Tracing the Supply Chains for the F-22 Raptor Fighter Aircraft, UH-60 Blackhawk Helicopter And the DDG 1000 Zumwalt-Class Destroyer

Prepared By Synthesis Partners for:

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Executive Summary

This report presents the results of a brief investigation to identify and assess the supply chains associated with three weapons platforms of the United States military. The purpose of the investigation was two-fold. First, the investigation was intended to determine the possibility of identifying, and obtaining access to a relatively small number of data sets that, taken as a whole, contain effectively complete information about all the components of the selected US military platforms, and the supply chain pathways they traverse on their way to final assembly. Second, if access was achieved, the investigation was intended to develop characterizations of the sources of key components of a selected subsystem of each platform, giving special attention to sources that might have the potential to reduce or restrict availability.

The primary key findings of the project are as follows:

Finding 1: For each of the platforms addressed in this study, with the exception of the DDG 1000, it appears that data on suppliers are available from a combination of Program Executive Offices (PEOs), Prime Contractors, and the Defense Logistics Information Service. However, the level of detail, accessibility, and other important factors remain to be confirmed.

Finding 2: The availability of data assets for the DDG 1000 is less clear, as the primes have indicated that they would wait for guidance from the PEO, which does not appear to be forthcoming.

Finding 3: The Defense Logistics Information Service (DLIS, an organization within the Defense Logistics Agency (DLA)) appears to have a database with all[1] parts associated with the UH-60 and F-22 platforms. Our request for this information has been reviewed and approved by DLA's Legal and Congressional Affairs offices, and is currently being reviewed by headquarters.

Finding 4: The Defense Contracts Management Agency's (DCMA) Industrial Analysis Center conducted a Helicopter Subcontractor Sourcing Assessment study in 2006 at the request of the Deputy Undersecretary of Defense for Industrial Policy. Synthesis received a redacted copy of this study, which indicated that no Chinese-owned companies were identified supplying material to any of the Prime Helicopter Integrators or its subcontractors. This report was made available to the USCC.

Finding 5: There are a variety of other information sources that appear to have some, but not complete, information regarding platform supply chains. Examples include detailed information concerning key systems and subsystems, especially those which have been associated with complex contracts of interest to those who follow specific industry segments, such as composite airframes or jet engine thrust and control systems.

[1] One contact indicated the parts database was complete for each platform; a second contact indicated the database contained only the parts uniquely found on the platforms. Synthesis is currently determining which is the case.

Introduction

America's ability to maintain effective military capabilities and appropriate international relationships and alliances that preserve these capabilities to further US interests can be profoundly influenced by the ways in which foreign countries cooperate in development, construction, sustainment, and use of major US military platforms.

In this era of rapidly accelerating technological and production capabilities of formerly non-competitive countries, such as China, and the increasing participation of such countries in the global technology supply chain for complex systems, it is appropriate to begin to assess the supply chains for major US military platforms to determine whether 1) it is now possible to assess supply chain risks; 2) there are now any specific supply chain risks and 3) such risks might emerge with an increase in the number of potential suppliers for previously sole-sourced technology. For example, as formerly cutting-edge technologies become commoditized it is easy to imagine that a second-tier supplier for a maintenance contract for a US military system would find the cheapest source of a component of its offerings, and that this source might not be friendly to the United States. Three systems at three distinct stages in system lifecycle were selected.

First, the UH-60 Blackhawk is a mature platform with a well-developed supply chain. It likely does not contain platform-critical components that could not be immediately multi-sourced, especially since it has been produced by five other countries (Japan, UK, Australia, Poland, South Korea).

Second, the F-22 Raptor is a relatively new platform incorporating new structural elements, weapons, sensors, and other technologies. The 100th airframe was recently delivered, and the aircraft is now entering the operations and maintenance phase. As its lifecycle continues, some components based on formerly cutting edge technologies could conceivably become commoditized, leading to their procurement from less-than-friendly sources. Additionally, some multi-sourceable critical components could nonetheless require damaging production/procurement replacement spin-up time.

Third, the DDG 1000 is a completely new platform that is currently in the process of detailed design efforts and procurement of long-lead time material and production items. As such the supply chain for this platform does not appear to be fully developed. This platform will incorporate new-generation sensing, stealth, propulsion, and other capabilities.

In particular, this project was intended to:

1. Determine the possibility of identifying and procuring sufficient data and information required to develop a clear picture of the complete supply chain for military platforms;
2. Identify and access as much data as possible for the three above-named platforms;
3. If data is available, perform basic quantitative analysis of such data so as to develop a general understanding of major sources of selected platform components

4. Depict the supply chains for specific subsystems

Sources and Methods

Synthesis Partners' collection activities began with the development of a collection and analysis strategy and process. We then accessed a wide range of secondary (e.g., commercial databases, Internet sites, and hard-copy documents) and primary sources to identify likely sources of relevant information. In addition to identifying information sources, our collection and analysis process focused on identifying access requirements and approaches and subsequently characterizing the content the various sources hold.

These initial efforts included coordinating with the USCC to develop an introductory letter to potential information sources to both explain the project and facilitate cooperation.

We identified and interviewed a variety of individuals, including those at the PEOs, the Defense Logistics Agency, the primes, other government entities, and private parts suppliers and information providers. Over 50 major sources were contacted in this process. Our interviews of individuals at these organizations involved extensive and important preparatory work aimed at developing a sufficient comfort level to encourage the sources to share relevant information. Our approach emphasized our intention to work with the interviewee to examine the information available to help assess these systems' supply chains and to identify information gaps that may exist, especially regarding foreign suppliers.

The hundreds of contact attempts Synthesis made during this phase of the work revealed that a focused approach targeting a specific subsystem for each platform was more likely to result in cooperation and success. Again working with the USCC, we developed a follow up letter reflecting this refinement, specifically soliciting suggestions to:

- Increase the likelihood of a positive response,
- Choose an appropriate subsystem, and
- Learn the expected timeframe for a response.

Our objective was to work with relevant contacts at the information sources to obtain sample data to determine format, depth, and coverage. An area of primary interest was the extent to which deep-tier suppliers are identified as opposed to being represented by "roll-up" suppliers who, for example, might assemble minor subsystems from parts obtained from a large number of suppliers of screws, fasteners, metal plates, springs, etc.

In the process of this effort we also sought to enhance our understanding of the landscape of other potential related efforts to understand weapon system supply chains.

Findings

This section reports the major findings of the project. In particular, it presents

1. Primary sources of information regarding components and supply chains for the three systems,
2. The major results regarding attempts to acquire data required to develop a complete picture of the supply chains for three systems studied in this project, issues and successes encountered in these attempts, and possible solutions to the issues

Finding 1: Synthesis has identified sources and Points of Contact for supply chain information regarding the three platforms. The following initial taxonomy was developed to characterize potential information sources:

- PEOs
  - ex: Redstone – UH-60
- Primes
  - ex: Lockheed-Martin – F-22
- Others
  - Government agencies
    - ex: Intelligence Community Acquisition Risk Center (CARC)
  - Suppliers
    - ex: Alstom - DDG 1000 AIM
  - Refurbishment companies
    - ex: Hamilton-Sundstrand – UH-60
  - Industry watchers
    - ex: Teal Group

Finding 2: The Program Executive Offices for the UH-60 and F-22 Raptor platforms have data assets that may contain relatively complete information on parts and suppliers for all systems and subsystems for their platforms. This must be confirmed by accessing a set of representative data. It also remains to be determined if the data is held in an accessible format. Below are summaries concerning the latest information developed regarding each organization:

UH-60 – Sikorsky and PEO

Redstone Arsenal (UH-60 PEO) and Sikorsky concluded that there is no "simple" UH-60 subsystem for which they can or are willing to provide supplier data to the USCC.

The simplest subsystem they could identify in their discussions was the UH-60 gear box. However, even this subsystem has at least 700 parts manufactured in the U.S. and abroad, and they claim it would be overly burdensome to their staff to provide the kind of supplier data we're looking for. They indicated that their databases are not organized to provide the types of information we discussed (supplier locations).

They then offered to report the number of parts manufactured overseas, the number of parts manufactured in the U.S., the number of suppliers overseas and the number of suppliers in the U.S. for this subsystem.

They also proposed that instead of a subsystem, they provide supplier data for the bell crank, which has approximately three to six suppliers.

Their condition to providing this information was another, more specific letter of request from the USCC.

However, on October 30th, the Army Materiel Command (AMC) responded directly to the USCC, stating that the letter requesting that agency's assistance would have to be directed initially to Army Legislative Liaison, which would "move it through appropriate channels." The AMC did go on to say that the agency would be "pleased to assist if directed to do so by the proper officials."

Subsequent attempts to contact the POCs have not ascertained if the original offer remains valid.

F-22 – Lockheed

Several conversations our Lockheed POC resulted in their assistance in identifying and accessing F-22 POCs. However, the F-22 POCs have not been responsive to date.

F-22 – PEO

Our POC at the PEO confirmed the F-22 supplier database has information on 5,000 systems, sub-systems, components and material suppliers. However, access is restricted. The POC indicated that he would have the legal team review our request. Since that time he has been unresponsive.

Comment: Our assessment is that we are least likely to gain access to the F-22 supply chain data, due to the sensitive and/or classified nature of the platform.

Finding 3: Data assets for the DDG 1000, which appears to be currently not completely specified, may be being developed as systems and suppliers are specified. Any that exist appear to be available from the Program Executive Office and the Prime Contractors, General Dynamics and Northrop Grumman.

DDG 1000 – General Dynamics-Bath

The GD POC reported that they've decided to wait for guidance from the PEO.

DDG 1000 – Northrop Grumman

The NG POC did not respond to repeated calls.

DDG 1000 – PEO

The PEO POC has stated that he is addressing our request. However, we've received no feedback to date.

Finding 4: The Defense Logistics Information Services (DLIS, an organization within the Defense Logistics Agency) appears to have a database with all[2] parts associated with the UH-60 and F-22 platforms. DLIS generated an internal tracking number for Synthesis' initial request. Our request for this information has been reviewed and approved by DLA's Legal and Congressional Affairs offices, and is currently being reviewed by headquarters.

Finding 5: The Defense Contracts Management Agency's (DCMA) Industrial Analysis Center conducted a Helicopter Subcontractor Sourcing Assessment study in 2006 at the request of the Deputy Undersecretary of Defense for Industrial Policy. The DCMA contact reported that Sikorsky was very helpful in compiling the report. Synthesis received a redacted copy of this study, which indicated that no Chinese-owned companies were identified supplying material to any of the Prime Helicopter Integrators or its subcontractors.

The DCMA's collection approach involved a survey distributed to the Helicopter Prime Integrators (1st Tier) to determine their suppliers (subcontractors) for the selected systems. The Prime Integrator's subcontractors (2nd Tier) also were surveyed (100% survey response) utilizing to determine their respective subcontractors (3rd Tier – 47% response rate).

DCMA's methodology may indicate, and as our work to date shows, that a single authoritative source covering the complete supply chain to the 3rd tier supplier level does not exist.

Finding 6: Other than the DCMA report noted above, our efforts did not identify other organizations addressing this issue. For example, Synthesis' contacts with the Intelligence Community's Acquisition Risk Center (CARC) determined that it has not conducted studies addressing the issue of the identification of foreign parts, components and material suppliers to U.S. weapons systems.

Finding 7: Other organizations are interested in this topic, including the DoD Inspector General. Mr. Kenneth H. Stavenjord, Director of the Technical Assessment Directorate with the DOD Inspector General's office is very interested in this project and offered to help in any way he can. He stated a desire to maintain a dialogue as we proceed. We submitted background information to him, including USCC contact information. Mr. Stavenjord says his office has a strong interest in supply chain data and quality control issues.

[2] One contact indicated the parts database was complete for each platform; a second contact indicated the database contained only the parts uniquely found on the platforms. Synthesis is currently determining which is the case.

Finding 8: Commercial sources do not appear to hold complete pictures of the supply chains. For example, some information providers collect detailed information concerning key systems and subsystems, especially those which have been associated with complex contracts of interest to those who follow specific industry segments, such as composite airframes or jet engine thrust and control systems.

Finding 9: Gaps in information held by the PEOs, primes, and DLIS (especially third-tier and below), may be addressed from open source literature, though it is unknown a) how extensive these gaps are, b) whether complete information is available to fill all gaps, c) the extent of the effort required to fill all such gaps.

Conclusions

An easily accessible comprehensive data set of detailed supply chain information concerning the platforms of interest may not exist. The most likely holders of more complete data sets include the PEOs, primes, and DLIS.

Even in the case that complete information on the studied platforms is available, it appears unlikely that the data will be in a single format. This suggests that a major effort may be required to render the data in a uniform format.

Synthesis has no "carrot" to dangle in front of the information holders to get them to move more quickly. Information holders may in fact perceive a downside to cooperating with the USCC, as they risk revealing something in their programs of which they had no foreknowledge. However, we do not believe that a "stick" approach (e.g., Congressional involvement) would result in straightforward or timely access to the desired information.

Synthesis Partners believes that the most productive approach to accessing the desired information is to continue the patient, sustained effort aimed at establishing a comfort level with the potential information providers, especially regarding how USCC intends to use the information.

This approach also involves generating very specific information requests – in contrast to broad requests, which we believe will lead to stonewalling. The downside to this approach is that we have no control over the information holders' response timeframe, which will have an affect on research and analysis budgets required to address the objectives.

Research did not reveal other US Government organizations that are currently assessing the potential risks associated with the foreign manufacture of weapons systems parts and subsystems.

Recommendations

Synthesis recommends continued extremely focused engagement with the more promising information sources (DLIS, PEOs, primes) identified in the course of this project. This will enable further evaluation of:

- The availability of the information
- The breadth, depth, and format of the information
- The difficulty of assessing supply chain risks of selected components

If assessing supply chain risks using current data sets proves tractable, Synthesis recommends developing a clear and replicable risk assessment methodology to identify other platforms, components, and parts of strategic importance to the US, and to subsequently perform supply chain risk analyses of these platforms and components.

If performing comprehensive supply chain risk assessments proves extremely arduous, an argument could be made for the value of developing a single point-of-entry mechanism to track weapons platforms. Such a mechanism could be integrated into partner management systems utilized by government platform procurement and maintenance entities. The most obvious platforms for which this capability could be developed would include the F-22 as it moves into O&M phase and the DDG 1000 which is in the design cycle.

It may be productive to identify and engage with other organizations (e.g., the Deputy Undersecretary of Defense for Industrial Policy and the DoD IG) that may have an interest in the USCC's efforts to understand and assess potential risks associated with weapons system supply chains.

The following charts depict selected information sources, relevant details, and POCs. More comprehensive working documents listing information sources and Synthesis' interaction history with each is available upon request.

Appendix 1: UH-60

Data Source	Source Type	Information Contents	Format	Availability	Completeness	Contact
Defense Logistics Information Service	Government Agency	Parts		Appears Available, upon satisfying access requirements	Possibly Complete	Ms. Diana Funk, Battle Creek, MI, (269) 961-4717
Program Executive Office, UH-60 Black Hawk	PEO			Availability Questionable	Appears Extensive	Mr. William Bidwell, Program, Director, Utility Directorate, Program Executive Office for Aviation, Redstone Arsenal, AL, (256) 313-1616
Sikorsky Aircraft	Prime			Availability Questionable	Appears Extensive	Mr. Albert P. Altieri, VP Procurement. aaltieri@sikorsky.com.
Defense Contracts Management Agency	Government Agency	Subcontractor Supply Chains		Available	Not Complete	Mr. James Brennan, DCMA Industrial Analysis Center, (215) 737-3362
Hamilton Sundstrand	Refurbishment Supplier	Subsystems for which HS provides refurbishments		Availability Questionable	Not Complete	Mark Boettger or Elizabeth Wilson, (800) 609-8675, ext. 2536
Info Base Publishers	Industry Watcher	Tracks Contracts and Subcontracts		Available	Not Complete	Mr. Stuart McCutchan, (703) 327-8470
Teal Group	Industry Watcher	Tracks Contracts and Subcontracts		Available	Not Complete	Richard L. Aboulafia, (703) 385-2967

Appendix 2: F-22

Data Source	Source Type	Information Contents	Format	Availability	Completeness	Contact
Defense Logistics Information Service	Government Agency	Parts (organization unknown as of 08/30/07)		Appears Available, upon satisfying access requirements	Possibly Complete	Ms. Diana Funk, Battle Creek, MI, (269) 961-4717
Program Executive Office, F-22 Raptor	PEO			Availability Questionable	Appears Extensive	Brian King, Arlington, VA (703) 588-1307
Lockheed-Martin	Prime			Availability Questionable	Appears Extensive	Ken Hilderbrand, Marietta, GA (770) 494-7235
Info Base Publishers	Industry Watcher			Available	Not Complete	Mr. Stuart McCutchan, (703) 327-8470
Teal Group	Industry Watcher	Tracks Contracts and Subcontracts		Available	Not Complete	Richard L. Aboulafia, (703) 385-2967

Appendix 3: DDG 1000

Data Source	Source Type	Information Contents	Format	Availability	Completeness	Contact
Program Executive Office, DDG 1000	PEO			Availability Questionable	Unknown	Capt. Jim Syring, Program Manager, DDG-1000. Mr. George Gooden, supplier management specialist, (202) 781-4925
Bath Iron Works	Prime (GD)	Supplier data for major systems		Availability Unlikely	Unknown	Mr. Greg Harrison, Director, Material Acquisition, (207) 442-1770
Northrop Grumman Ship Systems	Prime	Supplier data for major systems		Availability Unlikely	Holds data on major systems and subsystems suppliers, but not sub-tier suppliers.	Mr. Billy Dorr, Section Manager, Supply Chain Management, Northrop Grumman Ship Systems, Pascagoula, Mississippi. Phone: (228) 935-3569.