



DRONES: A RISING MARKET

An Industry to Lift your Returns

September 8, 2015

ABSTRACT: THE UNMANNED AERIAL VEHICLE (DRONE) MARKET IS EXPECTED TO BE CUMULATIVELY WORTH \$91 BILLION OVER THE NEXT DECADE. ALTHOUGH MILITARY SPENDING DOMINATES THE INDUSTRY, THE INDUSTRIAL AND CONSUMER MARKETS ARE QUICKLY ADOPTING DRONES AND HAVE DECADES OF GROWTH AHEAD.

THIS IS THE FIRST OF TWO SOPHIC CAPITAL REPORTS ABOUT THE DRONE INDUSTRY. OUR SECOND REPORT WILL FOCUS ON HOW DRONES WILL WORK IN EARTH'S FINAL UNDER-EXPLORED FRONTIER – THE SEA.

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Five Reasons to Read this Report

1. The aerial drone market could cumulatively be worth \$91 billion over the next decade;
2. Military spending on aerial drones continues to ramp;
3. Consumer and industrial adoption of aerial drones is just starting;
4. Venture capitalists are pouring money into aerial drone startups; and,
5. This report is an introduction to a second Sophic Capital drone report – a report that will detail a nascent drone market that could yield large returns for investors.

Introduction

The aerial drone market could cumulatively generate \$91 billion over the next decade, according to a 2014 Teal Group report.ⁱ Modern aerial drones have been around since the early 1970s. Militaries have widely adopted them and continue to be the largest vertical. Large industrial companies are experimenting with aerial drones - GoPro's (NASDAQ:GPRO) announcement that the Company would place cameras on a quadcopter, Amazon's Prime Air drone delivery system, Uber even delivered ice cream by aerial drone in Singapore. Consumers are using aerial drones for photography, filming, and mapping.



*Uber to the rescue with drone-delivered ice cream.
Source: [Uber Singapore](#)*

This is the first of two Sophic Capital reports covering the drone industry. Although we see healthy growth continuing in the aerial drone market across all three verticals, we believe investors are starting to price in some of this growth as this market has been getting a lot of attention over the last year. Investors may also want to consider looking at an emerging and largely unknown segment of the drone market, which is poised to target the Earth's final unexplored frontier – the sea. While this report focuses on the areal market and its history and growth opportunity, Sophic Capital will soon release a follow up report on sea drones, or, as they're called in the industry, unmanned underwater vehicles (UUVs). Stay tuned in the coming days for the follow-up report.

Aerial Drones – A Market Expanding Beyond the Military

Exhibit 1 illustrates the dominance exerted by the military on current and future aerial drone sales. Militaries were the early adopters of drones, as far back as 1849 when Austrian forces attached balloons to bombs to attack Venice, Italy.ⁱⁱ Toward the end of World War I, the U.S. developed an aerial torpedo called the Kettering Bug.



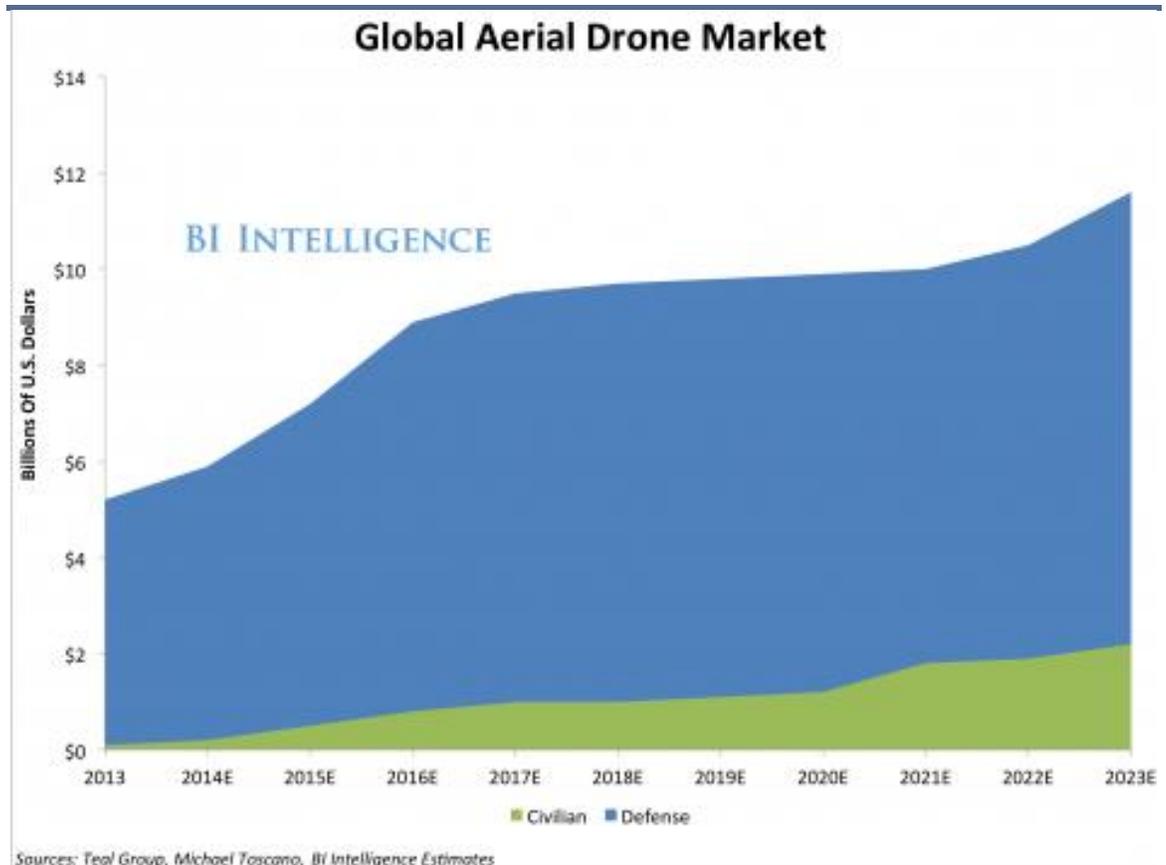
*MQ9 Reaper drone
Source: [The Washington Times](#)*

The OQ-2 Radioplane was the first mass-produced American unmanned aerial vehicle (UAV), developed during the early stages of World War II.¹ In 1973, after the Yom Kippur War, Israel invested heavily in UAVs for surveillance, and joint US/Israel projects evolved UAV technology. The CIA used UAVs to monitor activities during the Bosnian War in the 1990s and deployed them in search of Osama bin Laden in Afghanistan in 2000. During this time, the U.S. Air Force received permission to arm UAVs with missiles. Since then, military use of UAVs has continued to expand, and Exhibit 1 shows no sign of military UAV investment abating in the future.

Exhibit 1 also shows continued growth in the civilian aerial drone markets, which includes the industrial and consumer markets. Both of these markets regularly use aerial drones for filming and photography (sporting events are popular with shutterbugs). Crowdfunding startups AirDog and HEXO+ have sprouted to satisfy those who crave aerial selfies. Wherever a camera is used, we anticipate an aerial drone will hover above to provide a variety of new perspectives.

Technology is a key driver for increasing adoption with the civilian market. Component, power, and form factor reductions should allow drones to carry heavier payloads (cameras, packages, etc.) making aerial drones more versatile for the consumer and industrial markets.

Exhibit 1: Global Defense and Civilian Aerial Drone Market Estimates



Source: [Business Insider](#)

¹ Norma Jean Baker (a.k.a. Marilyn Monroe) had a job assembling OQ-2s.

Government regulations and new laws remain an unknown opportunity and risk for the drone market. This report will not touch on issues around government regulations, civilian complaints and safety concerns for drones; but investors should be aware that regulations, safety, and public privacy will remain risks. Recently there have been a number of concerns in the media, from teenagers putting handguns on drones to farmers shooting down drones in Texas to general concerns about how drones could pose a safety concern for commercial airlines. Investors should pay close attention to potential regulatory changes and new laws around drones.

Aerial Drone Manufacturers

Dajiang Innovation Technology (DJI)

According to Frost & Sullivan,ⁱⁱⁱ, Shenzhen, China-based DJI (private) controls approximately 70% of the consumer aerial drone market. In early May 2015, the Company raised \$75 million at an \$8 billion valuation,^{iv} and is expected to generate close to \$1 billion in revenue this year, doubling 2014 sales.^v

3D Robotics

Founded in 2009 by a former editor-in-chief of *Wired* and a college dropout engineering whiz, 3D Robotics (private) claims 100,000 customers. On April 23, 2015, the Company announced an expansion of a \$50 million Series C round of financing led by Qualcomm Ventures. 3D Robotics offers the Pixhawk autopilot system, Solo™ smart drone, and software platform. Unlike DJI, 3D Robotics software is open source, which should stimulate a wide range of applications from the developer community.

GoPro – Cameras in the Air

The months leading to GoPro's June 2014 IPO brought the Company's cameras to the forefront. Less than a year later, CEO Nicholas Woodman announced that GoPro had plans to make a quadcopter for the cameras. As mentioned before, the industrial and consumer markets use drones at sporting events, a vertical where GoPro has had good penetration, so in our opinion it makes sense for GoPro to develop an aerial drone to capture this market. Analysts forecast 2015 and 2016 EPS respectively at \$1.82 and \$2.10. Backing out net cash of \$3.52 per diluted share from the September 4, 2015 close of \$37.09, this values GoPro at 18.4x 2015 and 16.0x 2016 EPS. Although not a pure-play drone stock, at these valuations, the market is anticipating significant growth for many more years.

Trace – Tracking the Subject

Rather than relying upon a signal from another device to track a subject, the FLYR1 by Trace (private) tracks the subject itself. The platform accomplishes this by taking a photo of the subject (a skier, for example) which the FLYR1 encodes. The drone then uses this data to identify the skier and keep her in the video frame. Once the video is shot, FLYR1



Source: Trace

can upload it to a smartphone. It even has analytics (based upon speed, acceleration, and ascent) to determine the best video shots.

Google – Providing Internet from Above

In April 2014, Google (NASDAQ:GOOG) acquired Titan Aerospace, a startup that creates solar-powered drones that can fly for years. Titan Aerospace was making news for developing unproven technology to beam Internet via its drones, which looks like an improvement over Google's plans to use balloons for this purpose (balloons are at the weather's mercy). Google also has Project Wing, a system of drones delivering goods. The Company aims to deliver items that weigh less than 5 pounds within a 10 mile radius in under 30 minutes. While we think Google is a way to play the space, we see Google as a "must own" technology stock that offers investors more of an index approach to a basket of disruptive technology themes.



Titan Aerospace solar-powered drone concept.
 Source: [The Wall Street Journal](#)

Lockheed Martin – Land, Air, and Water

Lockheed Martin (NYSE:LMT) has over five decades of experience designing unmanned systems. The Company's solutions span the seas to the stratosphere. The K-MAX unmanned cargo helicopter saw duty in Afghanistan keeping military operating bases supplied thereby reducing the number of truck convoys and troops on the roads. K-MAX has also seen civilian duty, helping firefighters by hauling water to douse fires. Lockheed Martin's Indigo provides farmers with crop data, and the Desert Hawk III helps soldiers determine what's over the next hill. The land-based Squad Mission Support System vehicle lessens the loads soldiers have to carry. And the Remote Mine hunting System keeps sailors and ships out of harms ways. Lockheed Martin also supplies oil and gas customers with the Marlin, an underwater surveying and inspection vehicle. While also not a pure-play way to invest in the drone market, we believe land and air drones will become a larger percentage of the business.



Lockheed Martin's K-MAX deploys a load
 Source: [Lockheed Martin](#)

Northrop Grumman – Pioneers in Areas of Conflict

Most of Northrop Grumman's (NYSE:NOC) unmanned systems are for aerial- and land-based defense operations. With over 20 years of experience in the space, Northrop Grumman was the first company to employ unmanned aerial systems in Iraq and Afghanistan. In the Company's most recent 8-K (filed July 29, 2015), Northrop Grumman notes that second quarter Aerospace

Systems sales were higher year-over-year due to higher volume in unmanned systems.^{vi} A search of the Company's unmanned systems webpage reveals 18 air-based systems, seven land systems, and one water vehicle. We are speculating, but it appears as though the Company is focused on the aerial space above all others.

L-3 Communications Holdings – An Aerial Drone Veteran

L-3 (NYSE:LLL) has almost three decades of unmanned systems development. The Company's Cutlass provides an off-board sensing capability to intelligence, surveillance and reconnaissance aircraft. APEX is a small tactical unmanned aircraft system used for the same purpose.

Israel Aircraft Industries (IAI) – L'Flyim

Israel Aerospace Industries (private) is a leader in the development and production of systems for the defense and commercial markets. IAI offers solutions that target the space, air, land, sea, and cyber industries. IAI is the largest government-owned defense and aerospace company in Israel, but plans are underway for the Company to IPO. Over the past 60 years IAI delivered, supplied and supported advanced systems for the Israeli Ministry of Defense as well as many demanding customers worldwide. IAI has an impressive track record with aerial drones: - over 1,300,000 operational flight hours for over 50 users on five continents.

Aerial Drone Market Forecasts

The overall UAV market is large, with Teal Group in 2014 pegging the opportunity at \$91 billion over the next decade.^{vii} The military represents the majority of the market, but non-military verticals are increasingly implementing UAVs for applications such as crop spraying, video filming, surveying, and package deliveries. **Exhibit 2 provides a summary of the UAV market forecasts that we uncovered - for more detail, please continue reading.**

Exhibit 2: UAV Market Forecasts

Research Firm	Aerial Drone Market	Market Size (\$Billions)	Year
U.S. Consumer Electronics Association	Consumer	\$0.3	2018
ABI Research	Small	\$8.4	2018
MarketsandMarkets	Small	\$1.9	2020
Teal Group	Total	\$11.5	2024
Lux Research	Commercial	\$1.7	2025
Tractica	Commercial Hardware	\$4.0	2025
Tractica	Commercial Services	\$8.7	2025

Source: Company press releases

A March 2013 report from the Association for Unmanned Vehicle Systems International (AUSVI) estimated that from 2015 through 2017, aerial drones will create over 70,000 jobs in the United States generating more than \$13.6 billion in economic benefit.^{viii} From 2015 through 2025, AUVSI forecasts more than 100,000 jobs and an \$82 billion economic impact

resulting from UAVs.^{ix} Lux Research projects the commercial aerial drone market will reach \$1.7 billion by 2025, led by agricultural applications.^x

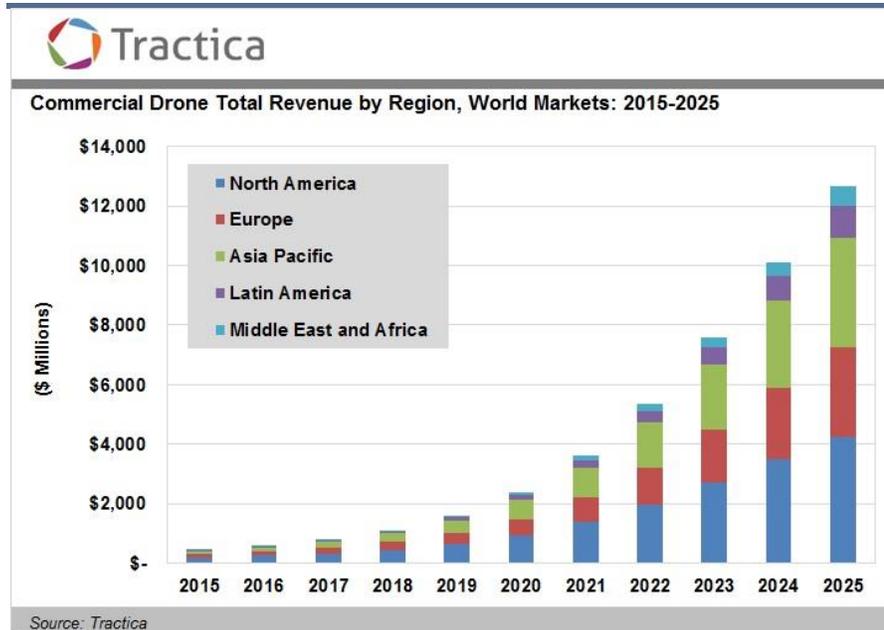
The U.S. Consumer Electronics Association forecasts that that consumer drones will approach \$300 million by 2018 on global sales of almost 1 million units.^{xi} This builds from a 2014 base estimate of \$84 million in revenue on almost 250,000 units, compared to a 2015 \$130 million forecast on 425,000 units.^{xii}

Earlier this year, ABI Research forecasted the market opportunity for small aerial drones. The firm forecasted that the market would exceed \$8.4 billion by 2018, dominated by commercial applications (\$5.1 billion market, 51% CAGR from 2014 through 2019).^{xiii} According to ABI Research, the consumer for these small aerial drones are about five times larger than the hobby market and 2.3 times bigger than the Military/Civil vertical.^{xiv} MarketsandMarkets pegs the small aerial drone market will reach \$1.9 billion by 2020 (a 12.3% CAGR from 2014 through 2020) driven by growth in Military/Civil applications.^{xv}

In 2014, Teal Group released a ten-year forecast that projected global UAV spending would grow from \$6.4 billion to \$11.5 billion.^{xvi} Cumulatively over the ten-year period, Teal Group estimated total UAV spending at almost \$91 billion with the military consuming 86% of spending over the decade and civilian 11%, with the estimates changing to 86% military and 14% civilian by the end of the ten-year forecast period.^{xvii}

Tractica expects commercial drone shipments to surpass 2.6 million units annually by 2025, an increase from 80,000 units the firm forecasts for 2015.^{xviii} Tractica's aerial drone revenue forecasts are shown in Exhibit 3.^{xix} The firm anticipates \$4 billion in hardware sales by 2025 and \$8.7 billion in services revenue by the same time. Tractica analysts believe aerial imaging and analysis will be the key applications to drive the commercial market, with the film, media, agriculture, and oil and gas industries.

Exhibit 3: Commercial Aerial Drone Revenues



Source: [Tractica](#)

Drone Startup Funding Supports our Thesis

We believe growth in the aerial drone industry will continue to accelerate. We support our thesis by the fact that the consumer and industrial markets have done little to leverage drone technology and have plenty of room to develop drone applications. Our thesis is further supported by the fact that aerial drone startup funding is hot (Exhibit 4), especially at the seed stage where early money makes the most money. Exhibit 5 shows the longer-term investment picture: investment in this space is accelerating.

Exhibit 4: Sample of Drone Startup Funding

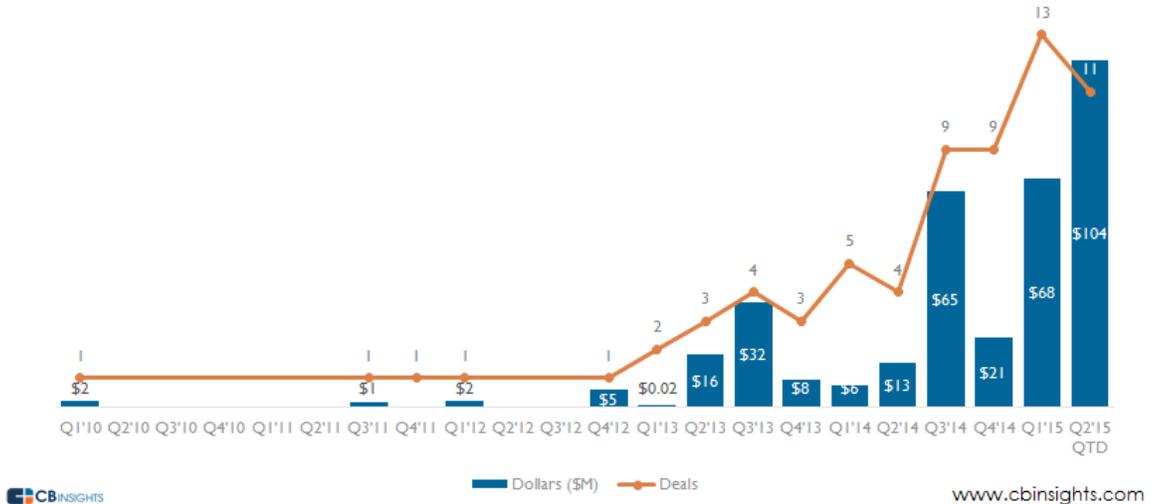
10 Early-Stage Drone Startups to Watch			
Company	Last Funding (Month/Year)	Total Disclosed Funding (\$M)	Select Investors
DroneDeploy	\$9M // Series A (03/2015)	\$11.0	Emergence Capital Partners, Draper Fisher Jurvetson, Redpoint Ventures, SoftTech VC
Kespry	\$10M // Series A (01/2014)	\$10.0	Lightspeed Venture Partners
Airphrame	\$4.25M // Series A (07/2014)	\$4.3	August Capital, Floodgate
Skydio	\$3M // Seed VC (01/2015)	\$3.0	Accel Partners, Andreessen Horowitz
Redbird	\$2.19M // Seed VC (04/2015)	\$2.2	Commercial Drone Fund, Engie New Ventures
MATTERNET	\$2M // Convertible Note (01/2014)	\$2.0	Undisclosed Investors
SkySpecs	\$0.1M // Seed (01/2015)	\$1.1	InvestMichigan!
DroneBase	Undisclosed // Seed VC – II (07/2015)	\$0.12	Rothenberg Ventures, SkyFund, SV Angel, Union Square Ventures, Y Combinator
Flirtey	\$0.12M // Seed – II (08/2015)	\$0.12	Space Angels Network, Y Combinator
Skyfront	\$0.02M // Seed (05/2015)	\$0.02	Qualcomm Robotics Accelerator



Source: CBInsights

Exhibit 5: Drone Funding Accelerates in 2015

Drone Investment Activity Q1'10 - Q2'15 QTD



Source: [CBInsights](http://CBInsights.com)

Conclusion

The military has widely adopted aerial drones, and forecasts suggests that this vertical will continue to invest in the technology. Consumer and industrial markets are ramping their adoption and have a lot of room to grow. Venture capitalist investment is increasing which hopefully will precipitate numerous future public companies for investors to look at.

In spite of the current and future growth prospects for the aerial drone market, Sophic Capital believes investors should also consider a new and less known investment opportunity in the drone market, which lies not in the air but in the sea. Within a short time, Sophic Capital will publish our report on the nascent sea drone market, a market we believe will ramp like the aerial drone market did a decade ago.

Acronyms Used in this Report

GPS	global positioning system
LiB	lithium-ion battery
UAV	unmanned aerial vehicle
UUV	unmanned underwater vehicle

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