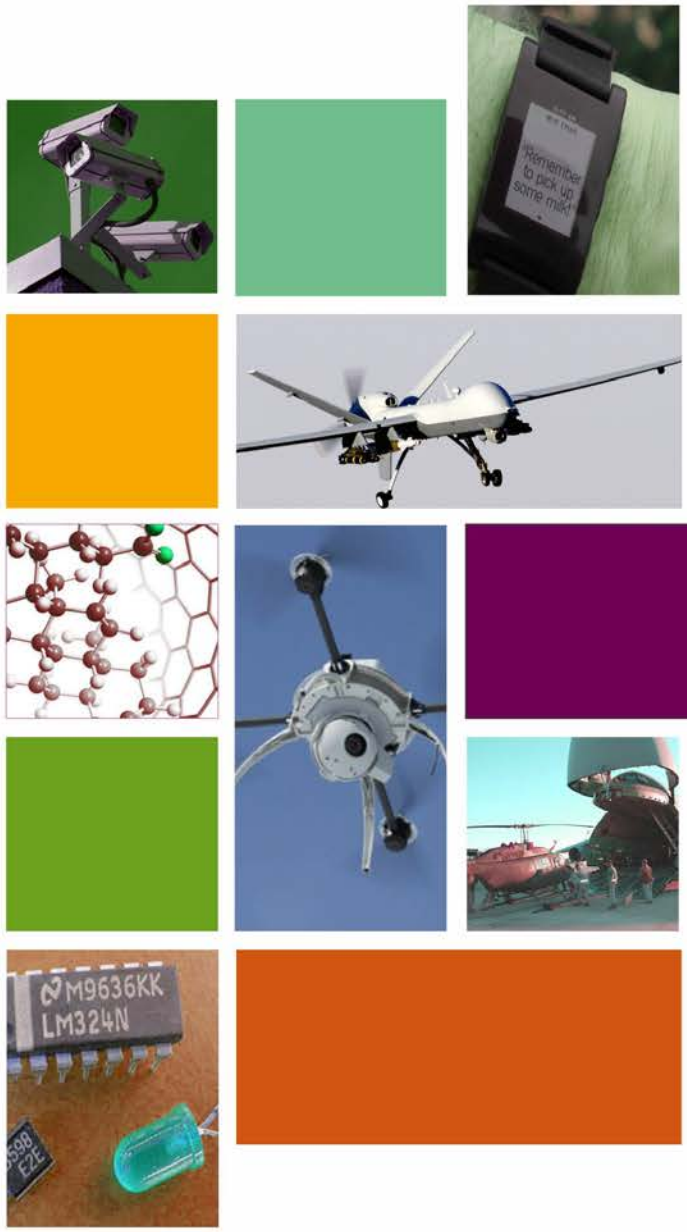

GLOBAL UNMANNED AERIAL VEHICLE (UAV/DRONES) MARKET OPPORTUNITIES

Focus on Application, Components & Region – 2015 to 2020

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1 REOPORT SCOPE

1.1 SCOPE OF THE STUDY

The scope of this report is limited to the market for the Unmanned Aerial Vehicles (UAV) devices and services. The study includes the analysis of components and end-use verticals in which UAV is used, in addition to the market study of the UAV devices across different geographical regions. The study presents a detailed analysis of device components, end-use verticals and geography along these lines; market size, drivers, growth opportunity, and challenges.

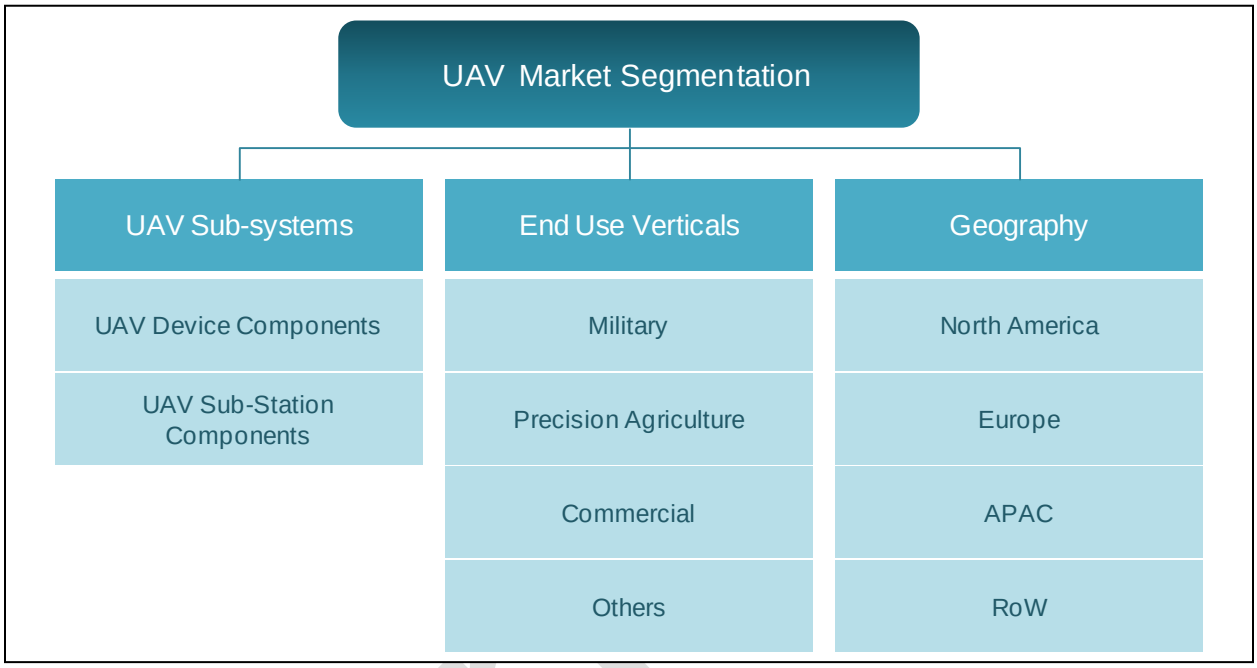
This report includes the market trends across the key geographic regions of the global market. The major end-use vertical areas of UAV device and services with respect to market size and growth rate, has been identified and discussed in the report.

1.2 UNMANNED AERIAL VEHICLE (UAV): REPORT COVERAGE

The figure below shows the list of market coverage features which are incorporated in this research study.

FIGURE 1

UAV MARKET STUDY COVERAGE AREA



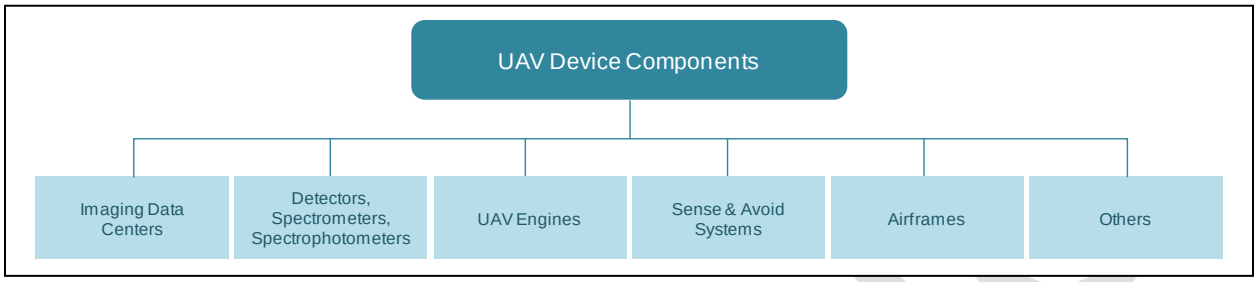
Source: BIS Research Analysis

Market Analysis includes an in-depth analysis of the market drivers, opportunities, challenges, and growth trend mapped across UAV device components, end-use verticals, and geographies. The Industry Analysis section presents detailed insights into the trend followed in the UAV market using the Porter's and Value Chain analysis. It also presents an exhaustive overview of the activities being undertaken by various stakeholders.

The UAV sub-systems chapter is divided into two major segments which are the UAV Device Components and UAV Sub-Station Components. UAV Sub-Station Components are qualitatively analyzed and the UAV Device Components are qualitatively and quantitatively studied and analyzed into five components: Imaging Data Centers, Detectors, Spectrometers & Spectrophotometers, UAV Engines, Sense and Avoid Systems, Airframes and others.

FIGURE 2

UAV DEVICE COMPONENTS



Source: BIS Research Analysis

The UAV Device market is studied under five headings of UAV device components. Each segment is analyzed and studied using secondary research databases and verified by industry experts during primary research and telephonic discussions. Device costs and assembly cost was taken into consideration for having a clear understanding about the market value of the UAV devices across different end-use verticals and different geographies.

The UAV market by geography includes a detailed analysis of the market size, growth opportunities, and trends across major geographies. The major geographical regions considered in this section are North America, Europe, Asia Pacific and RoW. The Geographic Analysis includes quantification of UAV devices and end-use verticals of the UAV market.

1.2.1 BY SUBSYSTEMS

The sub-system segment of the market is further segmented into two major sub divisions, viz. UAV device components and UAV sub-stations. The UAV device components include; imaging data centers, UAV engines, sense and avoid systems and airframes. These UAV Device components have been analyzed both, qualitatively and quantitatively. On the other hand, UAV sub-stations include antenna tracking systems, launch systems, ground control systems and autopilot navigation among others. The UAV sub-stations market has been covered qualitatively.

1.2.2 BY END-USE VERTICALS

End-Use Verticalsof the UAV market include three major segments, viz. military, commercial and agriculture. These segments can be sub-categorized into further categories that have been discussed in the report later. Military holds the maximum market share and commercial market has shown maximum growth in the past few years.

1.2.3 BY GEOGRAPHY

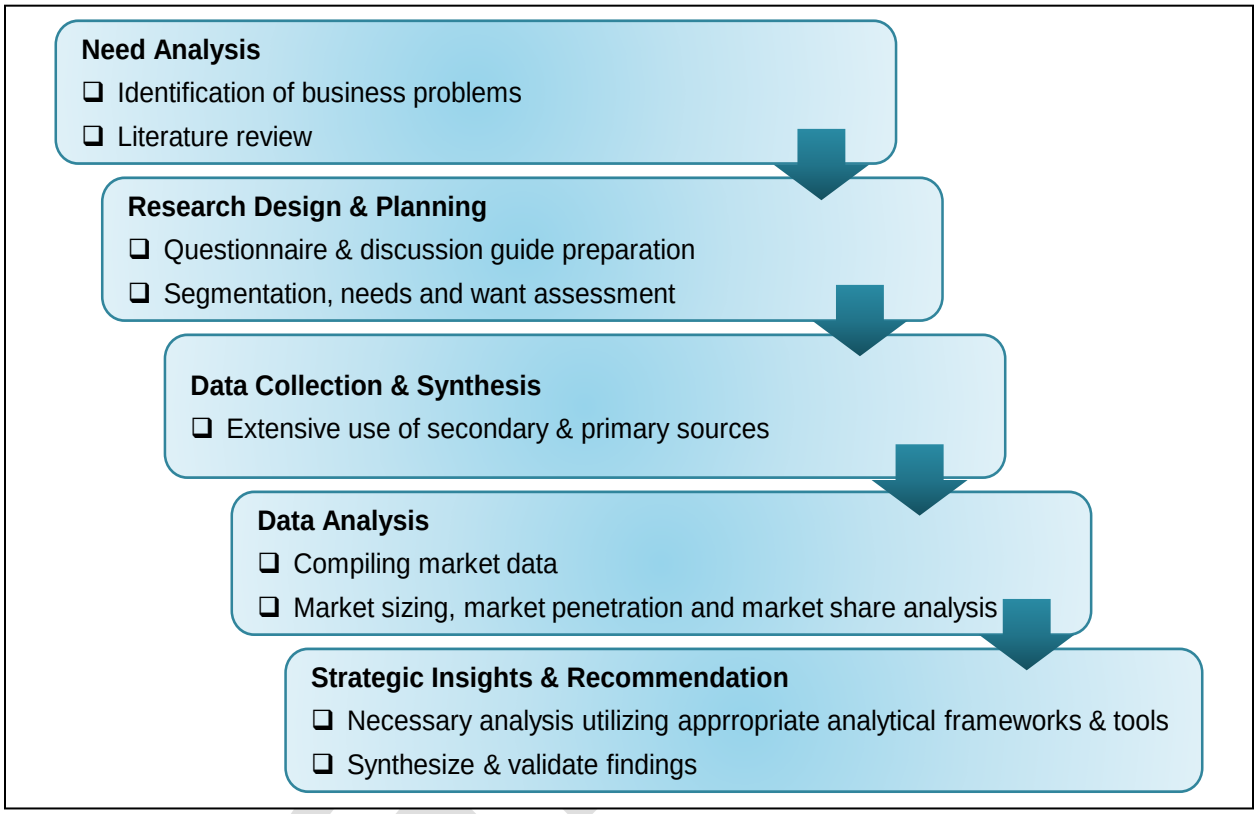
The biometric authentication market is segmented into North America& Canada, Europe, Asia Pacific (APAC) and Rest of the World (ROW). The Rest of the World (ROW) includes regions such Africa, Middle East, Latin America and few other countries.

1.3 BIS RESEARCH METHODOLOGY

We exhaustively use both primary sources (in-house experts, industry thought leaders, market players, and independent consultants) and secondary sources (a host of paid and unpaid databases) along with analytical tools to build our forecast and predictive models.

FIGURE 3

BIS RESEARCH METHODOLOGY



Source: BIS Research Analysis

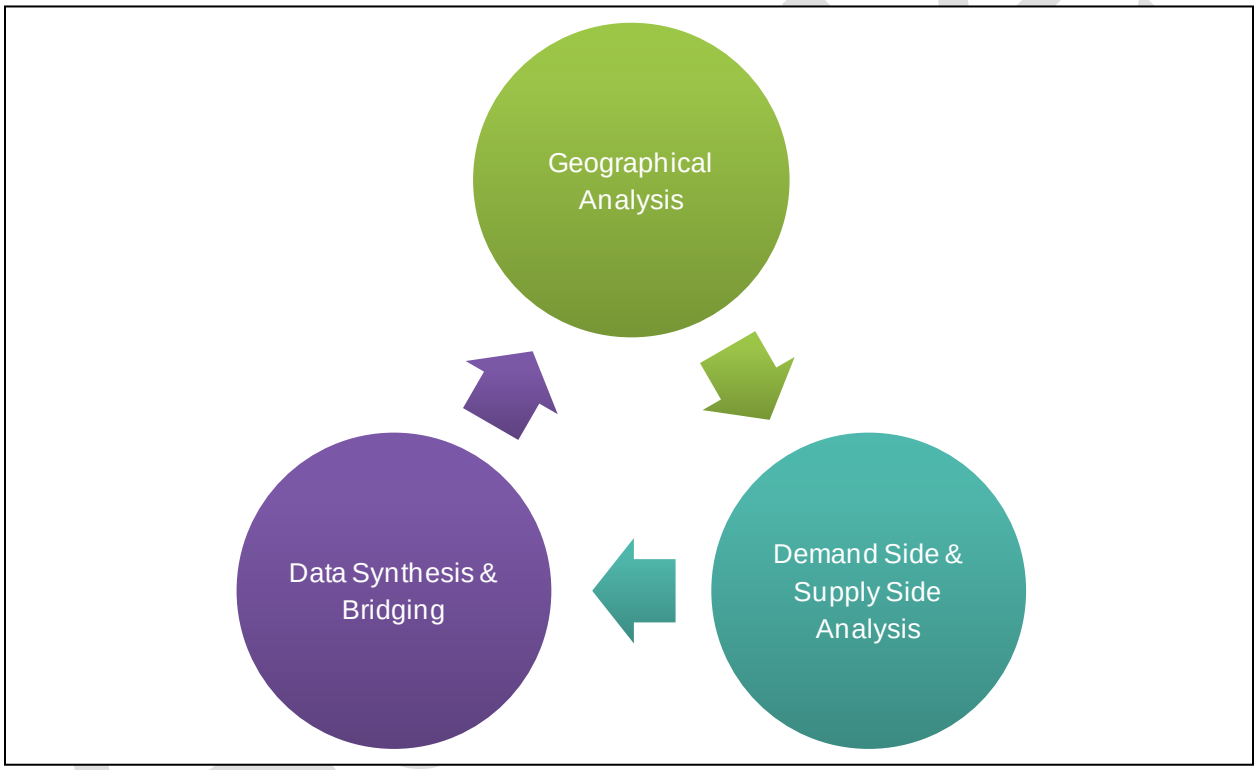
This research study involves the usage of extensive secondary sources, directories, company websites, and annual reports. It also makes use of databases such as IEEE, Hoovers, Bloomberg, Business-week, Factiva, and One-Source to collect useful and effective information for an extensive, technical, market-oriented, and commercial study of the global market.

The primary sources are comprised of industry experts from Unmanned Aerial Vehicle (UAV) industry and related industries as well as preferred suppliers, manufacturers, distributors, administrators, solution providers, technology developers, alliances, standards & certification organizations from companies, and other organizations related to the segments of this industry's value chain. All primary sources were interviewed to obtain and verify critical qualitative & quantitative information and assess the future prospects.

1.3.1 RESEARCH METHODOLOGY FOR GLOBAL MARKET STUDY

FIGURE 4

DIFFERENT PHASES OF RESEARCH METHODOLOGY FOR GLOBAL MARKET



Source: BIS Research Analysis

1.3.1.1 Geographical Analysis

The Geographical Analysis of the report covers the region-wise trends in the market. The market statistics for each of the major geographies are also given in this chapter. Besides identifying the key growth enablers in the biometric authentication market based on a detailed "push and pull" forces analysis, the chapter also undertakes an extensive Porters Five Forces analysis.

In estimating and forecasting the geographical market size and potential, purchasing power parity GDP (Gross Domestic Product) estimates for the benchmark year (2015) is derived from a host of sources such as the national income and products accounts from the Organization for Economic Co-Operation and Development (OECD), the European Bank for Reconstruction and Development (EBRD), the World Bank, Eurostat, the U.S. Central Intelligence Agency (CIA) and individual countries' statistical bureaus. The GDP data for individual countries are then converted to the U.S. dollars by valuing each country's output at the U.S. prices for the benchmark year, thereby addressing the issue of fluctuating exchange rate.

1.3.1.2 Demand Side & Supply Side Analysis

As the goal of the study was to estimate demand and identify growth opportunity in the market segment, a thorough analysis of demand side dynamics was undertaken. In this process various suppliers were interviewed and probed to understand the buying behavior across different demography. With detailed analysis (both primary and secondary) of suppliers (manufacturers, and channel partners) the supply side dynamics were understood, to get a complete picture of the market and triangulate the market data.

For each of the UAV Device components and end-use vertical types, a detailed secondary and primary (suppliers) research was done to understand the dynamics of the industry leading players. Both, the organized and unorganized sector were interviewed and researched upon. Some of the key factors that were probed during this process include market size (value), market share (by UAV Device type, end-use verticals and by geography), market channels and key segments, and regulations among others.

1.3.1.3 Data Synthesis & Bridging

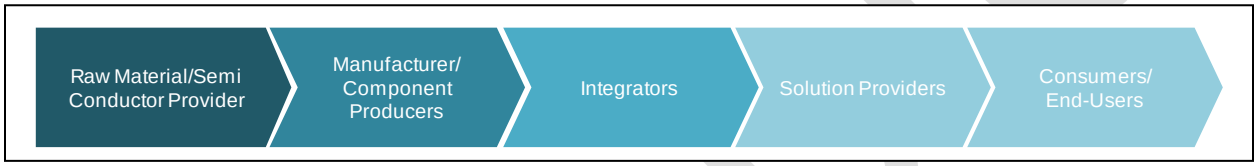
Following comprehensive market engineering which involves calculations of market statistics, market crackdown, market size estimations, market share analysis, market forecast, and data triangulation further primary research was undertaken to gather missing information, verify, and validate the critical numbers arrived at industry trends, and key players of each type of product and application market. Extensive qualitative and further quantitative analysis are also undertaken from all the numbers arrived at in the complete market engineering process, in order to list key information throughout the study.

2 MARKET OVERVIEW

2.1 VALUE CHAIN ANALYSIS

FIGURE 5

GLOBAL UAV MARKET: VALUE CHAIN



Source: BIS Research Analysis

To understand the UAV market, we must focus on the underlying approach of the research. The above chart breaks down the market flow at various steps for better understanding. The major raw material for the large chunk of the UAV production companies is composites. Extremely light weight nylon (PA 640 GSL) is procured by manufacturers of UAVs. Manufacturing firms in turn focus on the production of air frames, propulsion systems and other necessary UAV sub products. Other such products include sensors for monitoring purposes. These sub components are then further consumed by the integrators that are responsible for compilation of each of these sub products into Unmanned Aerial Systems (UASs).

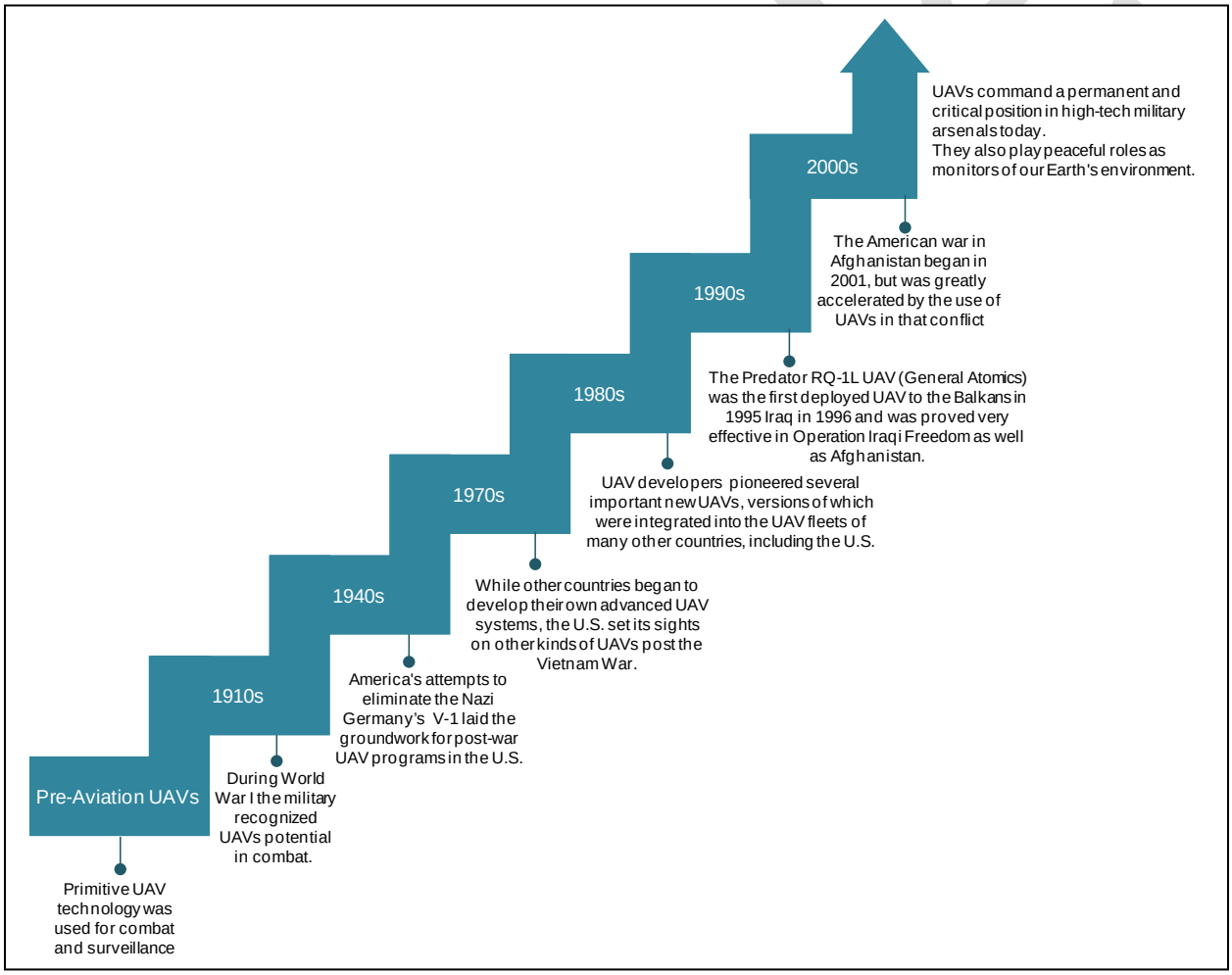
These systems can be incorporated within various application verticals. Solution providers try to understand the ready-to-use business requirements of the UAV applications and further revamp, redesign or reintegrate the product to meet the demands of the end users. Solution providers also help in integrating UAV components and subsystems such as ground stations and pilot monitoring. They also extend support facilities to end users in case of performance disruptions or other such assistance. The end use verticals of the UAV market can be broadly categorized into three categories, viz. military, commercial and agriculture.

2.2 EVOLUTION & PRODUCT LIFE CYCLE OF UAVS

2.2.1 UAV HISTORY AND EVOLUTION TIMELINE

FIGURE 6

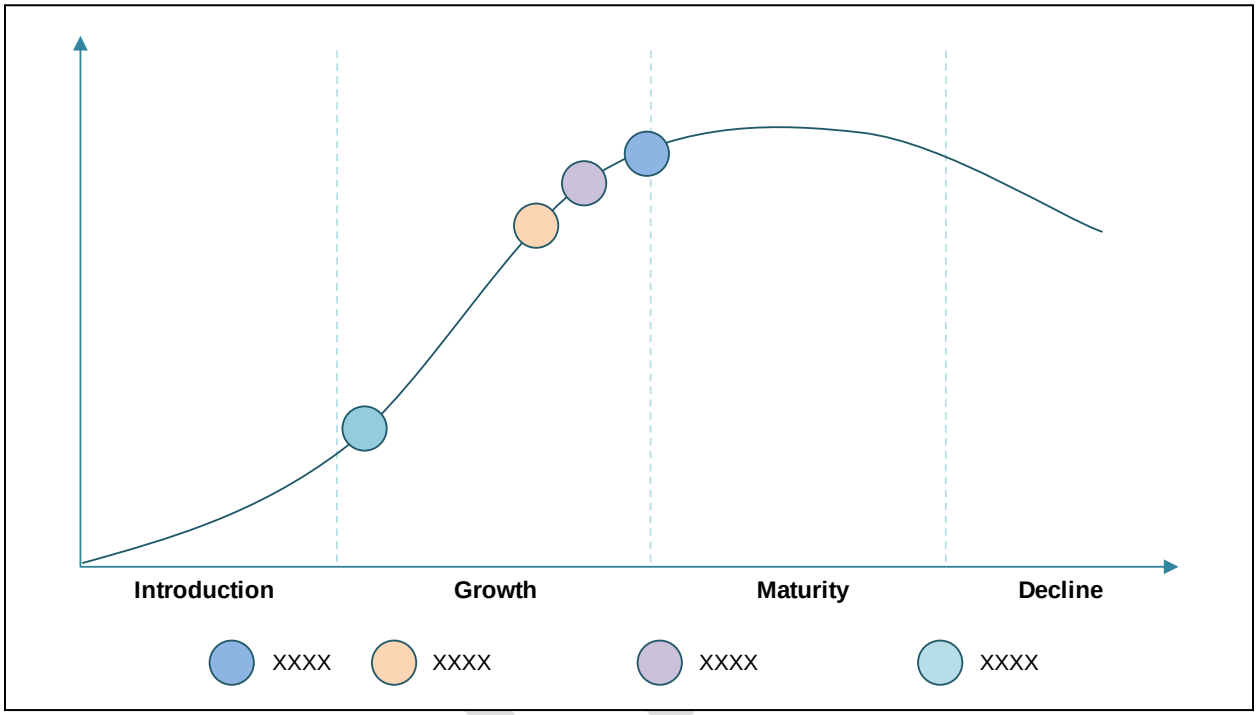
HISTORY AND EVOLUTION TIMELINEOF UAV MARKET



Source: BIS Research Analysis

FIGURE 7

UAV PRODUCT LIFECYCLE (2020)



Source: BIS Research Analysis

By 2020, the UAV market is expected to see significant growth especially in the commercial sector with military applications seeing constant growth which is expected to be offset primarily by increased commercial use of UAVs, driving manufacturing units towards the production of small UAVs. Precision Farming's total economic impact in the U.S. is estimated at $XX million with total job creation of XX in 2014 and is expected to grow significantly by 2020.

3 GLOBAL UAV MARKET, BY SUBSYSTEMS

3.1 UAV DEVICE COMPONENTS

The Components used in a UAV device are discussed below. The major components that are used for UAV construction are Imaging Data Centers, Detectors, Spectrometers, & Spectrophotometers, UAV Engines, Sense and Avoid Systems, Airframes, and others. These components are thoroughly studied and analyzed for market engineering and quantifying the market value.

TABLE 1

GLOBAL UAV DEVICE COMPONENTS MARKET VALUE, BY GEOGRAPHY, 2014-2020 ($BILLION)

Region	2014	2015	2016	2017	2018	2019	2020	CAGR% (2015-2020)
North America	XX	XX	XX	XX	XX	XX	XX	XX%
Europe	XX	XX	XX	XX	XX	XX	XX	XX%
APAC	XX	XX	XX	XX	XX	XX	XX	XX%
RoW	XX	XX	XX	XX	XX	XX	XX	XX%
Total	XX	XX	XX	XX	XX	XX	XX	XX%

Source: ME-BIS Research

North America holds the biggest portion of the UAV market. U.S. generates the largest chunk of the UAV market revenue and the North America region generated $XX Billion in 2014. As forecasted, the North America region is expected to grow at XX% CAGR from 2015 to 2020, and generate $XX Billion in 2020. Europe is currently generating the third largest revenue, but is expected to grow at the fastest CAGR of XX% from 2015 to 2020.

3.1.1 IMAGING DATA CENTRES

TABLE 2

IMAGING DATA CENTRES PRODUCT USE

Companies	Product	Application Vertical	Application End Use
Precision Hawk	The Lanchester Platform	Commercial	Aerial data gathering
Headwall Photonics	Micro-Hyperspec	Commercial	Hyperspectral Imaging
Resonon	Resonon'shyperspectral imaging cameras	Commercial	Hyperspectral Imaging
Slantrange	Airborne Remote Sensors	Commercial	Airborne remote sensing, drone aircraft, integrated flight data collection systems, imagery analytics, agronomy, operations, training

Source: BIS Research Analysis

3.1.2 DETECTORS, SPECTROMETERS, SPECTROPHOTOMETERS

Control and estimation of the electromagnetic spectrum has given ascent in science to an immeasurable exhibit of instrumentation that measures how atoms, molecules, and compounds, as crystals, gasses, fluids as aerosols and dispersions or solution, retain or emanate radiation of particular wavelengths when tested with radiation or varieties in attractive frequencies as in NMR imaging. Spectral information can be utilized to recognize and evaluate data about substances utilizing these estimations. This segment will survey items and innovations that have been scaled down or show guarantee for utilization in UAVs.

4 GLOBAL UAV MARKET, BY END-USE VERTICAL

4.1 INTRODUCTION

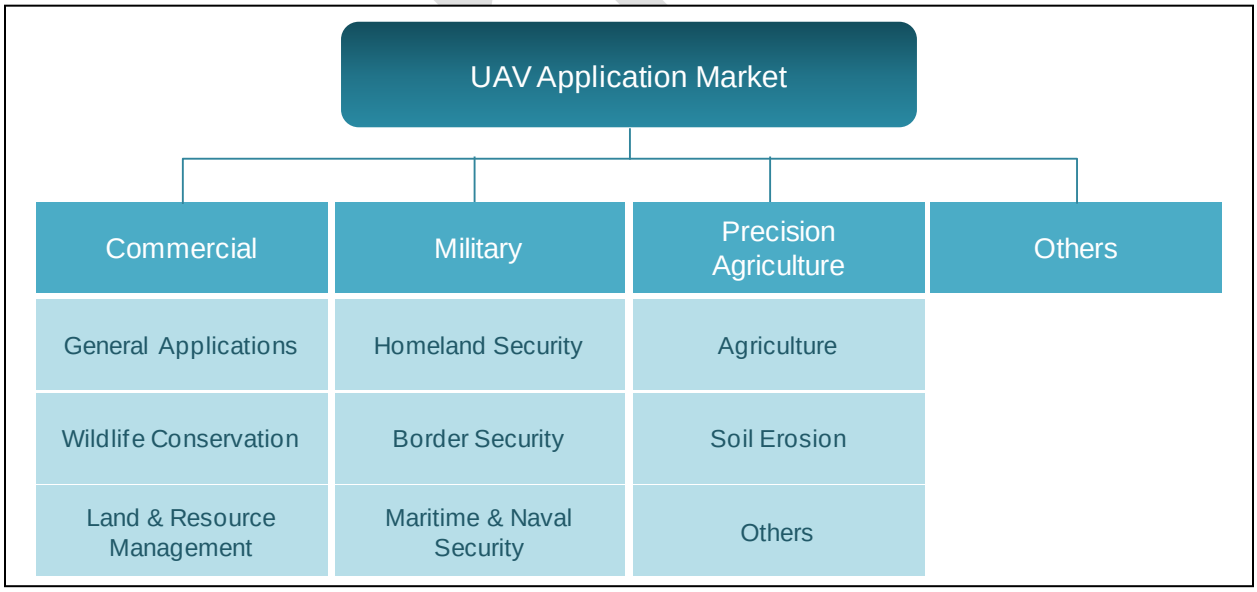
Unmanned aerial vehicles are majorly used in the military vertical, and in military end-use, the UAVs are used in border security, homeland security and maritime and naval security.

While calculating the commercial end-use; general applications, wildlife conservation, land and resource management and others are kept under consideration.

Similarly, under the precision agriculture end-use, there are several application of drones like: agriculture, soil erosion testing, field mapping, and others.

FIGURE 8

GLOBAL UAV MARKET CLASSIFICATION



Source: BIS Research Analysis

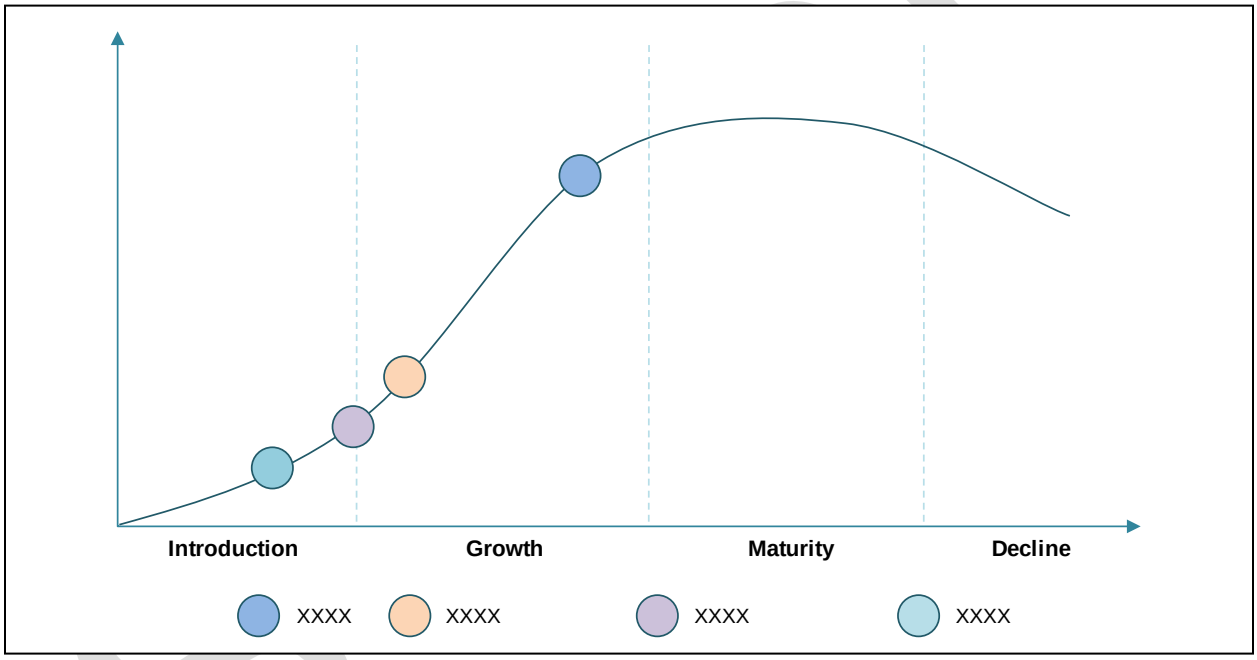
5 GLOBAL UAV MARKET BY GEOGRAPHY

5.1 NORTH AMERICA

5.1.1 PRODUCT LIFE CYCLE IN NORTH AMERICA

FIGURE 9

NORTH AMERICA: UAV PRODUCT LIFECYCLE, 2015



Source: BIS Research Analysis

Currently, in the U.S., the Federal Aviation Administration (FAA) restricts the use of drones for commercial purposes but has been directed by Congress to allow drones to be used for commercial use by 2015. These rules are expected to allow drones to fly up to XX feet with a weight of no more than XX lbs. In the light of such regulations coming up with a set of regulations already released in Feb 2015, UAV market segments including Homeland Security, Civil/Commercial Applications, Precision Farming and Border Security and Precision Farming are expected to grow through 2015. Individually, both Border Security and Homeland Security

have shown growth in recent times. Being the two major application verticals of the UAV market they have accelerated the overall market growth of UAVs. Precision farming and Commercial Sector have seen various new applications of UAVs with the new regulations. Others including areas such as Wildlife Management, Mining, Hyper Spectral Imagery, Oil Refineries among others have initiated and propelled the use of UAVs in 2014-15.

5.2 EUROPE

The key countries analyzed in Europe include the U.k, Germany, France, the Netherlands, and Spain among others.

5.2.1 MARKET STATISTIC

TABLE 3

EUROPE: UAV MARKET, BY UAV DEVICE COMPONENTS, 2014-2020 ($MILLION)

UAV Device Components	2014	2015	2016	2017	2018	2019	2020	CAGR % (2015-2020)
Imaging Data Centers	XX	XX	XX	XX	XX	XX	XX	XX%
Detectors, Spectrometers, Spectrophotometers	XX	XX	XX	XX	XX	XX	XX	XX%
UAV Engines	XX	XX	XX	XX	XX	XX	XX	XX%
Sense and Avoid Systems	XX	XX	XX	XX	XX	XX	XX	XX%
Airframes	XX	XX	XX	XX	XX	XX	XX	XX%
Others	XX	XX	XX	XX	XX	XX	XX	XX%
Total	XX	XX	XX	XX	XX	XX	XX	XX%

Source: ME-BIS Research

6 KEY MARKET PLAYERS PROFILE

6.1 KEY PLAYERS IN THE UAV MARKET

6.1.1 AEROVIRONMENT, INC.

6.1.1.1 Overview

Particular	Specific (as of 2014)
Website	http://www.avinc.com/
Contact Details	Monrovia, California, U.S.
Year of Establishment	1971
Ownership Type	Public
Company Type	Aerospace & Energy
Number of Employees	Manufacturer & Dealer
Competitors	Lockheed Martin Corporation
Relevant Products	Military UAVs
Other Products	Tactical missile systems, Charging systems for electric vehicles

Source: Company Website, AeroVironmentAnnual Report

6.1.1.2 Product Portfolio

AeroVironment, Inc. primarily produce and deals inunmanned aerial vehicles (UAVs), electric vehicle systems, and energy systems.

The company is known for creating a lightweight human-powered and then solar-powered vehicles series. AeroVironment is top supplier of small drones to the Pentagonwhich includes the models like Raven, Wasp and Puma. The company has undergone a strategic partnership

with Lockheed Martin Corp, one of the UAV market leaders, to develop their 'Global Observer' to provide "persistent airborne observation".

AeroVironment has this strategy to develop its new solutions safe, reliable and innovativewhichgiveits customers with convincing value thereby creating new markets.

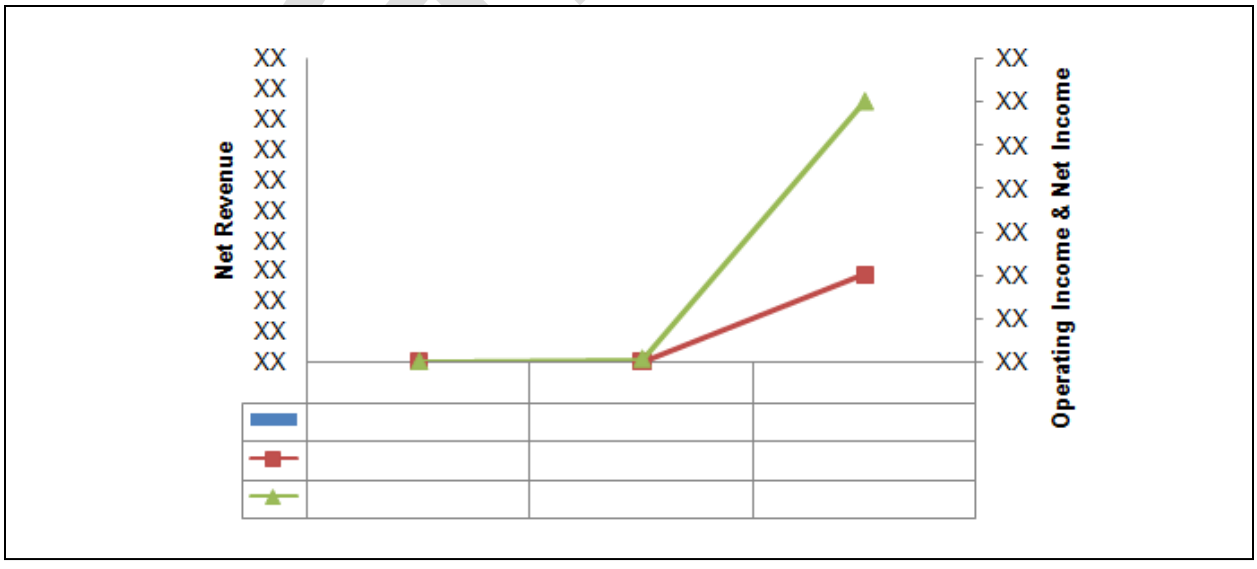
The company is following some strategies discussed below:-

- Deliver innovative new solutions
- Preserve agility and flexibility
- Expand the sale of existing solutions to current and new customers
- Effectively manage our growth portfolio
- Foster our entrepreneurial culture and continue to attract, develop and retain highly-skilled personnel

6.1.1.3 Financials

FIGURE 10

AEROVIRONMENT:OVERALL FINANCIALS 2012-2014 ($MILLION)

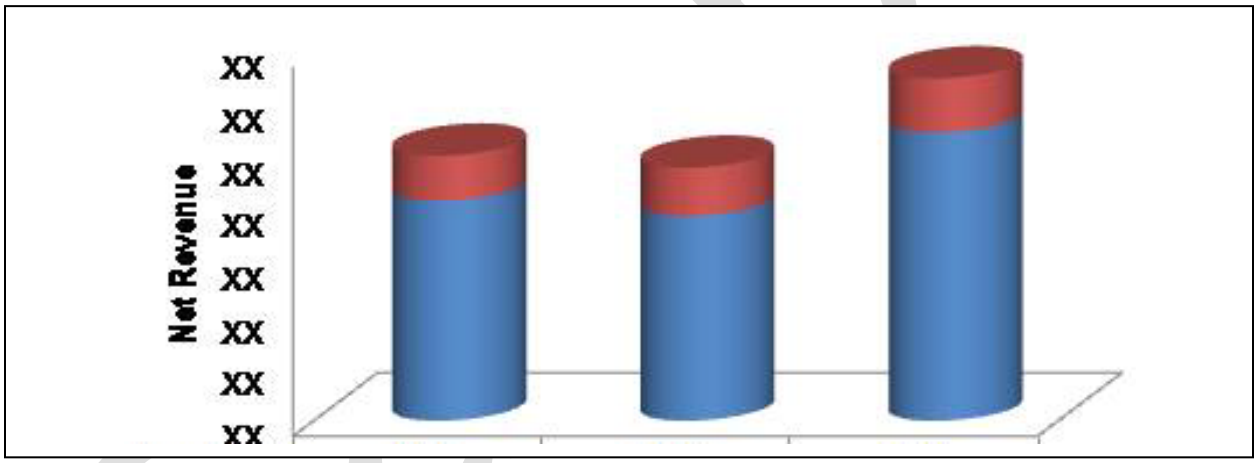


Source: AeroVironment Annual Report, BIS Research Analysis

Revenue for the fiscal year ended April 30, 2014 was $XX million, as compared to $XX million for the fiscal year ended April 30, 2013, representing an increase of $XX million, or XX%. The increase in revenue was due to an increase in product deliveries of $XX million offset by lower service revenue of $XX million. UAS revenue increased $XX million, or XX%, to $XX million for the fiscal year ended April 30, 2014, primarily due to higher product deliveries of $XX million offset by decreases in logistics service revenue of $XX million and customer-funded R&D work of $XX million.

FIGURE 11

AEROVIRONMENT: NET REVENUE BY SEGMENTS, 2012-2014 ($MILLION)



Source: AeroVironment Annual Report, BIS Research Analysis

6.1.1.4 Key Developments

Date	Strategy	Description
December 2014	Award	AeroVironment received $XX Million award and $XX Million option for switchblade Tactical Missile System support servicesfrom the United States Army Close Combat Weapons Systems office.
June 2014	Product Launch	BP and AeroVironment launch first FAA approved, commercial unmanned aircraft operations over land and

Date	Strategy	Description
		waterproviding comprehensive GIS services.
February 2014	Collaboration	Lockheed Martin Corporation and AeroVironment, Inc. to pursue joint opportunities in unmanned aircraft systems markets. Primary focus relates to integrating Lockheed Martin mission systems, ground systems and technology with AeroVironment's Global Observer® unmanned aircraft system
October 2013	Product Launch	AeroVironment unveils four-ounce pocket Digital Data Link(DDL)secure video and data receiver for remote access to aerial networks. It provides remote access to video and data from Digital Data Link (DDL) - enabled aircraft. USB interface offers easy integration with Android, iOS and Windows devices

Source: Company Website, BIS Research Analysis

6.1.1.5 Analyst's Insight

With the rise in the demand of UAVs, AeroVironment's innovative potential products in research and development pipeline will emerge as new growth platforms, creating additional market opportunities.

AeroVironment has even received the first FAA Type Certificate for commercial use over American soil for the Puma AE, while QUBE is quickly proving itself a remarkable tool for police, paramedics, firefighters and other rescue personnel. This has allowed its growth in the commercial sector. Going forward, it would look to strengthen its commercial UAVmarket primarily due to the rising demand of small UAVs for commercial applications.

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