

Statement of

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Before the

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

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Mr. Chairman, Senator Levin, Members of the Committee -

Thank you for this opportunity to appear before the Committee to share our views on the desirability of continuing the development of competing engines for the Joint Strike Fighter (JSF) program. I'm Scott Donnelly, President and CEO of GE-Aviation; and I'm Jim Guyette, President and CEO of Rolls-Royce North America. We are pleased to jointly present this statement to you.

As you may know, GE and Rolls-Royce have formed a 60/40 partnership to develop and produce the F136 engine for the JSF. We have brought together the best talent from the United States and the United Kingdom to develop and produce the GE/RR F136 engine. We believe our partnership is a shining example of transatlantic cooperation. If our program is continued, the F136 will compete head-to-head with the Pratt & Whitney F135 engine for the honor to power the Joint Strike Fighter. These two engines will be the most powerful, capable and technologically advanced fighter engines ever produced.

Mr. Chairman, simply put, we are here to seek your continued support for this competition. The Joint Strike Fighter program will be the largest aircraft procurement program in the history of the Department of Defense. It is a single engine aircraft that will be used by the Air Force, Navy, Marines, and several international partners, including the UK. It will have conventional, carrier-based and short take-off vertical-landing variants and over time, will replace the F-16, F-18, A-10 and AV-8B fleets.

Pratt & Whitney was initially chosen as the sole-engine supplier for JSF based on its earlier competitive selection to power the F-22. That engine, the F119, has since been modified and adapted to JSF requirements and is called the F135. In 1995, Congress added \$7 million to the DoD budget and directed the establishment of a second engine source for the JSF. Today, that engine, first known as the "Alternate Engine" and then as the "Interchangeable Engine," is now designated the F136 engine. Attached is a chronological history of the F136 program (Attachment 1).

For the past 10 years, Congress has included language and/or additional funding strongly supporting a JSF engine competition, citing the demonstrated benefits of competition resulting from the original "Great Engine War." That much-heralded competition had its roots in the late 1970's and early 1980's when Pratt & Whitney was the only supplier for high-performance fighter engines. During that time period, DoD experienced significant problems with P&W TF30-powered F-14s and P&W F100-powered F-15s and F-16s. Over a two-year period, Congress added \$41 million to the Navy budget to begin a TF30 replacement program. When the Navy failed to spend the \$41 million, and when problems with the F100 worsened, the money was shifted to the Air Force to develop an engine to compete with the F100. That engine, a derivative of the GE F101 engine for the B-1 bomber, was ultimately designated the F110.

Beginning in the 1980s, the "Great Engine War" pitted the F100 against the F110. The F110 was initially selected for new F-14s and F-16s and also to re-engine older F-14s. Until recently, only P&W's F100 has powered F-15s. However, in 2002, Korea selected GE to power its fleet of F-15s, and in 2005, GE was also selected to power Singapore's F-15s. Meanwhile, in recent years, Pratt & Whitney has also won their fair share of engine competitions worldwide. After 20 years of the "Great Engine War," all of the competitive benefits (reduced operational risks, better performance, increased readiness, enhanced contractor responsiveness, lower costs, etc.) continue to endure because our customers have a competitive choice for engines and are not captive to a single engine supplier as was the case in the early 1970's and 1980's.

An excellent history of this competition is detailed in Robert W. Drewes' book "*The Air Force and the Great Engine War*." Drewes notes that the "Great Engine War" was not initiated to achieve cost savings. In fact, it was expected to actually cost more money to bring on a second supplier to address significant operational problems and to obtain better reliability, durability and supportability. The competition established unprecedented levels of engine durability, reliability, operability and supportability for large, high-thrust fighter engines. Surprisingly, the competition achieved this at a significantly lower cost of engine ownership. The Air Force estimated - over the purchase of the first 1,800 engines - that it achieved approximately 20% cost savings over what the program would have cost with a sole-engine provider.

Mr. Chairman, with this background, let's get to the purpose of your hearing today. Is it wise to terminate this second "Great Engine War," and rely on a sole engine supplier for a single-engine aircraft to do multiple missions for multiple services and multiple nations? Is it wise to become dependent upon only one engine supplier and then hand over a volume of engine business that will reach tens of billions of dollars? Is it smart to put all your eggs in one basket, knowing this is a course of action that can't easily be rectified later? We believe the answer to these questions is a resounding "NO." This is a rare instance in defense procurement with not only a compelling operational case for continued competition, but also a compelling business case. Through the enduring value of competition, sufficient savings will be generated from a competitive JSF engine procurement that will more than offset the cost of completing the F136 engine development.

Attachment 2 of our statement is a matrix that places a rough order of magnitude on the money to be spent on engines and spare parts over the life of the JSF program. All analyses are assumption dependent and we have not attempted to predict a precise figure -- that is not necessary to make our point. Rather, we show a broad range of numbers based on potential aircraft procured, the number of engines bought per aircraft, and the price per engine. To produce the matrix, we selected the current aircraft program of record (3176 total of which 2443 are US only), while assuming an initial spares level of 15%. These assumptions yield an initial engine buy for JSF aircraft of approximately 3652 (worldwide)/2809 (U.S.).

As an example only, if we assume that over the operating life of a JSF engine, the spare parts consumed will equal an additional 1.5 "equivalent" engines, then the total number of engines and equivalent engines bought will be approximately 2.5x (3652/2809) = 9130/7022 engines. Further, assume the price of a F135 engine to be equal to the current selling price of the F119 (the F135 is based on the F119 and is about 10% higher in thrust), which is about \$9 million per engine. In this example, the money spent on engines for the total JSF program of record will be \$82billion/\$63 billion. If we assume that competition between two engine sources would reduce these costs by 10%, a savings on the order of \$8 billion/\$6 billion will result. For the original "Great Engine War," the savings through engine competition was on the order of 20%. Such a figure on the JSF would yield \$16B/\$12B in savings.

Mr. Chairman, let's acknowledge that someone will surely challenge our assumptions on engine price, or spare parts usage, or aircraft procurement levels, etc. Using lower numbers, such as an engine price of \$7 million and spares usage of one equivalent engine per JSF procured, yields total revenues of \$51 billion/\$39 billion. A 10% savings from competition produces total savings of \$5 billion/\$3.9 billion. Again, large savings that more than offset the investment needed to complete the F136 development.

The take-away from this matrix, Mr. Chairman, is that the potential revenues generated from the sale of engines and spare parts associated with the JSF program are huge! With competition, there is a chance to contain those revenues

near the lower left hand corner of the matrix. Without competition, the revenues will trend upward and to the right of the matrix. One of the main lessons that was learned from the original "Great Engine War" is that costs are lowered through vigorous head-to-head competition. We are confident a second "Great Engine War" will yield similar results.

Mr. Chairman, we are convinced there is a sufficient volume of engine business to justify continuing the engine competition - both for critical operational and for business considerations. The war fighter will be assured of the security that comes with not being dependent on a single engine source i.e., less risk, better performance, higher readiness, more technology infusion, enhanced contractor responsiveness ... and competition will drive down costs.

In closing, we have one final point. We have been on the F136 journey for ten years and the Congress has appropriated nearly \$1.3 billion to date to support the program. We were awarded a \$2.4 billion System Development and Demonstration Contract in August 2005. Our engine development is on schedule and slightly under cost. Our GE and Rolls-Royce partnership is strong. We will require approximately \$2 billion in additional appropriations, including about \$400 million in FY07, and it will take about six more years to complete the F136 development and be ready for production. If we can complete our journey, the F136 engine will be a formidable competitor to the F135, in both price and performance, and our engine industrial base will remain robust, resilient and capable of responding in a competitive way to all current and future requirements. If our program is

terminated, our highly skilled GE/RR team will be disbanded, \$1.3 billion dollars will have been wasted, and the United States, the United Kingdom and our allies will depend upon only one engine supplier to meet the challenging requirements for high-performance fighter engines. We submit to you that this is not a good thing. We respectfully request your continued support for this second "Great Engine War."

Thank you again for giving us the opportunity to share our views on this very important issue.

Chronology of the F136 Competitive Fighter Engine for the JSF

1991 - Advanced Tactical Fighter Program ends with selection of YF-22 (vice YF-23) powered by P&W YF119 (vice GE YF120) engine.

1992 - A-12 Program is cancelled by DoD.

1993 - UnderSec Def (AT&L) John Deutch launched "Joint Advanced Strike Technology" (JAST) Program - a "catalog" of advanced technologies and parts, to be used to draw from for future aircraft.

1994 - AT&L forms Joint Program Office (JPO) - changes focus from "catalog" to "aircraft" - keeps JAST title - requests \$200M R&D in FY95 budget to begin design - neither Airframe, nor Engine specific.

- Air Force LtGen George Mueller named first JPO PEO.
- Four Airframe/ STOVL Propulsion concept teams formed:
 - Lockheed* (shaft coupled lift fan)
 - Boeing* (Direct lift - e.g. current generation Harrier)
 - McDonnell-Douglas* (gas coupled lift fan)
 - Northrop Grumman* (lift + lift cruise)

1995 - Lockheed, Boeing and Northrop Grumman "choose" P&W F119 power, as JPO emphasizes advantages of "commonality" with the F-22 Program.

- McDonnell-Douglas chooses the GE F120 due to larger core size.
- JPO requests funding of F119 engine for JAST.
- McDonnell-Douglas abandons "gas coupled lift fan", teams with Northrop Grumman (lift + lift cruise) - now 3 competitors, all powered by F119.
- Congress establishes second source engine by adding \$7M and directive language to the FY96 JAST Budget.

1996 - JPO agrees to look at "competitive" engine, but asks GE to complete "trade studies" of variants of F120 vs existing F110 (again stressing "commonality" with existing USAF production).

- in keeping with Congressional directives, FY97 budget reflects first government funding request (\$18M) for "Competitive Engine Program."
- JPO renames Program "Joint Strike Fighter"; "down-selects" to 2 airframe teams: Lockheed and Boeing; and, establishes a Production Lot V introduction plan for the "Competitive Engine."
- Congress adds \$10M to the \$18M in the Competitive Engine baseline AND changes name to the "Alternate Engine Program" (AEP).

1997 - Major Office of the Secretary of Defense (OSD) initiative includes Program Decision Memorandum (PBD) to add \$300M to the AEP baseline in order to accelerate competition entry to Lot III; compromises with JPO and re-scopes AEP profile for production entry at Lot IV.

- IDA study approves AEP as cost effective.
- JPO continues to hold AEP entry to Lot V due to other funding priorities.

-- Congress adds \$15M more to AEP baseline in the FY98 budget, to support Lot IV competition entry AND requires Department of Defense to "certify" that full program funding is in place for the AEP.

1998 - First Program Managers Advisory Group (PMAG) recommends SecDef certify full funding as required by Congress, but to do so, moves competition entry to Lot VII.

-- Congress adds \$7.5M more to the new "certified fully funded" AEP baseline and directs the Department to accelerate competition entry to earlier than Lot VII.

1999 -- GE signs Phase III (pre-SDD) contract.

-- Congress again adds funding (\$15M) to the AEP budget request for acceleration of competition entry AND breaks out AEP as "Congressional Interest Program" in JSF budget line.

-- "Plug and Play" (PnP) concept for JSF engine development is first step toward total "interchangeability."

2000 - Congress continues to express dissatisfaction that the AEP as currently funded, will not be capable of completing development and flight qualification until after award of Lot V of JSF Production.

-- PnP definition continues to evolve (JPO wants GE to build to print the PW engine; GE wants both Engine Companies to retain unique hardware, but remain "interchangeable.")

-- OSD suggests Executive Independent Review Team (EIRT) meeting to review Plug n Play definition as a "Propulsion Acquisition Strategy."

-- JPO charters EIRT to "conduct technical assessment of implementation strategy against objectives of affordability, industrial base and operational readiness" (Specific areas chartered: technical feasibility of interface planes, systems engineering approach to achieve interchangeability, and ability to maintain EQUITY IN COMPETITION).

2001 - Joint Strike Fighter Engine Interchangeability Team Operating Agreement signed. ("Interchangeability" defined- common hardware still at issue).

-- JPO agrees with acceleration of competition - issues plan to bring F120 to "directed production" at Lots IV and V (for learning curve), and "full competition" beginning at Lot VI.

-- Congress adds \$2.5M to the FY02 request (\$118M) for the F120 AEP Engine.

-- JSF formally designated "F-35"; P&W F119 variant and GE F120 variant designated "F135 and F136" respectively. (*Editorial note: Although the common reference to both the F135 and F136 is "Interchangeable Engines," the JPO still lists the F136 as the AEP*)

2002 - Congress adds \$29.75M to the \$150M requested by DoD in the FY03 budget for the F136 Engine, "only to continue the current effort to develop and maintain two, competing, interchangeable engine programs for the JSF."

-- Second Program Manager's Advisory Group (PMAG -II) again validates merits of maintaining propulsion competition for the JSF Program.

-- GE and Rolls-Royce, NA officially form 60/40 Limited Partnership (LLC) to become the "Fighter Engine Team" to co-produce the F136 Engine.

2003 - JPO receives \$56M CPI reduction in overall JSF funding and elects to levy entire reduction to the F136 Program.

-- Congress adds \$66.8M to F136 FY04 budget request (\$52.8M to return all but equal program share (\$3.2M) of CPI reduction to the F136 and \$14M for Interchangeable Engine risk reduction).

2004 - Congress adds \$3.5M to continue acceleration of competition entry (\$235M total FY05 F136 Appropriations)

-- Final DemVal and Pre-SDD funding Appropriated (\$211M of \$235M)

-- First F136 SDD funding Appropriated (\$24M of \$235M).

2005 - FET Awarded \$2.4B SDD contract for F136 development

-- Congress again provides language in support of two competing engines for JSF; \$338M appropriated for F136 SDD in FY06.

-- Total F136 funding appropriated through FY06 reaches \$1.28B (\$.92B for DemVal and Pre-SDD; \$.36B for SDD).

-- \$2B remaining on F136 development.

2006 - FY07 DoD Budget proposes termination of the F136 Program; no funding requested (\$400M was FY06 budget estimate for FY07 request in F136 program of record).

-- \$104M of FY06 funding (\$338M) placed on contract; funds team through March 2006.

-- FET asked to provide Termination Liability costs by month, starting in April 2006.

-- Senate Armed Services Committee leadership send letter to SecDef urging DoD to continue F136 FY06 SDD funding until Congress fully evaluates the proposed termination.

-- DepSecDef concurs with Senate Armed Services Committee request and agrees, in writing, to continue to fund F136 with FY06 Appropriation.

-- House Appropriations Committee further includes language in the FY06 Supplemental that directs the DoD to execute the F136 program as Appropriated in the FY06 Bill.

Business Case Matrix

n = Number of Equivalent Engines Bought over the Lifetime of a JSF

		2.0	2.5	3.0
P = Price of a JSF Engine	\$10 M	\$73 Billion (\$56 B)	\$91 Billion (\$70 B)	\$110 Billion (\$84 B)
	\$9 M	\$66 Billion (\$50 B)	\$82 Billion (\$63 B)	\$98 Billion (\$76 B)
	\$8 M	\$58 Billion (\$45 B)	\$73 Billion (\$56 B)	\$88 Billion (\$67 B)
	\$7 M	\$51 Billion (\$39 B)	\$64 Billion (\$49 B)	\$77 Billion (\$59 B)

$$R = P \times N$$

R = Sole Source Revenue to Pratt

P = Price of a JSF engine

N = Total Engines Bought = [n x (Initial Engine Buy)]

**PRATT & WHITNEY SOLE SOURCE
REVENUES ARE HUGE!**

F136 Business Case Sample Calculation

1. Assume the JSF engine price (P) is approximately the same as the current F-22 engine price \approx \$9 M
2. Aircraft Buys 3176 (U.S. + International) / 2443 (U.S. only)
3. Initial Spares \sim 15%
4. Initial Engine Buy \approx 3652 / 2809
5. Sustainment (all parts consumed in the operational life of the engine) \approx 1.5 x (Initial Engine Buy)
6. Total JSF Business = 2.5 x (3652 / 2809) = 9130 / 7022
7. Sole Source JSF Engine Volume to Pratt @ \$9 M/engine
 $R \approx$ \$82 B / \$63 B
8. Savings from competition:
 - 10% = \$8.2 B / \$6.3 B
 - 15% = \$12.3 B / \$9.5 B
 - 20% = \$16.4 B / \$12.6 B