JSF International Industrial Participation:

A Study of Country Approaches and Financial Impacts on Foreign Suppliers

June 2003

This report and all appendices can be viewed online and downloaded at:

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This report was produced by the Office of the Deputy Under Secretary of Defense (Industrial Policy) from March - June 2003. Michael Caccuitto and Dawn Vehmeier, Industrial Base Transformation Directorate in the Office of the Deputy Under Secretary, led this effort. Rosemary Carpenter, Victor Ciardello, and Cara Negrette of the Industrial Policy staff also had major roles in the production of this report. Support was provided under contract by First Equity Development, Inc. Among others, special thanks are due to Joshua Krotec, Matthew Mejía, and David Cohen of First Equity for their important contributions.

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Companies listed or mentioned in this report are representative; the list is not exhaustive. Inclusion or exclusion in the report does not imply future business opportunities with or endorsement by DoD. Inquiries regarding the report should be directed to Michael Caccuitto at (703) 607-4065 or Dawn Vehmeier at (703) 602-4322.

INTERNATIONAL INDUSTRIAL PARTICIPATION:
A STUDY OF COUNTRY APPROACHES AND FINANCIAL IMPACTS ON FOREIGN SUPPLIERS

OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE
(INDUSTRIAL POLICY)

JUNE 2003

STUDY OBJECTIVES/METHODOLOGY

Provide a preliminary assessment of partner country strategies and the financial impact on their defense industrial base of the Joint Strike Fighter (JSF) program.

Use comprehensive case studies of partner country governments and major industrial suppliers to characterize financial effects of JSF for representative companies in order to assess the likely return on investment.

- UK, Canada, Italy, and Netherlands were selected for in-depth assessment based on their level of partnership and/or the maturity of their industrial linkages.
- Norway, Denmark, Australia, and Turkey were examined on a more prospective basis to illuminate their approaches and earnings potential from participation in the program.

Document “lessons learned” for JSF and other programs to capitalize and improve upon the success of JSF’s revolutionary acquisition strategy.

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Joint Strike Fighter (JSF) program was conceived as an international acquisition program in order to attract financial investment and technological innovation from partner countries, as well as to partner early with governments whose military Services were likely users of this state-of-the-art coalition forces platform.

This study was produced to provide an initial assessment of the international acquisition strategy of the program. While it has only been about a year and a half since the October 2001 award of the System Design and Development (SDD) contract to the Lockheed Martin/Northrop Grumman/BAE Systems contracting team, for number of reasons we chose to do an initial assessment now.

First, we believe that enough time has elapsed to do a "first look" at the strategies partner countries have adopted in the face of the industrial and economic opportunities which this program's acquisition strategy presents. Second, we feel that our findings could lead to refinements in the program acquisition strategy, approaches taken by individual partner countries, or companies – or all three. Third, we hope that this study may help prospective JSF partner countries and companies forge more robust accession strategies for this program and its opportunities for coalition warfare and financial return. Finally, many of the largest programs moving toward production in this Administration provide for international industrial participation to help our war fighters get the best of what the global defense industrial base has to offer. As such, some of the early lessons learned in JSF may help programs such as Missile Defense, Future Combat System, Littoral Combat Ship, the Multi-Mission Maritime Aircraft, and Deepwater optimize their own international acquisition strategies.

This report is based on comprehensive case studies of partner country governments and major industrial suppliers. We used standardized engagement questionnaires to conduct inquiries and guide the collection of data to support uniform development of findings and conclusions. We selected the UK, Italy, Netherlands, and Canada for in-depth assessment based on their level of partnership or the maturity of their industrial linkages. We examined Australia, Denmark, Norway, and Turkey in a more abbreviated fashion to characterize their approaches and plans for the road ahead.

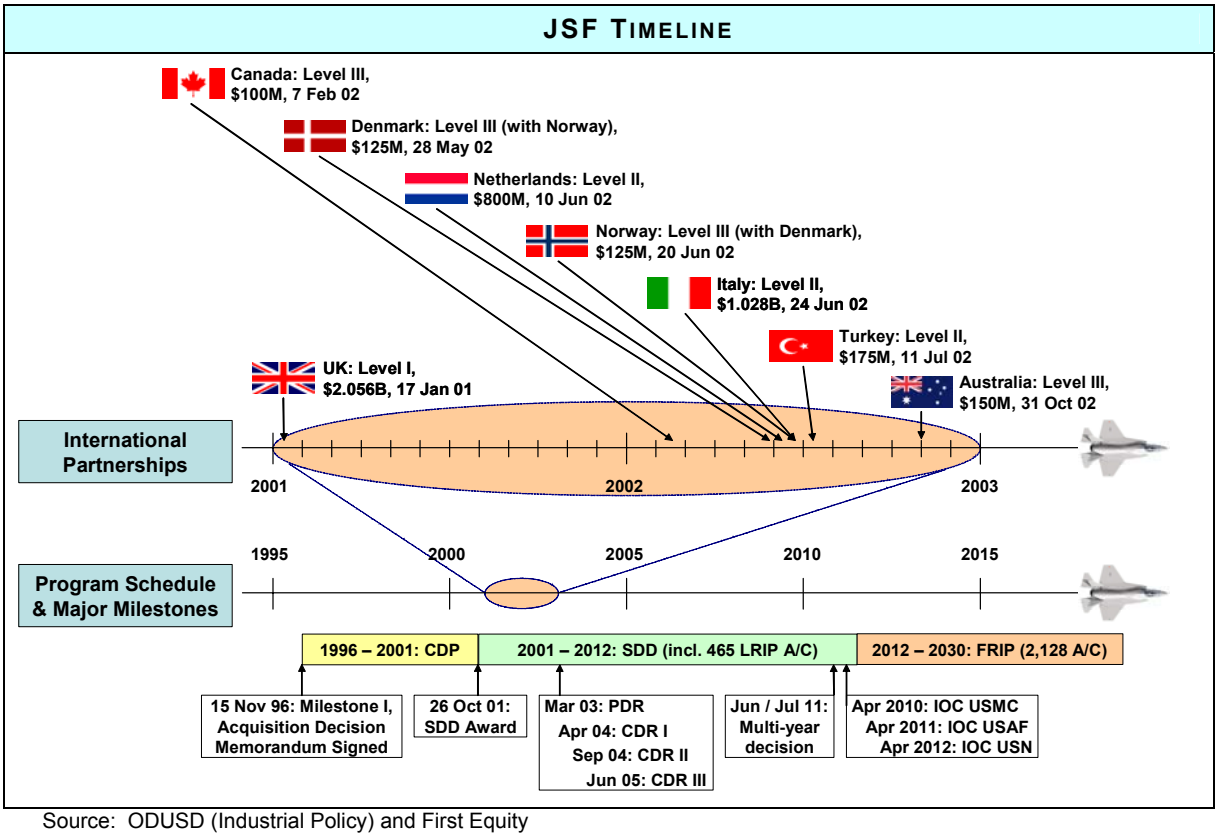
The primary objectives of this study are to: 1) assess the various approaches of partner countries to the JSF program, 2) characterize the financial impact of the JSF development and baseline procurement programs on selected international suppliers, and 3) estimate a country-level financial impact and return on investment for the four most mature partner countries.

FINANCIAL SUMMARY

Conceived in the late 1990s, the international aspect of the JSF's acquisition strategy has had important successes. Eight partner countries collectively have invested about $4.5 billion in the program to date, 18% of total SDD funding. The United Kingdom has made a commitment to purchase the aircraft while many partner countries are well advanced in their deliberative process. The program's engine has been much

enhanced by the joint research and development work done on the Short Take-Off and Vertical Landing (STOVL) variant by Rolls Royce. JSF has also benefited from transformational new suppliers with innovative technologies such as Ultra Electronics and their High Pressure Pure Air Generator (HiPPAG) pneumatic weapon ejection technology that eliminates the need to replace and recharge gas bottles, provides direct support to air-to-air missiles, and decreases aircraft turnaround time. Contract award examples testify to the breadth of industrial base participation: Rolls Royce, a venerable blue chip of the global defense industrial base; and a Canadian company which grew from 12 to 15 employees to produce innovative semiconductor chips for JSF.

With the approval of the SDD contract in October 2001, the opportunities for the companies of the partner countries to participate in this program should only increase with many SDD contracts yet to be awarded – JSF timeline below.



Source: ODUSD (Industrial Policy) and First Equity

It is important to remember that we are only 18 months into a program that will span well into the third decade of this century. For many of the companies in partner countries, the most lucrative bidding opportunities may be closer to the aircraft's in-service date, when flight training, maintenance, and logistics systems requirements will better leverage, for example, software development expertise. Even farther in the future, as partner countries and other nations acquire JSF, follow-on support activities and the prospect of revenues from future export sales should exert a compounding effect on current earnings estimates.

EXECUTIVE SUMMARY

Focusing solely on revenues to be derived from SDD, LRIP, and FRP contracts, and assuming no further production beyond the current baseline US/UK procurement schedule of 2,593 aircraft, estimated potential JSF-related revenues are significant. They range from about $4 billion to $40 billion for the United Kingdom, Italy, the Netherlands, and Canada. Based on margin assumptions, program earnings for these four countries range from over $500 million to several billion dollars through 2026.

SUMMARY OF COUNTRY FINANCIAL IMPACT

Summary (US$M)	Revenues 2002-2011	Revenues 2012-2026	Earnings Before Interest & Taxes 2002-2011	Earnings Before Interest & Taxes 2012-2026	EBIT Margin Assumption
United Kingdom	$11,749.6	$31,706.9	$956.1	$2,723.8	8.5%
Italy	942.5	3,953.9	100.6	438.0	11.0%
The Netherlands	1,275.0	4,466.7	133.8	464.5	10.4%
Canada	1,093.8	2,817.0	110.2	384.0	12.6%

Source: ODUSD(Industrial Policy) and First Equity
Methodology discussion in Appendix A

We estimate that the annually-compounded return from the partners' SDD investments range from 25% to over 100%. In other words, JSF partner countries will potentially earn between approximately $5 and $40 of revenue in return for every $1.00 invested into the program, as shown below. While Canada's dollar-for-dollar return is nearly twice that of the UK, due to their relatively small partnership investment, the UK's annually-compounded rate of return is much higher due to the earlier timing of industrial revenues.

SUMMARY OF PARTNER COUNTRY RETURN POTENTIAL

Summary (US$M)	SDD - FRP Revenues 2002-2026	Partnership Investment 2002-2026	Nominal Return 2002-2026	Annually Compounded Rate of Return 2002-2026
United Kingdom	$43,456.5	$2,056.0	**2113.6%**	109.2%
Italy	4,896.4	1,028.0	**476.3%**	23.8%
The Netherlands	5,741.7	800.0	**717.7%**	38.1%
Canada	3,910.8	95.0 [1]	**4116.6%** [2]	66.7% [3]

Source: ODUSD(Industrial Policy) and First Equity
Methodology discussion in Appendix A

[1] Canada received a $5 million discount from its $100 million commitment due to early payment of participation investment
[2] Disproportionately high relative to UK due to dramatically lower participation investment
[3] Canada's annually compounded rate of return is low relative to the UK because of compounding effects from early revenues in the UK program

EXECUTIVE SUMMARY

COUNTRY STRATEGIES AND CONCERNS

Our assessment of the financial earnings impact on partner country companies and on the overall investment return potential for partner countries has shown a notable correlation – between multiple contracts/high financial return potential and early, active, and far-reaching government involvement in structuring an in-country industrial strategy for the program. While the U.K. may have been expected to generate high returns based on its involvement in the program's R&D phase, Canada's approach to the program certainly helped it assure the 60-70% annually-compounded rate of return currently anticipated from the program.

Canada created an interagency group to administer the JSF program that has important features that other countries' similar organizations do not, such as the proactive identification of JSF requirements and bidding opportunities, the fact that they worked to match Canadian industrial capabilities with these requirements, and the team's outreach initiatives to other international partner countries. Canadian government and industry expended significant resources to compete within the best value sourcing model and relied heavily upon the best value concept when promoting JSF participation to the Canadian government. As such, Canada does not want to see the credibility of the best value model damaged due to the inability of certain partner countries to effectively compete in this environment.

Canada also made available funds from which companies interested in participating in the JSF program can borrow a portion of their development costs. Canada is the only country that has complete control of these industrial funds. The pool of $75 million set aside for loans is not only larger than any of the other partner countries, but its distribution is solely at Canada's discretion. Italy, The Netherlands, Norway, Denmark, and Turkey have bilaterally controlled funding available totaling approximately $100-150 million.

Another feature that made a difference in the amount of support the program had from the government and industry was the extent to which partner countries were committed to purchasing JSF for their own forces. Countries committed to purchasing the aircraft for themselves have greater incentive in helping to market the aircraft elsewhere for reasons of investment recoupment via price reduction, return levies from non-partner sales, and larger incremental revenues for their participating companies. In addition, in the cases where a mix of JSF and Eurofighter aircraft are envisioned, countries with clear plans such as Italy were better able to "referee" industrial interests attached to the two platforms. Finally, in these countries, the government, the military services, and the industry were able to most effectively lobby their parliamentary bodies on behalf of the program. That said, the program is still bedeviled by the spoiler strategies of industrial interests that would be better served by purchases of the Eurofighter – which has made for something less than a level playing field for the JSF program.

SUMMARY COUNTRY STRATEGIES AND CONCERNS

Countries	Primary Motive behind SDD Participation	Major Key to Government Approach to JSF Program	Main Concerns with JSF Program
United Kingdom	Operational Requirement	Early Commitment to JSF Program	Delayed information disclosure
Italy	Operational Requirement	Worked with Lockheed Martin to develop industry support	US contracting practices unfamiliar, Lengthy TAA approvals
The Netherlands	Industrial Benefit	"Public - Private Partnership"	US sub-tiers unwilling to source work to global suppliers, Lengthy TAA approvals
Canada	Industrial Benefit	Pro-active "JSF Canada" organization	"Strategic Sourcing"
Norway	Industrial Benefit	Teaming with other partner countries to increase competitiveness	US top tier contractors favor established suppliers
Denmark	Operational Requirement	Liaison between Danish industry and Lockheed Martin and sub-contractors	Large companies often absorb upfront development costs
Australia	Operational Requirement	Government liason between Austalian industry and progam IPTs	Export regulations - TAAs and GPA
Turkey	Industrial Benefit	MoD liason between industry and Lockheed Martin	Lack of communication

Source: ODUSD (Industrial Policy) and First Equity

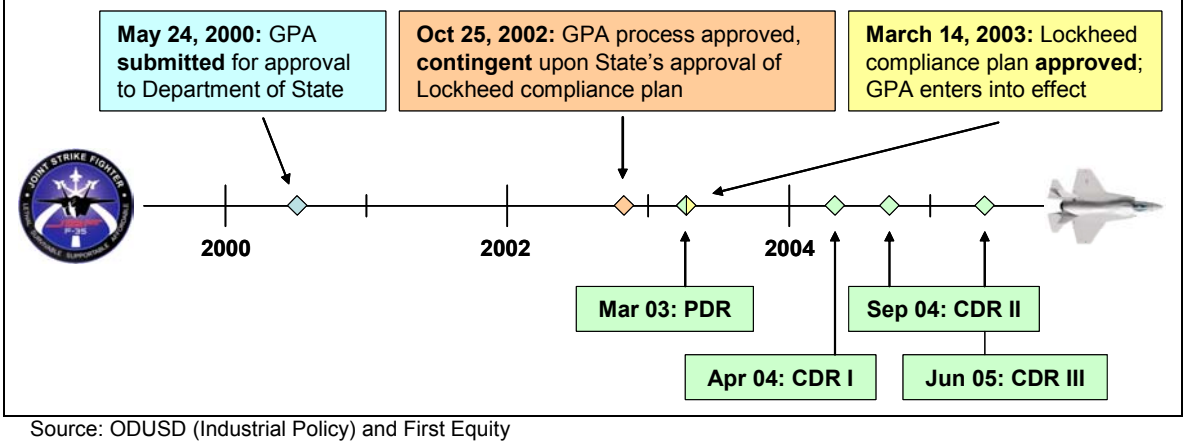
An interesting paradox worth noting is the fact that the UK and Canada and their industries have, to date, been the most successful JSF partners despite the fact that they neither procured Lockheed's F-16, nor leveraged any industrial connections from F-16 procurement. This leads one to question the industrial effectiveness of designated, short-term work arrangements which did not lead to commensurate industrial success in F-16 countries.

However, by all partner country accounts, the single most important factor to de-level the playing field has been the lateness and ineffectiveness of the Global Project Authorization (GPA). This had the greatest impact on those suppliers that did not have well-established relationships pre-existing with US primes and first-tier suppliers. Even Canada's statutory advantage of exemption from some US International Traffic in Arms

Regulations (ITAR) did not eliminate their need for Technical Assistance Agreements (TAAs). Export control issues have plagued virtually all of the JSF international partners. As the table below shows, the GPA request was initially submitted by Lockheed in March 2000 in order to facilitate the transfer of technical information. It took over two years for the GPA process to be approved, owing to internal government negotiations regarding sensitive technology areas. It then took a further year and a half until, in March 2003, the associated Lockheed compliance plan was approved and the GPA entered into effect.

GLOBAL PROJECT AUTHORIZATION (GPA) DESCRIPTION AND TIMELINE

GPA licenses are **intended to reduce the number of authorizations** governments must seek to perform activities in furtherance of government-to-government international agreements or Memorandums of Understanding (MOUs) concluded between the governments or DoD and a foreign Ministry of Defense to carry out cooperative programs for research and development, including test and evaluation of defense systems and technologies or cooperative production.



Source: ODUSD (Industrial Policy) and First Equity

As a consequence, valuable time between the SDD decision in October 2001 and spring 2003 was lost for partner countries and companies to craft strategies based on full insight of the broad array of classified and unclassified program opportunities available. Indeed, some of the partner countries and companies maintain that the GPA was rendered so restrictive that it is almost meaningless and countries would have done better to craft individual TAAs on technologies where they thought their companies might make a relevant contribution. Most notably, few countries took advantage of the bid and proposal exemption, an effort initiated by the JSF Joint Program Office (JPO) to help alleviate the necessity for TAAs during the Concept Development Phase (CDP), and later extended through March 2004. This exemption does not appear to be a widely known or used mechanism.

CONCLUSION

It is important to remember that industrial participation opportunities on JSF, and indeed on other major US defense programs, will continue to become available as these programs mature. It is also important to remind ourselves of the incalculable benefits of coalition warfare where multinational war fighters use the same platform, tactics, and

operational concepts. We must also not forget the technological innovation available in the global industrial base. While these contributions have historically been modest relative to overall program value,[4] there are two conclusions reached again and again by our industrial base assessments: first, innovation typically comes from smaller, second- and third-tier suppliers of the scale of many of our partner country companies and second, the US does not have the global monopoly on good ideas.[5]

As the study indicates, the JSF program and its new international acquisition strategy are works in progress and provide insightful lessons learned for future international programs. If we stay the course with minor rudder adjustments, JSF will provide great benefits to the US and global defense industrial base and war fighters alike. Not to do so would undermine US credibility in the global market place and among our important friends and allies.

[4] Study on Impact of Foreign Sourcing of Systems, October 2001 (Required by Section 831 of the National Defense Authorization Act for Fiscal Year 2001) concluded that foreign subcontracts represented less than 2% of the dollar value of all subcontracts for the programs studied (Apache helicopter upgrade program, F/A-18E/F aircraft, M1A2 Abrams tank system enhancement package, Advanced Medium Range Air-to-Air Missile, Patriot missile ground system, Longbow Hellfire missile, Joint Direct Attack Munition, and Advanced Amphibious Assault Vehicle.

[5] Space Research and Development Industrial Base Study Phase Two Final Report (Booz-Allen & Hamilton) indicated that 26% of all space innovation would derive from foreign sources.

JSF PROGRAM OVERVIEW

JSF PROGRAM OVERVIEW

The Joint Strike Fighter (JSF) program is the largest development and procurement program in US, or for that matter, world history. With a planned current procurement volume of over 2,500 aircraft and a programmed cost of over $200 billion, this program is not only critical to US and partner countries' future force structures and military capabilities, but is also critical to the health of the international defense industrial base.

On October 26, 2001, the Department of Defense (DoD) selected Lockheed Martin as the winner of the JSF downselect to proceed into SDD. The first SDD aircraft will fly in October 2005 (Conventional Take-Off and Landing (CTOL) variant). The first of six Low Rate Initial Production (LRIP) lots is scheduled to begin production in late FY 2006, with delivery of the first operational JSF in 2008. LRIP Lot I will be for 10 aircraft with successive quantity increases to 168 aircraft in Lot VI. A total of 465 aircraft will be delivered by the end of SDD – a span of about 10½ years. Procurement is planned to continue through 2026 and possibly beyond. JSF aircraft may well stay in service until 2060 or longer.

Many major system-level suppliers have been selected for the SDD phase. However, there is still significant opportunity for suppliers to win work on the program – sources for many important subsystems are yet to be selected. In all, 55% of the total value of the JSF work in the SDD phase will be subcontracted. A further 15% is expected to be subcontracted once the fighter goes into production.

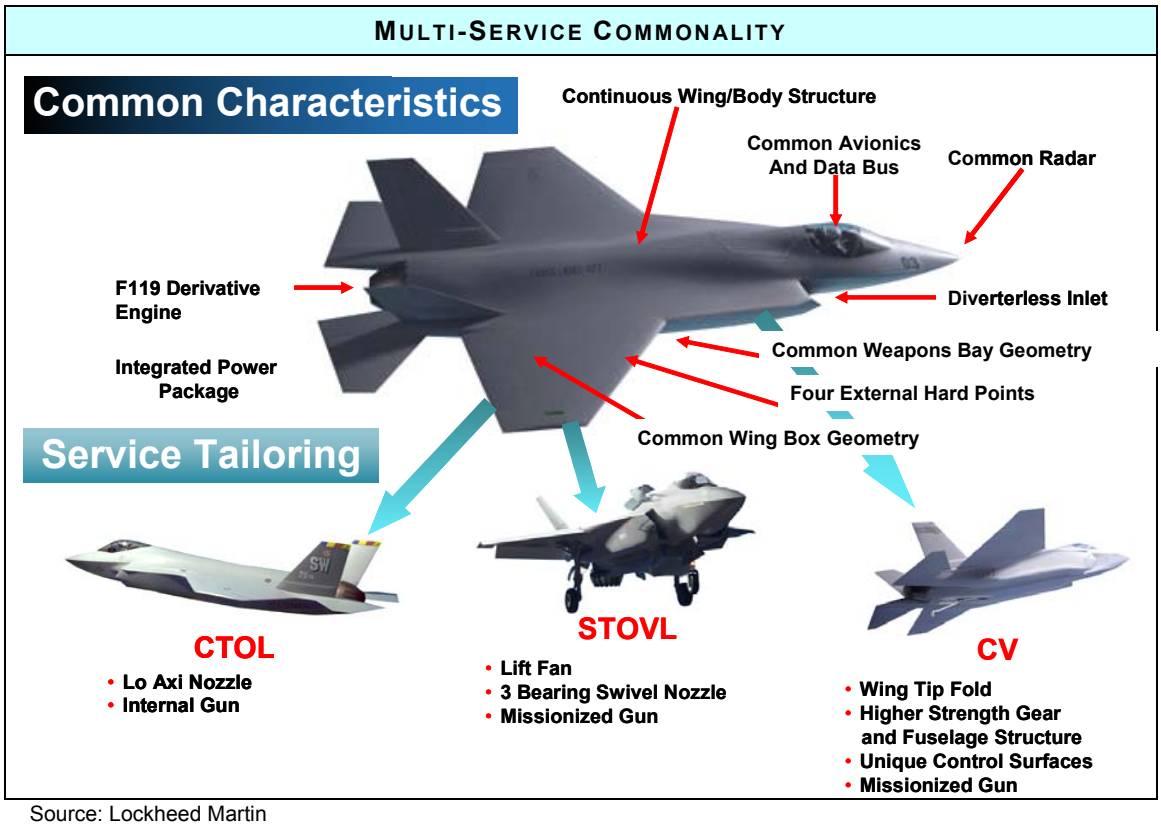
JSF is a single-seat, supersonic aircraft, incorporating stealth technology, capable of performing multi-role operations from both sea and land. As many as 2,593 aircraft are currently programmed for the US and UK. The JSF will be the first aircraft to put stealth into the multi-role environment. JSF aircraft will be able to carry the usual range of air-to-air and air-to-ground munitions, including Joint Direct Attack Munitions (JDAMs), Joint Standoff Weapons (JSOWs), and AIM-120 AMRAAMs. An internal weapons bay will preserve stealth characteristics.

A NEW PARADIGM

While JSF is accomplishing many technological firsts, perhaps the more important story is the programmatic firsts that may very well make the JSF program a model for future joint and multinational acquisitions. The program was structured from the beginning to be a model of acquisition reform, with an emphasis on: jointness, affordability, an international interchangeable engine, international participation, and "best value" acquisition.

Jointness

Three JSF variants will be produced as a highly-common family of aircraft for the US Navy, Air Force, Marine Corps, and partners. The Carrier Variant (CV) will provide the Navy with a multi-role, stealthy strike fighter aircraft to complement the F/A-18E/F. The Short Take-Off and Vertical Landing (STOVL) variant will provide a multi-role strike



Source: Lockheed Martin

fighter to replace the Marine Corps AV-8B and F/A-18A/C/D. The US Navy/Marine Corps planned buy of Carrier Variant (CV) and STOVL is 680. The CTOL will provide the Air Force with a multi-role aircraft, primary air-to-ground, to replace the F-16 and A-10 and to complement the F-22 Raptor air superiority fighter – a planned buy of 1,763 aircraft.

JSF is also a strong contender to meet the UK's need for a future strike fighter aircraft to replace the Sea Harrier and the Harrier GR7/T10 aircraft operated by the Royal Navy and Royal Air Force. The UK planned buy is 150 aircraft. Many other international customers are also interested in JSF to replace their various strike and multi-role fighter aircraft, with particular interest in the CTOL and STOVL variants.

Among all of the Level 2 and 3 international partners, Italy is most committed in principle to its decision to replace the Tornado and AMX for ground attack roles, and Harriers for naval defense roles with a buy of up to 150 JSF aircraft. The Netherlands is considering an F-16A/B replacement for NATO close-air support and could buy up to 85 JSFs, most likely the CTOL variant. Canada is evaluating JSF as a potential conventional multi-role replacement for their CF-18A/Bs. Other prospective customers include Norway, Denmark, Turkey, Australia, Singapore, and Israel – many of whom plan to replace existing F-16 fleets. While a direct comparison cannot be made, it is expected that many of the 24 countries who bought more than 4,200 F-16 aircraft could be future customers of JSF.

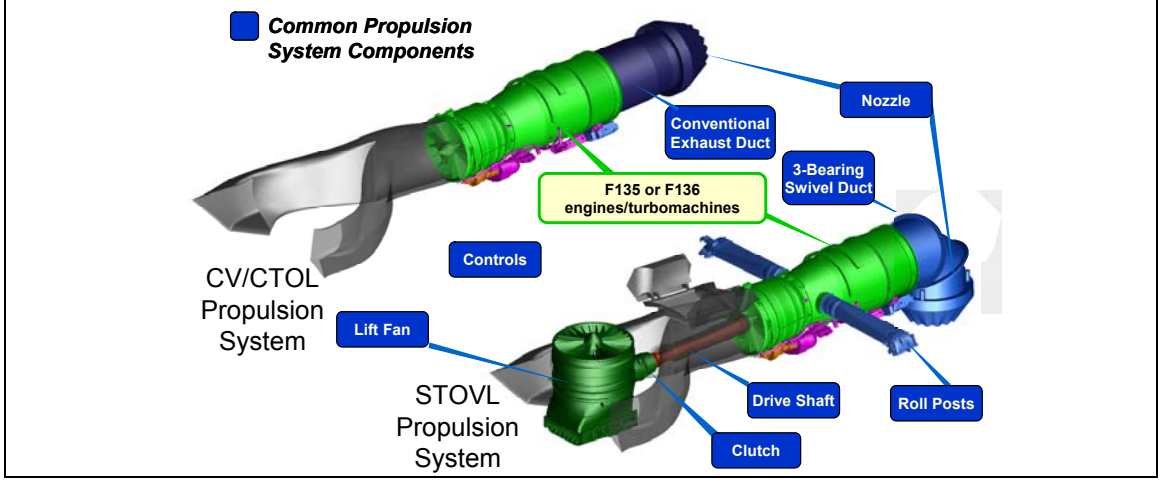
Affordability

The cornerstone of the JSF program is affordability – reducing the development cost, production cost, and cost of ownership. JSF is accomplishing this objective through an evolutionary requirements definition process based on early and extensive cost and performance trades, maturing and demonstrating technology prior to the SDD phase, competitive procurement of subsystems from a global supplier base, and flying concept demonstrator aircraft.

International Interchangeable Engine

Two engine sources are being developed and will compete in the production phase. The General Electric and Pratt & Whitney engines will be physically and functionally interchangeable in order to minimize development and support costs. Pratt & Whitney powered the JSF in CDP and leads the way in SDD and will power LRIP lots 1-5. Pratt & Whitney is also the lead propulsion system integrator for SDD.

INTERNATIONAL INTERCHANGEABLE ENGINE



Source: Lockheed Martin

The power plant competition starts in 2011 and is slated to continue through the life of the program. The winning engines for each lot will be supplied to Lockheed Martin as Government Furnished Equipment. Additionally, international customers have their choice of engines – a commercial best practice concept.

International Participation

The UK became the only Level I partner on the program. Denmark, Norway, the Netherlands, Canada, Australia, Turkey and Italy signed

"Our suppliers are working with [foreign companies] and we're going to make sure [partner countries] get the return on their initial investment that they expect to get as a part of this program."
- *Tom Burbage*
April 21, 2003

Memoranda of Understanding (MOUs) becoming Level 2 and 3 SDD partners during 2002. Singapore and Israel are currently in preliminary discussions to join the program as Security Cooperation Participants.

"Best Value" Acquisition

Another new feature of the JSF acquisition strategy is to facilitate the selection of foreign suppliers for production of all aircraft via a "best value" or "best athlete" approach rather than by traditional offset arrangements. Offset programs are largely limited to short, build-to-print production runs for a limited quantity of aircraft. Typically, due to the inefficiency of this process, they result in increased program price to the customer.

The best value approach requires industrial partners, whether international or domestic, to qualify for participation through demonstration of world-class products and technologies representing cost advantages to the program. Once Lockheed Martin and its top-tier partners have chosen a supplier, they will pursue sole source contracts with these companies based on schedule, performance and cost benchmarks. If the suppliers do not meet these benchmarks, they open themselves to re-competition.

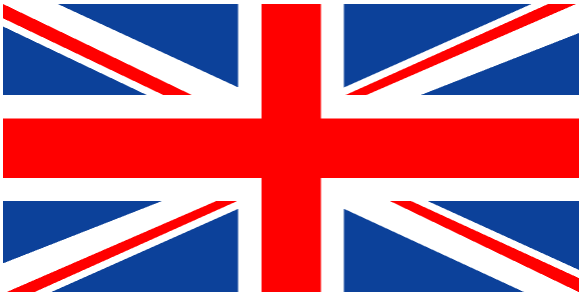
In addition, Lockheed Martin has developed the Strategic Best Value Sourcing (SBVS) Plan – a limited number of air system work packages designated to supplement the industrial opportunities/awards through best value competition. Production MOUs will be generated by Lockheed Martin for these work packages with targeted companies to attain industrial participation on the JSF program. If the targeted company cannot complete the work for the pre-determined cost goal, the work will then be fully competed. Although an apparent compromise between directed workshare and a full-and-open competition, SBVS promises to strengthen international partnerships and expand industrial participation.

IMPORTANCE TO DOMESTIC AND GLOBAL INDUSTRIAL BASE

The JSF program, with its sheer size and global reach is critically important to the worldwide defense industrial base. Companies that are on the team are in a good position to retain their single source positions on the program and enhance their competitiveness – assuming schedule and cost goals are met and maintained. Those that are not JSF suppliers may see their tactical aircraft business dissipate as JSF comes to dominate the market for tactical aircraft.

For many firms, the JSF program stands to represent a significant percentage of future business. The program also offers opportunities for additional financial return from partner and non-partner country sales, recoupment for level 1 and 2 partner country JSF purchases, price levies on non-partner country sales, associated logistics and training, and spin off technologies or sales. Thus, for many of the JSF companies and some of their respective countries' defense industrial bases, this $200+ billion dollar

program could be the most important driver of financial success well into this century. In addition, the access that this program will provide foreign countries into the business base of major US defense primes, subcontractors, and other program opportunities is incalculable.



UNITED KINGDOM

DETAILED CASE STUDY

Key Features of Government Approach:

- *Royal Air Force/Navy operational requirements are the key reason for JSF participation*
- *Early involvement in program has helped UK firms gain entry to the program*
- *UK government and industry are committed to best value strategy—government trusts industry to fight for work while it acts to ensure a "level playing field"*

Concerns:

- *Lack of disclosure of technical information has potential to limit industrial competitiveness*
- *International nature of JSF exposes UK to potential risks, particularly cost impacts of US reprogramming or Congressional intervention via "Buy-America" legislation*

Financial Impact:

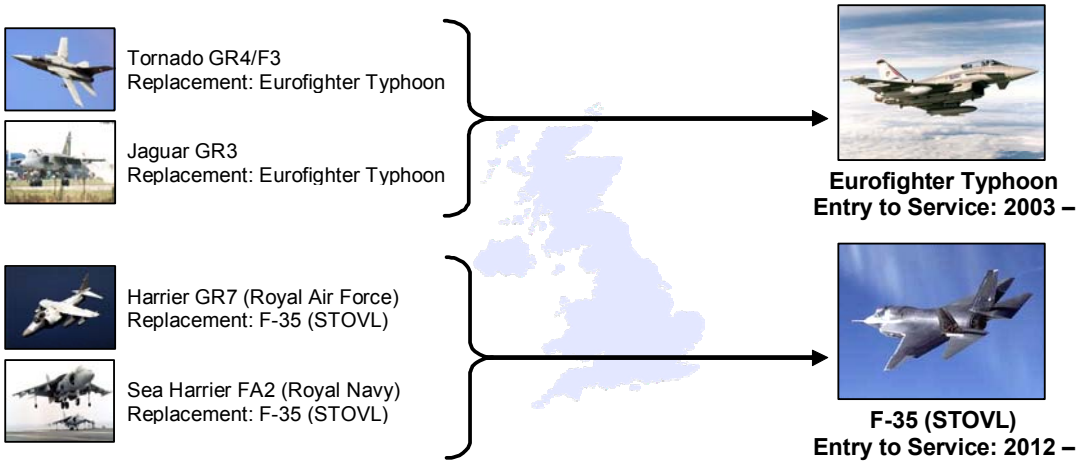
- *Incremental earnings attributable to JSF work will likely run well into the billions of US dollars over the life of the program bringing great vitality to UK industry*
- *Nominal return on investment is likely to be very high, perhaps exceeding 21 dollars for every dollar of direct program investment over the life of the program*

KEY FEATURES OF GOVERNMENT APPROACH

Motives behind JSF Systems Design and Development Participation

In the late 1980's, anticipated future operational requirements of the Royal Navy drove the United Kingdom to seek a replacement for the aging Sea Harrier. Studies with the US to improve Advanced Short Take-off and Vertical Landing (ASTOVL) technology led to the Common Affordable Lightweight Fighter (CALF) program in the early 1990's, which further developed into the Joint Affordable Strike Technology (JAST) program and finally, JSF in 1996.

UNITED KINGDOM – PLANNED TACTICAL FIGHTER FLEET EVOLUTION



Source: First Equity

UNITED KINGDOM – JSF PROGRAM SUMMARY

United Kingdom

JSF Program Participation Summary

Partnership Level:	I
SDD MOU signing date:	17 January 2001
Value of CDP funding:	US$200 million
Value of SDD funding:	US$2.056 billion

Primary Reasons for Participation

1. To meet operational requirements of RAF and Royal Navy
2. To achieve operational commonality with United States
3. To achieve an affordable Air System through economies of scale

Current Tactical Fighter Fleet

Type:	Harrier GR7 / Sea Harrier FA2
Prime Contractor:	BAE Systems
Procurement Dates:	1990 - 1993
Number in Fleet:	96
Typical Deployment:	Ground Attack / Naval Defense (STOVL)
Planned Retirement:	Exact dates as yet undecided

Type:	Tornado GR4/F3
Prime Contractor:	Panavia Consortium
Procurement Dates:	1980 - 1990
Number in Fleet:	224
Typical Deployment:	Ground Attack (GR4); Air Superiority (F3)
Planned Retirement:	Dependant on Eurofighter deliveries

Type:	Jaguar GR3
Prime Contractor:	Sepecat Consortium
Procurement Dates:	From 1973
Number in Fleet:	52
Typical Deployment:	Ground Attack; Reconnaissance
Planned Retirement:	Dependant on Eurofighter deliveries

Source: First Equity

In 1998, the Strategic Defense Review concluded that the Royal Air Force (RAF) Harrier fleet should merge with that of the Royal Navy (RN) and that the joint aircraft should operate from carriers. This followed 1995 US Congressional direction that the US DoD combine USMC AV-8B replacement, USAF F-16 and USN A-6 replacement into a single platform with high commonality. The aggregation of UK RN and RAF requirements increased the overall size of its future procurement requirement and meant that both the CV and STOVL variants of JSF could be considered. In September of 2002, the Ministry of Defence selected the STOVL over the CV variant. The UK also has a program underway to address long-term needs for deep strike capability: the Future Offensive Air Systems program. Under consideration for this requirement are standoff missiles, unmanned

"Collaboration is a central plank of UK defense and procurement policy...and JSF is a great example of this."
- Ken Furber, Joint Combat Aircraft Office, UK DPA

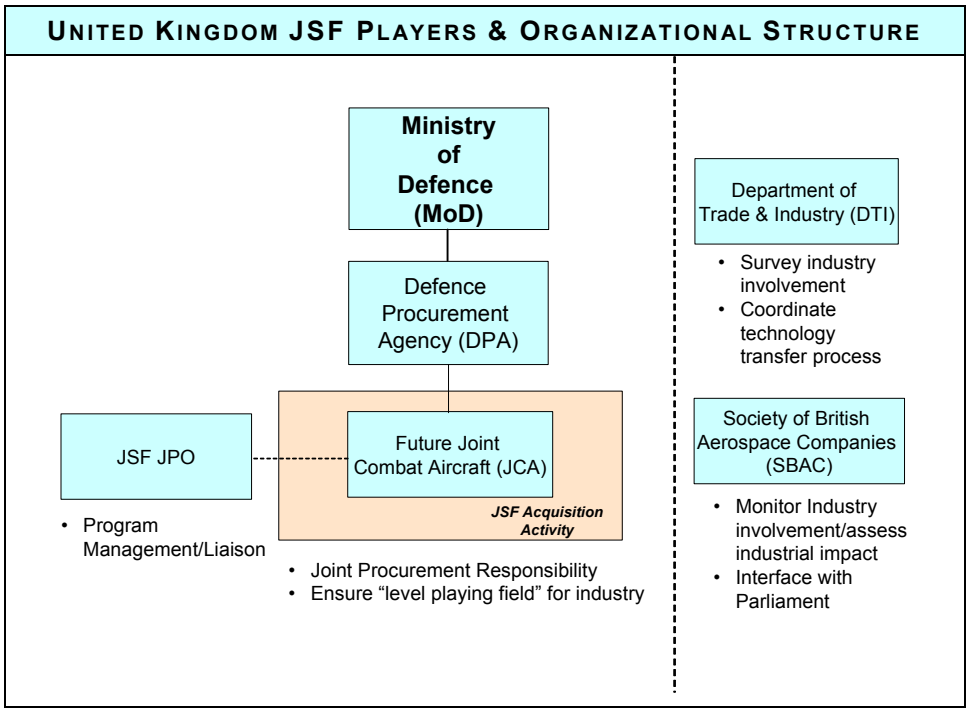
combat aircraft, and manned platforms, such as the JSF. Thus, there is a chance the UK will ultimately purchase more JSF aircraft than are currently reflected in the current procurement baseline.

The UK was involved in the program very early and with significant investment, in order to have sufficient influence over affordability issues, and to achieve a high degree of commonality with the US for operations and system sustainment. The UK was the only country to invest in CDP as a full partner with $200 million invested, and then in SDD as the only Level I partner, with investment in excess of $2 billion. An additional $882 million investment over the duration of the development program is to provide infrastructure necessary to bring the JSF into service, covering such things as weapon system integration, training, simulators and noise management. Unique among partner nations, and a testament to the UK commitment to the program, the SDD MOU was signed well in advance of the down-select of a winner from CDP. Their early signing permitted the UK to participate on the source selection team and in approving the Joint Operational Requirements Document (JORD).

Government Management

Industry led the way into the JSF program, notably via early involvement of Rolls Royce and BAE Systems (then British Aerospace), with presence on both competing teams in CDP. The UK government has provided excellent leadership to the program, primarily through the Future Joint Combat Aircraft Office (JCA) of the Defence Procurement Agency (DPA), the Ministry of Defence, and through a strong presence in the JSF Joint Program Office (JPO). The JCA is responsible for delivering the JSF in the UK, but is not responsible for overall JSF program management, which is, of course, a JSF JPO responsibility. Nor has the JCA or any other MoD entity taken an active role to help UK industry seek and obtain JSF business. Rather, the MoD truly embraced the concept of best value acquisition and trusted UK industry to fight for work, while helping where appropriate to ensure the “playing field” was level for UK firms to have a fair shake at opportunities. The UK believes that this approach has brought added value to the program that benefits all partners, including the US.

Beyond the MOD, the Department of Trade and Industry (DTI) has also been involved in the UK JSF efforts. DTI has run the technology transfer process, and along with the Society of British Aerospace Companies (SBAC), an aerospace/defense industry association, has helped monitor UK industrial involvement. SBAC also provides liaison with the UK Parliament. DTI was particularly important in the period of time leading up to the UK decision to join SDD in 2001, canvassing industry to assess the implications and prospects for UK firms.



Source: ODUSD (Industrial Policy)

Parliamentary approval was not difficult in the UK, particularly relative to other partner countries, as will be discussed later in the report. This is because there has been lively interest in the JSF from the outset that has not been hostile. There was some Eurofighter interest on the part of members of Parliament, but the MoD has always been clear on the distinct need and respective roles for JSF and Eurofighter. The need for a mixed aircraft fleet appears to be widely accepted now in Parliament. Although industrial and economic issues are always relevant, at present, Parliament's chief concerns seem to revolve around capability and affordability, and thus align well with those of the MoD.

Early Involvement Key to Success

The MOD was as adept at "selling" JSF and the best value strategy to the broader industry as it had been in selling the concept in Parliament. Industry was not overly concerned with the change of approach from directed offset as long as it was convinced it would get a fair shot at work. The impressive track record of UK industry to date at all supply levels is a success by almost any standard.

'Best value' concept accepted:
"It [best value acquisition strategy] is not Nirvana or a Shangri-la state to reach, but it is a worthy attempt to increase affordability—and we support it."
- Ken Furber, Joint Combat Aircraft Office, DPA, UK MOD

The UK does not believe the size of its SDD investment is responsible for the success of its industry. Rather, MoD officials attribute their success to early involvement in the

program, an inherently competitive and vital aerospace/defense industry, and a history of robust international supply relationships. These explanations would appear to be particularly relevant with regard to STOVL technologies.

To ensure a level playing field for lower tier firms who may not have otherwise been visible to the program and Lockheed Martin, JCA/IPT sponsored an "industry day" in cooperation with Lockheed Martin, BAE Systems and several other large JSF suppliers in March 2002. The purpose of the event was to provide an opportunity for smaller firms to increase their awareness of business opportunities and learn techniques for pursuing them. The event was attended by over 400 representatives from more than 200 firms. Although no quantifiable feedback is yet available, indications are that the event was a success.

CONCERNS

Disclosure delays compromising industrial competitiveness?

Perhaps one of the most compelling—and demanding—advantages of the international cooperative JSF program is access to groundbreaking new technologies. However, difficulty in obtaining Technology Assistance Agreements (TAAs) which are required for sensitive US technical information has proven to be difficult in many cases. As will be discussed in later sections of the report, delays imposed by the TAA application process are purported to be responsible for hindering the competitiveness of non-US firms across all countries.

> *"The TAA process is appalling. Talk of streamlining is good, but we continue to live in hope."*
>
> *- DPA Employee*

The JPO undertook an ambitious initiative to create a blanket export control license called a Global Project Authorization or GPA. This was intended to make information transfer simpler, and reduce the overhead expenses and delays associated with filing TAAs to address every individual need. However, by all counts, the GPA has not lived up to its promise, in part because of delays in its implementation, and in part to due its applicability only to unclassified materials. Most firms have had to "run the gauntlet" and obtain TAAs from the US State Department anyway—in many cases, after delaying the submission of applications in hopes that the GPA would help provide required technology access.

Emerging program risks associated with Congressional "Buy America" and other budgetary legislation

Lack of control is another risk that comes with cooperative international programs. This is particularly true with JSF because the US has such a dominant role on both the industrial and government levels due to the scale of its commitment. There are several factors not under control of the UK that could jeopardize the affordability or viability of

the JSF solution. Among these are: potential US Congressional interference, potential reprogramming vis-à-vis other US programs, scaling back or eliminating JSF within DoD independent of other programs, and system design changes that are not favorable to UK needs or interests. Although these risks are for the most part remote, they do exist, for JSF and all cooperative procurement programs. Thus, they are concerns for the UK and all member countries. But it is up to the UK and other partner countries to balance such risks against the potential costs of withdrawl, which can be quite significant.

With affordability being such a central consideration for the UK as well as other partners, changes to the program baseline, and termination risk, are of paramount concern. Changes to the program baseline tend to increase unit cost and decrease overall program revenues available to suppliers over the life of the program. In the case of the US Navy/Marine Corps Tactical Aircraft (TACAIR) Integration Study, a reduction of 409 units in the program baseline is likely to decrease overall program value on the order of 10% while having a price impact on all variants, but particularly the STOVL and CV.

Of further concern is the potential for US Congress to institute procurement requirements that severely disadvantage international suppliers. Although the US DoD does not support statutory provisions that could restrict or eliminate international supply relationships, Congresional “Buy America” initiatives would lead to degradation of military capability, endanger international support and potentially lead to retaliatory policies among partner nations. It is critical to the success of the JSF program, on both affordability and operational terms, that the international supply regime be made more efficient and effective rather than more restrictive.

FINANCIAL IMPACT

Given the early involvement of BAE Systems, Rolls Royce, and Smiths Group, the revenue and earnings impact of the program on UK industry is the largest of any partner country. Over the course of the program, UK industry could expect to see several billion dollars in incremental earnings attributable to potential JSF-related revenues of over $40 billion as shown in the table below.

ESTIMATED POTENTIAL FINANCIAL IMPACT OF JSF

(US$M) ***United Kingdom***	Revenues[1] 2002-2011	Revenues[1] 2012-2026	EBIT[2] 2002-2011	EBIT[2] 2012-2026	EBIT Margin Assumption[2]
BAE Systems	$4,269.6	$9,708.9	$318.3	$723.7	7.5%
Rolls Royce	2,130.7	5,404.3	167.6	425.1	7.9%
Smiths Aerospace	579.7	2,877.5	74.6	370.3	12.9%
Goodrich / TRW AS	159.0	614.2	20.0	77.2	12.6%
Ultra Electronics	13.7	61.7	1.6	7.3	11.8%
Others[3]	4,596.8	13,040.4	374.1	1,120.2	8.5%
Total Country Estimate[3]	**$11,749.6**	**$31,706.9**	**$956.1**	**$2,723.8**	**8.5%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on page 23 and Appendix A, respectively
Company case studies at Appendix B

Although the UK neither tracks the return on their JSF investment explicitly nor uses it as a discrete decision variable, by any measure the country appears poised to earn a significant return from the JSF program. As highlighted in the table below, the UK could potentially see a nominal return on its direct program investment of nearly 2114% - a nominal payback of $21.00 for every $1.00 invested into JSF. This translates into an annual compounded rate of return of over 100% over the course of SDD, LRIP, and FRP at the current US/UK procurement baseline of 2,593 aircraft.

ESTIMATED POTENTIAL COUNTRY-LEVEL RETURN ON JSF INVESTMENT

(US$M) ***United Kingdom***	SDD - FRP Revenues[1] 2002-2026	Partnership Investment[4] 2002-2026	Nominal Return[5] 2002-2026	Annually Compounded Rate of Return[6] 2002-2026
Total Country Estimate[3]	**$43,456.5**	**$2,056.0**	**2113.6%**	**109.2%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on page 23 and Appendix A, respectively

High British SDD content and the early onset of relatively large STOVL revenues during LRIP are largely responsible for the high annually compounded return on investment. Actual program returns may be significantly higher as this analysis includes neither the

potential revenue derived from training, maintenance, repair, and overhaul activities, nor additional UK or potential export sales.

Discrete case studies on five British companies, including BAE Systems, Rolls Royce, Smiths Group, Goodrich (former TRW AS), and Ultra Electronics are located in Appendix B.

[1]Revenues – JSF-specific revenues for each company are derived from company-provided data, or when such data was not supplied, from ODUSD(IP) estimates. These data include all contracts that have been awarded to the specific company, and future contracts the company hopes to win. In the analysis, SDD contracts are expected to translate into LRIP and FRP contracts, although single-source contracts are not necessarily assumed. LRIP and FRP revenues assume the current US/UK procurement baseline of 2,593 aircraft through 2026 and, as such, neither include potential revenues derived from training, maintenance, repair, and overhaul activities, nor additional domestic or potential export sales. The time periods shown depict combined SDD plus LRIP expected revenues (2002-2011) and expected FRP revenues (2012-2026), or all three phases combined (2002-2026).

[2]EBIT (Earnings Before Interest and Taxes) – JSF-specific EBIT is derived as follows. Where supplied by an individual company, a JSF-specific target EBIT margin has been applied to expected JSF revenues. In all other cases, a historical pro-forma EBIT margin, calculated as the company's average EBIT margin over the last four fiscal years, less any non-recurring or extraordinary income or expenses, has been applied. Please see Appendices B through F for a more detailed analysis of the relative impact and importance of JSF business to individual firms profiled.

[3]Others and Total Country Estimate – Total Country Estimate shows the expected potential country-level financial impact of JSF's SDD through FRP phases at the current baseline US/UK production total of 2,593 aircraft. Country-level revenues have been calculated via aggregated company-level data, as well as estimates for companies' and other earnings not captured in our case studies. This data has been provided by respective governments or industry associations. Where necessary, these data have been adjusted downward by ODUSD(IP) to reflect the new baseline US/UK procurement of 2,593 aircraft. In addition, the adjusted aggregate estimate has been split into two time periods (2002-2011 and 2012-2026) in proportion to the total JSF program budget over the specific time periods. "Others" refers to the rest of the companies in the country's aerospace industry that are or may become involved in the JSF program and are not specifically studied in this report.

[4]Partnership Investment – Partnership investment is the direct financial investment made by each country in order to be a partner in the SDD phase of the JSF program. This investment does not consider funds for potential aircraft procurement to be an investment nor are any assumption made for potential rebates for future JSF sales.

[5]Nominal Return – "Nominal Return" shows the ratio of total country-level expected JSF revenues to partnership investment. In simple terms, the nominal return represents the ratio of "dollars in" over "dollars out." A ratio greater than 100% indicates that a country is forecast to receive more money from the program than it has actually invested into the program.

[6]Annually Compounded Rate of Return – Annually compounded rate of return is the internal rate of return (IRR) generated by expected SDD-FRP annual revenues net of all partnership investment payments to JPO.

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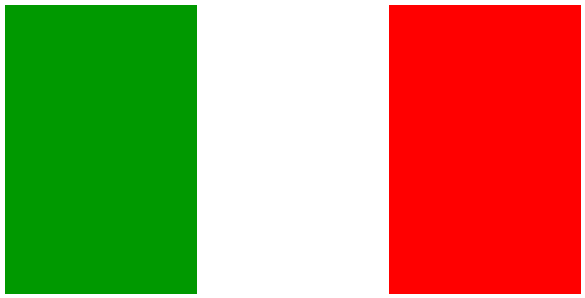


ITALY

DETAILED CASE STUDY

Key Features of Government Approach:

- *Air Force/Navy operational requirements are the key reason for JSF participation*
- *Italian JSF investment ($1.028 billion) funded by Ministry of Defense, with support from Ministry of Productive Activities*
- *Lockheed Martin-Italian Ministry of Defense LOIs and MOU outlining expected JSF participation with Italian industry precede Parliamentary approval*

Concerns:

- *Late commitment to SDD might have limited potential Italian contract wins*
- *Italy believes that several issues have impaired their SDD participation on a "level playing field" basis*
  - *Italian industry upset by short RFP response times, and lack of familiarity with the "best-and-final-offer" concept (no interim negotiations) – both standard US contracting practices*
  - *Limited effectiveness of GPA has forced firms into lengthy TAA processes*

Financial Impact:

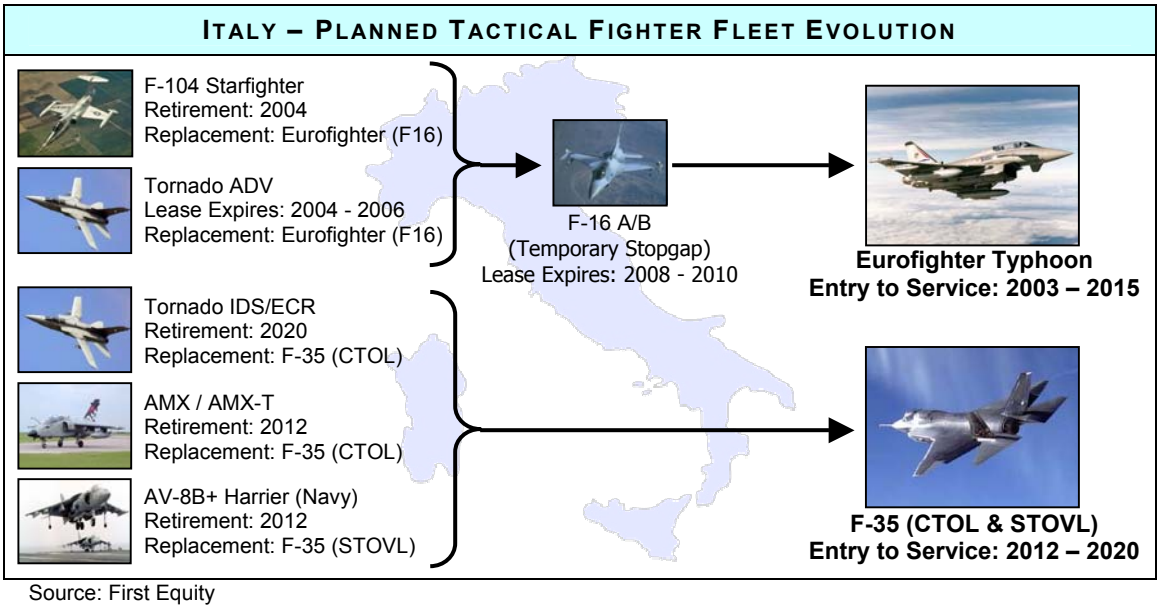
- *Italy will likely see a nominal return of over 476% on their SDD investment – ~25% compounded annually – over the course of SDD, LRIP, and FRP*

KEY FEATURES OF GOVERNMENT APPROACH

Motives behind JSF Systems Design and Development Participation

Operational requirements of the Italian Air Force and Navy led MoD officials to push for Italian participation in the JSF program. The Italian Air Force intends to build its future tactical fighter fleet around the Eurofighter Typhoon (air superiority) and JSF (ground attack and naval defense) as shown in the chart below. In all, Italy expects to be the 2nd or 3rd largest JSF operator behind the United States, depending on UK quantities.

ITALY – PLANNED TACTICAL FIGHTER FLEET EVOLUTION



Source: First Equity

ITALY – JSF PROGRAM SUMMARY

Italy

JSF Program Participation Summary

Partnership Level:	II
SDD MOU signing date:	24 Jun 2002
Value of CDP funding:	US$10 million
Value of SDD funding:	US$1.028 billion

Primary Reasons for Participation

1. Italian Air Force & Italian Navy requirement for future tactical fighters
2. To facilitate Italian industry participation in JSF program

Current Tactical Fighter Fleet

Type:	Tornado IDS/ECR (Tornado ADV)
Prime Contractor:	Panavia (ADVs leased from UK RAF)
Procurement Dates:	1982 - 1989 (plus recent ADV leases)
Number in Fleet:	100 (plus ADV leases)
Typical Deployment:	Ground Attack (IDS), Electronic Surveillance (ECR); Air Superiority (ADV)
Planned Retirement:	2020 (leased ADVs to be returned in 2004 - 2006)

Type:	F-104 Starfighter
Prime Contractor:	Lockheed Martin
Procurement Dates:	From 1969
Number in Fleet:	85
Typical Deployment:	Air Superiority
Planned Retirement:	2004

Type:	AV-8B+ Harrier II
Prime Contractors:	Boeing / BAE Systems
Procurement Dates:	From 1981
Number in Fleet:	18
Typical Deployment:	Naval Fleet Defense
Planned Retirement:	2012

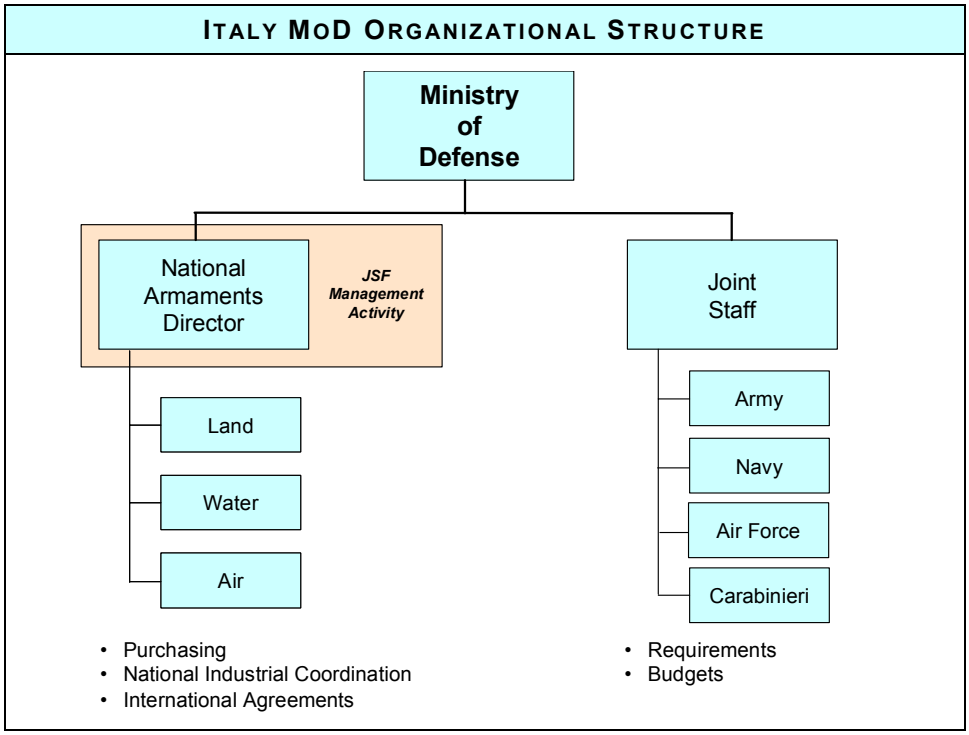
Type:	AMX/AMX-T
Prime Contractors:	Alenia / Embraer
Procurement Dates:	1989 - 1998
Number in Fleet:	136
Typical Deployment:	Ground Attack; Training
Planned Retirement:	2012

Source: First Equity

Foreseeing this operational need, Italy invested $10 million during CDP (though not as a full partner like the UK with a CDP investment of $200 million). As JSF progressed into SDD and due to the relatively large expected procurement, Italy chose to be a level II partner with a financial commitment of $1.028 billion. $65 million of this commitment is bilaterally controlled by both the Italian government and JSF program office, and specifically earmarked for investments within Italy to aid Italian industry's SDD efforts. To date, however, there has been no mechanism through which this funding can be distributed to industry, and it has therefore remained unused.

Government Management

Government management of JSF is the responsibility of the National Armaments Director (NAD) due to the cross-service interest as shown in the diagram below. JSF is one of the many aeronautical programs managed by the very limited NAD staff of about five people. This overburdened staff also serves as the conduit between MoD, Parliament, and Italian industry.



Source: ODUSD (Industrial Policy)

Although Italy first expressed interest in JSF in 1997, their SDD participation was delayed for an extended period due in large part to changes in government. Part of the delay can also be attributed to JSF's new procurement philosophy. Italian industry – and therefore Parliament – was reluctant to embrace the "best value" concept.

> *"They all [industry] looked at likely JSF wins versus likely Eurofighter wins [and determined that] a dollar for JSF took away a dollar for Eurofighter."*
> *- Gaetano Monetti, Multiconsult, Lockheed Martin representative*

Since Italy plans to procure a mix of JSFs and Eurofighters, Italian defense firms fear that funding for JSF will encroach on Eurofighter funding, the latter of which has guaranteed Italian industry at least 100% offset. Due to this difference in the programs' approaches to participation, Italian industry understandably seemed to initially prefer the guarantees of Eurofighter to the risk/reward nature of JSF. In addition, Italy has one of the smallest defense budgets in all of Europe (~$20 billion annually) and one of the most consolidated defense industries in the world. Partially government-controlled Finmeccanica accounts for over 70% of Italian defense industry

revenues. With such a limited supplier base, virtually all Italian defense companies have historically been involved in all defense programs, most of which have been fueled by offsets and workshare. Alenia has typically been awarded large system integration contracts from such offset programs and effectively played the role of country-wide prime contractor to other Italian firms. The responsibility that the JSF program places on Alenia's subcontractors to bid in their own right also contributes to Italian industry's skepticism of JSF's best value concept.

Recognizing these misgivings, the Ministry of Productive Activities (MPA) joined MoD to help secure Italy's SDD participation. MPA and MoD worked together with Lockheed Martin and Pratt & Whitney to survey Italian industry and identify specific areas of JSF opportunity that would play to Italy's strengths. Between November 2001 and June 2002, these efforts generated 20 Letters of Intent (LOIs) and one Memorandum of Understanding (MOU) with individual Italian companies. All LOIs/MOU specified certain opportunities for JSF design and development work, and many specified the value of the work. The industry LOIs/MOU paved the way for an LOI between Lockheed Martin and the MoD – the only such contractor to partner government LOI on the JSF program. In the LOI, Lockheed guarantees SDD/LRIP participation of at least $320 million, with high confidence that this will eventually reach $590 million. Only after a satisfactory level of potential value was reached in June 2002 – five years after their initial interest in the SDD program – did MoD approach Parliament to obtain approval of participation.

> *"Eurofighter was a 'self-made case'…there was an operational need, plus Italy had a specific share of the program."*
>
> *- Colonel Salvestroni, Office of the National Armaments Director*

Justification of JSF during Parliamentary debates stressed both operational requirements and industrial benefits of the JSF, but the best value strategy remained a more difficult sell than a traditional offset strategy. According to NAD, without the LOIs/MOU in place, JSF would have been an impossible sell, despite the Air Force requirement. Opposition to JSF remains; the upcoming summer Parliament session will likely host debates over the benefits of remaining in the JSF program since JSF contracts have fallen far short of the expectations upon which Italian participation had been based.

Ambitious Expectations

As of May 2003, Lockheed Martin had identified 30 Italian companies with 164 opportunities for possible JSF design, development, or manufacturing work with an estimated potential SDD/LRIP value of more than $1.05 billion, nearly double the target estimate in the 2002 MOU. These opportunities could amount to several billion dollars through FRP.

Even in the face of such robust long-term prospects, the LOIs/MOU negotiated between Lockheed Martin/Pratt & Whitney with Italian firms set high near-term expectations. To date, actual work contracted to Italian has fallen short of these expectations much to the concern of Italian firms, although our estimate foresees the potential for Italian industry

to win $950 million of SDD and LRIP work through 2011. Perhaps industry's discontent with the program is, in part, caused by the perceived disconnect between the work as described in these LOIs/MOU and the actual opportunities to compete. Additionally, expectations within Italian industry may be influenced by a non-competitive, sole source award of aerostructure work to Alenia which arguably established a precedent apparently inconsistent with the overall acquisition strategy. However, industry representatives on both sides of the Atlantic maintain that Alenia would have been a strong contender in a competitive bidding process had the Italian government entered the program earlier.

Long-term, Italy also plans to establish a national support center to provide an organic capability to maintain the Italian fleet of JSF aircraft that will feed additional long term revenues. Several senior Italian defense industry officials express hope that Italy participates in the maintenance of the JSF European fleet and suggest that, if an additional final assembly facility is needed, Italy should be considered a prime candidate. Also, these same officials would like to see Italy establish facilities that would be utilized by European and other JSF countries to train pilots and maintenance personnel.

CONCERNS

Late Involvement Forecloses Opportunities

Being new to the SDD program and having little time to respond to RFPs cost Galileo approximately 25% of their SDD/LRIP potential (as outlined in their LOI) within the first few weeks after Italy entered the SDD phase. Further, little warning of an RFP's impending arrival complicated some of Galileo's early RFP submissions.

Italy's late involvement in the program has clearly limited their opportunities to compete and leveraged their companies' competencies into the program. Many of the major subsystems of the airplane had already been sub-contracted by June 2002. This was an especially large problem for aerostructures companies. For example, because Lockheed Martin had designed most of the JSF structure prior to Italian participation, Alenia could not participate in the wing design and had to content itself with being the second source for the wing. However, Alenia engineers are assigned to the Lockheed Martin aerostructures Integrated Product Team (IPT) and over a hundred engineers from Alenia, Galileo, Datamat, and Piaggio Aero will participate in other IPTs in Fort Worth, Texas, and El Segundo, California.

Lack of a "Level Playing Field"

In the year since Italy signed the SDD MOU, Italian industry has won only one additional significant JSF contract. However, there are a number of substantial contracts valued at over $100 million that may materialize soon.

All the same, differences in scale between actual contract awards and best value opportunities outlined in the LOIs/MOU on one hand, and the Italian government's sizable investment in SDD, have created an air of discontent with JSF. Italian government and industry officials cite numerous frustrations with their experience thus far, including short RFP receipt and response times; a general lack of access to necessary program information due to delays in TAAs and licenses; limited communications between the bidder and contractor, particularly with respect to proposal feedback and discussion; the positive impact of government funded R&D in other partner countries and the US; and the lack of available JSF work due to the late contract signing.

> *"It's not the fact that [Italian industry] is losing competitions, it's the way in which they lose"*
> *- Colonel Salvestroni, Office of the National Armaments Director*
>
> ***Future Considerations:***
> *"More preparation and collaboration from the US side before the start of the program would have helped to make the best value concept more successful and helped to level the playing field."*
> *- Colonel Salvestroni*

A Broken RFP Process?

> ***Point and Counterpoint:***
> *"[Strategic sourcing] may help by limiting competitions to companies on a level playing field."*
> *- Colonel Salvestroni, Office of the National Armaments Director*
>
> *"Are we going back to workshare? We want open competition!"*
> *- Alenia Aeronautica*

Differences in contracting cultures have also led to some misunderstandings of the bidding process. Many Italian industrialists expected that RFPs would lead to negotiations that would give their companies an opportunity to improve their proposals, but learned the hard way that the "best value"/best-and-final-offer model doesn't accommodate such opportunities. Italian industry believes that many competitions were initially lost due to relatively "minor" issues such as high bid prices, and wish that they had been given the opportunity to discuss changes to their bids that might have made them more competitive.

Other Italian firms felt price-disadvantaged from the start when bidding against large foreign companies able to absorb R&D and other non-recurring expenses. Several companies complained that American government-funded R&D – both directly through the JSF program and indirectly through other programs such as the F-22 – gives the US defense industrial base an unfair advantage when competing on price.

A GPA Without Teeth?

Several Italian companies have expressed disappointment in the Global Project Authorization (GPA), echoing the sentiments of the UK and other partner countries. Many international partner industries were initially encouraged to postpone TAA applications in favor of the forthcoming GPA in order to gain access to the information necessary for successful proposals. When finally approved, however, the GPA was so

generic in nature that it didn't include most of the necessary competitive areas. This essentially required that all potential partner companies receive TAAs prior to winning any JSF SDD work. The process of obtaining these TAAs, however, has cost significant time; in many cases, international partner industries and companies measured the progress of their TAAs in years rather than months or weeks. These delays are not due to the US Department of State, however; the Italians claim, as do the Dutch, that TAAs are held-up in the legal departments of potential US subcontractors well before ever reaching the State Department. In any case, the lack of a TAA is detrimental to a company's ability to compete as certain technical information essential to understanding the exact function, specifications, or requirements of the RFP are available only with TAAs. Additionally, without TAAs, Italian industry has been largely unable to gain enough insight into the program to carry out their own "anticipatory" R&D efforts to prepare for expected RFPs.

Lesson Learned:
"Timely issuance of TAAs and necessary licenses are critical issues for companies to be competitive on RFPs."
- Dennys Plessas, VP Business Development Initiatives for Europe, Middle East, and Africa, Lockheed Martin

"You sign a $1 billion MOU between two governments and can't get the TAAs done? That's ridiculous!"
- a Marconi Selenia employee

In the minds of several Italians, these factors have combined to eliminate the possibility that Italian industry can compete on a "level playing field" with larger foreign and US companies. NAD hopes that Lockheed Martin's new "best value strategic sourcing" plan will help level the playing field for potentially disadvantaged countries – a strategy that, in turn, isn't being welcomed by all partner countries.

FINANCIAL IMPACT

To date at least $475 million in SDD and LRIP commitments have been awarded to Italian industry, more than half of this from a second source contract between Alenia and Lockheed Martin for wing production. The two companies have agreed that Alenia will produce 80-84 wings during LRIP, starting with Lot 2 at a "must cost" price below the cost to produce wings in Fort Worth. Additionally, Marconi Selenia Communications has been chosen to design JSF's back-up UHF radio. Considering the potential SDD and LRIP contracts that remain to be awarded, plus follow-on FRP contracts and FiatAvio's MOUs with GE and Rolls Royce to be a 5% risk-sharing partner on the F136 interchangeable engine, the JSF program could return nearly $5 billion of revenue to Italy baselined on the US/UK procurement of 2,593 aircraft. These revenues could potentially translate into more than $500 million in earnings before interest and taxes.

"Less than a year after signing up, we've already achieved contracts and commitments far in excess of our stated minimum in the LOI."
- Robert Haskell, JSF International Program Manager for Italy, Lockheed Martin

"JSF is very important. [FiatAvio] is keen to strengthen its US market position, especially in the military."
- Riccardo Brussa, FiatAvio

ESTIMATED POTENTIAL FINANCIAL IMPACT OF JSF					
(US$M)	Revenues[1]		EBIT[2]		EBIT Margin
Italy	2002-2011	2012-2026	2002-2011	2012-2026	Assumption[2]
ASE	$5.3	$14.3	$0.6	$1.7	12.0%
Fiat Avio	28.4	343.0	4.3	51.9	15.1%
Finmeccanica*	499.4	2,095.0	52.0	218.0	10.4%
**includes Marconi Selenia Communications, Alenia Aerostructures, and Galileo Avionica*					
Others[3]	409.4	1,501.7	43.7	166.4	11.0%
Total Country Estimate[3]	**$942.5**	**$3,953.9**	**$100.6**	**$438.0**	**11.0%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on A-7 and Appendix A, respectively
Company case studies at Appendix C

Despite initial disappointment with bidding success, Italy is expected to earn a large return on their SDD investment. Through FRP, Italy could potentially see a nominal return on their investment of over 476% - a nominal payback of almost $5.00 for every $1.00 invested into the program. In real terms, this translates to an annually compounded rate of return of approximately 24%, representing a significant value to the Italian economy. Italy expects additional opportunity for even greater financial returns through training, maintenance, repair, and overhaul activities, and royalty payments for export sales of JSF.

ESTIMATED POTENTIAL COUNTRY-LEVEL RETURN ON JSF INVESTMENT				
(US$M)	SDD - FRP Revenues[1]	Partnership Investment[4]	Nominal Return[5]	Annually Compounded Rate of Return[6]
Italy	2002-2026	2002-2026	2002-2026	2002-2026
Total Country Estimate[3]	**$4,896.4**	**$1,028.0**	**476.3%**	**23.8%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on A-7 and Appendix A, respectively

Discreet case studies highlighting the impact of JSF have been prepared for three Italian companies; the Finmeccanica case study specifically includes Alenia Aeronautica, Galileo Avionica, and Marconi Selenia Communications. All of the Italian case studies are located in Appendix C.

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THE NETHERLANDS

DETAILED CASE STUDY

Key Features of Government Approach:

- *During CDP, JSF was selected by the Dutch government as one of two aircraft platforms upon which to build the Dutch aerospace industry of the future*
- *Early (1997) financial support from Dutch government to Dutch industry promoted JSF participation*
- *Public-Private Partnership (PPP) provided government sponsorship of SDD investment in exchange for a 3.5% tax on all Dutch JSF production and support revenues in order to repay SDD investment*
- *JSF CDP and SDD efforts are being led by the Ministry of Economic Affairs, with key input by industry, MoD, and Royal Netherlands Air Force*
- *Dutch JSF organization intended to be a "first responder" contact with Lockheed Martin and other JSF contractors and an "enabler" of business relationships for Dutch industry – however,it was unable to prevent two non-compliant bids*

Concerns:

- *Dutch companies feel that they can not compete on a level playing field with American counterparts due to geographic, financial, export control, and security of supply limitations*
- *Dutch Parliament's early concerns related to return on investment a constant threat to future participation in JSF program*

Financial Impact:

- *The Netherlands is expected to earn a nominal return on their SDD investment of well over 700% - ~40% annually-compounded return*

KEY FEATURES OF GOVERNMENT APPROACH

Motives behind JSF System Design and Development Participation

Following the mid-1990s financial failure of Fokker, the Netherlands' leading aerospace company, the Dutch government decided that it would be necessary to re-build a highly capable cluster of aerospace companies in the Netherlands. Shortly thereafter, JSF (then "JAST") and the Airbus A380 (then "A3XX") were chosen as the military and commercial aircraft platforms, respectively, from which to build the technical capabilities of the Dutch aerospace industry of the future. At the end of the 1990s, the Dutch government invested $100 million to directly enhance Dutch industrial capability prior to JSF's SDD phase. As an example of such Dutch efforts to prepare for SDD, Stork used this funding to research the application of it's new "Glare" material – a high-strength, lightweight composite / metal material – to the JSF.

As SDD neared, the Dutch government hesitated before making another large financial commitment to JSF. Many feared the risk that a non-offset program carried and questioned why the Dutch government should commit such a large amount of money without any assurance that their investment would be returned to the Dutch government or economy. Lockheed Martin and Pratt & Whitney, in conjunction with the Dutch government, surveyed Dutch industrial capabilities and concluded that the Netherlands would likely have a high level of success in JSF SDD competitions. Pratt & Whitney

THE NETHERLANDS – JSF PROGRAM SUMMARY

The Netherlands

JSF Program Participation Summary

Partnership Level:	II
SDD MOU signing date:	06 June 2002
Value of CDP funding:	US$10 million
Value of SDD funding:	US$800 million

Primary Reasons for Participation

1. To use JSF as the military aircraft platform off which the Dutch aerospace industry would be technically based for the future
2. To evaluate JSF as a potential replacement for F-16

Current Tactical Fighter Fleet

Type:	F-16 A/B
Prime Contractor:	Lockheed Martin
Procurement Dates:	1979 - 1990
Number in Fleet:	137 (213 originally purchased)
Typical Deployment:	Multirole (Conventional)
Planned Retirement:	Undecided

actually guaranteed that the Netherlands would receive a share of the F135 program proportionate to any Dutch purchase of the F135 engine.

Public-Private Partnership

Following the comfort level provided by the industrial assessment, Dutch government and industry (through the 50 members of NIFARP – the Netherlands Industry Fighter Aircraft Replacement Platform) created the "Public-Private Partnership" (PPP). With the consensus embodied in PPP, the Dutch government then made the Level II Partnership investment in the program.

PPP

1. Government/industry partnership to achieve consensus for SDD investment.
2. Intended to facilitate Dutch industrial participation by transferring up-front risk to government.
3. Funds recouped through 3.5% surcharge on JSF production and support profits through 2052.

The Netherlands Level II investment of $800 million consists of $750 million paid directly to the JPO, and an additional $50 million bilaterally co-controlled between the JPO and the Dutch government.

***Dutch government opinion of SDD**:*
"SDD is for the benefit of industry. The Netherlands could have just bought JSF in 2012."
- Rini Goos, Ministry of Economic Affairs

To recoup the $800 million Dutch government industrial investment from Dutch JSF contract proceeds, the Dutch government has instituted a 3.5% levy against all JSF production and service contracts commencing after 2008. Although many Dutch firms and the Dutch government do not believe that the tax will impair their ability to win production work, in

a highly competitive environment a 3.5% levy will be reflected in a bid price premium that could well affect their competitiveness. However, many NIFARP members seem confident that the 3.5% taxation scheme will be relaxed or perhaps repealed when PPP is reviewed in 2008 prior to the letting of the affected production contracts.

Dutch JSF Management and Oversight Organization

A loose consortium of government entities and industry groupings manages Dutch participation in the JSF program. The Ministry of Economic Affairs (MEA) currently chairs this consortium, leading Dutch industrial JSF efforts and interdepartmental coordination. If the Netherlands buys JSF, this role will shift to the Ministry of Defense (MoD) and Royal Netherlands Air Force (RNLAF) once the procurement MOU is signed. The RNLAF stresses the need for a new Dutch fighter aircraft and intends to purchase JSF as a replacement for Dutch F-16s. Other participants in the Dutch JSF effort include NIFARP, the Netherlands Defense Manufacturers Association (NIID) and the Netherlands Agency for Aerospace Programs (NIVR). Currently, MEA has a staff of two full-time people dedicated solely to management of JSF – one of whom is based in the Dutch embassy in Washington, DC – and the support of a handful of MEA employees who work with the JSF program on a part-time basis. Furthermore, MoD and RNLAF have also created a project team to manage the replacement of the Dutch F-16 fleet.

Within the JSF program, the role of this consortium is twofold: 1) to be a liaison between Lockheed Martin, Northrop Grumman, BAE Systems, and their sub-tier suppliers and Dutch industry, and 2) to be an "enabler" of relationships between such companies and Dutch industry (although in some cases, they haven't been successful in preventing mistakes in the bidding process). Within the Netherlands, this JSF organization acts as a voice for industry, government, and the military, particularly during political debates. Inclusion of industry in a government-led JSF organization is unique to the Netherlands, although other partner countries have government-only, or industry-only facilitating organizations.

"If you pay, you get a say."
- Dutch government attitude toward industry inclusion in Dutch JSF organization

Additionally, the JSF organization – and NIFARP in particular – intend to promote JSF participation across a multitude of Dutch aerospace capabilities. The Netherlands does not want to see just its largest companies win JSF contracts. With Fokker's (Stork's) historical significance in the Dutch aerospace industry, there were early concerns that the Dutch JSF effort might become the "Joint 'Stork' Fighter." However, Stork appears to agree that a high rate of participation across Dutch industry is important – accordingly, Stork plans to outsource $30-50 million of SDD work to lower tier Dutch companies.

"Stork plays a leading role in the Dutch aerospace cluster, but without a successful [Dutch] aerospace cluster [at the lower tiers], there is no successful Stork."
– a Stork representative

CONCERNS

Lack of a "Level Playing Field"

> *"[It is unclear] how 'best-value' is defined… it seems that it means you have to be within 50 miles of the contractor [in order to win any contracts.]"*
> *- a Philips representative*

Similar to the concerns expressed by the Italians and Norwegians, Dutch officials and industry representatives repeatedly remark that JSF has not achieved the promised "level playing field" for SDD contract competitions. Most Dutch cite U.S. second and third tier suppliers as the largest impediment to equality in international competitions. While the Dutch believe that Lockheed Martin accurately assessed their country's capabilities, they complain that the sub-tier JSF contractors seem to have no intentions of outsourcing work into the Netherlands. Despite Lockheed Martin's efforts to persuade sub-tier contractors to look for outsourcing opportunities outside the United States, discussions between Dutch industry and sub-tier U.S. contractors rarely materialize because "[the contractors] say they can't talk due to TAA reasons." But MEA believes that these contractors have "deliberately slowed down" the approval of TAA applications submitted by Dutch industry, presumably to protect their own internal capabilities or those of a local, trusted supplier. This, according to industry and government, has been a major factor behind the lack of SDD contracts awarded in the Netherlands.

In a more questionable argument, the Dutch cite differences in business practices and risk profiles as an impediment to the "level playing field" concept. "U.S. companies will eat non-recurring cost in order to get [a full rate production contract]," claims MEA. While the Dutch government has told their industry to try to do the same, industry is reluctant due to the lack of any guarantees for follow-on FRP contracts. This risk is heightened in the eyes of Dutch industry due to the chance that the Netherlands could postpone or cancel their proposed JSF purchases. The Dutch believe that, contrary to the program acquisition strategy, production contracts for Dutch industry will be contingent on Dutch aircraft purchases. They are also concerned that the US government will be biased towards establishing "trusted" second sources for all production inside the United States for security of supply reasons. Additionally, Dutch industry fears a rise in non-recurring development expenses due to the need to reduce the weight of the aircraft, a significant burden that is increasingly pushed down to lower-tier suppliers.

Most questionable, however, are the viewpoints of the CEO of the aerospace division of one well-known Dutch company, who claims that because the Dutch government has paid $800 million to be part of SDD, his company "should not have to [actively search for work]" and that "it is Lockheed Martin's responsibility to bring work to us." While this sentiment is not necessarily shared by all of the Netherlands, it puts into stark contrast the difference between traditional offset programs

> *"Lockheed Martin has been very open with [RFP opportunities] for things under their control. It's the lower-tier [contractors] that are a problem."*
> *- a Stork representative*

and the new "best-value" strategy.

Dutch Political Debates

Increased parliamentary concern over return on JSF investment causes concern among many Dutch proponents of the JSF program, as there is the risk that Parliament may cancel Dutch participation in JSF. Above all, Dutch Parliament wants to see at least $800 million of benefit to Dutch industry in order to make their investment worthwhile. However, there also exist minorities whose viewpoints exacerbate the JSF investment debate by claiming that the F-16 fleet does not need replacement or asserting that the Netherlands purchase a "European" aircraft. This last argument is quickly losing ground, however, as JSF can claim as many European partners as Eurofighter Typhoon, Dassault Rafale, and Saab Grippen combined. Along these lines, senior Dutch government officials and industry representatives are beginning to recognize the benefits of the JSF program, even in a Eurocentric context.

FINANCIAL IMPACT

In the year since the Netherlands signed the SDD MOU, Dutch industry has won approximately $95 million in SDD contracts, including a significant contract awarding Fokker Elmo the design of several JSF wiring harnesses. Additional SDD contracts awards worth $50-100 million are expected within the next few months. It is estimated that these contracts, plus additional potential contracts to be won by Dutch companies, could amount to over $5.7 billion over the course of SDD, LRIP, and FRP at the current US/UK procurement baseline of 2,593 aircraft. At targeted EBIT margins, this revenue stream could generate $625 million in incremental earnings through 2026.

ESTIMATED POTENTIAL FINANCIAL IMPACT OF JSF

(US$M) **Netherlands**	Revenues[1] 2002-2011	Revenues[1] 2012-2026	EBIT[2] 2002-2011	EBIT[2] 2012-2026	EBIT Margin Assumption[2]
Philips Aerospace	$123.3	$659.7	$12.3	$66.0	10.0%
SP Aerospace	20.5	96.6	2.0	9.7	10.0%
Stork N.V.* **includes Fokker Elmo and Stork AESP*	474.9	1,645.9	57.0	197.5	12.0%
Thales Nederland	148.5	549.8	8.8	32.4	5.9%
Urenco Ltd	24.3	85.3	2.9	10.2	12.0%
Others[3]	483.5	1,429.5	50.7	148.6	10.4%
Total Country Estimate[3]	**$1,275.0**	**$4,466.7**	**$133.8**	**$464.5**	**10.4%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on A-7 and Appendix A, respectively
Company case studies at Appendix D

THE NETHERLANDS

The Netherlands' financial commitment to the program consists of $800 million of funding through 2010. The Dutch economy is expected to earn a significant return on this investment over the course of SDD, LRIP, and FRP. Although the majority of direct JSF revenues will be realized many years from now during FRP, the size of the program revenue stream is expected to generate a nominal payback on the Netherlands' $800 million SDD investment in excess of 717% - better than a $7.00 payback for $1.00 of direct investment – or an annually-compounded rate of return of approximately 38%. Because the data below include only the current baseline for US and UK commitments to purchase 2,593 aircraft, export sales could dramatically increase the Netherlands' return potential.

ESTIMATED POTENTIAL COUNTRY-LEVEL RETURN ON JSF INVESTMENT

(US$M) ***Netherlands***	SDD - FRP Revenues[1] 2002-2026	Partnership Investment[4] 2002-2026	Nominal Return[5] 2002-2026	Annually Compounded Rate of Return[6] 2002-2026
Total Country Estimate[3]	**$5,741.7**	**$800.0**	**717.7%**	**38.1%**

Sources: ODUSD (Industrial Policy) and First Equity

Footnotes and methodology discussion on A-7 and Appendix A, respectively

Discrete case studies highlighting the impact of JSF have been prepared for five Dutch companies involved in or bidding for JSF contracts. These case studies are located in Appendix D.

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CANADA

DETAILED CASE STUDY

Key Features of Government Approach:

- *The Department of National Defense and Industry Canada took the lead in championing Canadian participation in the JSF program through the innovative organizational structure of "JSF Canada"*
- *JSF Canada pro-actively sought opportunities for Canadian industry by meeting with major JSF contractors and surveying the Canadian industrial base*
- *Canada hopes to foster best value performance on a global scale through partnerships with other JSF countries*

Concerns:

- *"Strategic sourcing" may hurt the credibility of best value programs in future Canadian parliamentary debates on JSF and potentially other programs that are similarly structured, e.g., Multi-Mission Maritime Aircraft*
- *Canada's ITAR exemption has not been used, which has created delays in obtaining clearances to access technical RFP information*

Financial Impact:

- *Canada will likely see an annual compounded rate of return on their SDD investment greater than 75% over the life of the JSF program*
- *Technical knowledge gained through SDD is expected to fuel future earnings through "spin off" products*
- *"JSF supplier" label will boost earnings from other programs due to marketing appeal*

KEY FEATURES OF GOVERNMENT APPROACH

Initial Efforts and Motivations

The Canadian Department of National Defense (DND) and Industry Canada led the initial push for Canadian commitment to the SDD phase of the JSF program. The major motivator for this was to facilitate Canadian industry participation. The DND and Industry Canada worked to gain an early approval for Canadian participation in order to give Canadian industry a time advantage over international competitors. Other motivators for SDD participation included: a desire to thoroughly evaluate JSF as a replacement for the Canadian Forces CF-18 (due for retirement in 2017-2020); the need for interoperability with the US military; and the wish to gain insight into US procurement methodologies and best practices. Additionally, Canada wished to take advantage of the potential for R&D cost recuperation should Canadian Forces decide to purchase the JSF, as well as of potential return levies on future JSF sales to other countries.

"Technology transfer from JSF will be critical to maintaining [double-digit revenue] growth in the future." - Ron Kane, AIAC

Paradoxically, Canadian industry was a late convert to the program relative to the significant efforts of the DND. During the early stages of the JSF program, Canadian industry felt that there was little chance of winning significant JSF business without a certain level of financial commitment to JSF by the Canadian government. Lacking a high probability of potential return, companies would not commit to investing time and capital

CANADA – JSF PROGRAM SUMMARY

Canada

JSF Program Participation Summary

Partnership Level:	III
SDD MOU signing date:	07 Feb 2002
Value of CDP funding:	US$10 million
Value of SDD funding:	US$100 million
Additional TPC funds:	up to US$75 million

Primary Reasons for Participation

1. To facilitate Canadian industrial participation in JSF program
2. To evaluate JSF as a potential candidate for the Canadian Forces
3. To promote interoperability between US, British, and Canadian militaries
4. To gain insight into US procurement methodologies and best practices

Current Tactical Fighter Fleet

Type:	CF-18A/B
Prime Contractor:	Boeing
Procurement Dates:	1982-1988
Number in Fleet:	122
Typical Deployment:	Multirole (Conventional)
Planned Retirement:	2017-2020

Source: First Equity

into JSF-related research and development. Additionally, in the late 1990s, the Canadian aerospace industry was in the midst of a booming commercial aviation market, further adding to their reluctance to commit significant resources to JSF.

Canadian industrial attitudes changed quickly in late 2001 as their government began to show signs of commitment to JSF and also guaranteed up to $75 million to help Canadian industry in R&D for the program. Also, the commercial aircraft markets began to falter. As the market downturn worsened, the Aerospace Industries Association of Canada (AIAC) stressed that JSF participation would be crucial to maintaining the Canadian aerospace industry's double-digit revenue growth rate and strong position in the global aerospace marketplace. Canada had seen aerospace revenues double – to more than $23 billion – between 1995-2002 and now ranks as the world's fourth largest aerospace industry after the US, UK, and France.

"Winning JSF contracts isn't so much about the potential to supply JSF production—although that certainly is an attractive aspect—but rather, the competitive position in which such technology puts our company for its future."
- Bill Matthews, Magellan Aerospace

Since late 2001, not only have potential JSF production revenues attracted Canadian industry, but potential "side-effects" of such a large, technically oriented defense program have been viewed as opportunities to further bolster the Canadian aerospace industry for decades to come. Most significantly, the transfer of JSF-inspired technologies, business practices, and production efficiencies are expected to have a positive effect on the Canadian economy equal to or greater than that of the direct JSF revenues. For example, Pratt & Whitney Canada is taking on a considerable portion of the research and development burden for the F135 engine, not

for gains in defense revenues, but because the technical know how that they gain from their JSF work will be directly applicable to the commercial aircraft sector and will position Pratt & Whitney Canada's future commercial product families in a commanding market position.

JSF will also offer Canadian companies visibility and prestige. The marketing cachet of the "JSF supplier" label alone will bring much additional business to SDD participants. Lastly, the global nature of the JSF program is being used as an opportunity to seek new relationships internationally, which may foster new commercial opportunities for Canadian industry in previously closed international markets.

Ultimately, the projected importance of JSF to Canada's aerospace industry and economy were essential in winning parliamentary approval for JSF SDD participation, as Canada's political climate typically shuns aggressive military policy, large defense programs, and major weapons acquisitions. In this light, although Canadian industry was slow to accept JSF, AIAC and its partner companies may have played a crucial role in gaining approval for Canadian SDD participation not only because they have the ability to lobby the government, but also because AIAC support helped emphasize economic and industrial benefits.

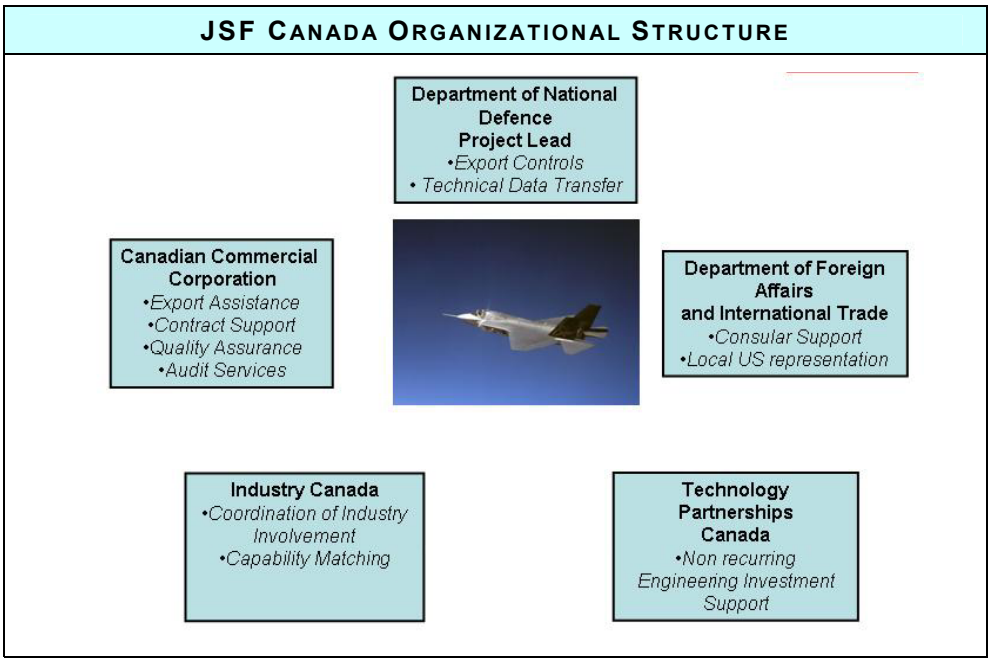
Innovative Organizational Structure

Following Canada's official entry into the SDD phase in February of 2002, the chart of Canadian government set up a five-pronged organization ("JSF Canada" – organizational structure shown on next page) to lead and optimize Canada's JSF program effort within the new best value sourcing model. The significance of the Canadian approach lies not in its organizational form, but rather its three-step function: 1) to *proactively* identify JSF requirements and bidding opportunities; 2) to match them to Canadian industrial capabilities; and 3) to encourage JSF participation by decreasing industries' financial burden through government-sponsored performance guarantees and research and development loans.

Two government entities exist within the JSF Canada organization with noteworthy roles. The Canadian Commercial Corporation (CCC) acts as an intermediary between Canadian companies and the US (or international) contractor. CCC carries out strict quality assurance and auditing procedures that effectively provides JSF contractors government "certification" – highly incentivizing program participation. In addition, Technology Partners Canada (TPC), a Canadian government-sponsored technology investment fund ($75 million of which has been set aside for the JSF program) provides loans for strategic technology

TPC FUNDS

1. *The Canadian government has set aside up to $75 million of additional TPC funding to support JSF-specific research and development as part of Canada's financial commitment to SDD.*
2. *Money borrowed from TPC must be repaid in full if the funded technologies result in production revenues.*
3. *TPC funds are limited to 40% of total R&D cost of a project.*



Source: ODUSD (Industrial Policy)

investments. TPC provides a significant benefit to Canadian industry as TPC bears the cost of capital and the risk if JSF-related R&D fails to result in production revenue. Although both the TPC and CCC are optional, these programs can greatly reduce the financial burden of SDD participation for Canadian companies.

Proactive Search for JSF Opportunities

In addition to establishing a JSF program specific government entity and R&D funding, members of the JSF Canada team traveled extensively throughout the United States and United Kingdom in 2002 to meet not only with the JSF co-primes (Lockheed Martin, Northrop Grumman, and BAE Systems), but also with their second and third-tier contractors (e.g. Moog, Goodrich, Smiths Aerospace, and Parker Aerospace). To date, JSF Canada has identified 156 companies as potential partners in the JSF program and estimates that these companies have capabilities spanning 412 "industrial activities" that may serve one or more JSF requirement. Besides identifying these companies, JSF Canada has met with 36 of them to specifically discuss JSF bidding opportunities and to market Canadian capabilities. The JSF Canada team emphasizes the importance of this proactive approach: while Lockheed Martin and the JPO oversee the JSF program, the sheer size of the potential supplier base makes it difficult for these two organizations to accurately keep track of all sub-tier contracting opportunities. Additionally, Canada understood that Lockheed Martin was likely to be preoccupied with higher-level system projects and contracts, limiting the potential for

"You have to know who your supply base is, and what they are capable of doing in order to maximize probability of bid success." – Michael Slack, Director US-Canada Material Relations.

many direct contracting relationships with a country like Canada whose aerospace industry specializes in niche technologies, sub-systems, and smaller components.

JSF Canada's active matching of Canadian capabilities to JSF requirements has become an effective mechanism through which contractors can solicit RFPs in Canada. By identifying potential bidders, JSF Canada effectively acts as a one-stop point of contact for all Canadian companies and reduces the time required to review bids and select winners. JSF Canada uses their detailed survey of Canadian capabilities to limit bidders to those companies who best fulfill specific contract requirements. This ensures consistent, high-quality bids.

International Partnerships

Beyond the scope of JSF Canada's original credo, the team has recently begun conversations with other JSF partner nations in order to explore international partnerships. Canada's interest in international partnerships has two purposes: first, they would like to leverage existing R&D work by capitalizing on potential operating synergies between Canadian and other partner countries' industries; and second, they would like to promote the best value sourcing concept in other countries in order to maintain a level playing field. Many Canadian companies hope that international teaming may help them break into certain international markets as well.

CONCERNS

"Strategic Sourcing"

*JSF's best value sourcing has allowed smaller companies with **transformational technologies** to showcase their capabilities and bid for work. A twelve-employee, semi-conductor company from British Columbia recently won a JSF contract… and almost immediately grew 25% (to fifteen employees) to fulfill their SDD requirements*

In addition to promoting the best value approach to other international JSF partners, DND officials continue to express concerns over Lockheed Martin's recent decision to introduce directed workshare into the JSF program. Early in the JSF program, Canada recognized that the best value sourcing model signaled a significant paradigm shift for international defense industries, and considered itself to be in an advantageous position compared to other international partners. This is due in part to the legislation that considers Canada to be part of the national domestic defense industrial base[6] which has resulted in a high level of Canadian understanding of and experience in competing for US defense contracts. Not surprisingly, Canadian officials favored and embraced the new best value concept from the beginning and are concerned that the definition of best value may be changed to include an element of offset.

[6] US Code Title 10, Section 2500.

DND fears that such changes could compromise both the affordability and performance of the JSF program. Some aerospace pundits have stated similar views and mentioned the Eurofighter Typhoon as an example of this problem. While the Typhoon is considered to be a very capable aircraft, schedule delays due to an inherently inefficient workshare scheme have resulted in an aircraft with some obsolete technology and an escalating price.

Additionally, DND sees the best value program as a way for smaller companies with transformational technologies to become involved in the JSF program. Under previous Canadian workshare programs like the CF-18, prime contractors traditionally dealt with only a few large Canadian subcontractors in order to minimize administrative efforts while fulfilling the workshare requirements. Under JSF's best value sourcing, however, smaller players with niche technologies can bid for work on a level playing field with the much larger conglomerates. This was an important and attractive feature of JSF during Canada's parliamentary deliberations regarding SDD participation, and JSF Canada hopes that strategic sourcing will not harm the political credibility of future best value programs such as the Multi-Mission Maritime Aircraft (MMA).

Export Controls – ITAR

To the surprise of Canadian officials, export controls have proven to be a particular concern even though Canada has been exempt from some ITAR regulations for over 18 months. DND believed that these ITAR exemptions would ease Canadian SDD participation by eliminating the need for TAAs prior to sharing of unclassified RFP information. To date, however, this has not turned out to be true, as JSF contractors have seemed reluctant to employ the Canadian exemption afforded by ITAR. Some JSF contracts fell through in the early stages of Canadian SDD involvement solely because TAAs were not in place.

"We thought the ITAR exemption would give Canada a leg up, but it hasn't…every company has (export control) issues to resolve."
- a Canadian DND official

In this concern, Canada echoes the voices of all other partner countries who complain that non-US companies have not had access to all information required to make thorough and competitive bids in response to JSF RFPs. This lack of communication has been the single biggest inhibitor to the level playing field promised by the best value sourcing model. Canada strongly suggests that export controls be discussed with all potential partner nations in the very early stages of future international programs.

Future Considerations:
Export control issues must be resolved in the very early stages of future international programs. JSF has not allowed free flow of information among partner countries, often requiring foreign companies to bid on contracts without all of the required information. This has particularly hindered foreign participation in high value-added engineering and development competitions.

FINANCIAL IMPACT

CONTRACTING SUMMARY - CANADA	
Canada	
Contracting Summary	
Total Opportunities:	99
Contracts Awarded:	41
Competitions Completed:	61
RFPs Outstanding:	38

Since Canada signed the SDD MOU, Canadian companies have bid (or are preparing bids) on at least ninety-nine opportunities for JSF-related contracts. Sixty-one of these competitions have been completed and contracted; eighteen Canadian companies, representing a variety of technical disciplines and competencies, have won forty-one of these – a 67% success rate – amounting to approximately $150-160 million through SDD. The insert shows the extraordinary momentum with which Canada is bidding on JSF contracts, likely far surpassing the bid rate of all other partner countries.

Considering RFPs currently in competition, future bidding or second sourcing opportunities, and unit production total through FRP, JSF Canada estimates a potential for $4.4 billion to 6.3 billion of revenues for Canadian industry over the life of the JSF program; our estimate is $3.9 billion. The chart below details these revenue estimates and potential JSF-related earnings impact.

ESTIMATED POTENTIAL FINANCIAL IMPACT OF JSF

(US$M) ***Canada***	Revenues[1] 2002-2011	Revenues[1] 2012-2026	EBIT[2] 2002-2011	EBIT[2] 2012-2026	EBIT Margin Assumption[2]
CaseBank Technologies	$10.2	$266.8	$2.5	$66.7	25.0%
GasTOPS Ltd	5.8	15.9	0.7	1.9	12.0%
Héroux-Devtek	76.8	255.2	5.0	16.4	6.4%
Magellan Aerospace	93.4	319.6	9.7	33.1	10.4%
Pratt & Whitney Canada	50.6	70.6	6.0	8.4	11.8%
Others[3]	857.0	1,888.9	86.3	257.5	12.5%
Total Country Estimate[3]	**$1,093.8**	**$2,817.0**	**$110.2**	**$384.0**	**12.6%**

Sources: ODUSD (Industrial Policy) and First Equity
Footnotes and methodology discussion on A-7 and Appendix A, respectively
Company case studies at Appendix E

Canada's financial commitment to the program consists of $100 million of direct funding to be paid to the US government through 2010, plus up to $75 million of additional loans through TPC for Canadian industrial use. The Canadian economy will undoubtedly earn a significant return on this investment over the course of the JSF program. Although the majority of direct JSF revenues will be realized many years from now during FRP, the sheer magnitude of the revenues combined with a relatively low level of SDD and TPC investment is expected to translate into returns of approximately 4117% - a nominal

payback of over $41.00 per $1.00 invested into the program. As shown below, this translates to an annual compounded rate of return of nearly 67%.

ESTIMATED POTENTIAL COUNTRY-LEVEL RETURN ON JSF INVESTMENT

(US$M) ***Canada***	SDD - FRP Revenues[1] 2002-2026	Partnership Investment[4] 2002-2026	Nominal Return[5] 2002-2026	Annually Compounded Rate of Return[6] 2002-2026
Total Country Estimate[3]	**$3,910.8**	**$95.0**	**4116.6%**	**66.7%**

Sources: ODUSD (Industrial Policy) and First Equity

Footnotes and methodology discussion on A-7 and Appendix A, respectively

Of the eighteen companies involved in the JSF program, we have completed discrete case studies on five of them. These case studies are located in Appendix E.

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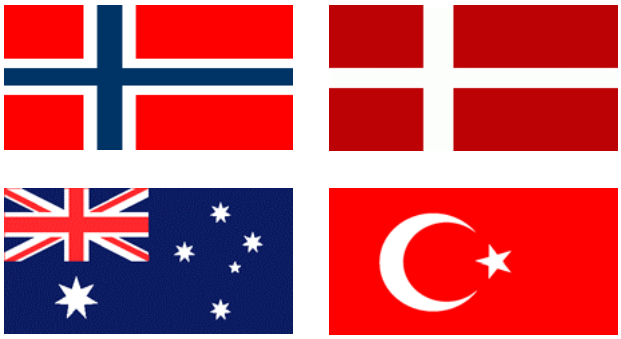

THE WAY AHEAD

NORWAY

DENMARK

AUSTRALIA

TURKEY

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Key Features of Government Approach:

- *Potential industrial benefits spurred initial involvement in CDP; potential operational requirement surfaced later*
- *Government/industry group formed to look at overall industrial implications of defense programs*
- *Norwegian government not organized to assist industry in winning JSF work*
- *Norway is forming international partnership with Canada and Denmark*

Concerns:

- *Lack of "level playing field" – Lockheed Martin and their first tier subs tend to favor pre-existing supplier relationships*
- *Lockheed Martin's new "Strategic Sourcing" plan is not the answer*

KEY FEATURES OF GOVERNMENT APPROACH

Motives behind JSF Systems Design and Development Participation

Similar to their F-16 cooperation, Norway, Denmark, and the Netherlands discussed a JSF collaboration beginning in 1995-1996 during the CDP phase. All three countries were primarily motivated by the potential industrial benefits that were expected to be available to JSF partner nations. While this former F-16/JSF collaboration never materialized, Norway and Denmark formed a JSF program partnership. Each country, including Norway, continues to support JSF participation for industrial and economic reasons.

In the meantime, the Norwegian Air Force decided that their F-16 fleet would be replaced between 2012-2015 by approximately 50 next-generation fighters. An official purchase decision is expected in 2007-2008. This potential operational requirement in fact reinforced the industrial motivation for JSF participation. Indeed, considering Norway's small defense budget (approximately one percent that of the United States), a purchase of 50 aircraft represents a sizable financial commitment. As such, it was well known to the Norwegian MoD that a high level of industrial participation in the replacement fighter program would be necessary in order for such a purchase to be approved. Interestingly, a Norwegian government study prepared in February 2002 concluded that Eurofighter presented greater industrial potential for Norway, but it was decided in summer 2002 to participate in JSF SDD anyway in order to maximize the Norwegian content in the latter program – anticipating greater sales of JSF due to its lower cost relative to Eurofighter.

While the JSF partnership decision was discussed with Parliament, a formal vote was never taken. However, with a minority party in charge, government officials must now be more attuned to Parliament's concerns. Hence, there has been increasing emphasis on realizing an industrial return on the JSF program. The Parliamentary Defense Committee scheduled a formal review of the JSF program status for June 17, 2003, and

NORWAY – JSF PROGRAM SUMMARY

Norway

JSF Program Participation Summary

Partnership Level:	III
SDD MOU signing date:	20 June 2002
Value of CDP funding:	US$10 million
Value of SDD funding:	US$125 million

Primary Reasons for Participation

1. To facilitate Norwegian industrial participation in JSF program
2. To evaluate JSF as a potential Norwegian Air Force purchase

Current Tactical Fighter Fleet

Type:	F-16A/B
Prime Contractor:	Lockheed Martin
Procurement Dates:	1980 - 1987
Number in Fleet:	58
Typical Deployment:	Multirole (Conventional)
Planned Retirement:	2012 - 2015

will use this opportunity to determine if Norway will remain in the SDD phase or cancel participation.

In determining an acceptable level of industrial participation to maintain partnership status in the JSF program, Norway has not specified a dollar threshold that defines success. Success will be based on a feeling of satisfaction based on a significant industrial project or several smaller projects of special interest for their technical content. Their main objective is to protect and sustain the small Norwegian defense industrial base.

Industrial Implications Group Formed

Admittedly, Norway has very little experience in the aerospace sector relative to other partner countries. Their offset work from the F-16 program was strictly build-to-print. Historically, Norwegian industry has excelled in sensitive areas such as sensors and sensor fusion, electronic warfare, and cryptography. The industry is primarily small companies with little experience delivering products to DoD.

In recognition of these factors, Norway formed an industrial oversight board to look at overall industrial implications of defense programs. The group is chaired by the MoD and consists of representatives from the MoD, the Chief of Defense, the Ministry of Trade & Industry, and the industry suppliers association. This group meets every four to six weeks and reports to a strategic project review team. Paradoxically, a year ago, it was this board that issued the aforementioned report concluding that Eurofighter presented the best opportunity for Norwegian industry.

The government's summer 2002 decision to participate in SDD finessed the industrial oversight board's previous pro-Eurofighter bias. However, the mileage that Eurofighter has achieved with the early placement of Eurofighter offset business in Norway, even prior to a procurement decision, may be hard to overcome. The MoD and the Royal Norwegian Air Force still recognize the advantages of JSF over Eurofighter; however, it is clear that ongoing competitions and industrial base issues will figure prominently in Parliament's final decision.

Government Not Organized to Assist Industry

> *"Norwegian government was not as well prepared to support industry as the Netherlands and Canada.. we realized this too late."*
> - *Christian Tybring-Gjedde, Assistant Director General, Ministry of Defense*

The Norwegian government admits that they are not well prepared to help industry find opportunities for JSF work despite their industrial oversight organization. In short, they do not have an integrated strategic plan. They credit both Canada and the Netherlands with doing a good job in this area. Five to six years prior to competitions, both of these countries identified technical capabilities required to compete and were able to help their companies prepare.

Small Norwegian companies were generally unprepared to spend significant resources for proposal development efforts. Government officials would like to be able to help them cover such upfront bidding costs but are not yet organized to effectively do so. Compounding the problem is the fact that the Norwegian Parliament feels like they've already "bought" their way onto the JSF program through their SDD participation fee and are not inclined to provide any additional funding to Norwegian industry to increase their competitiveness. Even if they were to do so, they believe it would be difficult to determine which government agency should fund this investment, much less how to fairly and equitably distribute this funding.

International Partnerships Being Formed

Norway continues to discuss an MOU with Canada and Denmark that would combine their forces in approaching the JSF program. They feel that teaming with complementary Canadian industry to find a way to benefit from Canada's ITAR exemption may help them get into the program and, in turn, Canada would gain access to Norwegian and Danish technologies they do not currently have. They also hope that Lockheed Martin will recognize and favor the opportunity to award work to three countries in one contract award. This partnership plan to collaborate in logistics, training, and other long-term opportunities could provide contracts and corresponding revenues beginning in the latter stages of the JSF program.

> *"We are not giving up! We will continue to look for future JSF opportunities."*
> - *Tore Sannes, Executive Vice President, Kongsberg*

Larger companies like Kongsberg state they are aggressively pursuing JSF business. They are

trying to team with other European industries to win work and are seeking guidance from Lockheed Martin and their subcontractors. We have not, however, seen any evidence that they have embraced the system-of-systems prime contractor role that, say, the Dutch company Stork has. The assumption of such a subcontractor role might provide Kongsberg the processes to contract JSF components where it has no specialty.

CONCERNS

It appears that Norwegian industry views JSF opportunities as too small and too difficult to win. Like a handful of other partner countries, Norway complains that they are competing with US industry on an uneven playing field primarily due to technical data transfer limitations and access to US industry. Notably however, Norway has chosen not to bid on some opportunities where their prospects were viewed as substantial.

Lack of a "Level Playing Field"

Kongsberg Defense and Aerospace has worked with Lockheed Martin and Lockheed Martin's subcontractors, but claims they have no visibility into either what bids will be competed or when. Even when "invited" to submit a proposal, they feel that there is no insight into which specifications are most important or what is considered acceptable risk, for example. There appears to be insufficient insight into the RFP process.

> *"'Best value' is not 'best value'… it's targeted…Lockheed Martin tells Kongsberg 'you will compete for this and that'… We feel that Lockheed Martin pre-deciding who gets RFPs is not a 'best value' approach.'"*
>
> *- Christian Tybring-Gjedde, Assistant Director General, Ministry of Defense*

Obtaining relatively sensitive data has also been very difficult for Norwegian industry. Norwegian companies have approached Lockheed Martin about their capabilities and interest in work on the JSF program but indicate that they have received no feedback. They feel that the level of US supplier involvement has been predetermined – even before Lockheed Martin was chosen as the prime. Now that there has been a downselect, Norwegian industry feels that there has been an even bigger shift in attitude to make JSF a US-only program.

> *"The 'best value' concept is good in theory, but has failed miserably in implementation."*
>
> *- Tom Gerhardsen, President Kongsberg Defense & Aerospace*

Norway believes that Lockheed Martin and their first tier suppliers use established US providers because there is no incentive to take a risk and bring international suppliers on-board. Volvo had an established US supplier relationship in their role as a direct supplier for Pratt & Whitney prior to the JSF program that may have enabled them easier entry onto the program. However, even though Kongsberg had several established US supplier relationships with Raytheon for

air defense and with Boeing for command and control, these have not translated into JSF work.

"Strategic Sourcing" is not the Answer

Kongsberg was contacted by Lockheed to bid on the CV arresting gear and pylons through their strategic sourcing plan. Kongsberg, however, felt that this "mechanical" work does not capitalize on their core mission systems competencies of software design/development or weapons interface design/integration. Christian Tybring-Gjedde, Assistant Director-General in the Norwegian MoD points to this "gap between where Lockheed Martin thinks Kongsberg can compete, and where Kongsberg believes it can most effectively compete" as evidence that Lockheed Martin is not adhering to the "best-value" sourcing model.

Ironically, strategic sourcing was created to help countries lacking in industrial participation such as Norway. Norway would get no argument from Canada or the Netherlands in voicing serious objections to the new sourcing plan. Case in point: a handful of Dutch and Canadian companies have expressed interest in both the CV and CTOL arresting gear SDD contracts on a competitive basis. By contrast, it was only after some of these components were offered to Norway on a strategic value basis that one Norwegian company in question became less ambivalent about the work.

FINANCIAL IMPACT

Slow to Materialize

Norway has won a handful of relatively small SDD contracts thus far. Lockheed Martin recently awarded a software contract for $275,000 to Metronor. While this is a very small contract, it indicates that Norwegian industry has products and technologies with real potential for the JSF program. In addition, Pratt & Whitney has placed a contract with Volvo Aero Norge for approximately ~$1 million for SDD, and Corena Denmark, which has a Norwegian subsidiary, has also won a contract that will be split between firms in each country.

Fourteen Norwegian companies participated in a weeklong program during the summer of 2002 in order to demonstrate their capabilities to JSF contractors. The Norwegians considered this a "good start" to their participation in JSF, but complain that not much has come from that opportunity. In truth, however, Christian Tybring-Gjedde laments that "maybe that was [Norwegian] industry's fault."

Nevertheless, with such large production quantities, the few existing JSF contracts should create a nominal return on Norway's Level III commitment of US$122 million greater than 100%. Volvo Aero Norge, alone, claims that three or four single source engine parts production contracts would pay for Norway's procurement of JSF from Volvo Aero Norge's revenues.

NORWAY

Discrete case studies highlighting the impact of JSF have been prepared for Kongsberg and Volvo Aero Norge. These case studies can be found in Appendix E.

DENMARK

Key Features of Government Approach:

- *Denmark is hoping to leverage its relationship with Lockheed Martin and its prior F-16 program experience to win JSF contracts*
- *Strong industrial support including co-funding of SDD investment*
- *Denmark believes that the primary benefit to program participation is in acquiring a replacement platform for its current F-16 fleet*
- *Political opposition has forced Danish defense suppliers to lobby for JSF program participation*
- *Danish industry and government officials have worked diligently to organize marketing opportunities for Danish defense companies and capabilities*

Concern:

- *In the "best value" contracting process, larger companies often absorb upfront development costs in order to under-price and eliminate competition, allowing them to capture windfall profits during production phases*

KEY FEATURES OF GOVERNMENT APPROACH

The defense industry in Denmark has historically had a long-standing, successful relationship with JSF's prime contractor, Lockheed Martin. Along with Norway, the Netherlands, and Belgium, Denmark teamed with the US Air Force and Lockheed on the F-16 fighter aircraft. Furthermore, most of the aircraft flown in the Danish Air Force were produced by Lockheed, and Danish forces recently ordered three additional C-130J transport aircraft. Consequently, Denmark and its defense industry have been eager to leverage their relationship with Lockheed Martin in order to play a significant role in the Joint Strike Fighter program.

Since joining the program during the Concept Demonstration Phase (CDP) in September 1997, Denmark feels that JSF partner-level participation offers a number of significant benefits. First and foremost, Denmark understands the value to its Air Force of acquiring a fighter aircraft that will meet its future manned aircraft warfighting needs and replace its aging fleet of F-16s. However, a certain political faction within Denmark's government feel that Denmark should not participate in the program and rather it should wait until its aircraft fleet needs to be replaced and then acquire a platform that meets the country's needs. In response, Danish industry lobbied its politicians, highlighting the monetary, strategic, technological, and other advantages the program would provide to Danish defense firms. In fact, to demonstrate their commitment to the program, representatives from the military supplier base agreed to partially fund SDD. Additionally, Denmark feels that JSF involvement will provide valuable knowledge and capabilities development. The Danish Air Force and defense industry expect to gain a better understanding of the aircraft, leading to lucrative aftermarket opportunities and technological spin-offs.

DENMARK – JSF PROGRAM SUMMARY

Denmark

JSF Program Participation Summary

Partnership Level:	III
SDD MOU signing date:	28 May 2002
Value of CDP funding:	US$10M
Value of SDD funding:	US$125M

Primary Reasons for Participation

1. To replace current F-16 fleet with F-35 aircraft
2. To support the Danish defense industry
3. To gain understanding of the F-35 platform and program

Current Tactical Fighter Fleet

Type:	F-16
Prime Contractor:	Lockheed Martin
Number in Fleet:	57
Typical Deployment:	Multirole (Conventional)
Planned Retirement:	2013 - 2015

Since entering the SDD process, Denmark has been proactive in involving its defense suppliers and government agencies in the JSF program. The country has used a number of different strategies to realize the benefits of JSF program participation. First, Denmark teamed with Norway for program partnership. Both countries participated in the F-16 program. The funding and technology sharing afforded by the F-16 partnership proved to be of significant value. Additionally, the Danish defense industry has been especially active in presenting its capabilities to the top-tier contractors. One Danish firm, Systematic has stationed several engineers on-site at Lockheed Martin to demonstrate their expertise and improve the likelihood of winning future contracts.

During the CDP phase, a consultant hired by MoD worked with the Danish National Deputy in the JSF Program Office to arrange marketing opportunities for Danish defense companies. Currently, a representative from Danish industry, supported by funding from Danish military suppliers, is continuing these efforts. Furthermore, the Danish representative in the JPO forwards Lockheed's monthly status reports, which detail current and upcoming JSF opportunities relevant to Denmark's military supplier base in order to help firms identify and fulfill JSF requirements.

Denmark has also set up the JSF Coordination Team as a part of their efforts to involve Industry in the program. This team acts as a liaison between Lockheed Martin and Danish Industry. One of their main missions is to identify bidding opportunities and try to match them up with Danish industries.

DENMARK

CONCERN

Denmark believes that, in the "best value" contracting process, large subcontractors have an unfair advantage over smaller contractors if they use their scale to absorb significant upfront development costs. The worry is that, in doing so, large subcontractors price smaller competitors out of the market and control the significant production revenue stream in the out years. However, Denmark feels that this issue has been mitigated to a degree with "strategic sourcing" contracts issued by Lockheed which direct subcontracting opportunities to certain countries if their industries can produce technologies that meet the price, technological, and operational requirements set for the fighter jet.

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Key Features of Government Approach:

- *Australia is taking a combined government-industry approach to maximize opportunities for Australian industry within the best value model*
- *A JSF program office has been formed to coordinate both industry and capability aspects of the project*
- *A JSF industry team has been formed to help maximize opportunities for Australian industry*
- *Australia is looking to team with US companies and companies from other partner countries where of mutual advantage*

Concerns:

- *Australia has been unable to bid on some JSF contracts due to the lengthy TAA execution process*
- *Australian companies sometimes have difficulty competing against larger US and Canadian companies that may subsidize their JSF programs in the SDD phase - Australia believes that strategic sourcing contracts will help overcome this somewhat but Australia is still very much in favor of the best value arrangements*

KEY FEATURES OF GOVERNMENT APPROACH

In October of 2002, Australia signed an MOU becoming a Level III partner in the Joint Strike Fighter (JSF) program, with a financial contribution of $150 million. Although a latecomer to the program, the Australians had considered entering into the JSF program for some time. The Australian armed forces had been looking into JSF since 2001 as part of Project Air 6000, a project that will replace the aging F-18 and F-111 fleets, scheduled to be retired progressively between 2012 and 2020. The Australians wanted a replacement capability that would give the Royal Australian Air Force a strike and air dominance capability, and became impressed with the F-35's combination of performance and affordability.

The Australian Government also recognized that industry opportunities were another major benefit of participation in the JSF program. In the past, Australian industry's military program participation was limited to involvement in support of the aircraft that they purchased. However, the JSF program is set up differently, and Australian industry realized that it would have the opportunity to win long-term production contracts for all JSF production units and to become part of the global supply and support chains. Because of this opportunity, the Australian government is working with Australian industry to promote its capabilities.

Australia has also established a JSF program office within the Australian DoD to advance the JSF partnership. The office is structured into teams that comprise all aspects of the JSF program: operational requirements, commercial support, project management and acquisitions, science and technology, and the JSF industry team.

AUSTRALIA – JSF PROGRAM SUMMARY

Australia

JSF Program Participation Summary

Partnership Level:	III
SDD MOU signing date:	31 Oct 2002
Value of SDD funding:	US$150M

Primary Reasons for Participation

1. To facilitate Australian industrial participation in JSF
2. To evaluate JSF as a potential platform for Australian forces

Current Tactical Fighter Fleet

Type:	F-18
Prime Contractor:	McDonnell Douglas
Number in Fleet:	71
Typical Deployment:	Multirole (Conventional)
Planned Retirement:	2012 - 2015

Type:	F-111
Prime Contractor:	General Dynamics
Number in Fleet:	36
Typical Deployment:	Strike and Reconnaissance
Planned Retirement:	2015 - 2020

The JSF industry team is an integral part of the project office. The team has worked with Australian industry to group companies into Integrated Capability Teams (ICTs) that aim to mirror the IPTs established by Lockheed Martin and other top tier contractors. Their ICTs have been in close contact with their IPT counterparts in order to become aware of bidding opportunities and to market their unique capabilities accordingly.

Additionally, Australia has been proactive in attempting to increase the value of its participation in the JSF program. Australia would like to work with companies from other partner nations.

CONCERNS

Like many other partners in the JSF program, the Australians have been displeased with the difficulties surrounding use of the GPA. Consequently, TAAs and Manufacturing License Agreements (MLAs) have been required by many of the prime contractors, which have slowed down the process. Australia believes that many of its industries have not had the opportunity to reply to RFPs due to the lengthy process required to acquire the necessary export license. Also, some restrictions placed on these licensing arrangements have also impeded industry involvement.

Finally, Australia has faced difficulty breaking into the US market. Some large US defense firms have been internally financing non-recurring costs when submitting bids

on JSF projects, effectively pricing smaller Australian companies out of the competition. Nonetheless, Australia is optimistic that the "strategic sourcing" program recently introduced by Lockheed Martin will help even out the playing field for its firms and Australia's "best value" industry will continue to win contracts on merit.

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TURKEY

Key Features of Government Approach:

- *The Turkish MoD chose to become a partner in the JSF program in order to support its defense industry and eventually replace its fleets of F-4s, F-5s, and F-16s*
- *The MoD is working to bring together respective points of contact in the Turkish defense industry and JSF contractors*
- *The Turkish government provides development funds to financially support companies that secure JSF opportunities*

Concern:

- *Until a recent meeting with senior Lockheed Martin and DoD officials, Turkey believed that it was not informed of the complete universe of available JSF contracts. As communication has since improved, Turkey believes that it is now better positioned to capitalize on its position as a JSF partner-level participant*

KEY FEATURES OF GOVERNMENT APPROACH

The Turkish MoD is planning to replace its fleets of F-4, F-5, and the Block 30 F-16 aircraft after 2012 with the JSF. To ensure a seamless and timely transition, Turkey has decided to join the JSF program as a Level III partner. Specifically, Turkish officials chose the F-35 program because they felt that the aircraft provided the most value at the lowest cost. Partnership status was desired for the expected positive impact on the Turkish military industrial base. This impact was expected to manifest itself in various ways, including increased revenues, job creation, capability development, and technological spin-offs.

Turkey is currently taking steps to help its companies identify, bid for, and win contracts. The Turkish MoD established an internal group of approximately seven individuals tasked with bridging the divide between JSF top-tier contractors and Turkish industry. This group coordinates and connects the respective points of contact within both groups so that Turkish companies have the opportunity to present their capabilities and expertise to decision makers. Through this group, the MoD is trying to ensure that Turkish companies receive consideration on contracts where they possess the capabilities necessary to deliver the requisite technologies. Furthermore, through funding supplied by the Under Secretariat for Defense Industries, the Turkish government intends to financially support its defense suppliers by providing funding for various phases of JSF development contracts.

CONCERN

In spite of these efforts, many Turkish officials believe that the country's partnership status has not yet provided many of the benefits initially projected. In fact, to date only one Turkish company, TEI, has secured a contract, which is worth only $92,000. The recently implemented "strategic sourcing" contracting methodology, according to

TURKEY – JSF PROGRAM SUMMARY

Turkey

JSF Program Participation Summary

Partnership Level:	III
SDD MOU signing date:	11 Jul 2002
Value of CDP funding:	US$6.2M
Value of SDD funding:	US$175M

Primary Reasons for Participation

1. Positive effect on industry in terms of increased revenues, jobs, and technological expertise
2. The upcoming need to replace existing fighter aircraft

Current Tactical Fighter Fleet

Type:	F-4
Prime Contractor:	Boeing (McDonnel Douglas)
Number in Fleet:	163
Typical Deployment:	Intercept and Attack
Planned Retirement:	2005 - 2010

Type:	F-5
Prime Contractor:	Northrop Grumman
Number in Fleet:	209
Typical Deployment:	Attack
Planned Retirement:	2005 - 2010

Type:	F-16
Prime Contractor:	Lockheed Martin
Number in Fleet:	166
Typical Deployment:	Conventional
Planned Retirement:	2005 - 2010

Turkish National Deputy, Major Arif Pazarlioglu, should help Turkey win JSF contracts in the future. However, it has yet to lead to a Turkish company securing a substantial JSF contract.

According to Major Pazarlioglu, until recently, Turkey was only informed of the few JSF opportunities that Lockheed Martin or other top-tier contractors believed could be carried out by one of the thirteen companies listed on Turkey's signed GPA. However, Major Pazarlioglu contends, many other Turkish companies could have bid on and won JSF contracts if only they or the Turkish officials were more informed. Pazarlioglu asserts that this has been one of the most important reasons why Turkey has not been as successful as it had hoped.

During an April 2003 meeting with top Pentagon and Lockheed Martin officials, Turkish representatives voiced these concerns. According to Major Pazarlioglu, conveying their issues directly to these senior defense leaders significantly improved Turkish government and industry communication with Lockheed and other contractors. Lockheed is doing a better job informing countries of all available opportunities, and the Turkish MoD and industry can now "see the roadmap" of the JSF opportunities. As

such, Turkish companies, including those not yet listed on the country's GPA, are now better positioned to identify, bid for, and secure JSF contracting opportunities and realize the benefits of partner-level participation in the JSF program.

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CONCLUSIONS

CONCLUSIONS

The JSF international acquisition strategy is unprecedented in the program investment it was able to attract from partner countries (and companies in the case of Denmark!) and in the opportunity it presents for partner companies to participate in the global industrial base supporting a state-of-the-art, cost-effective, and well-funded platform. This program provides the opportunity for participating companies to produce components of JSF not only for their own or consortia operational requirements (the F-16 model) but also, near term, for the much larger United States and United Kingdom JSF inventories – with the promise of content on all worldwide JSF inventories produced well into the first half of this century.

While a bold departure from previous models of international participation on U.S. military platforms, the JSF international strategy extends the foundation built over decades with friends and allies on co-production and consortia programs, as well as through key international industrial agreements and statutes. By statute, Canada is considered part of the national defense industrial base – an important cornerstone for the security of our shared North American continent. Declaration of Principles agreements with allies and friends such as the United Kingdom and Australia, and then the Netherlands, Spain, Sweden, and Norway in this Administration, built on Defense Equipment Cooperation Agreements signed in the 1990s. These Declaration of Principles agreements address key areas of interest such as the harmonization of military requirements, security of supply, export procedures, security, foreign ownership and corporate governance, research and development, and promoting defense trade. In recognition of the importance of security of supply, DoD has signed a bilateral security of supply arrangement with the United Kingdom, and is negotiating similar arrangements with Sweden, the Netherlands, Norway, Italy, and Spain. Individually and collectively, these arrangements encourage allies to acquire defense goods from US suppliers, promote interoperability, and provide increased assurance that the Department's non-US suppliers will be in a position to provide timely deliveries to DoD during peacetime, crisis, emergency, or armed conflict.

Our assessment of the impact of the JSF program on the partner countries and companies has made clear some of the challenges associated with its revolutionary international acquisition strategy. However, some of the strategies used by partner countries and companies in *their* approaches to JSF indicate that those strategies are no less revolutionary. The Netherlands identified the JSF program as one of two pillars on which it expects to build a world-class aerospace industry. Danish industry was so impressed with the opportunities the program affords that it invested in the SDD phase alongside the Danish government. Canada provides prized quality and business certifications to JSF contractors, and Canadian company bids on program opportunities will surpass 100 in its first year or so as a SDD partner. Major Italian companies are sending about 100 of their engineers to be part of six Lockheed IPTs in Dallas-Fort Worth and El Segundo. The Danish firm Systematic has stationed several of its engineers at Lockheed to demonstrate their expertise.

CONCLUSIONS

JSF Canada surveyed the US JSF industrial base, visiting the primes as well as second- and third-tier suppliers. The UK Department of Trade and Industry surveyed its own potential supplier base early in the program, as did Australia's JSF Industry Advisory Council. In addition, Australia established Integrated Capability Teams to parallel Lockheed's IPTs for maximum program connectivity. To oversee industrial participation in the program, the United Kingdom, Canada, and the Netherlands established JSF organizations in their countries. Many partner countries have also sponsored or co-sponsored "JSF Industry Days" for their suppliers.

Lockheed Martin and Pratt & Whitney have also been worthy quarterbacks to their global partners. Industrial surveys were conducted in all partner countries to assess competitive opportunities and better understand industrial capabilities. In tribute to the English motto that it is the exception that makes the rule, the best value acquisition strategy yielded to commitment to international industrial participation, as in the cases of the early award to Alenia of its wing contract, Lockheed's Letters of Intent and Memorandum of Understanding with the Italian government and industries, and the strategic sourcing approach.

While the jury is still out on the effectiveness of the GPA, delays in the TAA approval process must be addressed. This is not a new complaint, but is critical in allowing equal access to all competitors. Regardless of the reason for delays, it seems apparent that the program would have benefited from more foresight in terms of future information access needs of foreign industry. It would also appear that the bid and proposal exemption obtained by the JPO would help tremendously in alleviating the need for TAAs, but needs greater promotion by the US government and industry.

All the same, the massive financial return potential to partner companies and countries from the program is already apparent. Surely, a time traveler to 2030 would report back to present government and corporate decision makers their successors' disbelief that the opportunities from the JSF program were not clearly seen early in the program's history. We also believe that some of the JSF program's most important disciples will be other US program managers who refine their international acquisition strategies based on these early lessons learned – and gain even greater access to innovation from the global defense industrial base. Important lessons for JSF partner companies and companies seeking positions in other major US defense acquisition programs can also be gleaned from our case studies.

Evidence already abounds that the program is reshaping the global defense industrial base. UK industry is undoubtedly already reaping benefits from the substantive role they had in some of the most challenging aspects of the JSF development. Countries that chose to fund and focus discretionary R&D investments on the program and have done well speak volumes about the importance of R&D investment for innovation and competitiveness. Transnational links are already being forged among the partner countries and their companies which will yield untold international defense industrial alliances, market access, and technology spin-offs. Finally, the program will

dramatically increase the scale of many small and mid-size companies in the global defense industrial base. A Canadian specialty semiconductor chip manufacturer grew from 12 to 15 employees because of its position on the JSF program. Another 40-employee company, which develops decision support software, is forecast to source average annual JSF revenues in SDD/LRIP in line with its average total corporate revenues in the 2001-2002 timeframe. In FRP, this company's revenues from JSF could average over ten times 2002 revenue. At these growth rates, some of the smallest JSF suppliers could find themselves shoulder-to-shoulder with the blue chip giants of the industry as a result of being part of this program!

Above all, however, it is imperative to remember the promise and importance of the JSF program to the American, British, and other partner country war fighters. If we stay the course with minor rudder adjustments, JSF will provide great benefits to the US and global defense industrial base and war fighters alike. Not to do so would undermine US credibility in the global market place and among our important friends and allies.

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JUNE 2003

APPENDICES

APPENDIX A

FINANCIAL ANALYSIS METHODOLOGY &
ASSUMPTIONS

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All estimates of company specific and country level JSF-related revenues, earnings, value, and financial impact are derived from ODUSD (Industrial Policy) and First Equity analysis. The methodology behind the ODUSD (Industrial Policy) and First Equity analysis is discussed in this Appendix. The data used to arrive at the ODUSD (Industrial Policy) and First Equity estimates contained in this report were provided by a variety of sources, including non-proprietary information from companies, national aerospace industry associations, government and military officials of the partner countries, the US Department of Defense, and Lockheed Martin; however, the estimates of JSF-related revenues, earnings, value, and financial impact should not be considered the official position of any of these sources.

COMPANY CASE STUDY FINANCIAL IMPACT ANALYSIS

Estimating JSF-Related Revenues and Earnings

There exists a wide variety of metrics that can be used to assess the financial impact of the JSF program on a partner firm. Most broadly, the revenues (turnover) from JSF SDD and production contracts provide a measure of the magnitude of JSF-related business activity vis-à-vis the rest of a firm's business base.

One of the objectives of this report, however, is to show the estimated impact of JSF on the earnings and value of a company (on a per share basis, where applicable). To avoid comparative variations in the capital structures and tax liabilities of firms across partner countries, earnings before interest and taxes (EBIT) is used instead of net earnings. EBIT is important because it represents returns available for distribution to all capital owners – be they bondholders, preferred equity owners, or common shareholders – before taxes, and is a common basis for measuring value. With regard to potential impact on company value, the analysis has used a multiple of the company's enterprise value[1] to EBIT as a basis upon which the potential value of JSF business is estimated.

For simplicity, and to show no bias for the future performance of one company over another, a comparison to FY2002 financial results is used to assess the relative impact of potential JSF business.

Financial Impact Analysis Methodology Assumptions

Revenues – JSF-specific revenues for each company are derived from company-provided data, or when such data was not provided, from ODUSD(IP) estimates. These data include all contracts that have been awarded to the specific company and future contracts that the company hopes to win. In the analysis, SDD contracts are expected to translate into LRIP and FRP contracts, although single-source production contracts are not necessarily assumed in the overall program acquisition strategy. LRIP and FRP revenues assume the current US/UK procurement baseline of 2,593 aircraft through 2026 and, as such, neither include potential revenues derived from training, maintenance, repair, and overhaul activities, nor potential export sales. The time periods shown depict combined SDD plus LRIP expected revenues (2002-2011) and expected FRP revenues (2012-2026).

[1] Enterprise value = Market value of equity + Book value of debt – Cash

EBIT (Earnings Before Interest and Taxes) – JSF-specific EBIT is derived as follows. Where supplied by an individual company, a JSF-specific target EBIT margin has been applied to estimated potential JSF-specific revenues. In all other cases, a historical pro-forma EBIT margin, calculated as the company's average EBIT margin over the last four fiscal years, less any non-recurring or extraordinary income or expenses, has been applied.

Estimated Value of Average Annual JSF EBIT Contribution & Estimated Incremental Steady-State Value of JSF Program – The value of JSF-related earnings is computed by multiplying estimated JSF-related EBIT by the company's current pro-forma Enterprise Value / EBIT (EV/EBIT) multiple. This value is then compared to the current value of a company as a percentage of current company market value (on a per share basis, where applicable) to arrive at a measure of the relative financial impact of the JSF program to the equity shareholders of a partner company. In a few instances, company EV/EBIT multiples (calculated using publicly available data) were assumed to be skewed due to extraneous circumstances affecting the trading of related shares. In these cases, and in cases of privately held companies, EV/EBIT multiples were estimated using general market data for comparable companies. Where applicable, enterprise value has been estimated on a per share basis.

The following assumptions have been employed to achieve a comparative baseline:

- The period from 2002 through 2011 includes System Development & Demonstration (SDD) and Low Rate Initial Production (LRIP)
- The period from 2012 through 2026 generally represents Full Rate Production (FRP) for the US/UK baseline procurement of 2,593 aircraft
- Company-specific investment and capitalization costs are not estimated
- Estimates contain no company proprietary information as yet unreleased to the public or unapproved for use by the company
- Local currencies have been converted to US dollars at the closing exchange rate on 31 December 2002:
    - British Pounds Sterling: £1.00 = $1.6095
    - Euros: €1.00 = $1.0429
    - Canadian Dollars: C$1.00 = $0.6329
- Department of Navy (USN/USMC) procurement is as yet undefined (CV vs. STOVL quantities); analysis assumes a near even split (356 CV/324 STOVL)
- UK baseline procurement is assumed to be the STOVL variant
- Average engine unit recurring flyaway cost is estimated to be $8.95M (FY02); Source: Institute for Defense Analyses (IDA)

COUNTRY-LEVEL FINANCIAL IMPACT ANALYSIS

Estimating JSF-Related Revenues and Earnings

Revenues – same as company-level financial impact methodology

EBIT (Earnings Before Interest and Taxes) – same as company-level financial impact methodology

Others and Total Country Estimate – Total Country Estimate shows the expected potential country-level financial impact of JSF's SDD through FRP phases at the current baseline US/UK production total of 2,593 aircraft. Country-level revenues have been calculated via aggregated company-level data, as well as estimates for companies' and other earnings not captured in our case studies. This data has been provided by respective governments or industry associations. Where necessary, these data have been adjusted by ODUSD(IP) to reflect the new baseline US/UK procurement of 2,593 aircraft. In addition, the adjusted aggregate estimate has been split into two time periods (2002-2011 and 2012-2026) in proportion to the total JSF program budget over the specific time periods. "Others" refers to the rest of the companies in the country's aerospace industry that are or may become involved in the JSF program and are not specifically studied in this report.

Return on Investment Analysis

The financial analyses focus on the quantitative returns, although numerous qualitative returns are sighted throughout the body of the report and appendices. Quantitative return focuses on signed contracts and any discussion of return on investment invariably begs a number. In corporate finance, calculation of ROI is a rudimentary exercise, often calculated as a ratio of the dollars generated by a particular investment over the dollars therein invested ("nominal" return on investment). Others consider annually compounded rate of return to be a more accurate measure of return on investment as this calculation gives the "real" annual rate of return of a given investment, considering the value of the timing of net returns in addition to the value of straight "dollars in" versus "dollars out." In this report, annually compounded rate of return is calculated as the internal rate of return of a given net return profile. In any such return analysis, deriving the net return profile is the most difficult step, and is especially complicated in this analysis of the JSF program by several factors such as the large number of contracts still in competition and as yet not awarded, and the lack of guaranteed low- and full-rate production contracts. Further, such an exercise of reducing the cost/benefit calculus to a single parameter largely ignores qualitative returns, which are often equally, if not more, compelling. Other quantifiable returns , not estimated for the purpose of this analysis include, but are not limited to:

- price savings during aircraft procurement;
- collection of a portion of levees collected on sales to non-partner countries
- secondary economic effects of program-related expenditures;
- opportunity for maintenance, repair and overhaul business after JSF enters service;
- spin-off contracts resulting from JSF-specific work; and

- R&D efficiencies attained via co-investment.

For simplicity, each country's return on investment for the JSF program is calculated in two ways:

1. Nominal Return – the ratio of Total Country Estimate revenues to the country's JSF partnership investment shown as a percentage.

   Simply, nominal return represents the ratio of "dollars in" over "dollars out." A ratio greater than 100% indicates that a country is forecast to receive more money from the program than it has actually invested into the program. For example, a 100% nominal return signifies a return of exactly one dollar per every one dollar invested, while a 2000% nominal return signifies twenty dollars of return for every one dollar invested.

2. Annually Compounded Rate of Return – the internal rate of return (IRR) of the expected potential annual net revenues of the JSF program.

   As briefly described above, IRR captures the "real" return of a cash flow profile by capturing the value of time in addition to the value of every dollar in and out, and in doing so, the calculation of IRR values short-term net revenue more heavily than those that occur far off in the future. This is particularly relevant to the JSF program as much of the potential revenue is a decade away during FRP. Additionally, this rate of return has been calculated on an annual basis – that is, this number shows the average rate of return on investment expected to be generated *each year*. Such a calculation is analogous to the common practice of measuring stock market returns in terms of an annual rate (i.e., "the Dow Jones Industrial Average gained [returned] 10% this year").

   In order to calculate this return on an annual basis, Total Country Estimate revenues were distributed over the years 2002 through 2026 in proportion to the JSF program budget. These annual inflows were then netted against known annual partnership payments to JPO to form the net revenue basis of the IRR calculation.

In both calculations of return, "Partnership Investment" is the direct financial investment made by each country in order to be a partner in the SDD phase of the JSF program. This investment does not consider funds for potential aircraft procurement to be an investment nor are any assumptions made for potential rebates for future JSF sales to non-partner countries or recoupment of investment via procurement price reduction. Therefore, potential aircraft procurement has *no effect* on the calculation of return on investment. The reasons for this are twofold:

1. no SDD partner country will be forced to buy aircraft in order for their industry to participate during LRIP and FRP, and

2. if a partner country does decide to procure aircraft, the cost of such procurement is offset exactly by the value of the aircraft received, and as

such, has no net effect on the real return to a partner country.

Factors not explicitly considered that could reduce the return estimates include potential direct investment in full rate production and other industry or government co-investment in development or production activities. Other procurement or corporate expenses associated with preparing for program opportunities are also not included in the investment.

Factors not explicitly considered that could increase the return estimates include revenues from other military or commercial applications of JSF-derived technology, GDP multiplier effect of program-specific economic activity, procurement cost savings associated with partnership, and the guaranteed royalty payment on 3rd country JSF sales that the larger program partners will receive.

Footnotes to Country-Level Financial Impact Section Tables

[1]Revenues – JSF-specific revenues for each company are derived from company-provided data, or when such data was not supplied, from ODUSD(IP) estimates. These data include all contracts that have been awarded to the specific company and future contracts the company hopes to win. In the analysis, SDD contracts are expected to translate into LRIP and FRP contracts, although single-source contracts are not necessarily assumed. LRIP and FRP revenues assume the current US/UK procurement baseline of 2,593 aircraft through 2026 and, as such, neither include potential revenues derived from training, maintenance, repair, and overhaul activities, nor additional domestic or potential export sales. The time periods shown depict combined SDD plus LRIP expected revenues (2002-2011) and expected FRP revenues (2012-2026), or all three phases combined (2002-2026).

[2]EBIT (Earnings Before Interest and Taxes) – JSF-specific EBIT is derived as follows. Where supplied by an individual company, a JSF-specific target EBIT margin has been used. In all other cases, a historical pro-forma EBIT margin, calculated as the company's average EBIT margin over the last four fiscal years, less any non-recurring or extraordinary income or expenses, has been applied. Please see Appendices B through F for a more detailed analysis of the relative impact and importance of JSF business to individual firms profiled.

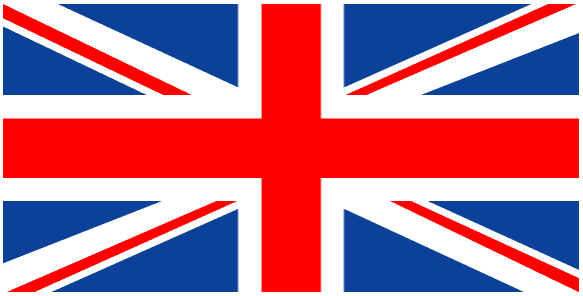
[3]Others and Total Country Estimate – Total Country Estimate shows the expected potential country-level financial impact of JSF's SDD through FRP phases at the current baseline US/UK production total of 2,593 aircraft. Country-level revenues have been calculated via aggregated company-level data, as well as estimates for companies' and other earnings not captured in our case studies. This data has been provided by respective governments or industry associations. Where necessary, these data have been adjusted downward by ODUSD(IP) to reflect the new baseline US/UK procurement of 2,593 aircraft. In addition, the adjusted aggregate estimate has been split into two time periods (2002-2011 and 2012-2026) in proportion to the total JSF program budget over the specific time periods. "Others" refers to the rest of the companies in the country's aerospace industry that are or may become involved in the JSF program and are not specifically studied in this report.

[4]Partnership Investment – Partnership investment is the direct financial investment made by each country in order to be a partner in the SDD phase of the JSF program.

This investment does not consider funds for potential aircraft procurement to be an investment nor are any assumption made for potential rebates for future JSF sales.

[5]Nominal Return – "Nominal Return" shows the ratio of total country-level expected JSF revenues to partnership investment. In simple terms, the nominal return represents the ratio of "dollars in" over "dollars out." A ratio greater than 100% indicates that a country is forecast to receive more money from the program than it has actually invested into the program.

[6]Annually Compounded Rate of Return – Annually compounded rate of return is the internal rate of return (IRR) generated by expected SDD-FRP annual revenues net of all partnership investment payments to JPO.



APPENDIX B

UNITED KINGDOM: COMPANY CASE STUDIES AND COMPENDIUM

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BAE SYSTEMS – COMPANY OVERVIEW

BAE Systems plc
London Stock Exchange – Ticker: BA
Headquarters: London, UNITED KINGDOM
Employees: 100,000 (including Joint Ventures)

BAE Systems, the UK's largest defense conglomerate, has extensive prime contracting experience and capability. BAE's business offerings are focused around major aircraft, marine, and C4ISR programs, with additional organizational structure focused on customer support and the North American market.

- **Major Businesses:** Prime contractor in defense and aerospace industries; air, sea, and C4ISR systems
- **Key Technological Capabilities:** avionics; flight control systems; electronic warfare; C4ISR; command & control systems
- **Major Military Platforms:** Eurofighter Typhoon; Nimrod; F-35 (JSF); BAe Hawk Trainer; Astute-class submarine; Type 45 destroyer; CVF

BAE SYSTEMS PRODUCTS

- **Major Programmes** (Prime Contracts) – Eurofighter (37% stake); Nimord; JSF (prime partner with Lockheed Martin and Northrop Grumman); BAe Hawk; Astute-class submarine; Type 45 destroyer; CVF
- **Avionics** – sensor systems technology; electronic warfare systems; advanced avionics; flight control systems
- **International Programs** – joint ventures: Airbus Industrie, SAAB, MBDA, Gripen International, STN Atlas, and others
- **BAE Systems North America** – HUDs, FMSs, GPS/INS systems; flight and engine controls; RF / IR / acoustic countermeasures, radar / laser / missile warning systems; mine countermeasures, IR imaging, electronic ID systems, camouflage and signature management systems; strategic warfare planning and mission management; reconnaissance and surveillance systems; communication/data link systems; space electronics; support & services

Eurofighter Typhoon

Nimrod

BAe Hawk Trainer

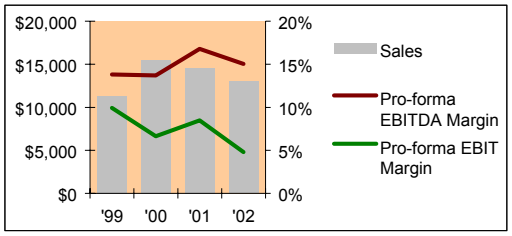
Astute-class Submarine

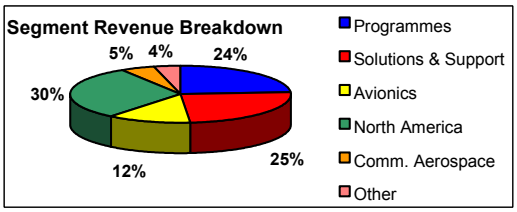
Type 45 Destroyer

CVF

BAE SYSTEMS – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$11,336**	**$15,525**	**$14,551**	**$12,998**
Sales growth:	*0%*	*37%*	*(6%)*	*(11%)*
Reported EBIT:	789	435	398	(660)
EBIT margin:	*7%*	*3%*	*3%*	*(5%)*
Pro-forma EBITDA:	1,568	2,126	2,445	1,954
EBITDA margin:	*14%*	*14%*	*17%*	*15%*
Pro-forma EBIT:	**$1,127**	**$1,028**	**$1,231**	**$623**
EBIT margin:	*10%*	*7%*	*8%*	*5%*
Revenue per employee:	$193,140 *(Estimated - includes Joint Ventures)*			
Stock price:	**$2.08** (as of 5/30/2003)			
52 week high:	$2.25			
52 week low:	$1.64			
Shares outstanding:	3,060.0 million			
Market capitalization:	**$6,378**			
Net Debt:	$2,075			
Enterprise Value:	**$8,453**			
EV/EBIT multiple*:	**13.6x** *(*Pro-forma)*			





Results are converted from British Pounds Sterling to US Dollars using the exchange rate as of December 31, 2002 (£ 1.00 = US$ 1.6095)

BAE Systems – JSF Participation

BAE SYSTEMS

BAE Systems is a Primary Teaming Partner with Lockheed Martin and Northrop Grumman Corporation on the F-35 Joint Strike Fighter program

ElectroOptical Targeting Laser

Aft Fuselage Structures

CV Wingfold

Electronic Warfare Systems
(Countermeasures systems)

Avionics & Flight Controls
(communications and navigation equipment; throttle quadrant)

JSF Content & Contract History

2000 **2001** **2002** **2003** System Design & Development **2012**

January 2001 – UK Government signs Level I Partnership MOU; orders 150 F-35B (STOVL) for the Royal Navy and Royal Air Force

1996 – BAE partners with Lockheed Martin and Northrop Grumman during CDP

JSF Financial Impact – BAE Systems

(Year 2002 US$M, except per share) *(GBP1.00 = US$1.6095)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$4,269.6	$9,708.9
Average Annual Revenue:	**$427.0**	**$647.3**
% of Reported 2002 Revenue:	*3.3%*	*5.0%*
Estimated Average Annual EBIT Contribution:	**$31.8**	**$48.2**
FY 2002 Reported Revenue:	$12,998.3	
FY 2002 Pro-Forma EBIT:	$622.9	
Enterprise Value/EBIT Multiple:	13.6x	
Estimated Value of Potential JSF EBIT Contribution:	$431.9	$654.7
Estimated Value per Share:	$0.14	$0.21
Current Share Price (5/30/03):	$2.08	
Estimated Impact of JSF EBIT Contribution on Company Value:	**6.8%**	**10.3%**

Financial Impact

- BAE will likely collect revenues of $3 million per aircraft
  - At current FRP schedule (2,593 total units), JSF will comprise nearly 4% of BAE Systems revenues
- Significant EBIT contribution could contribute to over 10% of company value during FRP
  - Large (~7%) value contribution during SDD/LRIP due to partnership with Lockheed Martin and Northrop Grumman

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **United Kingdom** (90%)
  - Company UK locations
- **United States** (10%)
  - BAE Systems North America

Lessons Learned

- Early partnership with Lockheed Martin and Northrop Grumman helped secure a substantial position in the program
- BAE Systems is concerned that export control regulations may prevent BAE Systems and the United Kingdom from ever having completely autonomous capability to update and operate the aircaft

GOODRICH (TRW AS) – COMPANY OVERVIEW

Goodrich Corporation
New York Stock Exchange – Ticker: GR
Headquarters: Charlotte, NC, UNITED STATES
Employees: 22,900

In 2002, **Goodrich Corporation** acquired the business units formerly known as **TRW Aeronautical Systems** ("TRW AS" – previously **Lucas Aerospace**) from TRW immediately prior to the merger with Northrop Grumman. The former TRW AS is now spread across several Goodrich business units.

- **Major Businesses (former TRW AS):** Actuation systems; engine control systems; power management systems; aircraft cargo systems
- **Key Technological Capabilities (former TRW AS):** Flight control actuation; specialized actuation systems; engine control software & hardware; starter/generators; cargo handling systems; rescue hoists & winches
- **Major Military Platforms (former TRW AS):** V-22, C-130J, Eurofighter Typhoon, F-35 (JSF), Gripen, Rafale, Mirage

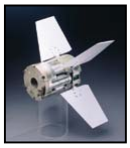
GOODRICH (TRW AS) PRODUCTS

- **Actuation Systems** – primary and secondary *flight control* and *fly-by-wire systems* (actuation and electronics) for fixed- and rotary-wing aircraft; engine and nacelle actuation; specialized actuation systems including *missile actuation and control systems*
- **Cargo Systems** – cargo handling systems (rollers, tracks, rail guides, PDUs)
- **Engine Control Systems** – fuel metering controls, fuel pumping systems, and electronic controls (*FADEC* software and hardware); variable geometry actuation controls; engine health and usage monitoring systems (*HUMS*)
- **Power Systems** – AC and DC generating systems; starter/generators; hoists & wenches

Thrust Reverser Actuation

Flap / Slat Actuation

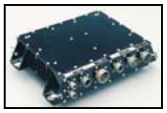
Missile Actuation



Aircraft Cargo Systems

Fuel Metering Units

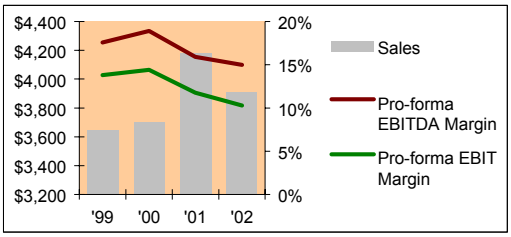
Engine Control



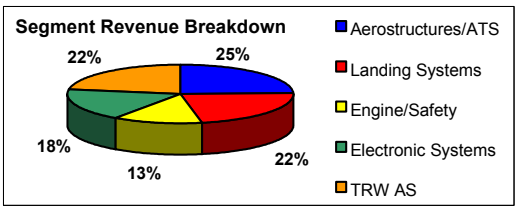
Starter / Generator

GOODRICH – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$3,646**	**$3,701**	**$4,185**	**$3,910**
Sales growth:	*4%*	*1%*	*13%*	*(7%)*
Reported EBIT:	274	490	385	361
EBIT margin:	*8%*	*13%*	*9%*	*9%*
Pro-forma EBITDA:	640	699	666	586
EBITDA margin:	*18%*	*19%*	*16%*	*15%*
Pro-forma EBIT:	**$502**	**$534**	**$492**	**$403**
EBIT margin:	*14%*	*14%*	*12%*	*10%*



Revenue per employee:	$170,751
Stock price:	**$18.27** (as of 5/30/2003)
52 week high:	$34.20
52 week low:	$13.10
Shares outstanding:	117.5 million
Market capitalization:	**$2,147**
Net Debt:	$2,358
Enterprise Value:	**$4,505**
EV/EBIT multiple*:	**11.2x** *(*Pro-forma)*



GOODRICH (TRW AS) – JSF PARTICIPATION

"[Goodrich] is deploying its full range of state-of-the-art manufacturing capabilities to ensure the weight, reliability, and above all, affordability demands of the F-35 are met." – Dave Goldney, Goodrich Corporation

Weapons Bay Door Drive System (WBDDS)
(Power drive units, actuators, & other drive system components)

Other Contracts:
- LiftFan Components
- Utility Actuators

JSF CONTENT & CONTRACT HISTORY

2000 **2001** **2002** **2003** System Design & Development **2012**

1 March 2002 – Northrop Grumman contracts TRW Aeronautical Systems to provide WBDD system for JSF

2 October 2002 – Goodrich completes acquisition of TRW Aeronautical Systems

2004 – 1st Delivery of WBDDS to Northrop Grumman

JSF FINANCIAL IMPACT – GOODRICH (FORMER TRW AS BUSINESSES ONLY)

(Year 2002 US$M, except per share) *(GBP1.00 = US$1.6095)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$159.0	$614.2
Average Annual Revenue:	**$15.9**	**$40.9**
% of Reported 2002 Revenue:	*0.4%*	*1.0%*
Estimated Average Annual EBIT Contribution:	**$2.0**	**$5.1**
FY 2002 Reported Revenue:	$3,910.2	
FY 2002 Pro-Forma EBIT:	$402.6	
Enterprise Value/EBIT Multiple:	11.2x	
Estimated Value of Potential JSF EBIT Contribution:	$22.4	$57.6
Estimated Value per Share:	$0.19	$0.49
Current Share Price (5/30/03):	$18.27	
Estimated Impact of JSF EBIT Contribution on Company	**1.0%**	**2.7%**

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Impact of TRW AS JSF contract revenues on Goodrich Corporation will be minor
  - Expected WBDDS revenues during FRP equate to over 3% of former TRW AS revenues
  - JSF will help diversify the former TRW AS's historical focus on civil market
- Value of EBIT contribution could equate to almost 3% of Goodrich market value
  - Potentially significant valuation impact relative to size of contract

Geographic Workshare

United Kingdom (>70%)
- Wolverhampton – WBDDS

United States (<15%)
- Rome, NY – LiftFan driveshaft components

Rest of World (<15%)
- Various Components

Lessons Learned

- Goodrich's capability in Europe for sophisticated actuation systems is a strong rival for traditional US military sources; the best-value sourcing model has allowed Goodrich/TRW AS to earn a significant position in the JSF program

ROLLS ROYCE PLC – COMPANY OVERVIEW

Rolls Royce plc
London Stock Exchange – Ticker: RR
Headquarters: London, UNITED KINGDOM
Employees: 39,200

Rolls Royce is one of the world's leading manufacturers of gas turbine engines, serving the aircraft, marine, and power generation markets with facilities in the US, UK, and Europe. Rolls Royce also supplies a wide range of marine propulsion products, including thrusters, propellers, and waterjets.

- **Major Businesses:** Gas turbine design, manufacture, and MRO services; marine equipment
- **Key Technological Capabilities:** Gas turbine design and integration
- **Major Military Platforms:** V-22, C-130, P-3, E-2C, AV-8B, T-45, JSF, Eurofighter Typhoon, Global Hawk, RAH-66 Comanche (through LHTEC JV), various European helicopter programs

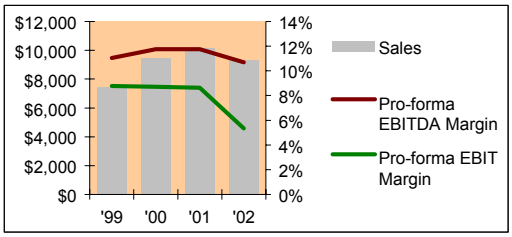
ROLLS ROYCE PRODUCTS

- **Civil Aerospace** – turbine engines; major platforms include: B747/757/767 (RB211), A340-500&600/A330/A380/B777 (Trent), A320 (IAE V2500), B717 (BR715), and a variety of general aviation and regional rotary- and fixed-wing aircraft (A250, BR710, Tay, AE3007, Williams-Rolls FJ33 and FJ44)
- **Power Generation** – gas turbine and diesel engine power generation systems (RR leverages aerospace turbine engine technology into power gen market)
- **Defense** – specialized turbine engines (turboshafts, turboprops, turbojets, and turbofans)
- **Marine** – marine gas turbine propulsion systems; thrusters; propellers; waterjets; ship stabilization and motion control systems
- **Aftermarket Services** – gas turbine maintenance, repair, and overhaul; accounts for 44% of Rolls Royce plc revenues

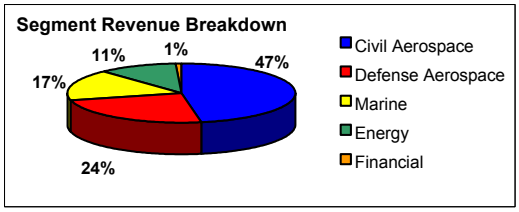
Trent series *RB211* *BR715* *Tay* *EJ200* *AE3007* *T-56*

ROLLS ROYCE PLC – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$7,458**	**$9,438**	**$10,185**	**$9,316**
Sales growth:	*4%*	*27%*	*8%*	*(9%)*
Reported EBIT:	665	465	501	377
EBIT margin:	*9%*	*5%*	*5%*	*4%*
Pro-forma EBITDA:	824	1,109	1,197	996
EBITDA margin:	*11%*	*12%*	*12%*	*11%*
Pro-forma EBIT:	**$655**	**$822**	**$879**	**$497**
EBIT margin:	*9%*	*9%*	*9%*	*5%*
Revenue per employee:	$237,648			



Stock price:	**$1.99** (as of 5/30/2003)
52 week high:	$3.00
52 week low:	$1.03
Shares outstanding:	1,601.0 million
Market capitalization:	**$3,189**
Net Debt:	$1,093
Enterprise Value:	**$4,282**
EV/EBIT multiple*:	**8.6x** *(*Pro-forma)*



Results are converted from British Pounds Sterling to US Dollars using the exchange rate as of December 31, 2002 (£ 1.00 = US$ 1.6095)

ROLLS ROYCE PLC – JSF PARTICIPATION

"[JSF] preserved Rolls-Royce position at the forefront of STOVL propulsion...Participation in STOVL JSF and F136 is vital to Rolls-Royce future propulsion strategy and position in the market place."
– Rolls Royce

JSF CONTENT & CONTRACT HISTORY

STOVL Propulsion Systems
(LiftFan, 3 Bearing Swivel Module, Roll Post Ducts)

GE/RR F136 Interchangeable Engine
(40% Share)

2000 2001 2002 2003 System Design & Development **2012**

19 December 2001 – Pratt & Whitney and Rolls Royce sign contract covering STOVL systems during SDD

January 2001 – UK Government signs Level I Partnership MOU; orders 150 F-35B (STOVL) for the Royal Navy and Royal Air Force

1996 – RR partners with Lockheed Martin and Pratt & Whitney during CDP

JSF FINANCIAL IMPACT – ROLLS ROYCE PLC

(Year 2002 US$M, except per share) *(GBP1.00 = US$1.6095)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$2,130.7	$5,404.3
Average Annual Revenue:	**$213.1**	**$360.3**
% of Reported 2002 Revenue:	*2.3%*	*3.9%*
Estimated Average Annual EBIT Contribution:	**$16.8**	**$28.3**
FY 2002 Reported Revenue:	$9,315.8	
FY 2002 Pro-Forma EBIT:	$497.3	
Enterprise Value/EBIT Multiple:	8.6x	
Estimated Value of Potential JSF EBIT Contribution:	$144.3	$244.0
Estimated Value per Share:	$0.09	$0.15
Current Share Price (5/30/03):	$1.99	
Estimated Impact of JSF EBIT Contribution on Company	**4.5%**	**7.7%**

Financial Impact

- Approximately half of Rolls Royce JSF-related revenues will come from sales of STOVL aircraft
  - STOVL aircraft deliveries are "front-loaded" (proportionally high during LRIP, and complete by 2021), giving Rolls Royce a relatively high revenue and earnings impact in early years compared to other partner companies
  - 40% share of F136 engine will help diversify the Rolls Royce JSF portfolio
- High potential for value contribution
  - $6 billion potential during FRP could significantly contribute to the bottom line

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

United Kingdom (50%)
- Bristol – roll posts and swivel duct

United States (50%)
- Indianapolis, IN – LiftFan and components
- 40% F136 workshare with (GEAE)

Lessons Learned

- F135 (PW) vs F136 (GE/RR) data separation – Training needed to mitigate contractual and liability issues related to being a member of both engine teams (PW STOVL & GE/RR F136)
- The success of this program is a building block for future US/UK defense co-operation; experience during CDP underlined the importance of fully integrated design definition supported by digital data exchange and leading edge program management skills and processes

SMITHS AEROSPACE – COMPANY OVERVIEW

Smiths Group plc
London Stock Exchange – Ticker: SMIN
Headquarters: London, UNITED KINGDOM
Employees: 33,000

Smiths Aerospace, one of four business units of UK engineering conglomerate Smiths Group plc, focuses on specialized integrated systems for aircraft platforms. Smiths is a key supplier to both Boeing (737 & 777) and Airbus (A340) in the commercial airliner market, and a variety of military platforms.

- **Major Businesses (Aerospace):** Electronic systems; actuation systems; detection and aviation security systems; precision components; Kelvin Hughes marine systems
- **Key Technological Capabilities (Aerospace):** Specialized engineering and manufacturing; electronic and actuation systems and components; precision component manufacturing
- **Major Military Platforms (Aerospace):** V-22, C-130J, F/A-18E/F, F-16, Eurofighter Typhoon, AH-64D Apache, F-35 (JSF), F-22, AV-8B, T-45, JPATS

SMITHS AEROSPACE PRODUCTS

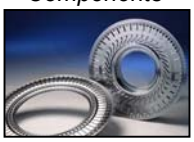
- **Electronic Systems** – flight management systems; voice, video, data recording, and analysis systems; stores management systems; crew information and mission planning systems; power generation and distribution systems; fuel gauging and management systems; environmental conditioning
- **Actuation Systems** – flight controls; thrust reversers; landing gear; hydraulics; propellers (Dowty)
- **Precision Components** – complex engine components; rigid tubular and flexible hose assemblies; aircraft structures
- **Detection and Aviation Security Systems** – trace detection equipment for chemical & biological agents, explosives, and narcotics (Smiths Detection); x-ray security systems (Smiths Heimann)
- **Marine Systems** (Kelvin Hughes) – radar; navigation systems; tactical displays

Flight Management

Power Systems

Actuation & Control Systems

Engine Components



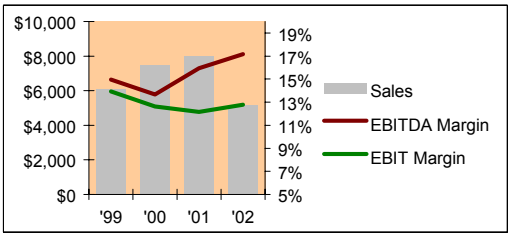
Tubular Assemblies

Bio Agent Detection

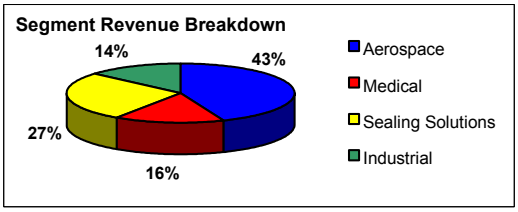
Marine Radar

SMITHS GROUP PLC – FINANCIAL SUMMARY

(US$M) Year ended 31 Jul	1999	2000	2001	2002
Sales:	**$6,070**	**$7,489**	**$7,980**	**$5,188**
Sales growth:	*20%*	*23%*	*7%*	*(35%)*
Reported EBIT:	821	909	6	553
EBIT margin:	*14%*	*12%*	*0%*	*11%*
Pro-forma EBITDA:	908	1,024	1,272	891
EBITDA margin:	*15%*	*14%*	*16%*	*17%*
Pro-forma EBIT:	**$845**	**$945**	**$970**	**$662**
EBIT margin:	*14%*	*13%*	*12%*	*13%*
Revenue per employee:	$157,219			



Stock price:	**$10.74** (as of 5/30/2003)
52 week high:	$14.13
52 week low:	$8.40
Shares outstanding:	558.5 million
Market capitalization:	**$5,996**
Net Debt:	$1,167
Enterprise Value:	**$7,163**
EV/EBIT multiple*:	**10.8x** *(*Pro-forma)*



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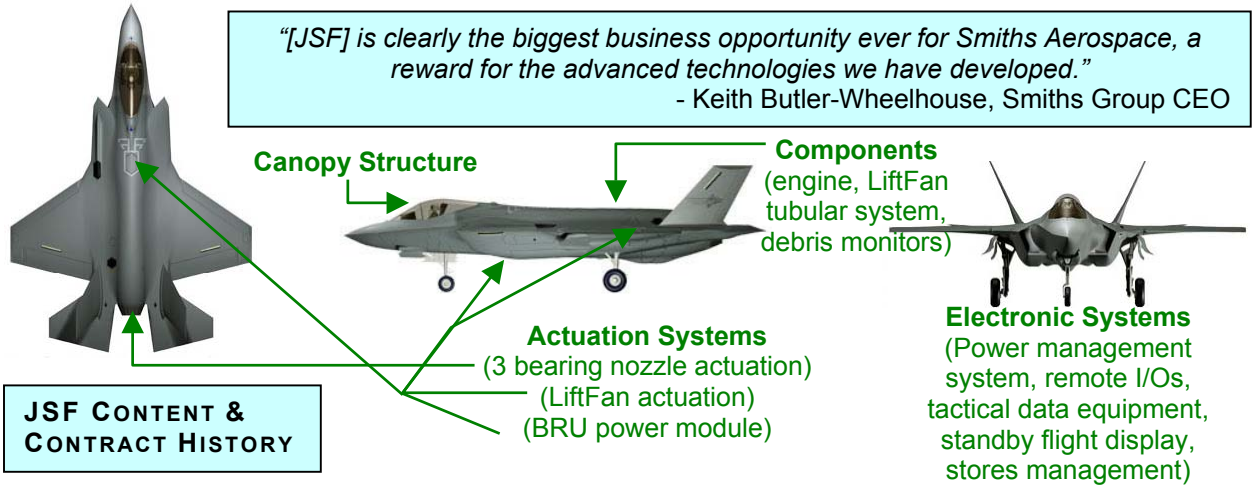
SMITHS AEROSPACE – JSF PARTICIPATION

smiths

"[JSF] is clearly the biggest business opportunity ever for Smiths Aerospace, a reward for the advanced technologies we have developed."
- Keith Butler-Wheelhouse, Smiths Group CEO



JSF CONTENT & CONTRACT HISTORY

2000 **2001** **2002** **2003** System Design & Development **2012**

December 2002 – Smiths is selected to produce the rigid and flexible tubing and

2004 – 1st Deliveries of several contracted components

1999 – Lockheed Martin selects Smiths Aerospace to provide electrical power management for JSF

JSF FINANCIAL IMPACT – SMITHS AEROSPACE

(Year 2002 US$M, except per share) *(GBP1.00 = US$1.6095)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$579.7	$2,877.5
Average Annual Revenue:	**$58.0**	**$191.8**
% of Reported 2002 Revenue:	*1.1%*	*3.7%*
Estimated Average Annual EBIT Contribution:	**$7.5**	**$24.7**
FY 2002 Reported Revenue:	$5,188.2	
FY 2002 Pro-Forma EBIT:	$662.5	
Enterprise Value/EBIT Multiple:	10.8x	
Estimated Value of Potential JSF EBIT Contribution:	$80.7	$266.9
Estimated Value per Share:	$0.14	$0.48
Current Share Price (5/30/03):	$10.74	
Estimated Impact of JSF EBIT Contribution on Company	**1.3%**	**4.5%**

Financial Impact

- Potential revenues of over $1 million per aircraft will have a significant impact on Smiths Aerospace, especially if JSF is produced in large quantities
  - At current FRP schedule (2,593 total units), JSF will comprise nearly 4% of Smiths Group revenues
  - ~9% of Smiths Aerospace revenues
- Significant EBIT contribution could contribute to over 4% of company value during FRP
  - Relatively large (>1%) value contribution during SDD/LRIP

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

United Kingdom (~50%)

- Various UK facilities – power management; I/O units; standby flight display; actuation; debris monitors

United States (~50%)

- Various US facilities – SMS; tubes & hoses

Lessons Learned

- Cross-functional Integrated Product Teams with membership by all involved parties leads to a culture with no surprises
- Performance Based Specifications and the shift to suppliers having total system performance responsibility has allowed optimization of designs for long-term affordabilty
- International participation early in the development program is both challenging and rewarding
- The aggressive schedule to first flight creates a highly focused, highly motivated program

ULTRA ELECTRONICS – COMPANY OVERVIEW

Ultra Electronics Holdings plc
London Stock Exchange – Ticker: ULE
Headquarters: Greenford, UNITED KINGDOM
Employees: 2,390

Through acquisitions, **Ultra Electronics** has grown into an international group of companies providing electrical, electromechanical, and software design, development, and manufacturing capability to first- and second-tier suppliers in the aerospace and defense industries.

- **Major Businesses:** Electrical and electromechanical components; sonobuoys; software/IT
- **Key Technological Capabilities:** Sonobuoys, sonar, and related ASW technologies; HiPPAG; aircraft noise and vibration suppression; C4ISR systems; airport IT systems
- **Major Military Platforms:** F/A-18E/F, Eurofighter Typhoon, P-3 Orion, BAe Hawk, F-35 (JSF), and various submarines, ships, and armored vehicles

ULTRA ELECTRONICS PRODUCTS

- **Air & Land Systems** – *ASW systems:* active and passive sonobuoys; bathythermal buoys; towed sonar arrays; sonobuoy telemetry receivers; torpedo countermeasures; *Civil Aerospace:* aircraft noise and vibration suppression systems; landing gear control computers; electric propeller controls; propeller de-icing; *Military Aerospace:* HiPPAG; software and systems integration; sidewinder missile MRO; *Land Systems:* controls; flat screen displays; TACISYS

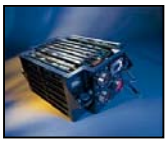
- **Information & Ship Systems** – *Naval Systems:* torpedo acoustic countermeasures; surfice ship torpedo defense; command & control systems; multi-function workstations; C4ISR systems; signature management systems; electromagnetic silencing systems; multi-beam side-scan sonars; *IT Systems:* airport IT systems

Active Noise Cancellation

HiPPAG Systems

Sonobuoy Systems

Flight Control Units



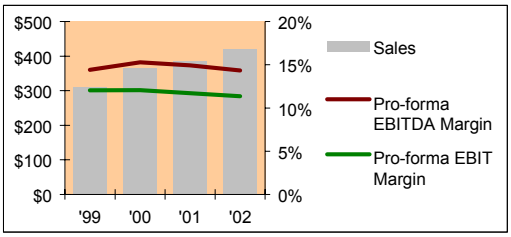
Tactical Displays

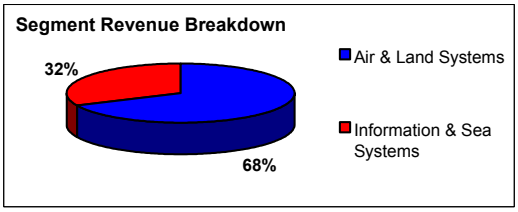
FIDS

ULTRA ELECTRONICS HOLDINGS PLC – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$311**	**$365**	**$386**	**$419**
Sales growth:	*22%*	*18%*	*6%*	*9%*
Reported EBIT:	37	44	45	48
EBIT margin:	*12%*	*12%*	*12%*	*11%*
Pro-forma EBITDA:	45	56	58	60
EBITDA margin:	*14%*	*15%*	*15%*	*14%*
Pro-forma EBIT:	**$37**	**$44**	**$45**	**$48**
EBIT margin:	*12%*	*12%*	*12%*	*11%*
Revenue per employee:	$175,329			

Stock price:	**$8.02** (as of 5/30/2003)
52 week high:	$8.21
52 week low:	$6.43
Shares outstanding:	66.0 million
Market capitalization:	**$529**
Net Debt:	$63
Enterpise Value:	**$592**
EV/EBIT multiple*:	**12.4x** *(*Pro-forma)*





Results are converted from British Pounds Sterling to US Dollars using the exchange rate as of December 31, 2002 (£ 1.00 = US$ 1.6095)

ULTRA ELECTRONICS – JSF PARTICIPATION

"This important selection emphasizes the superiority of Ultra's innovative HiPPAG technology. We are delighted to be meeting this key requirement on the F-35 program." – Andy Hamment, Ultra Electronics

JSF CONTENT & CONTRACT HISTORY

High Pressure Pure Air Generator (HiPPAG)
Pneumatic Weapons Ejection System

2000 **2001** **2002** **2003** System Design & Development **2012**

2000-2001 – HiPPAG systems fly on F-15, F-16, F/A-18, Harrier, Eurofighter, and other platforms

1998-2000 – JSF Proposals to Lockheed Martin; pit firing demonstrations at EDO

Q3 2003 – Ultra expects to sign a contract with EDO Corp to supply HiPPAG weapons ejection systems for JSF

JSF FINANCIAL IMPACT – ULTRA ELECTRONICS

(Year 2002 US$M, except per share) *(GBP1.00 = US$1.6095)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$13.7	$61.7
Average Annual Revenue:	**$1.4**	**$4.1**
% of Reported 2002 Revenue:	*0.3%*	*1.0%*
Estimated Average Annual EBIT Contribution:	**$0.2**	**$0.5**
FY 2002 Reported Revenue:	$419.0	
FY 2002 Pro-Forma EBIT:	$47.6	
Enterprise Value/EBIT Multiple:	12.4x	
Estimated Value of Potential JSF EBIT Contribution:	$2.0	$6.0
Estimated Value per Share:	$0.03	$0.09
Current Share Price (5/30/03):	$8.02	
Estimated Impact of JSF EBIT Contribution on Company	**0.4%**	**1.1%**

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Impact of JSF HiPPAG contract revenues on Ultra Electronics will be minor
  - Ultra's portfolio of products and platforms is highly diversified
  - Precision Air Systems business is diversified across several platforms: JSF, Eurofighter, Harrier, F-15, F-16, F/A-18
- JSF-related value creation will be in line with revenue impact (~1%)

Geographic Workshare

- **United Kingdom** (70%)
  - Gloucester facility
- **Rest of World** (30%)
  - Suppliers – Goodrich; Pacific Scientific – Artus
  - US service centers

Lessons Learned

- Ultra continuously invests in R&D (~20% of annual revenues) to keep a technical edge on its competitors
- Contract negotiation process can extend many months longer than expected – Ultra had previously expected to have a HiPPAG contract over one year ago in Q2 2002

United Kingdom - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**Total Sales ($ Millions)**	**Potential Technology/Capability**
Apollo Logistics Ltd. (Apollo Materials)	1999	Preston	60	63.9	Aerospace materials and logistics services
Aircraft Research Association	1952	Bedfordshire	n.a.	n.a.	Aerodynamic research, design, and testing
BSL Ltd. (Brammer Group plc)	n.a.	Manchester	n.a.	n.a.	Industrial engineering products
Cytec Engineered Materials Ltd. (Cytec Industries Inc.)	1993	Wrexham	240	51.4	Frequency hopping, secure, and anti-jam high frequency radio equipment
Computer Devices Corporation	n.a.	East Sussex	n.a.	n.a.	Avionics and other electronic systems
EMF Ltd.	1991	Cambridge	n.a.	n.a.	High purity organometallics for III/V epitaxy
FHL (Claverham Group)	1960	Bristol	360	72.0	Electro-hydraulic, electro-mechanical, electro-pneumatic and hybrid technologies
Flight Refueling (Cobham plc)	n.a.	Dorset	n.a.	n.a.	Air to air refueling systems
Honeywell Normalair-Garrett Ltd. (Honeywell)	1946	Somerset	1,381	173.9	A/C, oxygen, hydruaulic, and control equipment
Lucas Aerospace Ltd. (TRW)	n.a.	Wolverhampton	n.a.	n.a.	Flight controls, engine controls, electrical power
Martin Baker Aircraft Co. Ltd. (Martin Baker Engineering Ltd.)	1966	Uxbridge	750	122.7	Ejection seats
MBDA	n.a.	London	10,000	2,000.0	Airframes, engines, and systems
Messier-Dowty Ltd. (Snecma)	1932	Gloucester	880	301.3	Landing gear systems
Oxley Group plc	1969	Ulverstron	250	18.6	Avionics and electronic components and systems
Page Aerospace Ltd. (The Page Group Ltd.)	1942	Sunbury-on-Thame	197	30.2	Cabin power and lighting products
QinetiQ Group plc	2001	Ively Road	9,000	1,044.8	Radar, LCDs, carbon fiber, and infrared sensors
RTI International Metals Ltd. (RTI International Metals Inc.)	n.a.	Staffordshire	n.a.	n.a.	Titanium and Nickel Alloy products
Scantron Industrial Products Ltd.	1981	Taunton	12	n.a.	Laser measuring equipment
Thales Optronics Taunton	1992	Taunton	250	30.0	Optical instrumentation and lenses
Thermion Systems Europe Ltd. (Thermion Systems International Inc.)	n.a.	Bedfordshire	n.a.	n.a.	Aircraft deicing and material joining systems
Thomson Training and Simulation (Thales)	n.a.	Crawley	1,200	n.a.	Simulation and training systems
All Metals Services	1974	Middlesex	135	400.0	Aerospace and related metals
Wesco U.K. (Wesco Aircraft)	1984	West Yorkshire	77	20.3	Fasteners distribution and inventory management

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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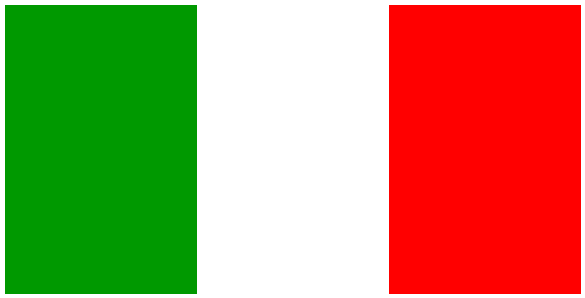

APPENDIX C

ITALY: COMPANY CASE STUDIES AND COMPENDIUM

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ASE SpA – Company Overview

ASE S.p.A.
Joint-stock company
Headquarters: San Giorgio su Legano, ITALY
Employees: 79

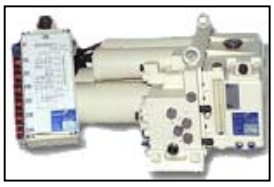
ASE S.p.A. specializes in the design, development, production, and repair of electronic, electromechanical, and hydraulic equipment for aircraft and special ground vehicles. ASE, then known as **Marelli Avio**, was purchased from **Simmel Difesa** in 1998.

- **Major Businesses:** starter / generators, electronics, braking systems, component overhaul
- **Key Technological Capabilities:** electronics, electromechanical equipment, and hydraulic systems
- **Major Military Platforms:** Aermacchi M346; Tornado; Eurofighter; EH101; Super Lynx; A129 Mangusta; various armored vehicles

ASE Products

- **Electromechanical Equipment** – AC and DC, and oil- and air-colled motors; starters; starter-generators; current transformers
- **Hydraulic Equipment** – braking systems for armored vehicles
- **Electrical Equipment** – generator control units; engine monitoring units for endothermic engines; transformer rectifier units; high energy ignition units

Hydraulic Braking System



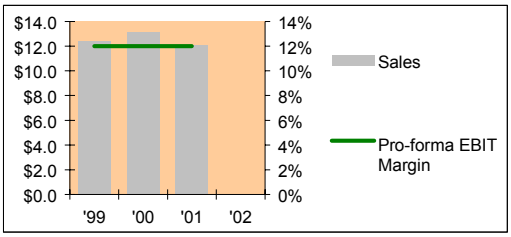
High Energy Ignition Units

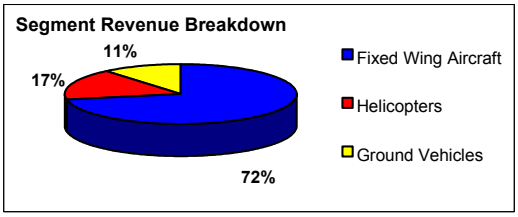
Generator

D.C. Electrical Power Generating System

ASE Financial Summary

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$12.4**	**$13.2**	**$12.1**	**n.a.**
Sales growth:	*n.a.*	*6%*	*(8%)*	
Reported EBIT:	n.a.	n.a.	n.a.	n.a.
EBIT margin:				
Pro-forma EBIT:	**$1.5**	**$1.6**	**$1.5**	
Estimated EBIT margin:	*12%*	*12%*	*12%*	
Revenue per employee:	$151,295			





Privately held company

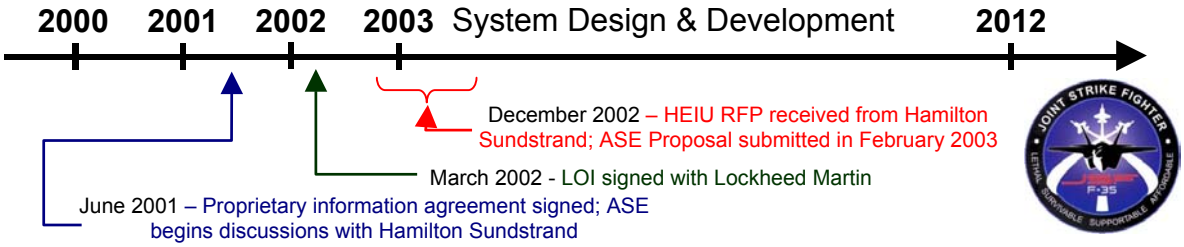
Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00 = US$ 1.0429)

ASE SpA – JSF Participation

"ASE is interested in participating in JSF Program, where the proposed equipment are an evolution of [ASE's] products in line with the company capability"
– Salvetore Spina, JSF Program Manager, ASE

Potential Contracts:
- High Power Igniters (Pratt & Whitney F135)
- Permanent Magnet Alternator (Smiths Aerospace & Hamilton Sundstrand)

JSF Content & Contract History



JSF Financial Impact – ASE

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$5.3	$14.3
Average Annual Revenue:	**$0.5**	**$1.0**
% of Reported 2001 Revenue:	*4.4%*	*7.9%*
Estimated Average Annual EBIT Contribution[1]:	**$0.1**	**$0.1**
FY 2001 Reported Revenue:	$12.1	
FY 2001 Pro-Forma EBIT:	$1.5	
Enterprise Value/EBIT Multiple[2]:	*8.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$0.5	$0.9
Estimated Impact of JSF EBIT Contribution on Company Value:	**4.4%**	**7.9%**

Financial Impact

- Assumptions:
  - ASE is awarded contracts to design and produce high-energy ingitor units for the F135 engine
  - Expected 12% EBIT margin
- HEIU contract would significantly increase the value of ASE by increasing profit by an estimated 35%-65%
- Future contracts could further increase financial impact of JSF
  - Current discussions between ASE and Lockheed Martin may uncover further contract opportunities on JSF

[1] *Incremental JSF EBIT margin = 12%*
[2] *EV/EBIT multiple of 8.0x assumed for private component manufacturer*
Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Italy**
  - ASE performs all work at its facilities in northern Italy

Lessons Learned

- Communications between foreign companies and some JSF contractors have been sparse. ASE received and submitted a bid for the F135 ignitors; however, a year prior, an ASE competitor distributed a press release announcing that they had won the F135 ignitor contract. ASE has neither received feedback on its bid nor responses from the JSF program regarding this confusion.

FIATAVIO – COMPANY OVERVIEW

FiatAvio S.p.A.
In the process of being divested from Fiat Group
Headquarters: Turin, ITALY
Employees: 5,243

FiatAvio designs and produces engine modules and components for the aviation and marine industries and space propulsion systems, typically as a partner (with occasional risk-share) with some of the industry's largest engine manufacturers. FiatAvio also maintains, repairs, and overhauls turbine aircraft engines, both in the military and commercial markets.

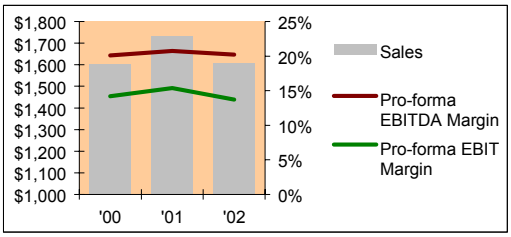
- **Major Businesses:** aeroengine modules and components, aerospace propulsion systems, turbine engine MR&O
- **Key Technological Capabilities:** design, development, mechanical manufacturing, accessory and propeller gearboxes, power transmissions for, transmissions, low pressure turbines, afterburners, auxiliary power units, turbine engine MR&O, solid and liquid fuel propulsion systems, light launch vehicles
- **Major Military Platforms:** F-22 (F119); Apache & Blackhawk (T700/CT7); Aermacchi M346 (F124); Tornado (RB199); Eurofighter (EJ200); F35 (F136), C-130J (AE2100); AMX (Spey Mk807), A400M (TP400); Vega; Ariane

FIATAVIO PRODUCTS

- **Commercial & Military Aircraft Engines** – design, development and production of turbine engines, modules, and components
- **Space Propulsion** – Design and production of solid and liquid propellant boosters
- **Marine Systems** – propulsion systems for high-speed ships (derived from aeroengine technology); automation and control systems
- **Turbine Engine MR&O** – maintenance, repair, and overhaul of aerospace and marine turbine engines

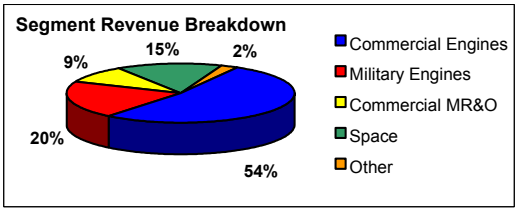
FIATAVIO FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**n.a.**	**$1,604**	**$1,732**	**$1,609**
Sales growth:			*8%*	*(7%)*
Reported EBIT:	n.a.	239	579	220
EBIT margin:		*16%*	*35%*	*14%*
Pro-forma EBITDA:	n.a.	322	359	325
EBITDA margin:		*21%*	*22%*	*21%*
Pro-forma EBIT:	**n.a.**	**$228**	**$266**	**$220**
EBIT margin:		*15%*	*16%*	*14%*
Revenue per employee:	$292,631			



Fiat Avio is in the process of being divested

Enterprise Value: **$1,679**
EV/EBIT multiple*: **7.6x** *(*Pro-forma)*



Enterprise equals the acquisition price offered by The Carlyle Group; this price is reflected in the EV/EBIT multiple
Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00 = US$ 1.0429)

FIATAVIO – JSF PARTICIPATION

"F136 is one of our main products for the future...our company is based on design and development strengths." –FiatAvio

Memorandum of Understanding:
- 5% risk-sharing partner in F136 engine (with GE and Rolls Royce)
  - Low-pressure turbine components
  - Engine-mounted accessory drive

Other Potential Opportunies:
- APU components (Honeywell)
- F136 MR&O
- Engine controls

JSF CONTENT & CONTRACT HISTORY

2000 2001 2002 2003 System Design & Development **2012**

FiatAvio begins discussions with General Electric and Rolls Royce in 1999

F136 production to begin (two-year lag behind F135)

JSF FINANCIAL IMPACT – FIATAVIO

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$28.4	$343.0
Average Annual Revenue:	**$2.8**	**$22.9**
% of Reported 2002 Revenue:	*0.2%*	*1.4%*
Estimated Average Annual EBIT Contribution:	**$0.4**	**$3.5**
FY 2002 Reported Revenue:	$1,609.5	
FY 2002 EBIT:	$220.3	
Enterprise Value/EBIT Multiple[1]:	7.6x	
Estimated Value of Potential JSF EBIT Contribution:	$3.3	$26.4
Current Enterprise Value:	$1,678.7	
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.2%**	**1.6%**

[1] *EV/EBIT multiple of proposed acquisition by The Carlyle Group*

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Assumptions:
  - FiatAvio shares 5% of F136 program revenues
  - F136 program wins 50% of JSF engine business
  - FiatAvio is awarded $150 million of engine MR&O over the course of FRP
- FiatAvio expects new relationship with Lockheed Martin to result in significant new business
  - Lockheed Martin and FiatAvio are currently discussing potential involvement in marine automation and space equipment
  - Direct result of participation in JSF

Geographic Workshare

- **Italy**
  - FiatAvio facilities in Italy are expected to carry out all design and development work

Lessons Learned

- TAAs require substantial efforts to obtain; FiatAvio TAAs with GE and Rolls-Royce took a long time as FiatAvio had to show that they had the capability to design parts without American technology
- Intellectual Property issues have hampered involvement in JSF; FiatAvio wants to retain its IP, while the engine primes want FiatAvio to surrender it
- JSF will help to increase FiatAvio's experience with the US government

FINMECCANICA – CORPORATE OVERVIEW

Finmeccanica S.p.A.
Italian Stock Exchange – Ticker: SIFI.MI (32.3% owned by Ministry of Economics and Finance)
Headquarters: Rome, ITALY
Employees: 97,500

Finmeccanica is the leading Italian manufacturer of aircraft and aeronautical components, specializing in the production of complete combat aircraft, special mission aircraft, aerostructures and components for civil aircraft, as well as MR&O and conversion services. Finmeccanica is a leading provider of defense electronics and systems integration capabilities in Europe. Finmeccanica is also active in the transportation, energy, and IT sectors in Italy.

- **Major Businesses:** aeronautics (fixed-wing & helicopters), defense, space, energy, transportation, IT services
- **Key Technological Capabilities:** aircraft assembly, systems integration and design, defense electronics, microelectronics, mass transit systems, power generation, IT security
- **Major Military Platforms:** Eurofighter, AM-X, Tornado, B767 Tanker, EH-101, NH-90, ATR42/72 ASW/MP, JSF, A129, various tanks and armored vehicles

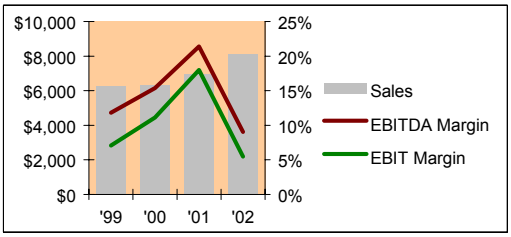
FINMECCANICA BUSINESSES

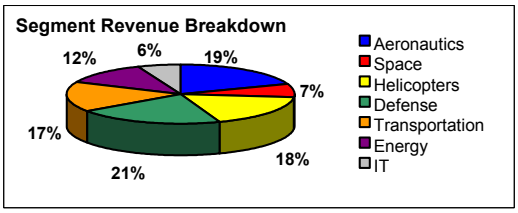
- **Aeronautics** – Alenia Aeronautica (aircraft and sub-systems design, production, and support); Aeronavali (aircraft MR&O and conversions); Lockheed Martin Alenia TTS (C-27J)
- **Space** – Alenia Spazio and Laben (development and production of satellites, subsystems and components for space infrastructures; electronics)
- **Microelectronics** – STMicroelectronics
- **IT Serivces** – Elsag (electronic / IT security and reliability)
- **Energy** – Ansaldo Energia (power generation systems)
- **Helicopters** – AgustaWestland (joint venture with GKN) – helicopter design, development, production and support
- **Defense Systems** – Marconi Selenia Communications, Galileo Avionica, Oto Melara, WASS, AMS (JV), and MBDA (JV); design and manufacturing of airborne systems, electro-optical systems, on-board radar, surface and underwater naval systems, armored vehicles, naval, anti-aircraft and field artillery, strategic communications
- **Transport** – Ansaldo Breda, Ansaldo Signal, Ansaldo Transporti Sistemi Feroviari; design and production of mass transportation systems

FINMECCANICA – FINANCIAL SUMMARY

(US$ M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$6,276**	**$6,309**	**$6,945**	**$8,140**
Sales growth:	*2%*	*1%*	*10%*	*17%*
Reported EBIT:	288	550	368	n.a.
EBIT margin:	*5%*	*9%*	*5%*	*n.a.*
Pro-forma EBITDA:	742	971	1,486	734
EBITDA margin:	*12%*	*15%*	*21%*	*9%*
Pro-forma EBIT:	**$443**	**$700**	**$1,250**	**$446**
EBIT margin:	*7%*	*11%*	*18%*	*5%*
Revenue per employee:	$198,080			

Stock price:	**$0.59** (as of 5/30/2003)
52 week high:	$0.62
52 week low:	$0.45
Shares outstanding:	8,430.4 million
Market capitalization:	**$4,953**
Net Debt:	$529
Enterprise Value:	**$5,482**
EV/EBIT multiple*:	**12.3x** *(*Pro-forma)*





Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00 = US$ 1.0429)

ALENIA AERONAUTICA – COMPANY OVERVIEW

Alenia Aeronautica S.p.A.
Ownership: Subsidiary of Finmeccanica
Headquarters: Rome, ITALY
Employees: 9,352

Alenia Aeronautica is the Italian industrial leader in aircraft design, manufacturing, and support. Alenia has vast experience in international aircraft programs, both military and commercial, including several with the United States.

- **Major Businesses:** combat aircraft, military transport aircraft, special missions, commercial aircraft and aerostructures, aircraft MR&O
- **Key Technological Capabilities:** Mechanical machining, metal bonding, composite material technology development, aircraft assembly, computational fluid dynamics/electromagnetic fields, and system control
- **Major Military Platforms:** Eurofighter; AM-X, Tornado, AV-8B Harrier II, C-27J Spartan, G222, ATR42/72 MP/ASW, B767 Tanker, JSF, ETAP research project

ALENIA PRODUCTS & SERVICES	
– **Combat Aircraft** – design, production, and support of combat aircraft (Eurofighter, Tornado, AM-X, JSF, F-104, AV-8) – **Military Transport Aircraft** – designs, production, and support of military transport aircraft (G222, C-130J) – **Special Mission Aircraft –** development and production of special mission aircraft (ATR 42/72 MP/ASW)	– **Aerostructures and Commercial Aircraft** – manufacture aerostructures for commercial and regional aircraft; design and production of ATR 42/72 regional turboprop – **Aircraft MR&O** – Aeronavali: commercial aircraft MR&O, passenger-to-freighter conversions, B767 Tanker conversions, B707 AWACS MR&O

MARCONI SELENIA – COMPANY OVERVIEW

Marconi Selenia Communiications
Ownership: Subsidiary of Finmeccanica
Headquarters: Rome, ITALY
Employees: 4,500

Marconi Selenia Communications specializes in military and commercial communications systems. The strengths of Marconi Selenia, previously **Marconi Communications** under the previous ownership of **GEC** (prior to the acquisition of GEC by **BAE Systems**), lie in the areas of switching and secure radio technologies, with increasing capability in optical networks.

- **Major Businesses:** military and commercial communications systems
- **Key Technological Capabilities:** circuit, packed, and cell switches, optical networks, radio relay and single channel systems
- **Major Military Platforms:** Nimrod, Eurofighter, NH-90, C-27J, Tornado, A-129, EH-101, E-3 AWACS, numerous C4I and naval platforms

MARCONI SELENIA PRODUCTS & TECHNOLOGIES	
– **Communications Equipment and Networks** – optical networks, broadband routing and switching, network security access platforms, radio links, multimedia and voice offerings, mobile communications, satellite products, integrated network management, and security outsourcing and consulting	– **Military Communications** – switching and secure radio technologies – **Marconi Strategic Communications Group** – tactical, infrastructural networks, Command & Control, Ground and Satellite Systems

GALILEO AVIONICA – COMPANY OVERVIEW

Galileo Avionica
Ownership: Subsidiary of Finmeccanica
Headquarters: Campi Bisenzio, ITALY
Employees: 3,400

Galileo Avionica focuses on the design, development, and production of avionics, airborne radar, surveillance and reconnaissance UAVs, radar environment simulators, and electro-optics, infrared, and microwave systems. Galileo primarily serves the defense and space industries.

- **Major Businesses:** avionics, airborne radars, UAVs, drones, radar environment simulators, surface systems (electro-optics, IR, microwave), and space equipment
- **Key Technological Capabilities:** integrated avionics system design & development, radar, electro-optics, microwave, and IR systems, surveillance and reconnaissance UAVs, thermal imaging
- **Major Military Platforms:** Eurofighter, EH101, NH90, Aermacchi M346, International Space Station

GALILEO AVIONICA PRODUCTS & TECHNOLOGIES

- **Avionics Systems** – avionics (mission computers, HUDs/HDDs, weapon control systems, flight control systems, stores management), electro-optics systems (targeting systems, laser range finders), integrated navigation/attack systems, surveillance systems, mission support systems
- **Surface Systems** – fire control systems (armoured vehicles), thermal imaging units, radar sub-systems
- **Airborne Radar** – maritime surveillance radar, ground surveillance radar, passive search & track IR sensors, precision approach radar (PAR)
- **UAVs & Simulators** – surveillance and reconnaissance UAVs, radar environment training simulators, target drones
- **Space Equipment** – electro-optic instruments, attitude sensors, RF equipment, solar arrays, vision cameras


C-27J (Lockheed Martin Alenia TTS)


Eurofighter Typhoon (Alenia, Marconi, Galileo)


A129 (AgustaWestland)


Panavia Tornado (Alenia, Marconi, Galileo)


Boeing 767 Tanker & Boeing aerostructures (Aeronavali / Alenia)


EH-101 / US-101 (Alenia, Marconi, Galileo)


ATR 72 (Alenia)


Airbus aerostructures (Alenia)

FINMECCANICA – JSF PARTICIPATION

FINMECCANICA

"Finmeccanica is the leading company in the second largest JSF partner country."
– Enzo Casolini, Alenia Aeronautica

JSF CONTENT & CONTRACT HISTORY

Awarded Contracts:
- Wings (2nd Source - Alenia)
- Back-up UHF Radio (Marconi Selenia)
- IPT Participation

Potential Contracts:
- Avionics and mission systems:
  - Maintenance Interface Panel; Radar Altimeter Module; Cockpit Control Panel; IFF Mode 5; ELT; VDL; HF Data Link
- Italian Final Assembly & MR&O

2000 2001 2002 2003 System Design & Development **2012**

Alenia, Galileo, and Marconi Selenia IPT participation

Alenia begins JSF wing production (LRIP – 83 units)

Alenia expects to perform a large portion of JSF maintenance for the Italian Air Force and Navy, as well as other European operators (projected to begin after 2012)

JSF FINANCIAL IMPACT – FINMECCANICA

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$499.4	$2,095.0
Average Annual Revenue:	**$49.9**	**$139.7**
% of Reported 2002 Revenue:	*0.6%*	*1.7%*
Estimated Average Annual EBIT Contribution:	**$5.2**	**$14.5**
FY 2002 Reported Revenue:	$8,139.7	
FY 2002 Pro-Forma EBIT:	$445.9	
Enterprise Value/EBIT Multiple:	12.3x	
Estimated Value of Potential JSF EBIT Contribution:	$63.9	$178.7
Estimated Value per Share:	$0.01	$0.02
Current Share Price (5/30/03):	$0.59	
Estimated Impact of JSF EBIT Contribution on Company Value:	**1.3%**	**3.6%**

Financial Impact

- Assumptions:
  - Alenia, Galileo, and Marconi Selenia will win the remaining contracting opportunities outlined in their MOUs with Lockheed Martin and Pratt & Whitney
  - Analysis eliminates all identified contracts that have been awarded to other companies
- JSF financial Impact to Finmeccanica will increase dramatically if Italian units are assembled or supported in Italy
  - Alenia expects to support and/or assemble the JSF fleet in Italy and other European countries (potential effect not included in financial impact analysis)

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Italy**
  - Finmeccanica intends to perform all JSF-related work in Italy
  - Finmeccanica will use Italian suppliers for outsourced work

Lessons Learned

- Foreign companies can not compete with Americans for classified systems. Alenia was sent RFP for flying cockpit testbed "by mistake" – for example Alenia feels that they would have been potentially suited to be the best value supplier for this contract, but non-US companies were not allowed to bid. Future business opportunities are dependent on resolution of theclassified data exhange issue.
- Better communication with the prime contractor is necessary for foreign partners to be able to compete more successfully

Italy - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**Total Sales ($ Millions)**	**Potential Technology/Capability**
Aerea SpA	1927	Milan	85	20.5	Aircraft and avionics
Aermacchi SpA	1913	Venegono Superiore	1,814	291.5	Jet trainer aircraft and systems
Datamat SpA	1971	Rome	1,564	162.3	Information and communications technologies
Elettronica Aster SpA	1945	Milan	100	15.8	Frequency hopping, secure, and anti-jam high frequency radio equipment
Elsag SpA	1981	Genoa	1,829	311.7	Industrial machinery and filters
Fiar SpA (Finmeccanica)	1953	Milan	500	90.7	Radars, transmitters, sonar and altimeters
Lital SpA	1961	Pomezia	240	24.1	Reference systems and navigation systems
Logic SpA	1962	Cernuso sul Naviglio	99	17.1	Electronic systems and components
Magnaghi Aeronatuica SpA	1923	Naples	370	43.8	Aircraft engines and components
Marconi Mobile SpA (Finmeccanica)	1906	Rome	3,700	450.0	High performance communications solutions
Marconi Sirio Panel	n.a.	Montevarchi	64	n.a.	Electro-luminescent flight deck panels
Mecaer Meccanica Aeronautica SpA	1902	Borgomanero	154	23.5	Aircraft components and systems
Meteor - Costruzioni Aeronautiche ed Elettroniche SpA (Finmeccanica)	1947	Ronchi dei Legionari	250	38.0	UAVs, navigators, pilot controls, and systems
Microtecnica SRL (United Technologies)	1929	Turijn	780	83.4	Measuring, fluid flow, and control devices
OMA SpA	1949	Foligno	335	31.1	Aeronatical equipment and overhaul
Piaggio Aero Industries SpA	1963	Genoa	1,450	148.6	Piaggio aircraft
Secondo Mona SpA	1903	Somma Lombardo	160	16.3	Fluid and electromechanical systems
Sicamb SpA	1975	Latina	350	32.2	Aircraft and engine manufacturing
Space Software Italia (Finmeccanica)	1988	Taranto	98	8.4	Space, military, and civil software systems
Vitrociset SpA	n.a.	Rome	1,500	158.1	Logistics and IT support

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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APPENDIX D

THE NETHERLANDS: COMPANY CASE STUDIES AND COMPENDIUM

PHILIPS

SP

STORK Fokker

Fokker Elmo

Stork Fokker AESP

THALES

urenco

Urenco Nederland B.V.

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PHILIPS AEROSPACE – COMPANY OVERVIEW

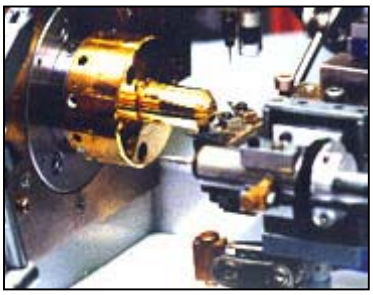
Subsidiary of Royal Philips Electronics
New York Stock Exchange – Ticker: PHG
Headquarters: Amsterdam, THE NETHERLANDS
Employees: 166,000 (Aerospace : 170)

Philips Aerospace applies the precision machining and fabrication skills developed by Philips Electronics to the aerospace industry. Philips Aerospace, at EUR 25 million in turnover, accounts for an extremely small portion of Philips revenues.

- **Major Businesses:** machining, sheet metal fabrication
- **Key Technological Capabilities:** high speed machining of hard and soft alloys, electro chemical machining, forming/welding, surface treatments, NDT
- **Major Military Platforms:** Rafale (M88 engine); F-16; JSF (F136 engine); Nimrod; Apache

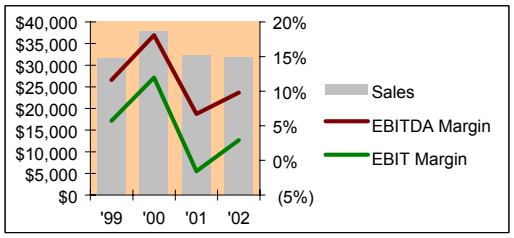
PHILIPS AEROSPACE PRODUCTS

- **Machining** – high speed machining of turbine blades, blisks, impellers, casings, and airframe structures; Electro Chemical Machining (patented technology to be applied to turbine blade manufacture)
- **Sheet Metal Fabrication** – sheet metal engine component manufacture
- **Design Activities** – FEM analysis, ANSYS, MSC/NASTRAN, and static fatigue testing (in cooperation with NedTech)

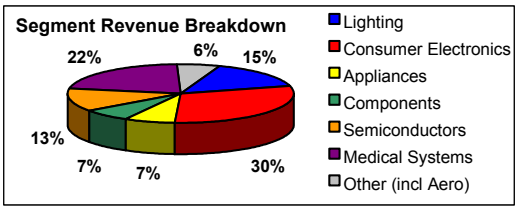


ROYAL PHILIPS ELECTRONICS – FINANCIAL SUMMARY

(US$ M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$31,459**	**$37,862**	**$32,339**	**$31,820**
Sales growth:	*3%*	*20%*	*(15%)*	*(2%)*
Reported EBIT:	1,751	4,281	(1,395)	420
EBIT margin:	*6%*	*11%*	*(4%)*	*1%*
Pro-forma EBITDA:	3,649	6,842	2,168	3,119
EBITDA margin:	*12%*	*18%*	*7%*	*10%*
Pro-forma EBIT:	**$1,796**	**$4,522**	**($503)**	**$935**
EBIT margin:	*6%*	*12%*	*(2%)*	*3%*
Revenue per employee:	$191,687			



Stock price:	**$18.81** (as of 5/30/2003)
52 week high:	$32.00
52 week low:	$12.75
Shares outstanding:	1,276.5 million
Market capitalization:	**$24,010**
Net Debt:	$5,251
Enterprise Value:	**$29,261**
EV/EBIT multiple*:	**31.3x** *(*Pro-forma)*



Results are as reported in US$M in Form 20-F (United States SEC)

PHILIPS AEROSPACE – JSF PARTICIPATION

The JSF SDD program has allowed Philips Aerospace to expand its relationships with the large aerospace contractors, particularly those in turbine engines

Potential Contracts:

- 7% Risk-Share of F136 Engine as part of a consortium of Dutch companies
- F136 component machining (BTP)
- High-speed machining (titanium and aluminum)
- Assorted Build-to-Print work

Awarded Contracts:

- F136 Engine Phase III
- Fan casing
- Stage I & II HPC Blisks

JSF CONTENT & CONTRACT HISTORY

2000 2001 2002 2003 System Design & Development **2012**

Original development of Electro Chemical Machining (ECM) technology for production of electrical shaver heads; Philips further develops ECM technology to apply to large scale items such as turbine blisks

Expected role as risk-sharing partner on F136 engine; F136 production begins (2008)

JSF FINANCIAL IMPACT – PHILIPS AEROSPACE

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$123.3	$659.7
Average Annual Revenue:	**$12.3**	**$44.0**
% of Reported 2002 Revenue:	*0.0%*	*0.1%*
Estimated Average Annual EBIT Contribution[1]:	**$1.2**	**$4.4**
FY 2002 Reported Revenue:	$31,820.0	
FY 2002 Pro-Forma EBIT:	$935.0	
Enterprise Value/EBIT Multiple[2]:	*19.3x*	
Estimated Value of Potential JSF EBIT Contribution:	$23.8	$85.0
Estimated Value per Share:	$0.02	$0.07
Current Share Price (5/30/03):	$18.81	
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.1%**	**0.4%**

Financial Impact

- Assumptions:
  - Philips Aerospace wins approximately 7% of F136 engine program (~$1B)
  - Philips is awarded 25% of aluminum high-speed machining contracts
  - Philips performs approximately $200M of build-to-print machining for Lockheed Martin
- Impact on Philips Electronics is minimal – commercial technologies fueled the existance of Philips Aerospace subsidiary
  - However, JSF would account for the majority of Philips Aerospace revenues if all expected contract wins occur

[1]Incremental JSF EBIT margin = 12%; [2]EV/EBIT multiple calculated via four year average EBIT margin

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **The Netherlands**
  - Phillips Aerospace is a components manufacturer performing all JSF-potential work in the Netherlands

Lessons Learned

- F136 delay may dramatically reduce the financial benefit of JSF as many air forces will need to take JSF deliveries prior to proposed in-service date for F136
- SDD participation only affords partners the opportunity to receive RFQs – success is based upon company performance
- Transparency in program and contract management would help partner companies optimize their efforts within the best-value sourcing model

SP AEROSPACE – COMPANY OVERVIEW

SP Aerospace
Subsidiary of RDM Technology Holding BV
Headquarters: Geldrop, THE NETHERLANDS
Employees: 300

SP Aerospace's business is mainly concentrated on landing gear systems. Over the years, SP aerospace & vehicle systems has grown from a purely build-to-print manufacturer to a company that covers the entire life cycle of landing gear systems from design and development to repair and overhaul.

- **Major Businesses:** landing gear
- **Key Technological Capabilities:** landing gear design, manufacturing, assembly, repair, and overhaul; composite landing gear component design & manufacturing
- **Major Military Platforms:** NH-90, F-16, Apache AH 64, P-3, C-130

SP AEROSPACE PRODUCT AREAS	
– **Landing Gear** – design, development, test & qualification of landing gear (CAD, CAE, FEM analysis, dynamic simulation, NDT, fatigue calculations, ILS, drop rig); landing gear component manufacturing and gear assembly	– **Manufacturing & Assembly** – aerostructures, gearboxes, actuation systems – CNC milling, turning, grinding, deep hole boring and drilling; shotpeening – **Repair & Overhaul** – landing gear MR&O




SP AEROSPACE – FINANCIAL SUMMARY

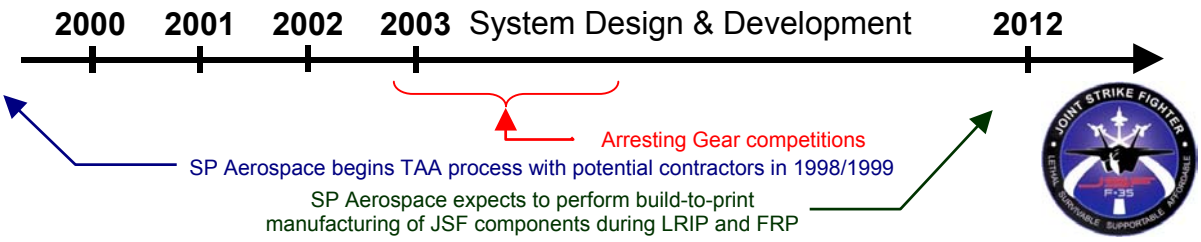
Privately held company – Information not available

SP AEROSPACE – JSF PARTICIPATION

"[JSF] is important technology-wise…we need to make the next step with [our composites] technologies… and no other program has such quantities."

Potential contracts:
- CTOL arresting gear
- CV arresting gear
- Landing gear components (built to print)

JSF CONTENT & CONTRACT HISTORY



JSF FINANCIAL IMPACT – SP AEROSPACE

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$20.5	$96.6
Average Annual Revenue:	**$2.0**	**$6.4**
% of Reported 2002 Revenue:	*n.a.*	*n.a.*
Estimated Average Annual EBIT Contribution[1]:	**$0.2**	**$0.6**
FY 2002 Reported Revenue:	*n.a.*	
FY 2002 Pro-Forma EBIT:	*n.a.*	
Enterprise Value/EBIT Multiple[2]:	*8.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$1.6	$5.2
Estimated Impact of JSF EBIT Contribution on Company Value:	**n.a.**	**n.a.**

[1] *Incremental JSF EBIT margin = 10%;*
[2] *EV/EBIT multiple of 8.0x assumed for private component manufacturer*

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Assumptions:
  - SP Aero is awarded both arresting gear design, development, and production contracts (CTOL & CV)
  - SP Aero performs build-to-print work during production
- SP Aero is positioned to capture significant landing gear MR&O revenue
  - SP Aero currently performs landing gear repairs and overhauls for several military customers, including the United States
- New relationships with US industry are expected to lead to new business opportunities

Geographic Workshare

- **The Netherlands**
  - SP Aerospace possesses the capabilities to perform all potential contracts in-house

Lessons Learned

- Early (1998/1999) start to TAA process with Lockheed Martin and Northrop Grumman allowed the process to run smoothly and has avoided the headaches experienced by competitors

STORK AEROSPACE – CORPORATE OVERVIEW

Stork Aerospace
Subsidiary of Stork NV
Euronext Amsterdam – Ticker: VMFN
Headquarters: Schiphol, THE NETHERLANDS
Employees: 4,353

Stork Aerospace develops and produces advanced components and systems for the aviation and aerospace industry and supplies integrated services to aircraft owners and operators.

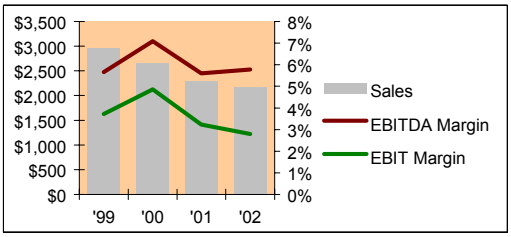
- **Major Businesses:** electrical systems and electronics, structures, services
- **Key Technological Capabilities:** material design, development, and production; automation of design and production processes; and knowledge of integrated technical and logistics systems
- **Major Military Platforms:** F-16, NH90, JSF, C-17

STORK BUSINESSES

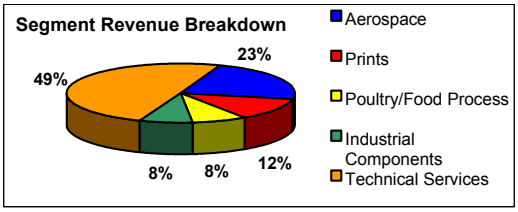
- **Electrical Systems and Electronics** – Fokker Elmo (design and production of wire harnesses)
- **Structures** – Stork Fokker (manufacture structural airframe components, assemblies, and systems of commercial and military aircraft and helicopters)
- **Services** – Fokker Services (provide worldwide support to owners and operators of Fokker aircraft, operate as an authorized Embraer service station in Europe, and perform MRO and modification services for the family of Boeing 737s)

STORK – FINANCIAL SUMMARY

(US$ M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$2,965**	**$2,652**	**$2,305**	**$2,181**
Sales growth:	*10%*	*(11%)*	*(13%)*	*(5%)*
Reported EBIT:	58	94	(5)	(58)
EBIT margin:	*2%*	*4%*	*(0%)*	*(3%)*
Pro-forma EBITDA:	168	188	129	126
EBITDA margin:	*6%*	*7%*	*6%*	*6%*
Pro-forma EBIT:	**$110**	**$129**	**$74**	**$61**
EBIT margin:	*4%*	*5%*	*3%*	*3%*
Revenue per employee:	$132,501			



Stock price:	**$10.21**	(as of 5/30/2003)
52 week high:	$13.02	
52 week low:	$5.04	
Shares outstanding:	33.0	million
Market capitalization:	**$337**	
Net Debt:	$51	
Enterprise Value:	**$388**	
EV/EBIT multiple*:	**6.4x**	*(*Pro-forma)*



Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00) = US$ 1.0429

FOKKER ELMO – COMPANY OVERVIEW

Fokker Elmo BV
Subsidiary of Stork Aerospace
Headquarters: Hoogerheide, THE NETHERLANDS

Fokker Elmo is a dedicated specialist for electrical systems and electronics for commercial, business, defense, and space applications.

- **Major Businesses:** design, certification, and production of electrical systems for aircraft, associated equipment, and engine interconnection systems
- **Key Technological Capabilities:** design and production of wire harnesses
- **Major Military Platforms:** JSF, C-17

FOKKER ELMO PRODUCTS	
– **Interconnection Systems** – manufacture wiring harnesses for Bombardier CRJ700 and CRJ900, FD 728Jet, Hawker Horizon, Gulfstream, Pratt & Whitney Canada, Rolls Royce Trent 500, Honeywell, and Airbus A340-500/600	– **Power Distribution Systems** – manufacture utility control systems for Bombardier CRJ700 and CRJ900




STORK FOKKER – COMPANY OVERVIEW

Stork Fokker AESP
Subsidiary of Stork Aerospace
Headquarters: Papendrecht, NETHERLANDS

Fokker Aerostructures supplies aircraft components to leading European and American aircraft builders in the civil, business, defense and space sectors.

- **Major Businesses:** manufacture airframe component structures including lightweight wing, tail, and fuselage sections
- **Key Technological Capabilities:** metal bonding, sheetmetal, machining to the assembly of complex airframe structures
- **Major Military Platforms:** NH90, C-17, JSF

FOKKER AEROSTRUCTURES PRODUCTS AND SERVICES	
– **Components** – specialize in the design, manufacture and support of structural airframe components, assemblies, and systems of commercial and military aircraft and helicopters	– **Materials** – develop thermoplastic composites and other materials applications including Glare®, a new type of laminated material made of aluminum sheet and glass fiber



STORK JSF PARTICIPATION

"JSF is the biggest and most important program for the coming years"
– Rob Hermans, Stork – Fokker Elmo

Expected Contracts:
- Inflight Opening Doors
- Control Surfaces/Edges (in partnership with Hawker de Haviland of Australia)
- Engine components
- F135 Wiring Harness
- Autolog

Awarded Contracts:
- Aircraft Wiring Harness
- Engine Wiring Harness

JSF CONTENT & CONTRACT HISTORY

2000 2001 2002 2003 System Design & Development **2012**

Ongoing discussions between Lockheed Martin and Stork Fokker regarding In-Flight Opening Doors "bridge contract" covering production of the first 14 shipsets; contract expected summer 2003

Stork expects to have a large role in the remainder of the SDD phase, especially in the areas of wiring and aerostructures

Stork F-16 production ends; F-35 FRP begins (2012)

JSF FINANCIAL IMPACT – STORK

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$474.9	$1,645.9
Average Annual Revenue:	**$47.5**	**$109.7**
% of Reported 2002 Revenue:	*2.2%*	*5.0%*
Estimated Average Annual EBIT Contribution:	**$5.7**	**$13.2**
FY 2002 Reported Revenue:	$2,181	
FY 2002 EBIT:	$61	
Enterprise Value/EBIT Multiple:	6.4x	
Estimated Value of Potential JSF EBIT Contribution:	$36.3	$83.9
Estimated Value per Share:	$1.10	$2.54
Current Share Price (5/30/03):	$10.21	
Estimated Impact of JSF EBIT Contribution on Company Value:	**10.8%**	**24.9%**

Financial Impact

- Assumptions:
  - Fokker Elmo is awarded 25% of wiring harness production
  - Stork receives contracts for in-flight opening doors SDD and production as well as other expected and potential SDD and production contracts worth approximately $1.1B through FRP
- Although a small portion of Stork NV revenues, JSF production would represent 25% of annual Stork Aerospace revenues if all expected contracts are won
- Stork expects to outsource $30-50M of SDD work to Dutch industry
- Logistics and supply chain are future areas of JSF potential

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **The Netherlands**
  - JSF work not performed by Stork is expected to be outsourced to Dutch industry and remain inside the Netherlands

Lessons Learned

- CDP participation helped avoid problems obtaining TAAs
- Stork will outsource work to Dutch industry – Stork has appointed a dedicated JSF Industrial Relation Officer to help SMEs and Research Institutes / Universities to win JSF work either through Lockheed Martin & partners or Stork
- Foreign companies feel that there needs to be someone at Lockheed Martin that can help foreign suppliers address small problems that have begun to compound on each other and create price discrepancies (e.g.: exchange rates; growing aircraft weight)

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THALES NEDERLAND – COMPANY OVERVIEW

Subsidiary of Thales Group
Euronext Paris – Ticker: HO (31.8% owned by French Government)
Headquarters: Hengelo, THE NETHERLANDS
Employees: 2,800

Thales Nederland creates high–tech defense solutions for air, naval, and ground-based environments in the fields of radar, infrared, weapon control, display technology, and communications equipment.

- **Major Businesses:** communications, optronics, cryogenics, munitronics, power electronics, IT systems consulting
- **Key Technological Capabilities:** manufacture of customized power electronics, proximity fuses, special batteries, integrated C3 systems, thermal imaging products, stirling coolers
- **Major Military Platforms:** F-16, Apache, ESSM, ASTOR, Sawari II, SAN PC, FR SIGINT Vessel

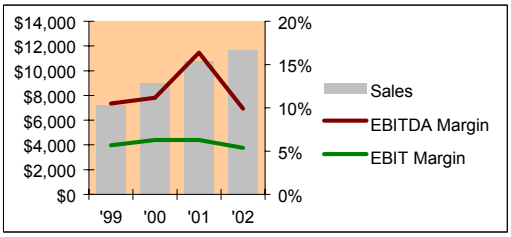
THALES NEDERLAND PRODUCTS

- **Ground Based Systems** – combine radar technology, electro-optical equipment and advanced weapon control equipment to provide capability in ground based air defense, surveillance, and communications, as well as border surveillance systems
- **Naval Systems** – naval systems ranging from radar surveillance, weapon control and combat management systems, to fully integrated combat systems
- **Services and Support** – offer integrated logistic support, through life support, and industrial services

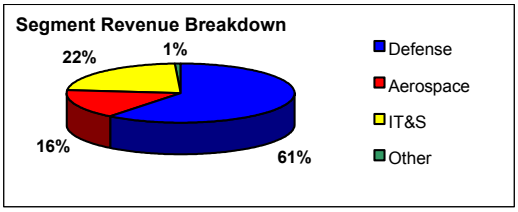



THALES GROUP – FINANCIAL SUMMARY

(US$ M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$7,229**	**$9,002**	**$10,773**	**$11,651**
Sales growth:	*12%*	*25%*	*20%*	*8%*
Reported EBIT:	270	452	494	469
EBIT margin:	*4%*	*5%*	*5%*	*4%*
Pro-forma EBITDA:	759	1,004	1,764	1,155
EBITDA margin:	*10%*	*11%*	*16%*	*10%*
Pro-forma EBIT:	**$409**	**$566**	**$677**	**$626**
EBIT margin:	*6%*	*6%*	*6%*	*5%*
Revenue per employee:	$179,252			



Stock price:	**$24.55** (as of 5/30/2003)
52 week high:	$44.88
52 week low:	$24.91
Shares outstanding:	171.9 million
Market capitalization:	**$4,219**
Net Debt:	$1,530
Enterprise Value:	**$5,749**
EV/EBIT multiple*:	**9.2x** *(*Pro-forma)*



Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00 = US$ 1.0429)

THALES NEDERLAND – JSF PARTICIPATION

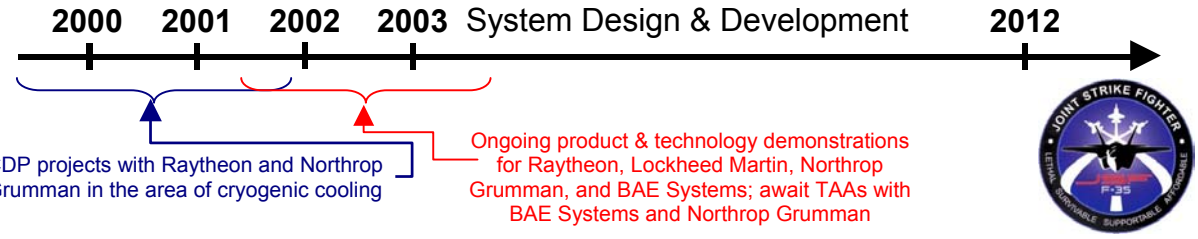
THALES

"[Thales Nederland] is the largest Dutch defense company… and there are many areas [in the JSF program] where we have much to offer"

Potential Contract Areas:

- Cryogenic Coolers
- Electro-Optic Parts: Optical Module for IR System; CDD camera; Distributed Aperature System
- Mission Computer Parts: Integrated Core Processor
- Radar Receiver

JSF CONTENT & CONTRACT HISTORY



JSF FINANCIAL IMPACT – THALES NEDERLAND IMPACT ON THALES GROUP

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$148.5	$549.8
Average Annual Revenue:	**$14.9**	**$36.7**
% of Reported 2002 Revenue:	*0.1%*	*0.3%*
Estimated Average Annual EBIT Contribution:	**$0.9**	**$2.2**
FY 2002 Reported Revenue:	$11,651	
FY 2002 EBIT:	$626	
Enterprise Value/EBIT Multiple:	9.2x	
Estimated Value of Potential JSF EBIT Contribution:	$8.0	$19.9
Estimated Value per Share:	$0.05	$0.12
Current Share Price (5/30/03):	$24.55	
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.2%**	**0.5%**

Financial Impact

- Assumptions:
  - Thales Nederland wins development and production contracts in its core areas of technical expertise (~$200K per aircraft)
- Despite large parent company, JSF revenue and earnings would be significant to Thales Nederland
- JSF could serve as an entrée into other US military programs, boosting the benefit to Thales Nederland

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **The Netherlands**
  - Thales Nederland bases programs at four facilities in the Netherlands
  - Thales's German facilities are also controlled by the Dutch company

Lessons Learned

- Specialty in mission systems and related technologies make it difficult to work in international programs; the US always requires TAAs for every individual technology
- Likewise, it is difficult to communicate with potential American contractors as their engineers will never speak with a defense company such as Thales Nederland – they are too afraid of potentially crossing a line with regards to export controls

URENCO NEDERLAND – COMPANY OVERVIEW

Urenco Nederland BV
Subsidiary of Urenco Limited
Headquarters: Almelo, THE NETHERLANDS
Employees: 700 (Urenco Nederland BV)

Urenco is a global supplier of uranium enrichment services to nuclear power utilities, delivering more than 13% of the worldwide enrichment requirements.

- **Major Businesses:** enrichment of uranium and other isotopes by means of centrifuge, manufacture of precision parts and aerospace subsystems
- **Key Technological Capabilities:** design, manufacture and utilization of centrifuges
- **Major Military Platforms:** Eurocopter Tiger; C-17; JSTARS

URENCO PRODUCT AND SERVICE AREAS

- **Uranium Enrichment** – develop, manufacture, and utilize centrifuges and deliver uranium enrichment services to nuclear power utilities around the world
- **Aerospace** – manufacture air turbine starters, cooling turbines, and centrifugal compressors for APUs, composite helicopter drive shafts, nutation dampers, and other precision products

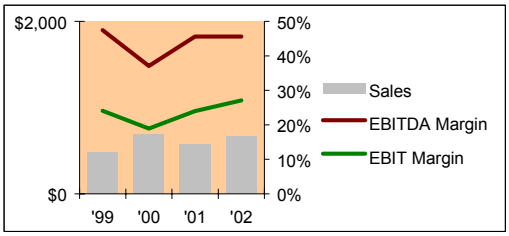
Stable Isotopes – utilize the centrifuge to enrich isotopes for use in medical and nuclear applications; applications include the treating of tumors, diagnosis of brain, kidneys or neurological sicknesses, and the cooling of water at a nuclear power station to reduce corrosion and prevent the release of the cobalt





URENCO LIMITED – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$479**	**$688**	**$575**	**$664**
Sales growth:	*8%*	*44%*	*(16%)*	*15%*
Reported EBIT:	115	131	138	180
EBIT margin:	*24%*	*19%*	*24%*	*27%*
Pro-forma EBITDA:	227	255	263	303
EBITDA margin:	*47%*	*37%*	*46%*	*46%*
Pro-forma EBIT:	**$115**	**$131**	**$138**	**$180**
EBIT margin:	*24%*	*19%*	*24%*	*27%*
Revenue per employee:	$373,217			



Net Capital Employed: **$428** (as of 12/31/2002)
Net Debt: $532
Enterprise Value: **$960**

EV/EBIT multiple*: **5.3x** *(*Pro-forma)*

Segment analysis not available

Results are converted from Euros to US Dollars using the exchange rate as of December 31, 2002 (EUR 1.00) = US$ 1.0429

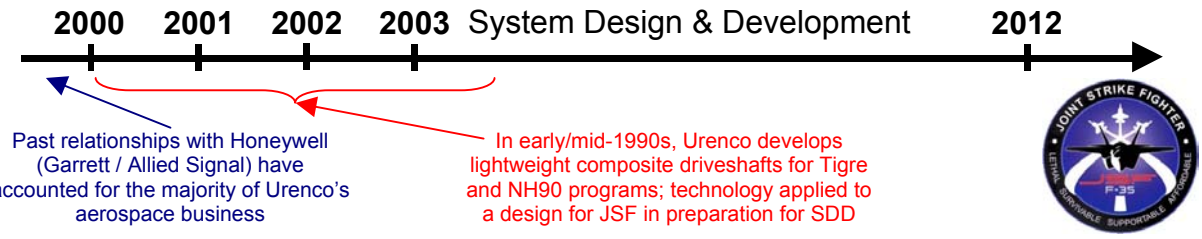
URENCO NEDERLAND – JSF PARTICIPATION

Urenco Nederland B.V.

"[Urenco Nederland] specializes in things that spin fast."
– Dick Alta, Urenco Nederland

Potential Contracts:
- LiftFan Driveshaft
- Power & Thermal Management System (PTMS) components

JSF CONTENT & CONTRACT HISTORY



JSF FINANCIAL IMPACT – URENCO AEROSPACE

(Year 2002 US$M, except per share) *(EUR1.00 = US$1.0429)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$24.3	$85.3
Average Annual Revenue:	**$2.4**	**$5.7**
% of Reported 2002 Revenue:	*0.4%*	*0.9%*
Estimated Average Annual EBIT Contribution[1]:	**$0.3**	**$0.7**
FY 2002 Reported Revenue:	$663.6	
FY 2002 Pro-Forma EBIT:	$179.9	
Enterprise Value/EBIT Multiple:	5.3x	
Estimated Value of Potential JSF EBIT Contribution:	$1.6	$3.6
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.2%**	**0.4%**

Financial Impact

- Assumptions:
  - Urenco supplies all production LiftFan driveshafts for STOVL units
  - Urenco is awarded PTMS component contracts
- Financial impact on Urenco Ltd is small compared to uranium business
- Although an extremely small portion of Urenco Ltd revenues, impact to Urenco Aerospace would be significant – likely to equate to over 10% of sales during FRP
- JSF supply contract would increase awareness of Urenco technology for future aerospace programs

[1] *Incremental JSF EBIT margin = 12%*

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Netherlands**
  - Urenco's aerospace facility is located in Almelo, Netherlands

Lessons Learned

- US MIL-SPECs dictate required performance for engine driveshafts; Urenco feels that MIL-SPEC standards for driveshaft impact resistance have hampered the application of Urenco's lightweight composite technology to JSF – Urenco's driveshaft is half the weight of a comparable steel driveshaft
- Poor JSF communications may cost Urenco millions of dollars in potentially wasted R&D efforts – the requirement to meet conventional MIL-SPEC impact resistance (virtually impossible to meet using composite) was never communicated to Urenco

Netherlands - Potential Defense Industry JSF Competitors

Company Name	Est.	Location	Employees	Sales ($ MM)	Potential Technology / Capability
Atos Origin B.V.	1995	Eindhoven	6,140	1,518.0	E-business, m-commerce and IT solutions
BAAN Nederland B.V. (BAAN)	2000	Voorthuizen	224	n.a.	Computer systems design
Dutch Space B.V.	n.a	Leiden	350	100.0	Spacecraft solar arrays
Fokker Defense Marketing (Stork Aerospace)	1996	Schiphol	2,500	500.0	Aircraft platforms and components
Futura Composites B.V.	2000	Heergugowaard	25	n.a.	Fiber reinforced composite components
IFS Benelux B.V. (Industrial and Financial Systems)	1998	Eindhoven	50	n.a.	Web and portal business technologies
Nedtech Engineering B.V.	1999	Uithoorn	35	n.a.	Mechanical systems, interiors, and systems installation
National Aerospace Laboratory	1919	Amsterdam	900	n.a.	Advanced research and development
NLR/DNW	n.a	Amsterdam	n.a.	n.a.	Aeronautical wind tunnel testing and simulation
Perot Systems Nederland B.V. (Perot Systems Corp.)	1990	Amersfoort	75	n.a.	Software and systems integration
Philips Electronics Nederland B.V. (Phillips Electronics N.V.)	n.a	Eindhoven	n.a.	n.a.	Aviation and defense electronics
Philips HTA	n.a	Eindhoven	n.a.	n.a.	Hazardous testing services
Philips Machinefabrieken (Phillips N.V.)	n.a	Eindhoven	350	n.a.	Automated production equipment
Rexroth Hydraudyne B.V. (Rexroth Bosch Group)	1977	Boxtel	700	n.a.	Drive, control systems and hydraulic cylinders
Senior Aerospace Bosman B.V.	2000	Rotterdam	106	n.a.	Pressure carrying components and systems
SERGEM Engineering B.V.	1933	Leidschendam	n.a.	n.a.	Extremely lightweight materials and systems
Eldim B.V. (Sulzer Metco)	1970	AD Loom	350	n.a.	Land-based and flight gas turbine components
Sun Electric Systems B.V.	1981	Weesp	90	n.a.	Aircraft hydraulics testers
Thales Nederland B.V.	1948	Hengelo	2,928	342.6	Radar, infrared, display, and IT technologies
TNO	1930	The Hague	5,500	n.a.	Contract research and specialist consultancy
TNO-TPD	1941	Delft	350	n.a.	Innovative technological applications

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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APPENDIX E

CANADA: COMPANY CASE STUDIES AND COMPENDIUM

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CASEBANK TECHNOLOGIES – COMPANY OVERVIEW

CaseBank Technologies, Inc.
Privately Held Company
Headquarters: Brampton, Ontario, CANADA
Employees: 40

CaseBank specializes in experience-based decision support solutions for complex equipment systems. Casebank develops web-based software products that can be used to assist aircraft technicians in diagnosing maintenance problems. Core to all of these solutions is CaseBank's case-based reasoning software, SpotLight, and its suite of knowledgebase development tools. In use, past maintenance data is captured about a certain platform. When a new maintenance problem occurs, SpotLight takes the lead in asking incisive questions that guide the user to the best data available for fast and effective diagnosis.

- **Major Businesses:** decision support software
- **Key Technological Capabilities:** case-based reasoning
- **Major Military Platforms:** CC-130 (Canada), F-16 (demo), CP-140 (Canada), T-56 (engine – software in development)

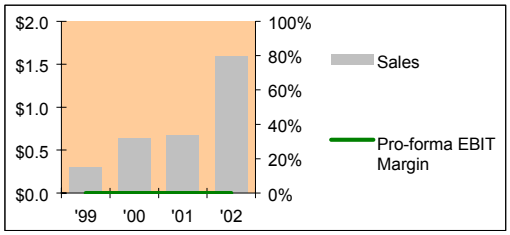
CASEBANK PRODUCTS

- **Diagnostic and Prognostic Applications** – case-based reasoning software for high-value asset management and maintenance decision making ("SpotLight"); software contains a proprietary knowledgebase of diagnostic knowledge for a particular aircraft type
- **Case Development Suite** – applications used for SpotLight case authoring (creating and editing subject matter domain models, creating cases, assigning attributes, and performing domain model customizations)
- **Learning Environments** – training applications

John Deere Products

CASEBANK TECHNOLOGIES, INC. – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$0.3**	**$0.6**	**$0.7**	**$1.6**
Sales growth:		*114%*	*6%*	*137%*
Reported EBIT[1]:	n.a.	n.a.	n.a.	n.a.
Reported EBITDA:	n.a.	n.a.	n.a.	n.a.
***Est. Pro-Forma* EBIT[1]:**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
Estimated EBIT margin:	*0%*	*0%*	*0%*	*0%*



[1] *EBIT not supplied by CaseBank; Pro-forma EBIT estimated to be $0 due to low revenue per employee figures*

Revenue per employee: $39,699

Privately held company

Revenue by segment not applicable

Results are converted from Canadian Dollars to US Dollars using the exchange rate as of December 31, 2002 (C$ 1.00 = US$0 .6329)

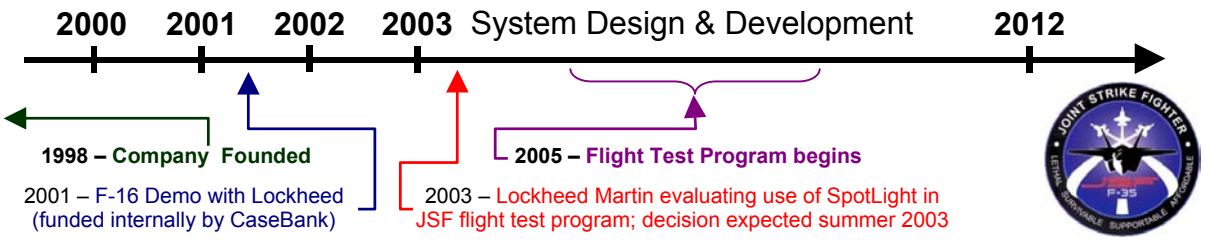
CASEBANK TECHNOLOGIES – JSF PARTICIPATION

"The JSF program is one that we think is crucially important to us and Canada" – Bob Hastings, CaseBank Director of Aerospace and Defense Business Development

JSF CONTENT & CONTRACT HISTORY

Potential Contracts:

- Lockheed Martin is currently evaluating CaseBank (SpotLight) for use during JSF flight test
- SpotLight for production aircraft



JSF FINANCIAL IMPACT – CASEBANK

(Year 2002 US$M, except per share) *(C$1.00 = US$0.6329)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$10.2	$266.8
Average Annual Revenue:	**$1.0**	**$17.8**
% of Reported 2002 Revenue:	*64.1%*	*1120.0%*
Estimated Average Annual EBIT Contribution[1]:	**$0.3**	**$4.4**
FY 2002 Reported Revenue:	$1.6	
FY 2002 Pro-Forma EBIT:	$0.0	
Enterprise Value/EBIT Multiple[2]:	*10.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$2.5	$44.5
Estimated Impact of JSF EBIT Contribution on Company Value:	**n.a.**	**n.a.**

[1] *Incremental JSF EBIT margin = 25%*
[2] *EV/EBIT multiple of 10.0x assumed for start-up software company*

Sources: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Assumptions:
  - Summer 2003 – contract award for "SpotLight" licenses during flight test
  - 2005 to 2007 – contract award for SpotLight licenses for production aircraft
- As a start-up, CaseBank views JSF business as the single most important engine for earnings
  - CaseBank's revenues would nearly double (from current levels) during LRIP, then increase tenfold during FRP
  - As a result of Spotlight evaluation for JSF, follow-on contracts with Lockheed Martin on the C-5A and F-22 APU are being discussed

Geographic Workshare

- **Canada**
  - CaseBank has performed all development work related to its product offerings in Canada

Lessons Learned

- Opportunities to prove one's technology in operation are invaluable; CaseBank was given the chance to prove concept on the F-16 – funded internally by CaseBank – which prompted Lockheed Martin to consider SpotLight for JSF
- Operators seem more willing to consider SpotLight after a painful maintenance experience involving hours of unnecessary diagnostic time – one CRJ operator tasked CaseBank with diagnosing a door seal problem that plagued one of their aircraft; SpotLight did so immediately by using a case in the software's knowledge-base…from the same operator on the same CRJ one year earlier

GasTOPS – Company Overview

GasTOPS Ltd.
Privately Owned
Headquarters: Ottawa, Ontario, CANADA
Employees: 112

GasTOPS excels in the field of engineering services to support the design, manufacture, and maintenance of turbo machinery. GasTOPS core technical expertise lies in engine and component modeling and simulation, which GasTOPS has used to develop engine control, condition monitoring, and predictive maintenance systems for a variety of applications.

- **Major Businesses:** engine condition monitoring systems, oil and filter debris analysis, engine control systems, engine component simulation, engineering design support
- **Key Technological Capabilities:** engine and component modeling and simulation, predictive algorithms for condition and health monitoring, engine control algorithms, engineering
- **Major Military Platforms**: CF-18 (Canada); F-22 (F119 Engine); JSF (F135 Engine)

GasTOPS Products & Services

- **Protection Systems** – "MetalSCAN" in-line, full-flow metallic particle sensors for machinery lubrication systems (Oil Debris Monitoring)
- **Condition Monitoring** – advanced systems for condition monitoring and condition based maintenance; "FilterCHECK" oil filter cleaner and debris analyzer; "Troubleshooter" event-based diagnostic tool
- **Maintenance Services** – electromechanical component repair & overhaul; software support for machinery control systems; condition assessment; training
- **Maintenance Engineering** – design, development, and implementation of maintenance programs.
- **Simulation** – engineering simulations to support the design of modern machinery control, condition monitoring and training systems; engine and component modeling
- **Controls Engineering** – engineering services to aid in the design, development, and commissioning of modern machinery controls

"Troubleshooter" tool in use with Canadian Forces fleet of CF-18s

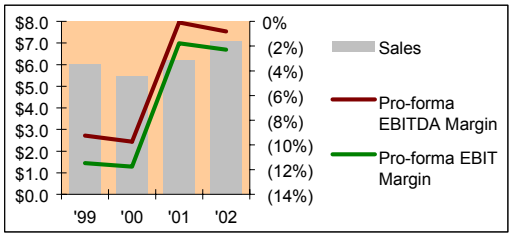
FilterCHECK filter cleaning and debris analysis system

MetalSCAN Oil Debris Monitor In use on F119 engine (F-22)

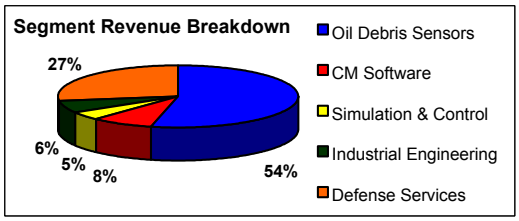
GasTOPS Ltd. – Financial Summary

(US$M) Year ended 30 Sep	1999	2000	2001	2002
Sales:	**$6.0**	**$5.5**	**$6.2**	**$7.1**
Sales growth:	*n.a.*	*(10%)*	*13%*	*15%*
Reported EBIT:	0.2	0.3	0.5	0.6
EBIT margin:	*3%*	*5%*	*8%*	*8%*
Pro-forma EBITDA:	(0.6)	(0.5)	(0.0)	(0.1)
EBITDA margin:	*(9%)*	*(10%)*	*(0%)*	*(1%)*
Pro-forma EBIT:	**($0.7)**	**($0.6)**	**($0.1)**	**($0.2)**
EBIT margin:	*(11%)*	*(12%)*	*(2%)*	*(2%)*

Revenue per employee: $63,362



Privately held company



Results are converted from Canadian Dollars to US Dollars using the exchange rate as of December 31, 2002 (C$ 1.00 = US$0 .6329)

GasTOPS – JSF Participation

"The JSF Program is unique and high profile. It is quite a boost to the reputation and credibility of a company." – Bernard MacIsaac, President, GasTOPS Ltd.

Contract Awards:
- Oil Debris Monitor ("MetalSCAN") for F135 engine (awarded through Hamilton Sundstrand)

Potential Contracts:
- LiftFan Oil Debris Monitor
- APU Oil Debris Monitor
- F136 Oil Debris Monitor

JSF Content & Contract History

2000 2001 2002 2003 System Design & Development **2012**

GasTOPS develops MetalSCAN oil debris monitoring technology for F119 (F-22) on contract with Hamilton Sundstrand / Pratt & Whitney

OCT 2002 – GasTOPS chosen by Hamilton Sundstrand to develop oil debris monitor for the Pratt & Whitney F135 engine

JSF Financial Impact – GasTOPS

(Year 2002 US$M, except per share) *(C$1.00 = US$0.6329)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$5.8	$15.9
Average Annual Revenue:	**$0.6**	**$1.1**
% of Reported 2002 Revenue:	*8.2%*	*14.9%*
Estimated Average Annual EBIT Contribution[1]:	**$0.1**	**$0.1**
FY 2002 Reported Revenue:	$7.1	
FY 2002 Pro-Forma EBIT:	($0.2)	
Enterprise Value/EBIT Multiple[2]:	*8.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$0.6	$1.0
Estimated Impact of JSF EBIT Contribution on Company Value:	**n.m.[3]**	**n.m.[3]**

[1] *Incremental JSF EBIT margin = 12%*
[2] *EV/EBIT multiple of 8.0x estimated for private engineering shop*
[3] *Not meaningful due to historical operating losses*

Sources: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Assumptions:
  - During 2003-2006, GasTOPS wins all expected MetalSCAN contracts (F136, APU, and LiftFan)
  - 12% EBIT (operating) margin on JSF work (GasTOPS estimate)
- As a small, R&D focused company, JSF revenues will contribute significantly to GasTOPS earnings
  - After research tax credits and TPC repayments, JSF will bring GasTOPS earnings above break-even during FRP
  - JSF will boost GasTOPS's recognition as an emerging defense supplier

Geographic Workshare

- **Canada**
  - GasTOPS sole location in Ontario will carry out JSF work

Lessons Learned

- Niche technology products must be "sold" to the end-user first before convincing a prime contracter / OEM to consider using an emerging supplier – USAF experience with F-22 MetalSCAN helped win JSF business from Pratt & Whitney, a contract for which GasTOPS competed against P&W sister company Sikorsky Aircraft
- Breaking into aerospace business is a long, drawn-out process that is often delayed by corporate politics; GasTOPS decided to first market their technologies in other industries (e.g. power generation) before committing resources to the aerospace industry

HĒROUX-DEVTEK – COMPANY OVERVIEW

Hēroux-Devtek, Inc.
Toronto Stock Exchange – Ticker: HRX
Headquarters: Longueuil, Quebec, CANADA
Employees: 1,200

Héroux-Devtek Inc. specializes in the design, development, manufacture and repair of aircraft components and landing gear systems. Héroux-Devtek's gas turbine component division manufactures a variety of gas turbine components for aircraft and industrial turbine engines.

- **Major Businesses:** landing gear; aerostructures; gas turbine components
- **Key Technological Capabilities:** manufacture and maintenance of landing gear and high precision components; gas turbine component design and manufacture; precision manufacturing; logistics management
- **Major Military Platforms:** C-5; C-130; P-3; KC-135; X-45B UCAV; F-16; F-35 (JSF); Global Hawk

HĒROUX-DEVTEK PRODUCTS & SERVICES

- **Landing Gear** – landing gear (small & medium sized aircraft); hydraulic actuators; flight critical components; design, manufacture, repair and overhaul services
- **Logistics** (part of landing gear division) – AOG services; full service logistics management; engineering, development, and short-run parts and component manufacture (for out-of-production aircraft); component MR&O; assembly; test
- **Aerostructures** – 5-axis milling; grinding; aluminum dip-brazing; vacuum brazing; epoxy bonded structural assemblies; complex components and assemblies & precision castings
- **Gas Turbine Components** – regional jet engine components; titanium welded actuation rings; turbine and compressor wheels; machined assemblies; large machined high-temperature steels and alloys

X-45 UCAV Landing Gear

Bombardier CRJ 700 Aerostructures

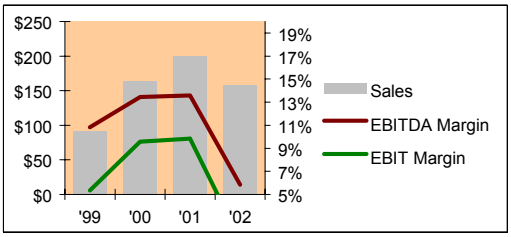
KC-135 Landing Gear Components

B-777 Landing Gear Components

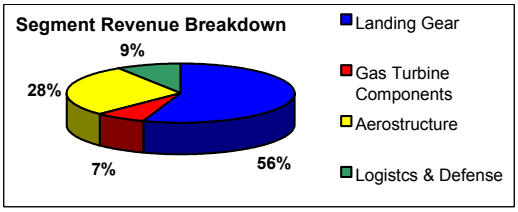
Global Hawk Landing Gear

HĒROUX-DEVTEK, INC. – FINANCIAL SUMMARY

(US$M) Year ended 31 Jul	2000	2001	2002	FY2003E
Sales:	**$91**	**$164**	**$200**	**$158**
Sales growth:	*17%*	*80%*	*22%*	*(21%)*
Reported EBIT:	5	16	20	(9)
EBIT margin:	*5%*	*10%*	*10%*	*(6%)*
Pro-forma EBITDA:	10	22	27	9
EBITDA margin:	*11%*	*13%*	*14%*	*6%*
Pro-forma EBIT:	**$5**	**$16**	**$20**	**$2**
EBIT margin:	*5%*	*10%*	*10%*	*1%*
Revenue per employee:	$131,856			



Stock price:	**$2.57** (as of 5/30/2003)
52 week high:	$6.36
52 week low:	$1.90
Shares outstanding:	23.5 million
Market capitalization:	**$60**
Net Debt:	$15
Enterprise Value:	**$75**
EV/EBIT multiple*:	**45.6x** *(*Pro-forma)*



Results are converted from Canadian Dollars to US Dollars using the exchange rate as of December 31, 2002 (C$ 1.00 = US$0 .6329)

HÉROUX-DEVTEK – JSF PARTICIPATION

Héroux-Devtek foresees great benefit from JSF participation. Design and development work, in its view, assures long-term production stability.

RFQs Submitted & Outstanding:
- CTOL Arresting Gear (Northrop Grumman)
- Weapons Bay Door Uplocks (Goodrich/TRW)
- High Speed Machining (Multiple Packages from Lockheed-Martin)

Expected RFQs
- CV Arresting Gear
- Additional Uplocks
- Landing Gear Components

Future Potential – Landing Gear MR&O; Turbine Engine Components

JSF CONTENT & CONTRACT HISTORY

2000 2001 2002 2003 System Design & Development 2012

October 2002 – Héroux-Devtek loses competition for Titanium machining package (won by Magellan)

March 2003 – Proposal for weapons bay uplocks submitted to Goodrich/TRW

April 2003 – Proposals for CTOL arresting gear and high-speed machining submitted to Northop Grumman and Lockheed Martin, respectively

JSF FINANCIAL IMPACT – HÉROUX-DEVTEK

(Year 2002 US$M, except per share) *(C$1.00 = US$0.6329)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$76.8	$255.2
Average Annual Revenue:	**$7.7**	**$17.0**
% of Reported 2002 Revenue:	*4.9%*	*10.8%*
Estimated Average Annual EBIT Contribution:	**$0.5**	**$1.1**
FY 2002 Reported Revenue:	$158.2	
FY 2002 Pro-Forma EBIT:	$1.6	
Enterprise Value/EBIT Multiple[1]:	*8.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$4.0	$8.8
Estimated Value per Share:	$0.17	$0.37
Current Share Price (5/30/03):	$2.57	
Estimated Impact of JSF EBIT Contribution on Company Value:	**6.6%**	**14.5%**

Financial Impact

- Assumptions:
  - Héroux wins all outstanding RFQs and the CV arresting gear
    - 25% of High-speed Machining packages expected to be won
  - Héroux wins ~$150 million of MR&O and spare parts business due to JSF over course of FRP
- Impact of JSF is expected to extend well beyond these specific contracts
  - JSF business will drive an expansion of capacity that will allow Heroux to bring in other business during SDD
  - Marketing cachet of JSF is a key benefit

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Canada**
  - Landing gear, components, & aerostructures based in Quebec and Ontario
- **United States**
  - Gas turbine components

Lessons Learned

- In Canada, pre-screening of potential bidders has likely saved time and effort – worldwide, 33 companies bid on the high-speed machining RFQ; JSF Canada recommended 3 Canadian companies to the contractor and only 2 qualified to bid.
- Feedback after unsuccessful bid attempts is limited; JSF needs a greater communications effort between the contractors and bidders
- Success with recent landing gear competitions (e.g. X-45) has made Héroux more visible – not only to JSF primes, but to Héroux's largest competitors, Goodrich & Messier Dowty

MAGELLAN AEROSPACE – COMPANY OVERVIEW

Magellan Aerospace Corporation
Toronto Stock Exchange – Ticker: MAL
Headquarters: Mississauga, Ontario, CANADA
Employees: 2,360

Magellan Aerospace, founded in the 1930s as Fleet Aerospace, has rapidly grown through acquisitions since restructuring in 1995. Today, the Magellan family of businesses serves as a major component supplier to most aerospace original equipment manufacturers (OEMs).

- **Major Businesses:** Aircraft structures; aircraft engine components; space; specialty components; maintenance, repair & overhaul
- **Key Technological Capabilities:** Precision machining; alloys; complex geometry sand castings; composites; advanced materials; reciprocating engine manufacture & design; rocket systems
- **Major Military Platforms:** F/A-18; F-16; M1 Abrams Tank; F-35 (JSF)

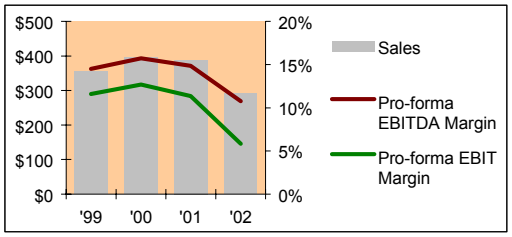
MAGELLAN AEROSPACE PRODUCTS & SERVICES

- **Aerostructures** – wings & wing components; fuselages & fuselage components; flight controls surfaces; fairings; landing gear; hydraulic systems; electromechanical systems; spacecraft structures
- **Aeroengines** – compressor and turbine rotor-stator components; combuster cases and liners; bearing cages; air & oil seals; casings; housings; afterburner components
- **Repair & Overhaul** – aeroengine component repair & overhaul; engine MR&O; aircraft refurbishment; engineering support services
- **Specialty Products** – advanced energy systems; aeroengine exhaust systems; industrial power packs; reciprocating engines; rocket weapon systems; space payloads and sounding rockets; spacecraft components; wire strike prevention systems



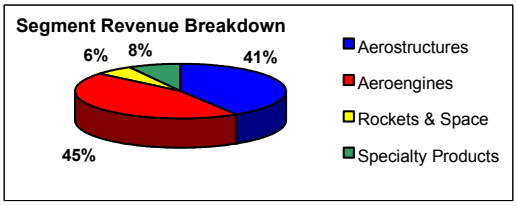

MAGELLAN AEROSPACE CORPORATION – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$356**	**$396**	**$389**	**$291**
Sales growth:	*32%*	*11%*	*(2%)*	*(25%)*
Reported EBIT:	41	50	44	(2)
EBIT margin:	*12%*	*13%*	*11%*	*(1%)*
Pro-forma EBITDA:	52	62	58	31
EBITDA margin:	*14%*	*16%*	*15%*	*11%*
Pro-forma EBIT:	**$41**	**$50**	**$44**	**$17**
EBIT margin:	*12%*	*13%*	*11%*	*6%*



Revenue per employee: $123,402

Stock price: **$1.42** (as of 5/30/2003)
52 week high: $4.59
52 week low: $0.97
Shares outstanding: 67.3 million
Market capitalization: **$96**
Net Debt: $151
Enterprise Value: **$246**
EV/EBIT multiple*: **14.6x** *(*Pro-forma)*



Results are converted from Canadian Dollars to US Dollars using the exchange rate as of December 31, 2002 (C$ 1.00 = US$ 0.6329)

MAGELLAN AEROSPACE – JSF PARTICIPATION

"Although [JSF production] is certainly extremely attractive… winning JSF contracts is more about the competitive position in which such technology puts our company for the future." - Bill Matthews, VP Marketing, Magellan

JSF CONTENT & CONTRACT HISTORY

Contracts Awarded:

- LiftFan casing assembly (From Rolls Royce):
  - Sand Casting (Haley); Machining (Middleton); Components (Chicopee); Integration (Bristol)
- Titanium high-speed machining (Chicopee – from Lockheed Martin)

Potential Contracts:

- Aluminum high-speed machining
- F136 components

2000 2001 2002 2003 System Design & Development **2012**

Oct 2002 – Magellan acquires Haley Industries

Magellan wins first JSF SDD contract

Mid-1990s – First Magellan JSF involvement during CDP Phase

JSF FINANCIAL IMPACT – MAGELLAN AEROSPACE

(Year 2002 US$M, except per share) *(C$1.00 = US$0.6329)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$93.4	$319.6
Average Annual Revenue:	**$9.3**	**$21.3**
% of Reported 2002 Revenue:	*3.2%*	*7.3%*
Estimated Average Annual EBIT Contribution:	**$1.0**	**$2.2**
FY 2002 Reported Revenue:	$291.2	
FY 2002 Pro-Forma EBIT:	$16.9	
Enterprise Value/EBIT Multiple:	14.6x	
Estimated Value of Potential JSF EBIT Contribution:	$14.1	$32.1
Estimated Value per Share:	$0.21	$0.48
Current Share Price (5/30/03):	$1.42	
Estimated Impact of JSF EBIT Contribution on Company Value:	**14.7%**	**33.5%**

Financial Impact

- Assumptions:
  - Magellan wins follow-on LRIP contracts for LiftFan Frame and Oil Tank
    - Current contracts cover only SDD units
  - Magellan wins F136 and Lockheed Martin aluminum components contracts
    - Expect to win 50% of aluminum high-speed machining packages expected
- Low stock price fosters a large JSF impact to market value
- Impact of JSF is expected to extend well beyond these specific contracts
  - Potential technical program with GE will have applications in commercial market

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Canada**
  - The majority of Magellan content is Canadian
- **United States**
  - Middleton, NY subsidiary will machine LiftFan Frame

Lessons Learned

- Megallan's integrated approach to JSF RFQs has been lauded by contractors; Magellan's corporate office integrates centralizes bidding across all Magellan subsidiaries, allowing contractors to manage fewer suppliers
- Remaining SDD contracts seem to consist of "commodity items;" Canada may be "too late to the game for systems level work"
- ITAR proceedures have been "very confusing" and inconsistent – the ease of obtaining TAAs seems to "depend on the customer, product line, and time of day"

PRATT & WHITNEY CANADA– COMPANY OVERVIEW

Pratt & Whitney Canada (P&WC)
Subsidiary of United Technologies Corporation (NYSE: UTX)
P&WC Headquarters: Longueuil, Quebec, CANADA
Employees: 8,985

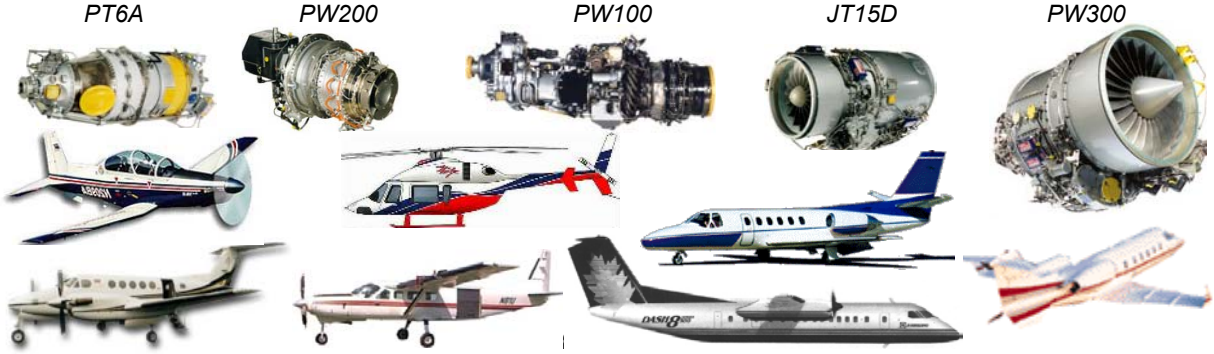
Pratt & Whitney Canada, a subsidiary of Hartford, CT-based United Technologies Corporation, specializes in the design, development, manufacture and repair of turbine engines for business, regional, and military aircraft (including rotary-wing).

- **Major Businesses:** Business & general aviation engines; regional aircraft engines; helicopter engines; military aircraft engines; engine services
- **Key Technological Capabilities:** gas turbine engine design, development, manufacture, & MRO
- **Major Military Platforms:** T1-A Jayhawk; T-6A Texan II (JPATS); C-12

PRATT & WHITNEY CANADA PRODUCTS & SERVICES

- **Business & General Aviation** – JT15D turbofan; PW100/300/500/600 turbofans; PT6A turboprop
- **Helicopter Engines** – PT6T, PT6B/C, and PW200 turboshafts
- **Regional Aircraft Engines** – PT6A and PW100 turboprop; PW100/300/800/900 turbofans & PW900 APUs
- **Military Aircraft Engines** – military applications of commercial engines
- **Service & Support** – maintenance programs; engine leasing; spare parts; sales

PT6A *PW200* *PW100* *JT15D* *PW300*



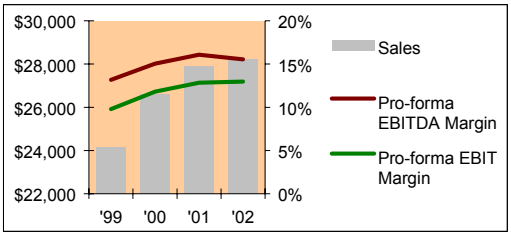
UNITED TECHNOLOGIES CORPORATION – FINANCIAL SUMMARY

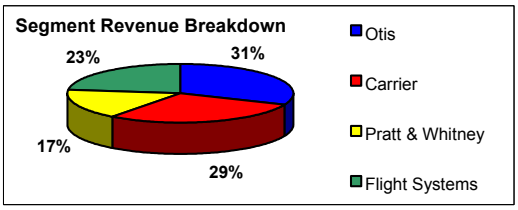
(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$24,127**	**$26,583**	**$27,897**	**$28,212**
Sales growth:	*6%*	*10%*	*5%*	*1%*
Reported EBIT:	1,517	3,140	3,233	3,657
EBIT margin:	*6%*	*12%*	*12%*	*13%*
Pro-forma EBITDA:	3,178	3,999	4,486	4,384
EBITDA margin:	*13%*	*15%*	*16%*	*16%*
Pro-forma EBIT:	**$2,359**	**$3,140**	**$3,581**	**$3,657**
EBIT margin:	*10%*	*12%*	*13%*	*13%*

Revenue per employee: $182,013

Stock price: **$68.25** (as of 5/30/2003)
52 week high: $72.06
52 week low: $48.83
Shares outstanding: 470.4 million
Market capitalization: **$32,105**
Net Debt: $3,221
Enterprise Value: **$35,326**

EV/EBIT multiple*: **9.7x** *(*Pro-forma)*





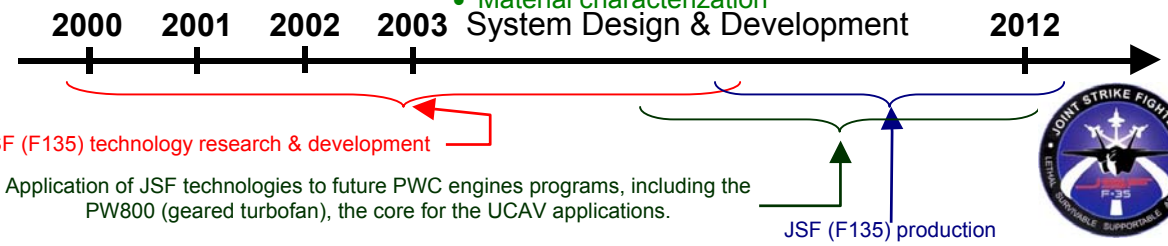
PRATT & WHITNEY CANADA – JSF PARTICIPATION

JSF-specific revenues are expected to be relatively small for Pratt and Whitney Canada, but P&WC input to the development of JSF technologies is potentially high as is the possibility of revenues from commercial products using JSF spin-off technology.

Potential SDD contracts (F135 R&D):
- Machine & repair of Nickel & Titanium IBRs
- 3D Dytran modeling & simulation of foreign object ingestion
- Micro Electromagnetic Monitoring Systems (MEMS) sensors
- Material characterization

Potential Contracts:
- IBR production (PW)
- MR&O of PWC-manufactured parts

JSF CONTENT & CONTRACT HISTORY



JSF FINANCIAL IMPACT OF PRATT & WHITNEY CANADA ON UNITED TECHNOLOGIES CORP.

(Year 2002 US$M, except per share) *(C$1.00 = US$0.6329)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$50.6	$70.6
Average Annual Revenue:	**$5.1**	**$4.7**
% of Reported 2002 Revenue:	*0.5%*	*0.4%*
Estimated Average Annual EBIT Contribution:	**$0.6**	**$0.6**
FY 2002 Revenue[1]:	$1,055	
FY 2002 EBIT:	n.a.	
Enterprise Value/EBIT Multiple:	9.7x	
Estimated Value of Potential JSF EBIT Contribution:	$5.8	$5.4
Estimated Value per Share:	$0.01	$0.01
Current Share Price (5/30/03):	$68.25	
Estimated Impact of JSF EBIT Contribution on Company Value[2]:	**0.0%**	**0.0%**

[1]*Estimated P&WC revenues;* [2]*Impact on United Technologies Corp due to P&WC JSF earnings only*

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Direct financial impact on UTC from Pratt & Whitney Canada JSF participation will be limited
- True benefit of JSF will stem from the potential application of transfer of JSF technologies to commercial sector
  - PWC gas turbine engines of the future (e.g. PW180, PW600, and PW800 families) could utilize technologies developed for JSF / F135
  - PHM (MEMS sensors), "more electric engine," designs to ease producibility, advanced materials and miniaturized components for lower weight

Geographic Workshare

- **Canada**
  - Pratt & Whitney Canada R&D expertise based in Quebec
  - P&WC may produce certain F135 components
  - P&WC will collaborate with other Canadian companies as needed

Lessons Learned

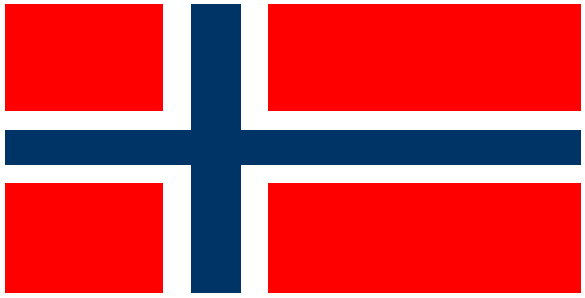
- Despite relationship with Pratt & Whitney and the Canadian ITAR exemption, Pratt & Whitney Canada was required to obtain 3 TAAs and 1 MLA to cover the four areas of JSF R&D.
- Pratt & Whitney Canada has had to compete against 3rd parties to obtain JSF work from Pratt & Whitney and UTC-subsidiary Hamilton Sundstrand.
- Benefits of the JSF program to Pratt & Whitney Canada are mainly related to commercial spin-off opportunities; direct JSF revenues will constitute less than 1% of future Pratt & Whitney Canada business

Canada - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**Total Sales ($ Millions)**	**Potential Technology/Capability**
Acsion Industries, Inc.	1998	Pinawa, Manitoba	17	1.0	Electron beam-based products and services
Aerospace Welding (I.A.T.S.)	1980	Blainville, Quebec	120	4.7	Fabrication, repair and overhaul aircraft engine assembly, welding and flame spraying
Alphacasting, Inc.	1990	Saint-Laurent, Quebec	100	6.4	Precision investment castings
Atelier D'usinage Aero (Aero Machining, Inc.)	1963	Montreal-Nord, Quebec	70	5.9	Frequency hopping, secure, and anti-jam high frequency radio equipment
Atlantis Systems International	1978	Brampton, Ontario	168	8.7	Develops, manufactures, and maintains simulation and training systems, performance support and pilot selection systems
Avcorp Industries Inc.	1986	Delta, British Columbia	400	52.7	Metal, plastic, and composite aircraft structures
Axia NetMedia Corporation	1995	Calgary, Alberta	500	62.3	High-speed interactive networks and media services
Bristol Aerospace (Magellan Aerospace)		Winnipeg, Manitoba	1,100	110.5	Engine components, rockets, and aircraft structural systems
Solectron Sherbrooke SSG (Solectron)	1977	Sherbrooke, Quebec	n.a.	n.a.	Integrated supply chain services
CAE Inc.	1947	Saint-Laurent, Quebec	7,000	729.0	Flight simulators and naval ship control systems
Centra Industries Inc.	1974	Cambridge, Ontario	150	13.0	Precision machined components and assemblies
Chicopee Manufacturing Ltd. (Magellan Aerospace)	n.a.	Kitchener, Ontario	175	47.7	Aerospace components and sub-assemblies
CMC Electronics Inc.	1902	Montreal, Quebec	1,100	130.0	Electronic systems and components
CMC Electronics Inc.	n.a.	Kanata, Ontario	300	n.a.	Navigational electronic equipment
Composites Atlantic (EADS)	200	Lunenburg, Nova Scotia	125	8.1	Advanced composite structures
Comtek Advanced Structures Ltd.	1994	Burlington, Ontario	114	7.6	Interior composite aircraft components
Cormer Group Industries Inc.	1988	Winnipeg, Manitoba	75	9.8	Components machining, processing, and assembly
Donlee Precision (General Donlee Ltd.)	1963	Toronto, Ontario	90	15.0	Precision-machined products
DY 4 Systems Inc. (Solectron)	1979	Kanata, Ontario	300	39.9	Embedded computing solutions
Edgewater Computer Systems, Inc.	1988	Regina, Saskatchewan	21	n.a.	High-performance real-time multiprocessor interconnect technologies
EMS Technologies Canada Ltd. (EMS Technologies, Inc.)	1974	Sainte-Anne-de-Bellevue, Quebec	850	118.9	Satellite based-terminals, antennas and aeronautical applications
FAG Bearings Ltd. (FAG Kugelfischer)	1953	Mississauga, Ontario	1,200	214.5	Aerospace bearings
Fellfab Ltd. (Fellfab Corp.)	1992	Hamilton, Ontario	130	5.1	Engineered textile products
FTG Edgelit (Firan Technology Group)	n.a.	Scarborough, Ontario	340	24.7	Illuminated panels and annunciator assemblies
FTG Precision (Firan Technology Group)	n.a.	Scarborough, Ontario	n.a.	n.a.	Mil-spec and high-end commercial printed circuit boards
Haley Industries Ltd. (Magellan Aerospace)	1952	Haley Station, Ontario	550	40.0	Light alloy aerospace foundries
Heroux Devtek Inc.	1954	Longueuil, Quebec	790	205.6	Design, development, manufacture, and repair of aerospace and industrial products
Heroux Devtek Aerostructures Inc.	n.a.	Dorval, Quebec	175	15.3	Manufacture of components and sub-assemblies
Heroux Devtek Landing Gear Div.	1950	Longueuil, Quebec	700	174.5	Manufacture, repair, and overhaul of small to medium size landing gear
Hochelaga (Heroux Devtek Inc.)	1954	Laval, Quebec	175	4.9	Landing gear and related services
Honeywell Ltd.	1930	Mississauga, Ontario	3,000	715.0	Aircraft controls

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

Canada - Potential Defense Industry JSF Competitors (cont'd)					
Company Name	Est.	Location	Employees	Total Sales ($ Millions)	Potential Technology/Capability
Honeywell Aerospatiale	1930	Slemon Park, Prince Edward Island	350	30.2	Engine fuel controls and repair and overhaul
Honeywell Electronic Materials	n.a.	Victoria, British Columbia	n.a.	n.a.	Advanced on-chip interconnect technology
Howmet Aluminum Castings Ltd. (Alcoa)	n.a.	Laval, Quebec	n.a.	n.a.	Aluminum investment castings
Howmet Aluminum Castings Ltd. (Alcoa)	n.a.	Georgetown, Ontario	95	n.a.	High-technology castings of aluminum and copper-based alloys
i3dimensions Inc.	2000	Vancouver, British Columbia	30	1.3	Graphic arts, computer software systems analysis, and design
IMP Group Ltd.	1967	Dartmouth, Nova Scotia	3,500	183.1	Aircraft servicing and repairing
Instrumar Ltd.	1979	St. John's, Newfoundland	54	n.a.	Engineering services and real time information systems
LearnStream Inc.	1993	Fredericton, New Brunswick	170	8.2	Computer software development
Litton Systems Canada	n.a.	Etobicoke, Ontario	700	70.3	Aircraft control systems, electronic flight control equipment
MBM Tool and Machine	1967	Woodbridge, Ontario	60	2.5	Structural, hydraulic, and undercarriage components/assemblies
Mustang Survival Corp.	1967	Richmond, British Columbia	n.a.	n.a.	Hazardous environment life support solutions for people exposed to the most .
National Research Council	1916	Ottawa, Ontario	3,400	516.0	Business development, government relations
Noranco Manufacturing Ltd.	n.a.	Pickering, Ontario	90	14.1	Fabricated metal products
Northstar Aerospace Inc. (Derlan Aerospace Canada, Ltd.)	1989	Milton, Ontario	1,500	123.4	Aircraft assemblies, subassemblies, and parts
Northstar Aerospace Inc. (Derlan Aerospace Canada, Ltd.)	n.a.	Cambridge, Ontario	120	n.a.	Aircraft assemblies, subassemblies, and parts
Northstar Aerospace Inc. (Derlan Windsor Gear and Drive)	n.a.	Emeryville, Ontario	50	n.a.	Gear cutting and finishing machines
Northstar Network Ltd. (Northstar Electronics)	n.a.	St. John's, Newfoundland	n.a.	n.a.	Design, manufacturing, and systems integration
Nova Crystals, Ltd.	1982	Halifax, Nova Scotia	n.a.	n.a.	Customized ceramic and glass products
Novatronics Inc.	1955	Stratford, Ontario	130	9.8	Aircraft control systems, electronic
Pivotal Power	1980	Bedford, Nova Scotia	75	5.2	Power conversion units
PyroGenesis Inc.	1992	Montreal, Quebec	50	2.4	Design and fabrication of waste treatment systems, and of high performance materials related to thermal spraying technology
Societe Industrielle de Decolletage et D'outillage	n.a.	Granby, Quebec	n.a.	n.a.	n.a.
Shellcast Foundries Inc.	1971	Montreal-Nord, Quebec	140	8.1	Aluminum and aluminum-based alloy castings
Simgraph Inc.	1993	Montreal, Quebec	27	1.6	Customized multimedia training solutions
Spectrum Signal Processing Inc.	1987	Burnaby, British Columbia	140	22.8	Computer software development
Strite Industries Ltd.	1964	Cambridge, Ontario	270	12.8	Engineering and prototyping services
West Heights (Devtek Aerospace, Inc.)	n.a.	Kitchener, Ontario	n.a.	n.a.	Landing gear and related services
Xwave (Alliant)	1980	Kanata, Ontario	2,500	260.0	Information technology services

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.



APPENDIX F

NORWAY: COMPANY CASE STUDIES AND COMPENDIUM

KONGSBERG

VOLVO AERO

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KONGSBERG – COMPANY OVERVIEW

Kongsberg Defence & Aerospace AS
Subsidiary of Kongsberg Gruppen ASA
Oslo Børs – Ticker: KOG (50.0% owned by Norwegian Government)
Headquarters: Kongsberg, NORWAY
Employees: 1,649

Kongsberg Defence & Aerospace is one of Norway's top suppliers of advanced defense systems and products to both the Norwegian government and international defense contractors.

- **Major Businesses:** missile and space, naval systems, land systems and communications, aircraft and air defense systems, dynamic systems
- **Key Technological Capabilities:** signal processing, engineering cybernetics, systems integration, software
- **Major Military Platforms:** F-16, Sea Hawk, E-3 AWACS, AMRAAM

KONGSBERG DEFENSE & AEROSPACE PRODUCTS

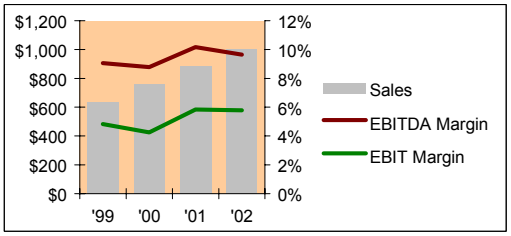
- **Missile and Space** – developed the Penguin anti-ship cruise missile, the world's leading anti-ship missile for deployment on naval helicopters; currently developing a naval strike missile on behalf of the Royal Norwegian Navy
- **Naval Systems** – design and develop surface ship combat systems, submarine combat systems, and mine countermeasures combat systems
- **Aircraft and Defense Systems** – offer, in partnership with Raytheon, ground based air defense solutions
- **Dynamic Systems** – developed and produce a remote controlled weapon station for installation on armored vehicles
- **Land Systems and Communications** – key supplier of secure communications equipment to the Norwegian armed forces; products include a family of secure combat net radios, a battlefield management system, a range of secure encryption equipment and a command and control information system geared for more mobile, tactical Army operations

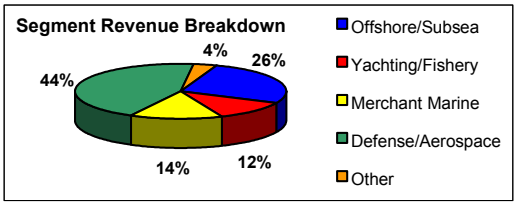



KONGSBERG GRUPPEN – FINANCIAL SUMMARY

(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$634**	**$762**	**$888**	**$1,004**
Sales growth:	*0%*	*20%*	*17%*	*13%*
Reported EBIT:	31	32	47	58
EBIT margin:	*5%*	*4%*	*5%*	*6%*
Pro-forma EBITDA:	58	67	90	97
EBITDA margin:	*9%*	*9%*	*10%*	*10%*
Pro-forma EBIT:	**$31**	**$32**	**$52**	**$58**
EBIT margin:	*5%*	*4%*	*6%*	*6%*
Revenue per employee:	$238,511			

Stock price:	**$11.36**	(as of 5/30/2003)
52 week high:	$15.82	
52 week low:	$10.64	
Shares outstanding:	30.0	million
Market capitalization:	**$341**	
Net Debt:	$114	
Enterprise Value:	**$455**	
EV/EBIT multiple*:	**7.8x**	*(*Pro-forma)*





Results are converted from Norwegian Kroners to US Dollars using the exchange rate as of December 31, 2002 (NOK 1.00 = US$0.1438)

KONGSBERG – JSF PARTICIPATION

Though a company with diverse capabilities, Kongsberg feels their core competencies most relevant to JSF are in mission system design and integration

Potential Contracts:
- CV Arresting Gear
- Missile Integration
- Crew Ladder
- Composites
- Training

JSF CONTENT & CONTRACT HISTORY

JSF FINANCIAL IMPACT – KONGSBERG

(Year 2002 US$M, except per share) *(NOK 1.00 = US$0.1438)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$44.2	$105.3
Average Annual Revenue:	**$4.4**	**$7.0**
% of Reported 2002 Revenue:	*0.4%*	*0.7%*
Estimated Average Annual EBIT Contribution:	**$0.2**	**$0.4**
FY 2002 Reported Revenue:	$1,003.7	
FY 2002 Pro-Forma EBIT:	$58.1	
Enterprise Value/EBIT Multiple:	7.8x	
Estimated Value of Potential JSF EBIT Contribution:	$1.8	$2.8
Estimated Value per Share:	$0.06	$0.09
Current Share Price (5/30/03):	$11.36	
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.5%**	**0.8%**

Financial Impact

- Assumptions:
  - Kongsberg designs and manufactures CV arresting gear
  - Kongsberg wins potential contracts worth approximately $115M
- Kongsberg does not expect significant impact from JSF (<1% of revenues)

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Geographic Workshare

- **Norway**
  - Kongsberg design and production facilities are located in Norway

Lessons Learned

- Bidding process would be more effective with improved communication; JSF has not afforded many opportunities to discuss bids with contractors in order to uncover opportunities to optimize the best-value model. Kongsberg applauds the Eurofighter sourcing team – during bid negotiations between Kongsberg and Eurofighter, it was discovered that Kongsberg's bid was too high because of raw materials cost… Eurofighter and Kongsberg then worked out a way to leverage Eurofighter's buying power, allowing Kongsberg to lower its bid without sacrificing return

VOLVO AERO NORGE – COMPANY OVERVIEW

Volvo Aero Norge AS
Jointly owned by Volvo Aero (AB Volvo) and Pratt & Whitney (United Technologies Corp)
Headquarters: Kongsberg, NORWAY
Employees: 475

Volvo Aero Norge is jointly owned by Volvo Aero (77.8%) and Pratt & Whitney (22.2%). The Company manufactures jet engine components for the world's leading aircraft engine manufacturers on both civil and military platforms.

- **Major Businesses:** produce and export mechanical jet engine components and modules
- **Key Technological Capabilities:** manufacturing, metal machining – chromium/nickel base alloys and titanium products
- **Major Military Platforms**: F-15, F-16, F/A-18 C/D, F/A-18 E/F, Gripen

VOLVO AERO NORGE PRODUCTS

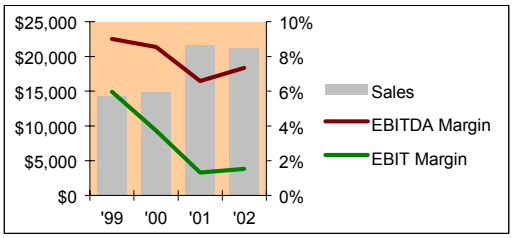
- **Military Engines** – develop and produce engine components for military engines including: RM12, F414, F404, F100, F110
- **Aeroderivitive Gas Turbines** – develop and produce parts for aeroderivitive gas turbines used in industrial, power generation, and marine propulsion applications

Civil Engines – develop and produce engine components for a variety of commercial engines including: CF6-80, CFM56, GE90-115B, GP7000, BR715, Trent 500, Trent 900, RR Tay, PW4000, PW2000, IAE V2500, and JT8-D




AB VOLVO – FINANCIAL SUMMARY

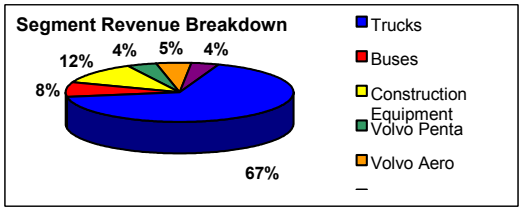
(US$M) Year ended 31 Dec	1999	2000	2001	2002
Sales:	**$14,302**	**$14,880**	**$21,654**	**$21,301**
Sales growth:	*n.m.*	*4%*	*46%*	*(2%)*
Reported EBIT:	3,908	763	(77)	325
EBIT margin:	*27%*	*5%*	*(0%)*	*2%*
Pro-forma EBITDA:	n.a	1,271	1,425	1,565
EBITDA margin:	*9%*	*9%*	*7%*	*7%*
Pro-forma EBIT:	**854**	**555**	**285**	**325**
EBIT margin:	*6%*	*4%*	*1%*	*2%*



Revenue per employee: $304,301

Stock price (ADR): **$20.99** (as of 5/30/2003)
52 week high: $21.35
52 week low: $13.40
Shares outstanding: 434.6 million
Market capitalization: **$9,122**
Net Debt: $7,272
Enterprise Value: **$16,394**

EV/EBIT multiple*: **50.5x** *(*Pro-forma)*



Results are converted from Swedish Kroners to US Dollars using the exchange rate as of December 31, 2002 (SEK1.00 = US$0 .1144)

VOLVO AERO NORGE – JSF PARTICIPATION

"[If Volvo Aero becomes] single source for three or four [major engine components, Volvo Aero Norge JSF revenue] would equal size of Norwegian buy."

JSF CONTENT & CONTRACT HISTORY

Awarded Contracts:
- F135 Turbine Shaft
- F136 Aft Compressor Case ("pre-SDD")

Potential Contracts:
- F135 –
  - LPT Case, Fan Case, Compressor Case, Intermediate Case
- F136 Compressor Case (SDD)

2000 2001 2002 2003 System Design & Development **2012**

Volvo Aero Norge was founded as "Kongsberg Vapensfabrikk" solely to fulfill F-16 offset requirements; it has grown since that time to become the major supplier for turbine shafts for Pratt & Whitney and General Electric

Volvo Aero Norge expects to capitalize on its experience on the F-15, F-16, and F-18 programs to gain a significant position on both JSF engines

JSF FINANCIAL IMPACT – VOLVO AERO NORGE (IMPACT ON AB VOLVO)

(Year 2002 US$M, except per share) *(NOK 1.00 = US$0.1438)*	SDD/LRIP (2002-2011)	FRP (2012-2026)
Expected JSF Program Revenue:	$37.7	$203.7
Average Annual Revenue:	**$3.8**	**$13.6**
% of Reported 2002 Revenue:	*0.0%*	*0.1%*
Estimated Average Annual EBIT Contribution:	**$0.1**	**$0.4**
FY 2002 Reported Revenue:	$21,301	
FY 2002 Pro-Forma EBIT:	$325	
Enterprise Value/EBIT Multiple[1]:	*8.0x*	
Estimated Value of Potential JSF EBIT Contribution:	$0.9	$3.4
Estimated Value per Share:	$0.00	$0.01
Current Share Price (5/30/03):	$20.99	
Estimated Impact of JSF EBIT Contribution on Company Value:	**0.01%**	**0.04%**

[1]EV/EBIT multiple common for component shops

Source: ODUSD(IP) & First Equity estimates; Discussion of Methodology in Appendix A

Financial Impact

- Assumptions:
  - Volvo Aero Norge wins SDD and production contracts for F135 turbine shaft, LPT case, fan case, compressor case, and intermediate case, and F136 compressor case
- Financial impact not noticeable at AB Volvo level
- Financial impact on Volvo Aero Norge will be significant during production years as F-16 and F-18 production will have ceased
  - Military program viewed as a necessary diversification from commercial aerospace

Geographic Workshare

- **Norway**
  - Volvo Aero Norge performs all contract work in its Kongsberg, Norway facility

Lessons Learned

- Past experience with GE and Pratt & Whitney was critical to winning JSF business – Volvo Aero Norge has become a proven supplier for both military and commercial programs
- Although born from an offset program, Volvo Aero Norge has embraced its history of build-to-print contracts and focused on production efficiency – Volvo Aero Norge now has some input into shaft design to help achieve cost-effective "producability"

Norway - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**Total Sales ($ Millions)**	**Potential Technology/Capability**
3D Perception AS	n.a.	Asker	n.a.	n.a.	Projection, and projection related equipment
Boxer Technologies AS (Reitan Invest)	1986	Kristiansand	35	n.a.	Multimedia-based training programs
Corena Norge AS (Corena Holding)	1991	Kongsberg	n.a.	n.a.	Structured XML/SGML content, integrated software system solutions
Data Respons AS	1986	Hovik	n.a.	22.8	Frequency hopping, secure, and anti-jam high frequency radio equipment
Det Norske Veritas	1864	Hovik	4,400	593.0	Maritime classification company; provides certification of management systems and products
Eidsvoll Electronics AS	1979	Eidsvoll	19	4.2	Electrical equipment and supplies
EPM Technology (Jotne Group)	n.a.	Oslo	n.a.	n.a.	Solutions for product data technology
Ericsson Radar AS (Ericsson AS)	n.a.	Halden	n.a.	n.a.	Sensors and command systems for artillery locating systems
High Density Devices AS	n.a.	Mandal	n.a.	n.a.	n.a.
IFS Norge AS	1991	Oslo	251	35.2	Electrical equipment and supplies
Kitron ASA	1996	Billingstad	1,745	299.0	Electronic components
Kongsberg Defense and Aerospace (Kongsberg Gruppen)	1814	Kongsberg	1,649	460.3	Manufactures air defense systems, missiles, command / control systems, avionics components
Kongsberg Protech AS (Kongsberg Gruppen)	1999	Kongsberg	220	73.4	Remote controlled weapon station, manufacturing services, aircraft maintenance
Luftforsvarets Hovedverksted (LHK)	n.a.	Kjeller	n.a.	n.a.	n.a.
MEMSCAP AS	1997	Skoppum	33	8.6	Micro-electromechanical systems (MEMS) based solutions
Metronor ASA	1992	Nesbru	n.a.	n.a.	Portable systems for geometric quality control and tool building
Mintra AS	1997	Oslo	n.a.	n.a.	Interactive learning solutions
Nammo AS	1998	Raufoss	1,297	205.0	Ammunition and missile propulsion capabilities
Natech AS	1995	Narvik	80	n.a.	Advanced contract manufacturing and engineering
Polydisplay ASA	n.a.	Sandefjord	n.a.	n.a.	Display and visual communication for information, management and entertainment
Scali AS	1997	Oslo	n.a.	n.a.	Scalable, high-performance cluster software and solutions
SensoNor ASA	1985	Horten	200	4.3	Sensors and devices based on silicon micromechanical technology (MEMS)
SINTEF	1950	Trondheim	1,829	188.0	Research based services, laboratory and workshop services, software, and systematic information
T&G Elektro AS	1955	Stabekk	n.a.	n.a.	Interconnection solutions for telecommunication, offshore and defense industries
Teknologisk Institut	1917	Oslo	250	20.5	Architectural services
Teleplan AS	1964	Lysaker	600	23.0	Telecommunications and information technology consultancy
Thales Communications AS (Thales)	n.a.	Oslo	270	n.a.	Military communications solutions
Triad AS	1986	Lillestrom			Experimental radar and sonar prototypes
VMETRO ASA	1986	Oslo	75	40.8	Integrated components for moving large amounts of data in real-time networks
Volvo Aero Norge	1987	Kongsberg	473	108.4	Manufactures civil and military aircraft engines ,and engine components

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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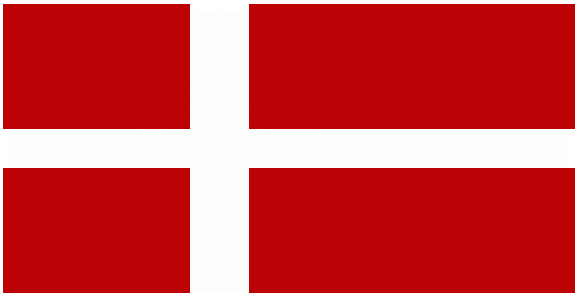

APPENDIX G

DENMARK: COMPENDIUM

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Denmark - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**($ Millions)**	**Potential Technology/Capability**
Aminova Consult ApS	2000	Odense	n.a	n.a.	Software development
Bruel and Kjaer	1942	Naerum	537	103.0	Transducers, analyzers, and amplifiers
Cadpeople Holding ApS	1992	Arhus	24	n.a.	Interactive 3D modeling and virtual reality
Corena Danmark AS (Corena Group)	1989	Birkerod	n.a	n.a.	Frequency hopping, secure, and anti-jam high frequency radio equipment
CSC Danmark AS (CSC)	1996	Tastrup	n.a	n.a.	IT consulting, systems integration, and outsourcing
Danish Stir Welding Technology / DanStir ApS	2000	Brondby	n.a	n.a.	Friction stir welding
Danish Aerotech	1999	Karup	85	9.1	Composite design, component manufacture
Danish Maritime Institute (Force Technology)	1959	Lyngby	n.a	n.a.	Specialized consultancy services and software products focusing upon maritime safety and efficiency
DDC-I	n.a.	Lyngby	n.a	n.a.	Supplier of development systems and run-time systems
DELTA Dansk Elektronik, Lys and Akustik	1944	Horsholm	130	25.6	Inspection and testing services
Dezide	n.a.	Aalborg	n.a	n.a.	Automation support software
Danish Technological Institute, DTI	1906	Taastrup	1,000	n.a.	Assists Danish firms with incorporating modern technologies
E. Falck Schmidt A/S	1935	Odense	140	15.8	Hydraulic aerial work platforms, refuse collection and handling systems
Embedit A/S	2000	Herlev	15	n.a.	Custom computer programming services
FORCE Technology	1941	Brondby	825	78.7	Technological service institute
GateHouse A/S	1989	Norresundby	10	n.a.	Custom computer programming services
GPV Industri A/S	1961	Glostrup	1	77.9	Fabricated plate work
Hamann Electronics A/S	1926	Holbaek	n.a	n.a.	Electronic products assembly
Hans Torsleff Management Systems AS	1987	Frederiksberg	22	n.a.	Computer hardware requirements analysis
HiQ WISE A/S (HiQ International)	n.a.	Brondby	n.a	n.a.	IT and management consultancy
IFAD	1988	Odense	16	n.a.	Simulation and training systems
Maersk Data Defence AS		Sonderborg	2,718	515.0	Integrated communication systems
Printca A/S	1974	Analborg	85	n.a.	Manufacturer of electronic components
RISO National Laboratory	1956	Roskilde	596	93.9	Research in science and technology
Systematic Software Engineering A/S	1985	Abyhoy	315	29.0	Software development, consultancy, software services
TERMA A/S	1944	Lystrup	950	1,017.4	Electronic and communications components
TEXIT Danmark A/S	1992	Odense	16	n.a.	Industrial machinery and equipment
Tirca	n.a.	Kobehavn	n.a	n.a.	n.a.
TSE	n.a.	Augustenborg	n.a	n.a.	n.a.
Unigate Innovation A/S	2000	Lystrup	24	n.a.	Custom computer programming services

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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APPENDIX H

AUSTRAILIA: COMPENDIUM

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Australia - Potential Defense Industry JSF Competitors

Company Name	Est.	Location	Employees	($ Millions)	Potential Technology/Capability
Adacel Technologies Ltd.	1987	Brighton	n.a.	71.5	Simulation, and software applications and services
ADI Ltd.	1989	Garden Island	2,700	162.5	C4ISR systems
Advanced Systems Pty Ltd. (ADI Ltd.)	1994	Hindmarsh	15	n.a.	Integrated data acquisition solutions
Advitech Pty Ltd.	1987	Tighes Hill Newcastle	40	n.a.	Frequency hopping, secure, and anti-jam high frequency radio equipment
AeroStructures Technologies Pty (The Aerostructures Group)	1995	South Melbourne	n.a.	n.a.	Usage monitoring and structural integrity management
Australian Photonics Cooperative Research Centre	1991	Eveleigh	328	n.a.	Interdisciplinary photonics research and development
BAE Systems Australia Ltd.	1961	Braddon	2,800	164.3	Aircraft engines and aircraft parts
Bishop Manufacturing Technology Ltd. (Bishop Technology Group)	1997	Villawood	100	4.8	Manufacturing solutions for highly qualified parts
Boeing Australia Ltd. (The Boeing Company)	1986	Brisbane	1,900	277.9	Systems integration, aviation services, and support
Broens Industries Pty Ltd.	1979	Ingleburn	n.a.	n.a.	Toolmaking, automation and special purpose machines
CEA Technologies Pty Ltd.	1983	Fyshwick	155	20.0	Radar surveillance systems
Cirrus Real Time Processing	n.a.	Sydney South	n.a.	n.a.	Software and systems design and integration services
Codarra Advanced Systems	1990	Bruce	38	n.a.	Data processing and preparation
Communication Design and Management Pty Ltd.	1991	Sydney	n.a.	n.a.	Information and computing technology
Compucat Research Pty Ltd.	1981	Belconnen	70	n.a.	Secure communications systems
Computer Systems Australia Pty Ltd.	1986	Lambton	60	n.a.	IT products and services
Cooperative Research Centre for Advanced Composite Structures	n.a.	Fishermans Bend	n.a.	n.a.	Civil aerospace research and development
Cooperative Research Centre for Sensor Signal Information Processing	1992	Mawson Lakes	n.a.	n.a.	Advanced sensor and communications technology R&D
CSC Australia Pty Ltd. (Computer Sciences Corporation)	n.a.	St. Leonards	n.a.	n.a.	Comprehensive e-business solutions
Daronmont Technologies Pty Ltd.	1991	Mawson Lakes	45	6.3	ISR technologies
Defense Science and Technology Organization	n.a.	Canberra	n.a.	n.a.	Requirement and systems research and development
Delta Hydraulics Pty Ltd.	1987	Tasmania	75	18.5	Aircraft parts and equipment
Diamond Australia Pty Ltd.	1994	Mitcham	30	n.a.	Optical instruments and lenses
Ericsson Australia	1960	Melbourne	1,300	597.2	Mobile handsets, broadband devices, and network routers
Ferra Engineering Pty Ltd.	1992	Tingalpa	100	6.0	Metal cutting machine tools
FlightStat Data-Link Pty Ltd.	n.a.	Surfers Paradise	n.a.	n.a.	Next generation black box technology
G.H. Varley Pty Ltd. (Varley Group)	n.a.	Tornago	n.a.	n.a.	Ship repair
GKN Engage Pty Ltd. (GKN plc)	n.a.	Port Mebourne	n.a.	n.a.	Engineering design and analysis services
Halliburton KBR Pty Ltd. Government Ops (Halliburton Company)	n.a.	Canberra	1,200	n.a.	Engineering, planning and project management services
Hawker de Havilland (The Boeing Company)	n.a.	Port Mebourne	950	92.0	Aircraft components and engine modifications
Hawker de Havilland Components Pty Ltd.	1991	Bayswater	74	n.a.	Aircraft engines and engine parts
Honeywell Holdings Pty Ltd. (Honeywell International Corp.)	1951	North Ryde	1,200	160.6	Electronics, components, and systems integration
Hunter Aerospace Corporation Pty Ltd. (BAE Systems plc)	1996	Newcastle	n.a.	7.8	Military helicopter maintenance and support
IPACS Australia Pty Ltd.	n.a.	Somerton Park	n.a.	n.a.	n.a.
L-3 Communications Australia Pty Ltd.	2002	Lara	n.a.	n.a.	ISR equipment
Levett Engineering	n.a.	Elizabeth West	n.a.	n.a.	Specialized materials engineering
Lovitt Technologies Australia	n.a.	Montmorency	n.a.	n.a.	Precision engineering and toolmaking
Marand Precision Engineering Pty Ltd.	1969	Moorabbin	130	n.a.	Tooling, jigs, fixtures, lay-up mandrels
Micreo Ltd.	n.a.	Murarrie	n.a.	n.a.	Ultra-high data rate, long-haul, fiber optic communication technologies
Mincom Ltd.	1979	Brisbane	1,150	114.4	Computer consulting
National Forge, Ltd.	1952	West Footscray	n.a.	52.8	Forged and sintered metal components
Normalair-Garrett Pty Ltd. (Honeywell International Inc.)	1951	Airport West	53	n.a.	Aircraft engines and engine parts
Parametric Technology Australia Pty Ltd. (Parametric Technology, Inc.)	1995	North Sydney	14	n.a.	Collaborative product commerce and flexible engineering solutions
Production Parts Pty Ltd.	1946	Airport West	20	n.a.	Aircraft and airframe structural components
Qantas Defence Services Pty Ltd.	1999	North Sydney	400	5178.7	Airport, flying fields, and services
Raytheon Australia Pty Ltd. (Raytheon Company)	n.a.	Canberra Airport	400	n.a.	Electronics and systems integration
RLM Systems Pty Ltd. (Tenix Pty Ltd.)	n.a.	Burwood East	n.a.	n.a.	Advanced electronics and sophisticated software systems
Rosebank Engineering Pty Ltd.	1977	Port Mebourne	74	n.a.	Component maintenance and precision machining
Saab Systems Pty Ltd.	1988	Mawson Lakes	231	27.0	Advanced operational software intensive systems
Smiths Aerospace Australia Pty Ltd. (Smiths Group)	1955	Brisbane Airport	40	n.a.	n.a.
Sydac Pty Ltd.	1988	Adelaide	n.a.	n.a.	Innovative simulation based engineering
Tenix Defence Pty Ltd. (Tenix Holdings International Pty Limited)	1987	North Sydney	1,900	242.1	Shipbuilding and repair
Thales Training and Simulation Pty Ltd. (Thales Group)	1987	Potts Point	115	n.a.	Simulation and training
Trident Tooling Pty Ltd.	1993	Netley	56	n.a.	Injection molded and die cast tools
TRW Aeronautical Systems Australia Ltd. (Northrop Grumman)	1929	Zetland	90	17.5	Flight controls, engine controls, electrical power
VIPAC Engineers and Scientists Ltd. (Vipac Laboratories Pty Ltd..)	1973	Kent Town	95	n.a.	Engineering systems development and consulting
VPIsystems Pty Ltd. (VPIsystems Inc.)	n.a.	Kew	n.a.	n.a.	Software to design, plan, configure and deploy communications equipment and networks
Wedgetail TRDC Pty Ltd.	2001	Mawson Lakes	n.a.	n.a.	Radar systems, signal processing research and development
Western Australian Specialty Alloys Pty Ltd.	1994	Canning Vale	50	n.a.	Nickel and cobalt based superalloys

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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APPENDIX I

TURKEY: COMPENDIUM

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Turkey - Potential Defense Industry JSF Competitors					
Company Name	**Est.**	**Location**	**Employees**	**($ Millions)**	**Potential Technology/Capability**
Aselsan Electronics Industries Inc. (Turkish Armed Forces Foundation)	1975	Ankara	2,955	105.6	Designs, develops and manufactures modern electronic systems for military and professional customers
Ayes as	n.a.	Ankara	n.a.	n.a.	n.a.
Havelsan (Turkish Armed Forces Foundation)	1982	Ankara	617	n.a.	C4I, simulation, electronic warfare, avionics, management information, and information security systems
Marconi Kominikasyon AS	1989	Ankara	n.a.	n.a.	Frequency hopping, secure, and anti-jam high frequency radio equipment
Milsoft	1998	Ankara	80	n.a.	Custom computer program services
Teknoplazma	1996	Ankara	n.a.	n.a.	Advanced technology materials
Tusas Aerospace Industries (TAI)	1984	Ankara	2,000	122.2	Aircraft production and development

Source: Potential defense industry JSF competitors sourced from the Joint Strike Fighter Global Project Authorization Annex II and the US Department of State. Financial information compiled from various databases and reports, including Dun and Bradstreet, Lexis Nexis, MASAI reports, ICC Shareholder reports, securities exchange filings, the Major Companies Database, FBR Company profiles, and others.

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