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Executive Summary

Piracy in the Gulf of Guinea and other illicit activity in the Niger Delta are undermining regional security and economic activity. This report advises on business opportunities for Six Maritime, LLC in the Nigerian security market, based on rigorous analysis of the operating environment.

Diverse Nigerian and international players are active in this region, and there is widespread demand for Six Maritime’s services. Potential clients include: international oil companies, particularly those implementing corporate social responsibility programs; tanker and container shipping companies; logistics and support companies; and other public and private sector security providers.

In order to succeed in the Nigerian market, Six Maritime must leverage its unique competitive advantages: elite specially trained personnel; cutting-edge technology; a focus on high quality services, not high quantity; and a commitment to intelligence-driven operations. This last point is especially salient. While Six Maritime should not try to compete with established risk intelligence firms, they stand a cut above other physical security providers in terms of their local knowledge and sensitivity.

With this in mind, Six Maritime could provide four types of services successfully in Nigeria: physical security, training, security consulting, and early detection through unmanned aerial system over-flight. This report details specific services within these categories and their relative marketability to target clients.

Division of labor will become increasingly important as Six Maritime expands. This report recommends the creation of dedicated intelligence and logistics cells to alleviate some of the duties currently shared by company management. In the short term, the intelligence cell also would be responsible for disseminating security insights via the company website and other publications. This would demonstrate the company’s regional expertise, enhance its operational credibility, and generate valuable leads.

This report also identifies a number of legal, regulatory, and reputational risk factors that impact the viability of entering and operating in Nigeria. Six Maritime will need to consult subject matter experts about these risks before entering into contractual agreements.

These recommendations are based on extensive qualitative and quantitative analysis of not only the Nigerian security market, but also the dynamics of piracy and on-shore conflict in the region. This includes: statistical modeling and descriptive statistical analysis of Gulf of Guinea piracy; analysis of evolving pirate tactics, techniques, and procedures; data visualizations; key policy areas to watch; and a number of previously-published articles relevant to Niger Delta security.
I. INTRODUCTION

Piracy in the Gulf of Guinea and other illicit activity in the Niger Delta are undermining regional security and economic activity. This report advises on business opportunities for Six Maritime, LLC in the Nigerian security market, based on rigorous analysis of the operating environment. It assesses:

- Potential clients and strategies for business development
- Six Maritime’s unique competitive advantages
- Demand for its services in the Nigerian security market
- New and existing capabilities for emphasis in ongoing company development
- Partnership opportunities with other Nigerian and international organizations
- Insights into the dynamics of conflict on and offshore in the Delta, based on both qualitative and quantitative analytic methods

Note: Nigeria is divided into 36 states, as well as the federal capital territory of Abuja. This report addresses Six Maritime’s potential contribution to maritime security within only the nine oil-producing states of the Niger Delta (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers), as well as the Nigerian waters in the Gulf of Guinea.

Figure 1: Map of Nigeria’s Nine Oil-producing States in the Niger Delta
Source: Christina Katsouris and Aaron Sayne, “Nigeria’s Criminal Crude,” Chatham House, September 2013
II. TARGET CLIENTS

This section provides a broad overview of the diverse Nigerian and international actors that operate in the Niger Delta. The objective is to identify potential clients for Six Maritime and to provide general recommendations for engagement and business development.

A. International Oil Companies

**Focus for Business Development**

1. U.S. companies (Chevron & Exxon-Mobil)
2. Established European players with high demand for security (Shell, Total & Eni)
3. Trustworthy contacts among Chinese players, such as the Chinese National Petroleum Company (CNPC), Chinese National Offshore Oil Company (CNOOC), and Sinopec, that are looking to safeguard their new investments

![Figure 2: Headquarter Location of Nine Largest IOCs with a Nigerian Presence](image)

*Source: Generated by authors*

**Security Needs**

Given that almost all of the major international oil companies (IOCs) have a presence in Nigeria, there is a nearly universal demand for security services. IOC employees are high value targets both on and offshore, and the security of company compounds, personnel, vessels, pipelines and platforms are all of critical importance. Current security practices and providers have not been sufficient to ensure a stable operating environment for foreign and domestic energy companies. Shell and Exxon executives in particular have cited instability and oil theft as key drivers of recent financial underperformance.¹

Two trends in IOC activity are worth noting. First, IOCs are responding to financial incentives and onshore instability by shifting their operations further offshore. Second, IOCs are focusing more heavily on natural gas. Chevron has taken the lead by spending $2.4B on a 40% stake in the Escravos Gas-to-Liquids (GTL) plant, while remaining the largest shareholder in the West

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African Gas Pipeline Company that supplies natural gas to customers in Benin, Ghana and Togo. Both of these trends have implications for IOC security needs.

The presence of Western firms in the Niger Delta dates back over a half-century, and their involvement at the community level is both extensive and contentious. Shell, Chevron, Total, Eni and Exxon-Mobil have extensive interests in both the Nigerian energy sector and the consumer market that extends downstream – to include hundreds of filling stations. These companies operate on and offshore to varying degrees and have lucrative contracts with international and regional security providers.

The Chinese presence in the Delta is relatively new (beginning in 2006) but rapidly expanding. Nigerian petroleum markets offer a promising frontier for Chinese companies looking to satisfy the demands of China’s resource-driven economy. Major Chinese players include the Chinese National Petroleum Company (CNPC), Chinese National Offshore Oil Company (CNOOC), and Sinopec. The Chinese investment initially began offshore, but has gradually expanded onshore to fill the vacuum left by Western IOCs. Security needs will continue to grow along with China’s expanding activity.

Oando is Nigeria’s largest independent and privately owned oil company. With three offshore and 12 onshore sights and accompanying downstream retail operations, Oando is the dominant domestic player. Though the company is Nigerian owned and operated, its domestic profile does not exempt it from security needs. As IOCs increasingly move operations offshore, Nigerian oil companies onshore may become more promising targets for Delta-based criminals and militants in search of a profit.

**Major IOCs with no presence:**
- Conoco Phillips (sold local assets to Oando Energy)
- BP (no local assets and highly unlikely to re-enter the Nigerian market)

**Corporate social responsibility:** Improving security conditions through social initiatives offers a significant untapped revenue source and could result in significant soft power gains for Six Maritime. Identifying opportunities to partner with IOC corporate social responsibility arms, such as Chevron’s Partnership Initiatives in the Niger Delta (PIND), may establish credibility and provide a foothold in challenging operational environments like Nigeria. Coupling humanitarian ambitions with security objectives will provide another appealing selling point that will set Six Maritime apart from its competitors.

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2 CNOOC’s 2006 purchase of a 45% stake in the Akpo offshore field was followed by Sinopec’s $7.5B 2009 purchase of ADDAX, an upstream Geneva-based player with six offshore interests in the Delta, but whose broader focus includes West Africa, the Middle East and the North Sea.

3 In mid-2012, CNOOC, the world’s fourth largest company by revenue, acquired Nexen for $15.1B. Nexen is a Canadian exploration company with both on and offshore interests. Later that same year, Sinopec acquired stakes in 19 on- and offshore blocks from Total for $2.5B. They are currently in the final phases of construction for an oil and gas project capable of producing 10,000 bpd in Akwa Ibom state.
B. Container Shipping Companies

Focus for Business Development

1. Medium-sized firms (numbers 4-10 on the list on page 5) that may not have a handle on vessel hardening, standard operating procedures (SOPs) or other security-related best practices. However, these firms may not be able to afford these services. The top three firms have formed an alliance (the “P3”) and are likely collaborating on security needs.4

2. Firms based in U.S.-friendly countries
   - Evergreen, based in Taiwan
   - Hapag, based in Germany
   - Nippon and Mitsui, based in Japan
   - American President Lines, based in Singapore

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Security Needs

The kidnap-for-ransom of crewmembers is the primary threat facing container ship owners and operators in the Gulf of Guinea. Theft of the ship’s cash, stores and crew’s personal effects are a secondary, but still significant, concern. While there are often millions of dollars of cargo onboard container vessels, the ship’s crew (often numbering less than a dozen) presents a soft and potentially lucrative target. Given the frequent lack of security measures employed by containers, they are ripe for kidnap-for-ransom attacks.

From the perpetrators’ perspective, the supply of these soft targets is plentiful. With over three million containers transiting West Africa’s waters each year and the region’s limited port capacity, container ships are left vulnerable to attack while anchored or in holding areas offshore. Additionally, citadels that can protect crews and buy time to call law enforcement are not a

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common feature aboard container ships. Even when installed, crews do not always have sufficient warning or training to use them effectively.

Both tankers and container ships are at high-risk for attack when transiting distances between 12-40NM (nautical miles) from shore. This area, known as the mid-range, is typically free from naval patrols and within reach of unsupported pirate skiffs. When targeting vessels in the mid-range and beyond, criminals frequently seek to acquire intelligence concerning ship contents, movements and scheduled STS (ship-to-ship) operations in order to identify lucrative and vulnerable targets for exploitation.

Top Global Shipping Companies
1. **A.P. Moller – Maersk Group**, Copenhagen, Denmark. Largest container ship operator and supply vessel operator. 600 vessels, 3.8 million TEU. Controls more than 15% of the containerized business. Maersk Drilling signed a contract with African Petroleum Corp. to supply an ultra-deepwater semisubmersible rig in the Gulf of Guinea. This is the third such rig delivered to the region.\(^5\)
2. **Mediterranean Shipping Company** S.A. (MSC), Geneva, Switzerland. 474 vessels (194 owned, 278 chartered), 2.3 million TEU. Controls 13% of liner shipping business.
3. **CMA CGM** S.A., Marseilles, France. 406 vessels (88 owned, rest chartered). Market share of 9%.
4. **Evergreen Marine Corporation**, Taiwan. 180 ships (87 ships owned). Subsidiaries Uniglory Marine Corp., Italia Marittima S.p.A. and Evergreen UK Ltd. Market share is 4%. They began shipping operations to Nigeria in July 2012.\(^6\)
5. **China Ocean Shipping Container Line (COSCO)**, China. Largest liner carrier and dry bulk carrier in China. 550 ships (owns 95 vessels), 30 million metric tons deadweight. Company is also involved in shipbuilding and repairing.
6. **Hapag Lloyd**, Germany. 147 vessels (60 owned). Owns CP Ships (Canadian firm). Has 4% market share of shipping business.
7. **Hanjin Shipping Co.**, Ltd., South Korea. 200 ships (60 owned), 4 million TEU containers. Formed strategic alliance with COSCO in 2003.
8. **Nippon Yusen Kabushiki Kaisha** (NYK), Tokyo, Japan. Part of Mitsubishi Group. 776 major ocean vessels.
10. **Mitsui O.S.K. Lines**, Ltd., Tokyo. The firm has a cruise liner business as well.

C. Oil Transport Companies
Focus for Business Development
1. Focus should be directed toward oil transport companies affiliated with larger firms (e.g. Chevron Shipping Co. or Nigeria LNG). It may be easier to build relationships in parallel, or gain entry to working relationships with larger oil companies through the smaller transport affiliates.

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\(^5\) “Maersk Deliverer to drill in Gulf of Guinea,” *DrillingContractor.org*, 9 November 2010.
Security Needs
IOCs may employ their own fleets, enter into charter agreements with oil tanker owners, or use a combination of both. However, oil transportation platforms are high-risk targets for hijacking and product theft. Though intra-company relationships are complex and information concerning specific providers is difficult to attain, there appears to be space for private, non-indigenous security providers.

The following oil transport companies may benefit from Six Maritime’s services:

1. **Chevron Shipping Company** – a wholly owned subsidiary handling maritime transport operations.
2. **Carboflotta Group** – Italian firm that acquired ENI’s fleet in 2003.
3. **Nigeria LNG Limited** – has joint resource agreements with Shell Oil to manage their day-to-day manning of their vessels as part of a nationalization program.\(^7\)
4. **Oando Supply & Trading** (OANDA PLC) – provides tanker-chartering services to international and national oil trading companies.
5. **Stonebridge Marine Services** – Nigerian vessel management and brokerage company, specializing in petroleum tanker chartering. Clients include OANDA, ExxonMobil and Total.
7. **Pioneer Ship Management Services LLC (Dubai)** – oil transport company (had one of its tankers hijacked in 2012.)\(^8\)

D. Logistics and Support Companies

Focus for Business Development
1. Focus should be directed to companies affiliated with IOCs that are shifting operations offshore. An expanded offshore presence means an increase in logistical needs. There may be space for more or better security providers, and for security providers with an explicit focus on the maritime environment.

Security Needs

Logistics and support companies maintain a heavy footprint in virtually every sector of Nigeria’s maritime environment. These assets are therefore plentiful, and their lack of security measures leaves them vulnerable to attack. As with tankers, it is difficult to extrapolate information regarding Nigerian service vessels. A number of listed companies have no Internet presence, and some marine service companies provide services for sister marine service companies.

The following logistics and support companies may benefit from Six Maritime’s services:

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\(^8\) “23 Indians Aboard Hijacked Oil Tanker in Nigeria,” *Weekly Voice.*
1. **LADOL (Lagos Deep Offshore Logistical Base)** - fully integrated base where offshore oil and gas drilling companies can get 24/7 logistics support for their vessels, cargo, personnel and projects.

2. **Awaritse Nigeria Limited** – clients include Chevron and ExxonMobil.

3. **Bourbon Interoil** – French company with office in Port Harcourt.

4. **Edison Chouest Offshore** – American company whose personnel were kidnapped in October 2013.

5. **Japaul Oil & Maritime** (Port Harcourt) – offshore vessels, tankers and sub-sea services.


7. **Smit Lamnalco** – Dutch company that operates in over 30 countries serving leading IOCs. Office in Port Harcourt.

8. **Maersk Supply Services**

9. **Niger-Benue Transport NBTC** – provides tug transport within Nigeria’s river transport system.

10. **Seabulk Offshore Operators** – Nigerian marine support and transport business. Clients include Chevron, Eni, Total, ExxonMobil, and Oando.


13. **Seacor Holdings** – Listed in Nigerian service vessel list, but website does not list a Nigerian office.


### E. Security Providers

#### Focus for Business Development

1. Well-established training companies with a strong track record and local reputation (i.e. Elkins Training).

2. Seek complementary partnership opportunities with international firms operating in Nigeria (i.e. Risk Intelligence). Six Maritime can complement their sophisticated intelligence products and deep local knowledge with highly trained and readily deployable personnel and on-site security services.

3. The navies and coast guards of neighboring countries (e.g. Togo, Benin, Cameroon, Ghana, Ivory Coast) who clearly understand the threat but lack the capabilities, resources and expertise to manage the threat environment.

#### Security Needs

A number of security providers are currently operating in the Delta region and the Gulf of Guinea. They span both the public and private sectors; however, the line between the two is often blurred. They range in size and capability, from elite special operations forces with advanced equipment and training (i.e. Joint Task Force (JTF) & Mobile Police) to basic security guards.

- Public (indigenous navy and coast guard offshore, JTF and local law enforcement contingents onshore)
- Private (maritime security specialists or general service providers)
III. SERVICES

This section identifies Six Maritime’s competitive advantages and assesses demand for its services in the Nigerian security market. It also identifies several new and existing capabilities that should be emphasized in ongoing company development.

A. Competitive Advantage

In order to succeed in the Nigerian market, Six Maritime must leverage its unique competitive advantages:

- Small, high-quality boutique provider
- Elite personnel
- High-end technological capabilities
- Breadth of physical and security consulting services
- Intelligence-driven operations, with an emphasis on understanding complex foreign operating environments

Most private security firms active in Nigeria either a) offer only intelligence products (e.g. Risk Intelligence); or b) offer physical services, but have a reputation for poor local knowledge and limited internal intelligence capabilities (e.g. G4S). Therefore, the unique combination of intelligence-driven operations and breadth of service offerings distinguishes Six Maritime from its competitors (see Figure 5).

Figure 5: Six Maritime Market Position
Source: Generated by authors
B. Service Offerings

Six Maritime can offer a broad range of services to clients in this region. These services can be organized into four main service lines (see Figure 6), adapted from the company website with the following modifications:

1. Split Security Services into Physical Services and Training Services. This is an important distinction in the Nigerian market, given legal restrictions on armed foreign security.
2. Added Counter-piracy training, because of its salience in the region.
3. Excluded Offshore Oil and Gas Exploration. This is an industry-specific way to repackage offerings from other service lines.
4. Excluded Supply Chain Security and Custom Technology Solutions as repetitive.

The services in each line are listed from highest to lowest priority for business development. High priority services are more likely to be successful in Nigeria, based on market demand, legal and regulatory obstacles, and reputational risks.\(^9\)

\[\text{Figure 6: Portfolio of 18 Potential Offerings, Ordered in Descending Priority}\]

\text{Source: Adapted from Six Maritime website}\]

\(^9\) The assessment in Figure 6 should be considered a useful but imperfect tool for future business development efforts. These service rankings are ultimately subjective, based on author assessments, and do not take into account important cost and pricing factors.
Physical Services

1. Onboard security teams
   - **Demand**: Proven an effective counter-piracy measure in this region that mitigates IOC and shipping company vulnerabilities by protecting assets and personnel.
   - **Risk**: Restrictions on employment of armed security in territorial waters.

2. Vessel hardening
   - **Demand**: One of the simplest methods for countering piracy, with few risks attached. Best practices for vessel hardening should be familiar to area operators, but there is room for improvement. Making a vessel a hard target requires a comprehensive security plan that includes employing both active and passive security measures.
   - **Risk**: Defense-in-depth requires active security measures. Legal constraints, such as the use of airspace for unmanned aerial systems (UAS) and armed security teams, must be taken into account. Additionally, given the lengthy, multi-stop voyages that many vessels undertake, the location and timing of hardening procedures must be meticulously coordinated.

3. Pipeline protection
   - **Demand**: Pipelines, both on and offshore, are key oil company assets in the region. Pipeline damage from sabotage, vandalism and infrastructure failure is common and costly. The sheer length of the pipeline networks makes effective monitoring and protection difficult. Static and mobile security assets are required to protect vulnerable points.
   - **Risk**: Monitoring via UAS or other technological assets may encounter legal obstacles. Also, protection of both offshore and onshore infrastructure will require coordination and integration with both existing assets and measures employed by private firms and public entities.

4. Personnel security in high-risk areas
   - **Demand**: With kidnappings on the rise, both on and offshore, the Niger Delta is dangerous for individuals who pose high-value targets (e.g. foreign businessmen, wealthy Nigerians). Personal security details for key individuals are in high demand.
   - **Risk**: Legal constraints, such as the use of arms by foreign personnel and rules of engagement, must be considered.

5. Hazardous material protection
   - **Demand**: Compliance with local HAZMAT regulations, to include the transport, handling and disposal of materials in order to avoid contamination and spillage.
   - **Risk**: Compliance with standing SOPs and coordination with local agencies.

6. Diving & salvage
   - **Demand**: Subsurface services, to include vessel and infrastructure maintenance and repairs, and salvage of materials and equipment.
   - **Risk**: Diver operational risk management, to include the treatment of dive injuries.

7. Port security & hardening
   - **Demand**: Nigerian ports, particularly oil export terminals, are frequent targets of large-scale theft and vulnerable to sabotage. Services can seek to integrate with the port authority and provide added vigilance to cover existing gaps in port security.
   - **Risk**: Like onboard security teams, integrated port security likely will restrict the use of small arms. Demand and authorization for integration will come from port authority and require heavy coordination. Identifying Nigerian interest for such
services will pose a challenge; legal constraints, collusion and corruption reduce incentives to provide effective security measures or to outsource security solutions.

Training Services

1. Maritime security training
   - **Demand:** SOP development and tactical training for organic or indigenous security forces.
   - **Risk:** State Department guidelines and restrictions on the training of private and foreign government security providers.

2. Counter-piracy training
   - **Demand:** SOP development and tactical training for organic or indigenous security forces.
   - **Risk:** State Department guidelines and restrictions on the training of private and foreign government security providers.

3. Threat detection training
   - **Demand:** Client-driven employment of organic indication and early warning capabilities.
   - **Risk:** UAS assets to be retained by Six Maritime operators.

4. Quick Response Force (QRF)/counter-terrorism training
   - **Demand:** SOP development and tactical training for organic or indigenous security forces.
   - **Risk:** State Department guidelines and restrictions on the training of private and foreign government security providers.

Security Consulting

1. Internal security training program development
   - **Demand:** Internal countermeasure and security SOP development for leaders and employees.
   - **Risk:** No immediate risk identified.

2. Threat & vulnerability analysis
   - **Demand:** Red cell assessment to identify vulnerabilities in client’s operations scheme and logistics footprint.
   - **Risk:** No immediate risk identified.

3. Intelligence reports
   - **Demand:** Nigeria is a highly complex operating environment. There is value in both long-term intelligence reports on key issues and real time assessments of ongoing developments. Other companies that focus on providing intelligence are already well established in Nigeria, with in-house expertise and networks of contacts on the ground (e.g. Risk Intelligence). At this stage, Six Maritime should not to try to compete with these companies. This does not preclude Six Maritime from developing some internal intelligence offerings, which will distinguish it from other physical security providers. These intelligence reports will be most effective when paired with other security offerings.
   - **Risk:** If related to UAS monitoring, Six Maritime may run into legal questions regarding UASs in Nigerian airspace.

4. Security plan audits and reviews
5. Industry compliance
   - **Demand**: Existing and proposed security measures adhere to industry standards.
   - **Risk**: Defensive security measures should adhere to industry and regional frameworks, to include the use of airspace for UAS and employment of armed security teams.

### Early Detection Technology

1. UAS over-flight
   - **Demand**: Imagery intelligence capability and early indication and warning system to identify hazards, delays, or potential threats.
   - **Risk**: Region-specific restrictions on the use of airspace by the Nigerian Civil Aviation Authority (NCAA).
2. Tethered dirigible over the horizon surveillance
   - **Demand**: Continuous imagery intelligence capability and early indication and warning system to monitor the emergence of hazards, delays, or potential threats.
   - **Risk**: Region-specific restrictions on the use of surveillance equipment.

### C. Additional Considerations

Division of labor will become increasingly important as Six Maritime continues to expand. This section recommends two measures to alleviate some of the duties currently shared by company management and to improve the efficiency of Six Maritime’s operations.

#### Intelligence Capability

Using a Special Operations Forces (SOF) team framework, an organic intelligence cell would be beneficial in driving and supporting company operations. The primary responsibility of the intelligence cell would be to collect and process actionable information for internal use. It would provide relevant, timely and actionable information about the company’s areas of operations, partnering governments, legal considerations, potential clients and competitors. The intelligence cell also would disseminate security insights via the company website and online publication venues. The dissemination of such insights will demonstrate Six Maritime’s regional expertise and enhance its operational credibility, while providing a marketing vehicle.

It is important to recognize that private intelligence firms will continue to have a clear competitive advantage over an internal intelligence cell. Six Maritime's intelligence capability should not try to compete with these organizations. Rather, establishing strong working relationships and information-sharing partnerships may be mutually beneficial. The intelligence cell would be responsible for developing and managing these partnerships.

#### Logistics Capability

Like an organic intelligence element, a logistics cell would alleviate some of the duties and responsibilities shared by Six Maritime management. The company will continue to face complex logistical requirements to support its diverse mission set. A dedicated logistics officer would alleviate the time consuming task of moving the required personnel and equipment to various locations worldwide.
IV. RISK FACTORS

This section identifies a number of topics that require further expert investigation. These risk factors impact the viability not only of specific service offerings, but also of entering the Nigerian market in general. This list is not exhaustive, but it represents areas that Six Maritime should address before entering into contractual agreements.

A. Reputational Risk

- Corruption – common business practices involve shady actors and/or shady transactions (e.g. integration with military forces, routine bribery of business and government elite). How can Six Maritime identify and integrate with trusted Nigerian actors?
- Perception of corruption – how will Six Maritime safeguard its reputation for honest and responsible dealings?
- Compliance with US Foreign Corrupt Practices Act, US-ratified Organization of Economic Cooperation and Development’s (OECD) Anti-bribery Convention, etc.

B. Regulatory Risk

Munitions and UAS Considerations

- NCAA airspace claims into the Gulf of Guinea, and restrictions on the operation of privately owned UASs in their airspace.
- Restrictions on employment of armed security in territorial waters, ports, and on land.
- Restrictions on VBSS operations apart from the Nigerian Navy and integration with Nigerian Navy VBSS teams.
- The inherent vulnerability of Nigerian Naval operations to corruption, embezzlement and bribery schemes.
- Regulations around land-based or sea-based staging areas (i.e. floating armories)

Potential Regulatory Changes

- What impact will the Petroleum Industry Bill have on potential IOC clients and their security needs? What is the likelihood that it passes the National Assembly?
- What are the contents and implications of the new piracy bill, and what is the likelihood that it will pass the National Assembly?

SOP & ROE related Considerations

- Who has weapons release authority – the ship’s captain or the head of security team?
- If under attack or suspected attack, will guards be permitted to shoot at pirates or only fire warning shots?

Operational Compliance

- US State Department export controls on arms, munitions, and training.
- How is Six Maritime going to manage these compliance/risk management requirements systematically and efficiently? Does an enterprise-wide scalable system exist?
- Licensing and permitting for personnel, vessels and arms
V. STATISTICAL ANALYSIS

This section describes the findings and limitations of statistical analysis, used to explore the dynamics of piracy in the Gulf of Guinea and onshore conflict in Nigeria.

A. Data

The IMB Piracy Reporting Center releases quarterly and annual piracy reports, based on attack reports submitted by ship owners and operators globally. We used this information to create a database of incidents in the Gulf of Guinea (Nigeria, Cameroon, Ivory Coast, Angola, Ghana, Benin, Togo, Democratic Republic of Congo, Congo, Gabon) from 2003-2013.

For onshore incidents, we used data from the Armed Conflict Location & Event Data Project (ACLED) on nine states in the Niger Delta (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo, Rivers) from 2003-2012. ACLED does not have data publicly available for 2013.

B. Statistical Modeling

Originally, we hoped to use statistical modeling to test the following hypotheses:

- **The probability of a pirate attack increases when:**
  - H1. Date (autumn months)
  - H2. Time (hours of darkness)
  - H3. Disposition (anchored or at slow moving speeds)
  - H4. Ship type (high-payoff (oil), low freeboard, no security, slow moving)
  - H5. Ship flag (non-Western)
  - H6. Location (near on or offshore infrastructure)
  - H7. (onshore) Event type
  - H8. (onshore) Actor (perpetrator) interaction
  - H9. (onshore) Actor (victim) interaction
  - H10. (onshore) Location by state or lat/long

- **The probability that an attack will be successful increases when:**
  - H11. Number of pirates (4 or more)
  - H12. Number of boats (2 or more?)
  - H13. Weapons (heavy weapons used)

Most of these hypotheses proved infeasible to test with a statistical model. Our data set was not structured to model the probability of an offshore attack (i.e. the probability that an attack would occur). Instead, we modeled the probability that an attack would be successful as a function of a number of independent variables, using binomial logistic regression:

\[
P(y_i = 1) = \pi_i = \frac{e^{(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik})}}{1 + e^{(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik})}}
\]

where \( y_i = \begin{cases} 1 & \text{if the attack succeeds} \\ 0 & \text{if the attack fails} \end{cases} \)

We used the binary independent variable of whether pirates successfully board the ship as a proxy for the dependent variable of attack success. (Note: in a few cases, pirates successfully
boarded a ship but escaped before taking further action. These events count as successful attacks under this model.)

**Model A (Preliminary)**
Our preliminary statistical analysis was completed in October 2013, using data on piracy incidents in Nigerian waters between 2008-Q2 2013. Tentative findings:
- Steaming vessels are approximately 4% less likely to be attacked successfully than berthed vessels (with 99% confidence)
- Anchored vessels are approximately 9% less likely to be attacked successfully than berthed vessels (with 95% confidence)
- Attacks employing small arms and/or heavy weapons are more likely to succeed (with 99% confidence)

**Models B and C (Final)**
In February 2014, we revisited the model using an expanded dataset, based on all available information from the IMB piracy reports. As expected, Model A no longer seemed a good fit for the data. This called into question our earlier conclusions.

We attempted to build a new binomial model for the success of piracy attacks, based on our expanded dataset and several new independent variables. However, we were unable to find a model that provided an adequate fit. Most model variations failed to provide any statistically significant results. Missing data for some fields caused a number of observations to be dropped, resulting in an overestimation of fit. Models B and C, described below, are the best variations.

**Model B**

\[
P(y_B = 1) = \frac{e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4)}}{1 + e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4)}}
\]

\(\beta_0\) = intercept  
\(x_1\) = time of day of attack  
\(x_2\) = date of the attack  
\(x_3\) = ship type  
1  Supply ship  
2  Bulk carrier  
3  Container  
4  Tanker  
5  Tug  
6  Cargo  
7  Other  
\(x_4\) = ship disposition at the time of attack  
1  Anchored  
2  Steaming  
3  Berthed  
\(x_5\) = whether the pirates used small arms or not
Model B Regression Results

|                      | Estimate | Std. Error | z value | Pr(>|z|) |
|----------------------|----------|------------|---------|----------|
| (Intercept)          | 2.25E+01 | 1.84E+03   | 0.012   | 0.9902   |
| time                 | -5.69E-02| 2.31E-02   | -2.46   | 0.0139 * |
| date                 | -1.01E-02| 6.31E-03   | -1.597  | 0.1103   |
| as.factor(shiptype)2 | -1.78E+01| 1.84E+03   | -0.01   | 0.9923   |
| as.factor(shiptype)3 | -1.82E+01| 1.84E+03   | -0.01   | 0.9921   |
| as.factor(shiptype)4 | -1.81E+01| 1.84E+03   | -0.01   | 0.9922   |
| as.factor(shiptype)5 | -4.84E-01| 2.51E+03   | 0       | 0.9998   |
| as.factor(shiptype)6 | -1.77E+01| 1.84E+03   | -0.01   | 0.9923   |
| as.factor(shiptype)7 | -1.76E+01| 1.84E+03   | -0.01   | 0.9924   |
| as.factor(shiptype)8 | -2.12E+00| 2.82E+03   | -0.001  | 0.9994   |
| as.factor(disposition)2 | -1.26E+00| 4.28E-01   | -2.948  | 0.0032 **|
| as.factor(disposition)3 | 1.59E+01  | 1.37E+03   | 0.012   | 0.9907   |
| smallarms            | -1.30E+00| 6.82E-01   | -1.904  | 0.0569 . |

Signif. codes: *** 0.001  ** 0.01  * 0.05  . 0.1

AIC: 209.17

According to Model B, statistically significant variables in the success of an attack include time of day (95% confidence) and disposition (99% confidence). In particular, this model suggests that steaming ships are less likely to be successfully attacked. This is consistent with the earlier findings from Model A.

**Model C**

\[
P(y_c = 1) = \frac{e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4)}}{1 + e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4)}}
\]

\(\beta_0\) = intercept

\(x_1\) = time of day of attack

\(x_2\) = date of the attack

\(x_3\) = ship disposition at the time of attack

1. Anchored
2. Steaming
3. Berthed

\(x_4\) = whether the pirates used small arms or not

\(x_5\) = number of pirates in the attack
Model C Regression Results

|                      | Estimate  | Std. Error | z value | Pr(>|z|) |
|----------------------|-----------|------------|---------|---------|
| (Intercept)          | 4.06E+00  | 8.51E-01   | 4.767   | 1.87E-06*** |
| time                 | -6.02E-02 | 2.78E-02   | -2.17   | 0.03    |
| date                 | -1.26E-02 | 7.93E-03   | -1.591  | 0.1116  |
| as.factor(disposition)2 | -7.45E-01 | 5.20E-01   | -1.432  | 0.1522  |
| as.factor(disposition)3 | 1.61E+01  | 1.48E+03   | 0.011   | 0.9913  |
| smallarms            | -1.32E+00 | 7.38E-01   | -1.79   | 0.0734  |
| pirates              | 1.48E-01  | 7.49E-02   | 1.973   | 0.0485  |

Signif. codes: *** 0.001   ** 0.01   * 0.05   . 0.1

AIC: 146.08

The lower AIC suggests that Model C is relatively more likely to minimize information loss than Model B. However, under this model, only the number of pirates is statistically significant (95%). Rerunning the model without the insignificant variables creates a much higher AIC and less reliable model overall.

C. Correlation Tests

In addition, we calculated the Pearson’s correlation for a number of key variables related to on- and offshore conflict. The Pearson’s correlation measures the strength of the linear relationship between two variables. The coefficient value ranges between -1 and 1. A coefficient of -1 indicates a perfect negative linear relationship between variables, a coefficient of 0 indicates no linear relationship, and a coefficient of 1 indicates a perfect positive linear relationship.

It is important to remember that correlation indicates only the existence of a linear relationship, not causation or any other features of that relationship. It also fails to capture the existence of non-linear relationships. Thus, correlations are useful, but only within a limited scope of interpretation. Wrongly understood, they can lead to false conclusions.

We hypothesized a number of potential relationships based on the following variables:

- Success rate for offshore attacks in the Gulf of Guinea
- Unemployment rate in Nigeria
- Incidents of violence in the Delta
- Incidents of violence in the Delta tri-state region of Bayelsa, Delta, and Rivers States
- Oil production rate in Nigeria
- Kidnappings in the Gulf of Guinea
- Incidents of Government Security Force (GSF) violence upon civilians in the Delta
- Hijackings in the Gulf of Guinea
- Movement for the Emancipation of the Niger Delta (MEND) activity in the Delta
- Oil theft in Nigeria
- Misery index in Nigeria (sum of inflation and unemployment rates)
- Pipeline vandalism, indicated by the number of pipeline breaks in Nigeria
- Price of Bonny Light crude oil
- Piracy incidents in the Gulf of Guinea
<table>
<thead>
<tr>
<th>Relationship</th>
<th>Period</th>
<th>Coefficient</th>
<th>95% Conf. Int.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG success rate and unemployment</td>
<td>annual</td>
<td>-0.74</td>
<td>NA</td>
<td>0.015</td>
</tr>
<tr>
<td>Tristate violence and oil production</td>
<td>annual</td>
<td>-0.7</td>
<td>-0.92 to -0.13</td>
<td>0.02</td>
</tr>
<tr>
<td>kidnap and GSF on civ violence</td>
<td>annual</td>
<td>-0.7</td>
<td>NA</td>
<td>0.02</td>
</tr>
<tr>
<td>hijack and unemployment</td>
<td>annual</td>
<td>0.69</td>
<td>NA</td>
<td>0.027</td>
</tr>
<tr>
<td>Oil production rate and MEND activity</td>
<td>annual</td>
<td>-0.64</td>
<td>-0.9 to -0.02</td>
<td>0.047</td>
</tr>
<tr>
<td>Oil theft and MEND activity</td>
<td>annual</td>
<td>-0.64</td>
<td>-0.9 to -0.02</td>
<td>0.047</td>
</tr>
<tr>
<td>Tristate violence and oil theft</td>
<td>annual</td>
<td>-0.6</td>
<td>-0.89 to 0.05</td>
<td>0.068</td>
</tr>
<tr>
<td>Oil theft and misery index</td>
<td>annual</td>
<td>0.6</td>
<td>-0.05 to -0.89</td>
<td>0.069</td>
</tr>
<tr>
<td>Vandalism and oil price</td>
<td>annual</td>
<td>0.58</td>
<td>-0.07 to 0.89</td>
<td>0.07</td>
</tr>
<tr>
<td>Oil price and vandalism</td>
<td>annual</td>
<td>0.59</td>
<td>-0.07 to 0.89</td>
<td>0.074</td>
</tr>
<tr>
<td>hijack and oil price</td>
<td>annual</td>
<td>0.57</td>
<td>-0.09 to 0.88</td>
<td>0.08</td>
</tr>
<tr>
<td>kidnap and unemployment</td>
<td>annual</td>
<td>0.57</td>
<td>NA</td>
<td>0.085</td>
</tr>
<tr>
<td>kidnap and oil price</td>
<td>annual</td>
<td>0.56</td>
<td>NA</td>
<td>0.095</td>
</tr>
<tr>
<td>hijack and oil theft</td>
<td>annual</td>
<td>0.54</td>
<td>-0.13 to 0.88</td>
<td>0.11</td>
</tr>
<tr>
<td>Piracy and oil production</td>
<td>annual</td>
<td>-0.51</td>
<td>-0.86 to 0.18</td>
<td>0.13</td>
</tr>
<tr>
<td>Tristate violence and misery index</td>
<td>annual</td>
<td>-0.51</td>
<td>-0.86 to 0.17</td>
<td>0.13</td>
</tr>
<tr>
<td>hijack and misery index</td>
<td>annual</td>
<td>0.51</td>
<td>NA</td>
<td>0.13</td>
</tr>
<tr>
<td>hijack and battles</td>
<td>annual</td>
<td>-0.48</td>
<td>NA</td>
<td>0.159</td>
</tr>
<tr>
<td>GG success rate and misery index</td>
<td>annual</td>
<td>-0.47</td>
<td>NA</td>
<td>0.173</td>
</tr>
<tr>
<td>Vandalism and misery index</td>
<td>annual</td>
<td>-0.45</td>
<td>-0.84 to 0.25</td>
<td>0.19</td>
</tr>
<tr>
<td>hijack and GSF of civ violence</td>
<td>annual</td>
<td>-0.42</td>
<td>NA</td>
<td>0.22</td>
</tr>
<tr>
<td>hijack and tristate year</td>
<td>annual</td>
<td>-0.41</td>
<td>-0.83 to 0.3</td>
<td>0.24</td>
</tr>
<tr>
<td>Piracy and MEND activity</td>
<td>monthly</td>
<td>0.09</td>
<td>-0.09 to 0.27</td>
<td>0.31</td>
</tr>
<tr>
<td>Oil price and MEND activity</td>
<td>annual</td>
<td>0.35</td>
<td>-0.4 to 0.81</td>
<td>0.32</td>
</tr>
<tr>
<td>Piracy and MEND activity</td>
<td>annual</td>
<td>0.27</td>
<td>-0.43 to 0.77</td>
<td>0.45</td>
</tr>
<tr>
<td>Oil price and oil theft</td>
<td>annual</td>
<td>-0.26</td>
<td>-0.76 to 0.45</td>
<td>0.474</td>
</tr>
<tr>
<td>Piracy and Tristate violence</td>
<td>monthly</td>
<td>0.06</td>
<td>-0.12 to 0.24</td>
<td>0.48</td>
</tr>
<tr>
<td>Piracy and Tristate violence</td>
<td>annual</td>
<td>0.23</td>
<td>-0.47 to 0.75</td>
<td>0.52</td>
</tr>
<tr>
<td>Piracy and Delta violence</td>
<td>monthly</td>
<td>0.05</td>
<td>-0.13 to 0.23</td>
<td>0.6</td>
</tr>
<tr>
<td>Piracy and Delta violence</td>
<td>annual</td>
<td>0.12</td>
<td>-0.55 to 0.7</td>
<td>0.75</td>
</tr>
<tr>
<td>Delta violence and oil theft</td>
<td>annual</td>
<td>0.12</td>
<td>-0.55 to 0.7</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Signif. codes: *** 0.001 ** 0.01 * 0.05 . 0.1

The p-value here indicates the statistical significance of the Pearson’s correlation for each stated relationship. The 95% confidence interval describes the range of possible values in which the true Pearson’s correlation could fall, at that level of significance.
As shown in the table above, most of the relationships we tested did not show a statistically significant correlation. Six relationships were statistically significant at 95%, all but one of which had negative coefficients. The relationship between the unemployment rate and hijackings had a positive correlation of 0.69 at 95% confidence, which shows a strong positive linear relationship between those two variables. In other words, as the unemployment rate increases, so does the rate of hijackings.

D. Conclusions

We are not surprised at the difficulty of building a predictive model for the success of pirate attacks in the Gulf of Guinea. Relatively low significance values suggest our models fail to capture important independent variables, which makes sense in light of severe data limitations. Even so, these partial models have some value:

- *They show persistent significance for certain variables.* In particular, attacks on steaming vessels seem less likely to be successful than attacks on other dispositions. This matches intuition that ships in motion are significantly less vulnerable.
- *They underscore the complexity of the dynamics of conflict in this region.* Modeling simple problems is easy, but the nexus of on and offshore violence in the Niger Delta and the Gulf of Guinea is anything but simple.
- *They highlight the need for more and better data.* As discussed above, the inadequacies of our model are largely based on the lack of available data. Qualitative research suggests that a number of variables are key to the success of attacks, none of which are reflected in the available IMB data. These include use of armed onboard security teams, use of physical countermeasures (e.g. barbed wire) and other vessel hardening techniques, and crew collusion with pirates. Developing more comprehensive and targeted data should be a priority for anyone interested in piracy in this region. Until then, rigorous statistical modeling and quantitative analysis will remain difficult.

Like the models, the Pearson’s correlations highlight the diverse, interrelated, and complex relationships between variables in this region. Simple two-way linear relationships are hard to identify, but several statistically significant correlations point to the existence of these relationships nonetheless. Of particular note is the positive relationship between unemployment rate and hijackings. Though we must not infer a causal relationship from these tests, it is important to recognize in these numbers the underlying connection between economic issues and piracy. The negative relationship between oil production rates and violence in the tri-state area makes a similar point for dynamics on land in the Delta.
VI. VISUAL INSIGHTS

This section visually presents other quantitative and qualitative insights on trends in Gulf of Guinea piracy from 2003-2013. All data was compiled from IMB reports and the ACLED database, unless otherwise noted.

**Attack location.** 62% of pirate attacks in the Gulf of Guinea between 2003 and 2013 occurred in Nigerian waters. Attacks in the waters of neighboring countries were evenly distributed.

**Attacks vs. boarding success rate.** The ebb and flood of attacks in the Gulf of Guinea appears to follow a three-year cycle. However, attacks remained persistent over the 11-year span, despite the employment of various countermeasures. Boarding success rate reached a high in 2005 (100%) and has declined steadily, due to increased naval presence and crew vigilance.

**Attacks by ship type.** Tankers were the most frequently targeted vessel in the Gulf of Guinea, making up 44% of all attacks. Other popular targets included bulk carriers (14%), cargo vessels (12%), container ships (8%), supply vessels (7%), and tugs (5%). This reflects target availability as much as target preference.
**Time of attack.** Though daytime attacks were more prevalent during the winter months, the vast majority of attacks occurred during hours of darkness, regardless of season.

**Violence.** With the exception of a 2009 spike, offshore violence appears to be fairly consistent since the rise of MEND in 2007. Fatalities have remained low (<5), though the use of small arms fire to intimidate ship operators is on the rise.

**Hijackings and kidnapings.** Hijackings and kidnappings increased significantly since 2011. The emergence of a new piracy business model, emphasizing large-scale high-payoff oil theft, caused a significant spike in hijackings: in 2009, 3% of all ships boarded were hijacked, whereas in 2013, 76% of all ships boarded were hijacked. Similarly, the kidnapping rate in 2009 was 6%, compared to a 56% kidnapping rate in 2013.
Volume of attacks by region. Since 2003, the majority of attacks have occurred in Nigerian waters. Following the 2009 amnesty agreement, attacks migrated to waters west of Nigeria, to include the territorial waters of Benin, Togo, Ghana and Ivory Coast.

The swamp-like Delta is challenging to navigate and secure. This map demonstrates the number and complexity of waterways (major rivers in black, smaller waterways in blue) in the Delta. Government security forces have a difficult time monitoring, patrolling, and securing these regions, which play host to numerous militant hideouts and criminal camps.

Over three quarters of the 336 attacks in the Gulf of Guinea since 2003 have succeeded. This map indicates the high success rate (76%) and concentration of attacks in Nigerian waters.

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Attacks in Nigerian waters are similarly successful. 129 out the 232 reported attacks in Nigerian waters – or 73% – succeeded. The visual highlights the clear concentration of attacks outside Lagos port and around the Brass River export terminal. On the whole, however, there is no clear geographic pattern to the location of successful attacks.

Onshore violence comes in many forms and is unevenly distributed across the Delta. Protests largely occur inland, while MEND activity centers around the coastal Rivers State. Civilian, police and military, civilian and political violence occur largely in littoral areas surrounding Warri and Port Harcourt.
Pre-amnesty, attacks center on Lagos port and remain largely a near-shore phenomenon. Before the amnesty agreement was signed in October 2009, militants and criminals had access to a surplus of targets close to shore, due in large part to scant countermeasures.

Post-amnesty, attacks moved away from Lagos and extended their range offshore. After amnesty, criminals and militants ventured further from Nigerian waters to find viable targets.
VII. APPENDIX

A. Acronym List

- ACLED – Armed Conflict Location & Event Data Project
- CNOOC – Chinese National Offshore Oil Company
- CNPC – Chinese National Petroleum Company
- GG – Gulf of Guinea
- GSF – Government Security Forces
- GTL – Gas to Liquids
- ICC – International Chamber of Commerce
- IMB – International Maritime Bureau, division of International Chamber of Commerce
- IOC – International Oil Company
- ISO – International Organization for Standardization
- JTF – Joint Task Force Nigeria
- K&R – Kidnap & Ransom
- MEND – Movement for the Emancipation of the Niger Delta
- MT – Metric Tons
- NCAA – Nigerian Civil Aviation Authority
- NIMASA – Nigerian Maritime Administration and Safety Agency
- NM – Nautical Miles
- NNPC – Nigerian National Petroleum Corporation
- OECD – Organization of Economic Cooperation and Development
- QRF – Quick Response Force
- SOF – Special Operations Forces
- SOP – Standard Operating Procedure
- STS – Ship to Ship Transfer Operations
- TEU – Twenty Foot Equivalent Units
- TTP – Tactics, Techniques & Procedures
- UAS – Unmanned Aerial System
- UAV – Unmanned Aerial Vehicle
- UN – United Nations
- USD – United States Dollars

B. Additional Resources

The authors generated additional information that did not merit inclusion in this report, but may be of interest. This information can be provided upon request.

- Comprehensive list of sources
- Overview of Nigerian policy environment and key policy “areas to watch”
- Primers on socioeconomic, environmental, and security issues in the Niger Delta
- Underlying data sets used in statistical analysis (Microsoft Excel files)
- Underlying code for maps, visuals, and statistical analysis (R files)