



Global Aerospace & Defense Trading Exchange



On March 28, 2000, four of the world's largest aerospace companies – Boeing Company, Lockheed Martin Corporation, BAE Systems, and Raytheon – along with Commerce One, a leading US Business-to-Business (B2B) infrastructure company, founded the Global Aerospace & Defense Trading Exchange. The new exchange venture will attempt to serve as an electronic hub, or “ehub” for a significant portion of \$400 billion in annual commercial and military sales. Phil Condit, Boeing's chairman and chief executive officer, notes:

This trading exchange can deliver enormous buy- and sell-side efficiencies to our industry. ... By using a single e-marketplace, all of us -- manufacturers, suppliers, airline and government customers, and service providers -- can significantly lower transaction costs and deliver more value.²

This was a significant step for the aerospace partners as they tried to parlay their old-economy prowess into a winning new-economy e-commerce venture. A new, independent company is expected to replace the memorandum of understanding used to announce new venture. The independent company will own and operate the trading exchange, which is expected to begin functioning in mid-2000.

This note describes the Global Aerospace & Defense Trading Exchange as proposed by Boeing and its partners. It provides background information on the functioning of the business-to-business marketplaces and discusses the issues concerning the proposed trading exchange.

Associate Professor Suresh Kotha, University of Washington Business School prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. The author thanks David L. Van Sickle (MBA, 2001) and Joseph Smith (MBA, 2000) for their valuable research contribution which made this note possible. Copyright © 2000 Kotha. All rights reserved.

² Boeing, Lockheed Martin, BAE Systems and Raytheon to Create B2B Exchange for the Aerospace and Defense Industry, *Business Wire, Inc.*, March 28, 2000

Background

Boeing and its trading partners are attempting to establish a trading exchange that they hope will become the standard for B2B e-commerce exchanges. The proposed trading exchange plans to take advantage of the global nature of the aerospace and defense industry and help the participants to realize efficiency gains by linking a large volume of parts procurement with an extensive but fragmented supplier network.

The new exchange will be based on Commerce One's MarketSite Portal Solution, a comprehensive set of business services, including auctions, procurement, order management, and payment services available to all trading partners. This portal solution is expected to provide the robustness and scalability needed in the B2B e-commerce market to allow anyone to trade with anyone, any time, anywhere. The XML-based portal will also integrate with the buying and selling applications offered by other technology providers such as RightWorks, SAP, PeopleSoft, and Microsoft.

The exchange will attempt to bring the industry's 37,000 suppliers, hundreds of airline customers, and national governments together in a secure, electronic marketplace. The massive scale and scope of the proposed exchange is shown in Exhibit 1.³

Exhibit 1: The Scope of the proposed Exchange



³ Aviation Week Source Book 1999, ICAO, Europe Aerospace Industry Assoc., AIA, Teal Group

Founding Partners

The Boeing Corporation. Boeing is the world's largest aerospace company, with 1999 revenues of \$58 billion. Headquartered in Seattle, Washington, its portfolio of customer focused solutions includes commercial jetliners, military aircraft and missile systems, satellites and space launch systems, and a growing services business for both commercial and government customers.¹

BAE Systems, PLC. BAE Systems was formed in 1999 by a merger of British Aerospace and Marconi Electronic Systems. It posted \$19 billion in sales in 1999 and boasts the ability to offer global capability in air, sea, land, and space, with world-class prime contracting ability supported by a range of key skills.

Lockheed Martin. Headquartered in Bethesda, Maryland, Lockheed Martin is the largest military contractor in the world. Lockheed Martin's core businesses are systems integration, space, aeronautics, and technology services. It is also principally engaged in the research, design, development, manufacture and integration of advanced-technology systems, products, and services. In 1999 its sales surpassed \$25 billion.

The Raytheon Company. This Lexington, Massachusetts, company is a global technology leader that provides products and services in the areas of commercial and defense electronics, engineering and construction, and business and special mission aircraft. It serves customers in more than 80 countries and posted 1999 revenues of over \$20 billion.

Commerce One. Commerce One [www.commerceone.com] is the global leader in e-commerce solutions for business. The Commerce One Global Trading Network Web is the world's largest B2B trading community. Comprised of many interoperating portals, each portal independently owned and operated by a leading market in a region or industry, the Global Trading Web provides unprecedented economies of scale for buying organizations, suppliers, and service providers worldwide. Commerce One is currently involved in developing similar exchanges in the automotive, telecommunications, electronics, and financial services industries (see **Exhibit 2** for details about Commerce One).

Exhibit 2: Details about Commerce One

Founded: 1994, Pleasanton, Calif.

CEO: Mark B. Hoffman, 53, graduated from West Point with a B.S. in engineering and retired as a captain in the U.S. Army. He is former CEO and co-founder of Sybase, a database company.

Sales: (last four consecutive quarters) \$66.5 million

Gross profits: (last four consecutive quarters) \$40.1 million

Gross profit margin: (last four consecutive quarters) 60.3%

Net income/loss: (last four consecutive quarters): \$94.6 million loss

IPO: July 1, 1999, at \$21 per share; raised \$69.3 million on first day of trading

Batting average: Stock is up 251% (as of May 31, split-adjusted)
Market cap: \$5.6 billion
Employees: 1,300

Key strategic partners: General Motors, British Telecom, Shell International

Key customers: Wells Fargo, Boeing, BellSouth, Eastman Chemical

Strategic focus: Convinced that software makers have to do more than simply provide tools, Commerce One has formed strategic partnerships with its customers and helps manage their online marketplaces. It also convened its customers into an international trading network to build critical mass and facilitate ecommerce among them.

Key acquisitions: Acquired Mountain View, Calif.—based Veo Systems in January 1999 for \$23.2 million in combined cash and stock. Veo's software enables different online exchanges to communicate in XML. In a stock-for-stock exchange, acquired CommerceBid, a Santa Clara, Calif.—based maker of auction software.

Key victory: Last fall, Commerce One secured a contract to power GM's TradXchange portal, a B-to-B marketplace expected to transact \$50 billion by year's end. The TradXchange deal led to a stake in one of the leading technology partners in Covisint, the auto industry—sponsored exchange comprising Ford, GM, DaimlerChrysler, and Oracle. Covisint's publicity has led to other major deals with Boeing and Shell International.

Key defeat: None so far, but Commerce One still lags behind Ariba in sales, customers, and market value. Ariba's pact with IBM and i2 Technologies also poses an important challenge to Commerce One, as it enables Ariba to sell its products to IBM's hundreds of thousands of customers.

THE B2B MARKET SPACE

Although the revenues resulting from the business-to-consumer (B2C) marketplace have attracted greater media buzz, it constitutes only a fraction of its lesser-known sibling, B2B. According to Forrester, an Internet research company, annual B2B e-commerce is expected to swell from \$43 billion in 1998 to over \$1.3 trillion by 2003. In contrast, Gartner Research provides estimates that are more optimistic. It forecasts that B2B e-commerce will reach \$7 trillion by 2004 from a meager \$145 million in 2000. This bold projection represents a 5000 percent growth from 1999 to 2004 (see **Exhibit 3** below).

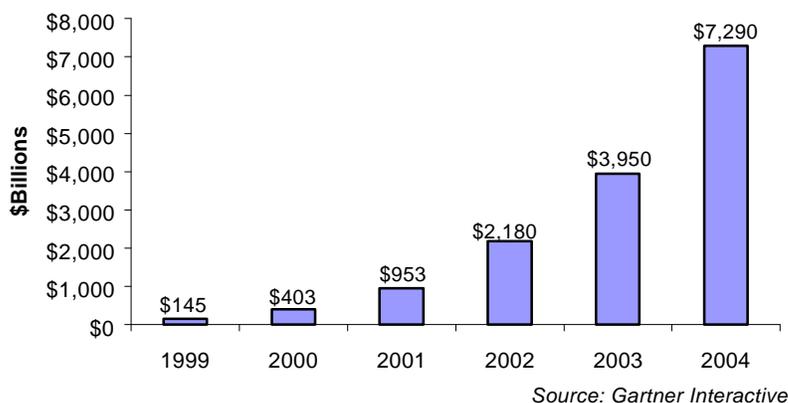
According to AMR Research, another Internet research firm, B2B commerce will be around \$5.7 trillion by 2004. However, AMR Research notes:

Whether the figure is \$2T or \$5.7 trillion by 2004 is of little importance to any one company. More significant is that companies take part in these digital marketplaces. The potential for wealth redistribution among winners and losers is gargantuan. \$500M e-commerce transactions are routinely conducted today: No company, of any size, can afford to miss out on transactions of this stature. Beyond mere participation in digital marketplaces, companies must also put the technology and processes in place to benefit from B2B e-commerce. By 2004 conducting business via the Internet will be as routine as making a telephone call. Know any businesses without a phone?⁴

⁴ AMR Research Inc. *The Report on E-commerce Applications*, April 2000.

AMR Research notes that parts and services transactions associated with the manufacturing of aerospace equipment amounted to \$166 billion dollars in 1999. This number is expected to grow to approximately \$209 billion by 2004. In 1999, approximately 1% of these sales were conducted over the Internet and in 2000 this number is expected to be 8%. By 2004, 35% of sales are predicted to be over the Internet.

Exhibit 3
Worldwide Business-to-Business E-Commerce Market



With the growing establishment of the Internet as an e-commerce platform, a new dynamic is emerging within the B2B space. New intermediaries or “net market makers” have started to establish giant “ehubs.”

eHubs are Internet-based metamediaries that focus on specific industry verticals or specific business processes, host electronic marketplaces, and use various market-making mechanisms to mediate any-to-any transactions among businesses.⁵

Metamediaries attempt to create value by first attracting and then aggregating a critical mass of buyers and sellers (market liquidity) in the market place. Once market liquidity is reached, buyers and sellers both benefit from reduced search costs, information transfer costs, and transaction costs. This is markedly different in scope from the B2C domain. In the B2C market, the benefits accrue only to the buyer or the seller, but not both. In other words, the B2C market tends to be a one-sided concern, unlike the B2B markets that tend to be two-way networks.

Various industry experts estimate the market size for metamediaries differently.

- According to Volpe Brown Whelan & Company, an investment-banking firm, metamediaries will account for more than a quarter of all B2B

⁵ Kaplan, S. and Sawhney, M. E-Hubs: The New B2B Marketplaces, *Harvard Business Review*, May-June, 2000,

commerce revenues by 2002. Their revenues from fees and advertising are projected to reach \$20 billion by 2002;

- Bear, Stearns & Company, a well known investment banking firm, notes that the metamediary market will reach \$400 billion by 2003;
- Online Metamediaries are expected to pass 2,500 by 2000 and balloon to 25,000 by 2001; and
- Gross margins for metamediaries will be around 85 percent.

Generally, B2B hubs can be separated into two distinct types: Vertical hubs and Functional hubs. Vertical hubs focus on industry specific markets. The Global Aerospace & Defense trading Exchange (aerospace), e-Steel (steel), and PlasticNet.com (plastics) are examples of such hubs. In contrast, functional hubs focus on providing standardized business processes across a wide range of industries. Examples of functional hubs include BidCom (an exchange focusing on project management related tasks) and Celarix (an exchange emphasizing global logistics related activities).

Both functional and vertical hubs must decide on the market-making mechanism they will employ to execute their business functions. Four generic mechanisms commonly employed include: (1) the catalog model, (2) the auction model, (3) the exchange model, and (4) the barter model. Among these, the auction, the exchange and the barter models are “dynamic” pricing mechanisms.

- *The catalog model* is a fixed-price mechanism that aggregates buyers and sellers. It works well when the size and frequency of the transactions make it impractical to negotiate each transaction individually.
- *The auction model* works well for non-standard products that have significantly different economic value to buyers and sellers. Examples of such products include used products, specialized capital equipment, returned products, and hard-to-find products.
- *The exchange model* works well in markets where products are commodity-like in nature. Usually these products have several characteristics, but these attributes are easy to specify. Raw materials, standardized products, and basic manufacturing inputs are examples. B2B exchange models currently exist in the paper, steel, and energy industries.
- Finally, *the barter model* allows companies to trade reciprocal assets, services, or capabilities. For example, a lumber company and a construction company might barter the use of heavy equipment owned by the construction company for building materials owned by the lumber company.

Vertical hubs with an exchange model mechanism have recently made major headlines in the financial markets. Besides the Global Aerospace & Defense Trading Exchange, a number of potentially large B2B concerns have recently been announced.

- In the automotive industry, the three industry titans, General Motors, Ford Motor Company, and DaimlerChrysler, along with Commerce One, Inc. and Oracle Corporation, have joined forces to create an exchange through which they will streamline the procurement of up to \$300 billion worth of parts, sub-assemblies and other supplies. This trading exchange is expected to impact more than 50,000 suppliers.
- Sears and Carrefour, a Paris based global retailer, recently announced a Global Retail Exchange.
- Vertical exchanges have also been developed for the telecommunication and financial services industries. The financial services exchange boasts industry companies including eScout, Citibank, and Bank Financial Group.
- Similarly, British Telecom, NTT Communications, and Swisscom announced an exchange to facilitate e-commerce transactions for buyers and sellers in telecommunications industry.

Despite the rapid emergence of such large trading exchanges, AMR Research observes that:

The best exchanges accounted for less than 1% of activity in their respective verticals in 1999. Once functionality, particularly integration, is established, adoption will be rapid. ... Certain industries will see much higher adoption rates including Electronics (72%), Aerospace (69%), Chemical (68%), and Discrete Manufacturing (65%).

BOEING'S FORAY INTO ELECTRONIC COMMERCE

Early Developments

Boeing's Intranet is a good example of how a large company uses technology to improve corporate communications. Boeing has a large employee base spread throughout the globe. Additionally, the firm's production facilities are incredibly large. These factors tend to impede communications among employees. Boeing has been able to use its Intranet to combat its scale challenges and improve communications. Each program (and group) has a customized home page. Program schedules are available online to any employee who needs them. Additionally, all corporate communications are available on the firm's Intranet.

In addition to improved communications, the Intranet also improves employee productivity. An internal search engine enables employees to access information quickly and easily. Boeing has placed formerly paper-intensive tasks such as time-keeping, forms, and scheduling on the firm's Intranet. Employees can accomplish these tasks more quickly than in the past, and the overall volume of paperwork has been greatly reduced according to company estimates.

While the intranet is an example of an Internet success, the firm has also had some failures. For example, *Digital Express*, a service that provides satellite-to-

desktop digital distribution of corporate TV broadcasts, is one such a venture. Boeing had planned to use this service internally and then offer it to external customers. The demand for the product, however, was overestimated, and the service never really took off.

Another disappointment was *Resource 21*. This service attempted to provide satellite-based remote sensing data for the agriculture industry. Using this service, farmers, in theory, could use the data to isolate soil conditions and improve crop yields. As with *Digital Express*, demand for this product never quite materialized.

The Current eBusiness Initiatives

Building on its successes and attempting to learn from its disappointments, Boeing has recently launched several e-business initiatives. These initiatives reflect Boeing's desire to use e-business solutions on both the buy and sell sides of its business. In a recent report, Boeing CIO Scott Griffin wrote:

If we do not establish e-business as an immediate priority for our profit centers and process councils, then we will put ourselves into a position of aerospace 'followership' rather than 'leadership.'

The new initiatives include: Boeing On-Line Delivery (**BOLD**), the Boeing Part Analysis & Requirements Tracking (**PART**) Page, **MyBoeingFleet.com**, **Connexion**, and **the Aerospace and Defense Trading Exchange**. BOLD, the PART page, and MyBoeingFleet.com are the firm's early forays into e-business ventures. They are attempts by Boeing to identify and capitalize on the e-commerce opportunities in the aerospace industry.

BOLD. Boeing established BOLD in 1995. Using BOLD, subscribers can directly access technical drawings, service bulletins, and manuals. The BOLD system was moved to the World Wide Web in 1999. This popular service has over 14,000 users and about 8,000 unique hits per day. This venture has enabled Boeing to reduce the costs involved in producing and distributing technical information to its various customer groups. It is an example of how information that was already available on the firm's Intranet can be offered to external users on a fee basis.

PART. Building on the success of BOLD, in 1969 Boeing established a web based ordering system for after-market commercial airplanes parts called the PART page. Subscribers to this service order any part for any Boeing airplane. The PART page has become very popular with customers (primarily airlines and maintenance facilities). In 1999, more than 250 airlines and 675 other companies generated over \$400 million in on-line sales utilizing the PART page. The PART page supplemented Boeing's earlier on-line efforts that provided technical manuals and documentation electronically anywhere in the world. Boeing sees this new venture as further evidence that it is making progress towards diversifying its operations by adding more service-related products. Boeing plans to migrate its current on-line operations to the new trading exchange.

MyBoeingFleet.com. Recently, Boeing launched a new web site that integrated the offerings of BOLD and the PART page into MyBoeingFleet.com. This new

offering allows users to customize the page for their specific needs. For example, a maintenance technician can receive automatic service bulletins for the aircraft models that he or she works on.

Connexion. Boeing is also attempting to establish a presence in the airborne Internet infrastructure market place. The firm recently unveiled a new service called Connexion. The service uses a Boeing-developed phased-array antenna to broadcast Internet and television service to airborne aircraft. Boeing foresees two primary revenue streams from this service: (1) sale of the enabling equipment to airlines, and (2) subscription fees for users. Additionally, the firm is in negotiations with Internet Content Providers to provide exclusive news, business, sports, and entertainment content for the Connexion Portal.

Connexion subscribers will be able to connect to this service using laptop computers or other web-enabled devices. Users will be presented with an “AOL-like” portal through which they can access content customized for Connexion, connect to the Internet, access their email accounts, or watch TV. Currently, Boeing has a technological advantage over its competitors in this domain. The company expects the Internet “on the fly” to represent a prime growth area in the future.

In March 2000, Boeing unveiled its most ambitious e-commerce initiative to-date: The Global Aerospace & Defense Exchange.

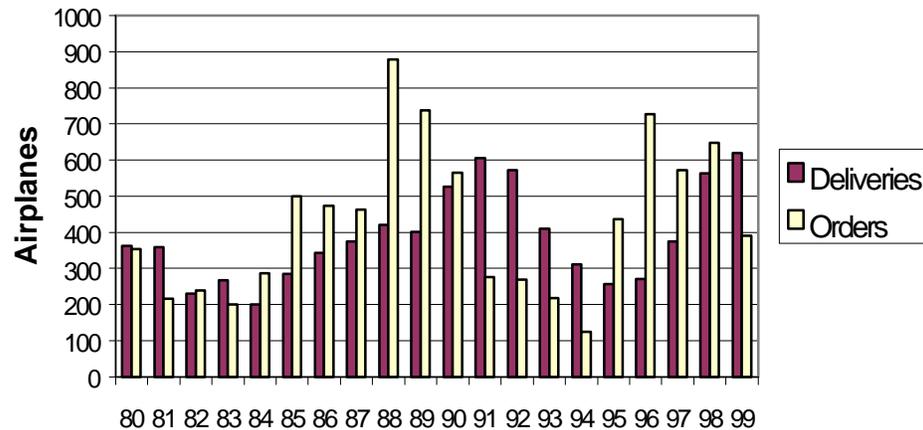
THE GLOBAL AEROSPACE & DEFENSE EXCHANGE

The catalyst that brought together the four founding industry participants was their mutual interest in cost reduction. The aerospace and defense industry has suffered from a post-Cold War slump in sales and a significant increase in the cost of its products. The past practice of producing the best product at any cost is no longer a valid business model. Private companies and governmental entities have been forced to seriously consider the costs of procuring aerospace and military products regardless of their increased technological or performance capabilities.

Boeing’s managers note that the Aerospace and defense industry is well suited to take advantage of the e-commerce exchange because the industry is “information” driven and data intensive, and a large proportion of industry players are e-commerce inclined. The industry is fragmented with thousands of buyers and sellers. Moreover, the industry’s supply chain is complex, and industry dynamics are complicated by demand for commercial aircraft, which is cyclical (see Exhibit 4 below).

Exhibit 4

Boeing - Commercial Airplane Orders & Deliveries (1980 - 1999)



Aviation Parts and Products Industry⁶

The worldwide market for aviation parts and products is highly fragmented and includes many types of suppliers, such as airlines, original equipment manufacturers, numerous independent distributors, on-site airport maintenance providers, also known as fixed base operators, Federal Aviation Administration certified facilities, traders, and brokers.

Aerospace Industries Association estimates that total exports and imports of aircraft parts and products were approximately \$29 billion in 1999. Further, the airline industry has experienced rapid growth in business and leisure travel in recent years. As a result, the world fleet of aircraft is projected to increase from 12,600 aircraft in 1998 to 28,400 aircraft in 2018.⁷ The increase in travel and the number of aircraft have likely contributed to the demand for aviation parts and products as existing aircraft must be serviced at scheduled intervals. As the age of the global fleet of aircraft increases, demand for new, used and overhauled parts and products is likely to increase further.

Historically, airlines have controlled the majority of the aviation parts and products inventory. However, they are beginning to reduce their parts inventories in an effort to reduce inventory-carrying costs. In doing so, they have increased their reliance on suppliers for parts that are difficult to obtain from OEMs on a timely basis. If airlines demand time responsive inventory procurement processes, responsibility for inventory storage and handling may shift to suppliers.

⁶ Much of the industry information provided here was abstracted from Partsbase.com's S-1 documents (2000).

⁷ Boeing Market Outlook report, 1999.

Suppliers of aviation parts and products are geographically disperse, and because of the specialized and complex nature of aviation parts and products, the particular part or product desired by a buyer may not be easily accessible. Buyers often search for a specific part or product to meet the parameters for a specific aircraft at a particular location. Buyers may spend several hours examining multiple paper catalogs and other information from different suppliers to identify the most appropriate part or product. After locating the desired part or product, buyers place orders by telephone, fax, or e-mail and typically must place orders with multiple suppliers in order to obtain parts or products related to a single aircraft.

Orders for aviation parts or products are typically handled through internal, paper-based processes that require manual preparation, written approval by purchasing managers, manual order tracking, and billing and reporting across multiple departments within an organization. Such paper-based procurement processes are complex, cumbersome, and time-consuming. Paper-based orders also tend to be costly for buyers and sellers to track and bill. And the decentralized order process does not facilitate collecting data necessary for efficient pricing and delivery.

Limitations of the Traditional Systems

Traditional purchasing methods also present a number of challenges to sellers trying to reach buyers of aviation parts and products. Due to the high cost of printing and distributing paper catalogs, sellers cannot cost-effectively manage frequent updates and distribution of time-sensitive information. These catalogs are cumbersome to search and limited in their ability to provide depth of product and seller content. Small sellers may have limited resources to support the growing challenge of marketing and selling to the highly fragmented worldwide market for aviation parts and products. As a result, traditional procurement and sales methods are inefficient in many respects for both buyers and sellers.

The current methods used to reduce inefficiencies in purchasing have limitations that prevent widespread adoption. Two methods currently used in the aviation parts industry are conventional Electronic Data Interchange, also known as EDI, and Enterprise Purchasing Software Systems.

- **EDI systems.** These allow computers to exchange information in uniform formats across private networks without human intervention. Because EDI systems rely on the execution of repetitive identical transactions, they are generally not well suited for dynamic procurement environments involving many buyers and sellers of a wide variety of goods and services.
- **Enterprise Purchasing Software Systems.** Some vendors have developed Enterprise Purchasing Software Systems designed to improve the coordination of the purchasing function across large enterprises.
- Both EDI systems and Enterprise Purchasing Software Systems are expensive to license and/or install and require users to pay ongoing

maintenance and/or transaction fees. Due to the expense and complexity of these systems, they are generally unsuitable for all but the largest organizations. Moreover, neither EDI nor Enterprise Purchasing Software Systems offer a full spectrum of online procurement functions.

The fragmentation and complexities of the aviation industry and the current paper-based purchasing processes create the need for a B2B e-commerce solution that seamlessly brings together buyers and sellers of aviation parts and products.

Similarly to the commercial aircraft industry, military contracts, especially in the U.S., are now being evaluated and awarded using unit cost as a significant criterion rather than just using strict performance based criteria. This has forced the industry to attack the cost of its products by streamlining not only the design and manufacturing processes, but also procurement and supply chain systems. Here too a B2B e-commerce solution seems appropriate.

The Proposed Exchange

The four industry founders each have taken an equal equity position in the exchange. *The Wall Street Journal* notes:

The amalgam of huge manufacturers is so eager to strike first that it has code-named the effort 'Zephyr,' after the mythical Greek god of the wind, and tentatively set late summer for its first transaction date. ... Boeing and its partners, which are all original-equipment manufacturers, or OEMs, will have equal ownership interests in their exchange. Ownership translates not only into transaction fees the exchanges will produce, but possibly bigger dollars if the exchange goes public.⁸

While the initial investments by the partners are unknown, future equity ownership will be adjusted based on the e-commerce revenues generated by each participant over the first three years of operation. For its technological contribution, Commerce One was granted a 5% equity position. Additionally, about 20% of the equity has been set-aside for future industry participants and employees of the new company. The value of these equity positions will be determined when the exchange executes an initial public offering currently scheduled for 2001. Commerce One, Inc. will also receive revenues based on transaction and revenue volume generated through the exchange.

The Wall Street Journal reports:

In the vision of the owners of [this] exchange, it will ease the buying and selling of everything from data services for operating and modifying commercial and private planes of every size, to procuring weapons parts and complying with military and regulatory rules around the world. ... Phil Duke, executive vice-president of shared services for Lockheed Martin in Bethesda, Md., points out that much of their drive is geared toward meeting Defense Department expectations for improved efficiency,

⁸ Air Wars. *The Wall Street Journal*, Monday, July 17, 2000.

and each participant is looking to smooth its own back-office operations along the way.⁹

To attract industry participation, the founders have invited all of their combined customers, suppliers, and competitors to join regardless of their size. Notes *The Wall Street Journal*:

Insiders on the project also point out that their effort to attract more big global partners is already well under way. For example executives close to the Zephyr project team say they have already begun approaching MyAircraft.com backers with overtures toward unifying these two exchanges. United Technologies' Mr. Bousbib says he can't confirm reports that the Boeing-led exchange is talking with MyAircraft.com, but also says, 'I can't discount them either.' ... And a spokesman for Daimler Chrysler Aerospace AG, the aerospace arm of Germany's Daimler-Chrysler AG that is helping form the new European Aeronautic Defense & Space Company confirms that Daimler Chrysler's leaders have held some serious talks with the B2B endeavor being led by Boeing and its partners.¹⁰

From these overtures, it appears that including all aerospace contractors and suppliers is the goal of the proposed exchange.

The Value Propositions

The exchange's value propositions for the initial founding stakeholders will be divided between the manufacturing and supply chain efficiencies gained and the value created by their equity ownership in the exchange. The exchange's ability to reduce search costs, reduce transaction costs and provide accurate and timely information will have an immediate impact on the entire supply chain. It will also have a dramatic effect on the participants production systems.

Through the exchange, a company like Boeing will be able to reduce the lead-time necessary to change its master production schedule because it can immediately broadcast its requirements to every tier-level of its supply chain. That will allow suppliers to rapidly change manufacturing schedules to meet fluctuating demand and reduce inventory levels. In 1999, the value of Boeing's inventory was \$6.5 billion, accounting for 41.6% of their current assets and 18% of their total assets.¹¹ Additionally, over \$2 billion of those inventories comprised commercial spare parts and general stock materials. Reduction of those levels is required for Boeing to meet its publicly stated goal of increasing inventory turns from the 1999 level of 2.9 to its long-term goal of 4.0.

It may also provide Boeing and its partners an opportunity to gain additional work by putting excess manufacturing capacity "for sale" on the exchange. For example, if Boeing has a parts plant facing a downturn due to temporary weak demand, it can offer the excess capacity on the exchange.

In addition to the value created by supply chain and production system efficiencies, the exchange will also create value through the ownership equity

⁹ Air Wars, 2000.

¹⁰ Air Wars, 2000.

¹¹ Boeing's 1999 Annual Report.

stakes. The exchange's initial public offering is expected to create instant value for the founding partners. These firms will also benefit from the collection of user fees and transaction-based fees.

The exchange will also create value for the exchange's customers. Customers will be able to lower their cost of doing business.¹² They can anticipate reduced procurement costs, lower prices due to a super-competitive pricing environment, and seamless information distribution. The customers also stand to benefit from the exchange's ability to standardize e-commerce activity within the industry and to further align industry with the customer's current e-commerce initiatives.

The supply side of the exchange should create tremendous opportunity for value creation as entirely new markets will be opened to companies that previously found them unavailable. This exchange will allow any supplier, regardless of size, to do business with anyone else. Buyers and sellers will have instant access to huge industrial concerns and governmental agencies on a global scale. In addition, the solicitation costs required to gain that access today, if access were even possible, will be at dramatically reduced.

The value created by the exchange for its founders, customers, and suppliers will obviously create value for the industry as a whole. Efficiencies created by exchange are expected to expand economic opportunity throughout this global industry. Increased productivity and reduced costs associated with these huge industries can conceivably support greater economic expansion without inflationary ramifications. It also will help these traditionally old-economy companies create value with new-economy assets.

Issues of Concern

To begin with, creating and executing the business plan is a monumental task. Despite the unanimous opinion of the participants that the exchange will be a huge commercial success, realizing benefits faces considerable obstacles.

Increased Competition. Many of Boeing's competitors are also eagerly eyeing the same electronic trove. In particular, three industry groups have announced their intention to operate trading exchanges, similar to the one proposed by Boeing and its allies. First, United Technologies Corp. and Honeywell International (a leader in airplane parts and avionics) are joining forces to launch an exchange called "MyAircraft.com." This exchange is expected to provide aerospace companies the opportunity to buy, sell and trade parts and services and better manage their supply chains. It is scheduled to begin operating mid-2000. Second, some of the world's largest airlines have their own plan to form a site trading in parts and fuel. Third, AAR Corp., a parts-inventory management company, and Sita, a Swiss communications cooperative, recently announced the formation of Aerospan.com, a portal that intends to provide parts and other services. This venture is scheduled to begin operating in the third quarter of 2000.

¹² The founders of the exchange will reap these benefits as well because they will be major customers of the exchange.

In addition to these proposed exchanges by industry veterans, a swirl of new dot-coms has already entered the industry. One such new entrant is PartsBase.com. This online provider of e-commerce services for the aerospace industry claims the following:

Our global e-marketplace provides a means for our over 18,000 members in more than 125 countries to buy and sell new, used and overhauled aviation parts, perform auctions, look for a job or employee, and sell aircraft in an efficient, competitive, and cost-effective manner. We estimate that our e-marketplace utilizes a database of approximately 2,100 suppliers and over 28 million line items of inventory, which we believe constitutes one of the largest independent databases of inventory and information in the aerospace industry. Current members of our e-commerce marketplace include Boeing, Honeywell, Federal Express, Pratt & Whitney, Northrup Grumman Aviation and United Parcel Service.¹³

This growing competition, however, should not be a major concern according to Ms. Williams, a Yankee Group analyst: "I am not sure that any one exchange would be broad enough to help everybody get what they want. ... There are going to be a lot of niche exchanges."

Mr. Anil Shrikhande, the new-ventures chief for Boeing, appears less concerned with this growing competition. He notes that if the exchange proposed by Boeing and its partners is seen as open, neutral trading table it 'will start to have a certain gravitational pull' encouraging other such ventures to join or at least offer linkage to their own sites.

Maintaining Neutrality. Another important issue facing the exchange founders is whether they can maintain 'true' neutrality, real or perceived. *The Wall Street Journal* notes:

A problem for big companies in particular may be the perception that they have mostly their owners' interest at heart. ... [Although] each new enterprise backed by a widely recognized manufacturer is taking pains to pronounce its neutrality, but analysts and some entrepreneurs suggest that may not be good enough for some buyers.

Until proven otherwise, there will likely be concern that these companies have formed an alliance to create benefits for themselves at the expense of other industry participants. Should the exchange fail to achieve sufficient market liquidity, then the benefits of the exchange would be severely compromised. Such an occurrence could leave the founding companies with large infrastructures set up to support the e-commerce concerns that are no longer economically justified.

Additionally, some with vested interests in the industry note that Airlines may be wary of the proposed exchange. For example, Hal Christian, senior vice president of marketing and business development in Chicago with Aerospan.com (a competitor to Boeing's proposed exchange) observes: "The airlines have had pricing issues with OEMs for a while, and I don't know if they're going to be able to trust these big companies with their transaction data." Mr. Siegel, an

¹³ <http://www.partsbase.com>

executive with PartsBase.com's, expresses similar concerns: "Buyers are concerned that manufacturers could try to control the pricing of certain components, or could use data from transactions for other competitive aims. ... If an OEM owns 30% or 40% of a venture, is it totally neutral?"

Anti-Trust Violations. There is also a possibility that the exchange could fall under the wary eye of the U.S. Justice Department's Federal Trade Commission (FTC). Randy Covill, senior analyst AMR Research, notes:

Aside from mollifying buyers, the big manufacturers will have one very important reason to convince onlookers that their operations are neutral and fair. ... [T]he government will be watching for any appearance of collusion or price fixing.

The FTC, for instance, is already investigating the new on-line automotive exchange mentioned earlier for anti-trust violations. Commenting on this investigation, Bert Foer, a former assistant director of the FTC's Bureau of Competition, observes:

The main concern over such exchanges is that they could ultimately deter competition by controlling pricing. ... While the venture is supposedly open to all comers, members may end up being charged inordinately high prices and commissions that will eventually return to the Big Three as profits. The upshot would be that those who participate in the marketplace -- but do not share in the ownership -- will not share in profits despite having created them.¹⁴

Additionally, the sheer magnitude of the exchanges could define them as monopolies, which could lead to new regulations curbing their influence. This could then lead to new legislation that might affect the entire B2B marketplace or the Internet as a whole. Potential new regulations and business practice restrictions could increase the cost of operating these exchanges and render their business model ineffective.

Taxation. The issue of taxation must also be addressed when looking at potential problem areas for the exchanges. The B2C market place is currently facing the issue of taxing Internet purchases. The problem may become significantly more complex when one begins to add not only state-to-state transactions, but governmental and international transactions as well. The exchanges will have to navigate a maze of national sovereignty issues, business practices, and different cultural aspects before they are able to determine an appropriate resolution to the taxation problem.

Security and Fraud. The scale of the exchange brings with it massive data security and fraud concerns. To realize the biggest gains from the exchange, companies will need to expose their procurement, accounting and financial systems to the Internet. The B2C marketplace is already dealing with privacy and fraud issues. However, as previously mentioned, the B2B space is expected to be over 10 times larger. One could only speculate about the implications of someone hacking into the exchange and stealing the corporate charge accounts numbers from Boeing or Lockheed Martin or others.

¹⁴ <http://www.ecommercetimes.com/news/articles2000/000329-1.shtml>

Reliance on Commerce One. Finally, the bulk of the technical work will fall upon Commerce One, which has signed mega-deals with other industry leaders to create similar exchanges. There is on going concern in the industry that Commerce One could run up against significant resource constraints while trying to accomplish this tremendous workload. Analysts ask: Are there enough qualified people out there to design, test, implement, and support the level of activity not only in the B2B market? This question remains to be answered.

The Global Aerospace & Defense Trading Exchange faces many hurdles in the near future, and its success is far from guaranteed.

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Appendix - Selected 1999 Summary Financial Data
(\$millions), except per share

	Boeing	Raytheon	Lockhead- Martin	BAE Systems*	Commerce One
Sales	\$57,993	\$19,841		\$10,564	\$33.56
Cost of Sales	\$51,320	\$16,256		\$9,791	\$16.07
Net Income	\$2,309	\$404		\$486	(\$63.32)
Assets	\$36,147	\$28,110		\$13,778	\$384.61
Inventory	\$6,539	\$1,950		\$12,798	N/A
Property, Plant & Equipment.	\$8,245	\$2,417		Included w/Inventory	\$11.89
Earn/Share	\$2.52	\$1.19		\$23.6	(\$1.01)

* Converted @ 1.00 GBP = \$1.50