File [redacted] File 25X1

Central Intelligence Agency

Washington, D.C. 20505

DATE 2/24/86

DOC NO GIM 86-20054

OCR 3

P&PD 1

DIRECTORATE OF INTELLIGENCE

21 FEB 1986

MEMORANDUM FOR: Dr. Donald A. Hicks
Under Secretary for Research and Engineering
Department of Defense

FROM: [redacted] 25X1
Director of Global Issues

SUBJECT: The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1

Attached is an analysis of current European strengths and weaknesses in aviation technologies important to future fighter aircraft programs. This paper was prepared in response to your expressed interest in opportunities for US participation in the European Fighter Aircraft (EFA) program as conveyed to us by Steve Austin, Office of the Assistant Deputy Under Secretary for International Programs. If you have any further questions on this matter, please feel free to contact [redacted]. 25X1

[redacted] 25X1

[redacted] 25X1

Attachment:
The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1
GI M 86-20054, February 1986, [redacted] 25X1

[redacted] 25X1

[redacted] 25X1

[redacted] 25X1

[redacted]

SUBJECT: The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1

OGI/TID/DI/bd/[redacted](19 February 1986) 25X1

Distribution:

1 - Donald A. Hicks, Defense
1 - Steve Austin, Defense
1 - SA/DDCI
1 - ExDir
1 - DDI
1 - DDI/PES
1 - NIO/Econ
1 - DD/OGI, D/OGI
1 - CPAS/ISS
3 - OGI/EXS/PG
5 - CPAS/IMC/CB
1 - C/TID
1 - TID/IA
3 - TID/DI

[redacted] 25X1

Sanitized Copy Approved for Release 2011/01/19 : CIA-RDP86T01017R000100420001-3

 25X1

[redacted]

Central Intelligence Agency

Washington, D.C. 20505

DIRECTORATE OF INTELLIGENCE

19 February 1986

# The European Fighter Aircraft (EFA) Program: Opportunities for US Participation

## Summary

**Western Europe is applying advanced technologies in the production of next-generation military aircraft highlighted by the European Fighter Aircraft (EFA). In airframe manufacture, these technologies include advanced materials, CAD/CAM and sophisticated machining methods, and advanced aerodynamics. Similarly, Europe's aggressive R&D programs in avionics are leading to more sophisticated radar and electronic warfare devices, cockpit technologies, inertial navigation sensors, and a new generation of flight control systems. In propulsion, Rolls-Royce, SNECMA, and MTU are developing hot-section technologies that may substantially improve engine operating performance. The integration of these advanced technologies will be dramatically displayed in the flight test programs of Britain's EAP and France's Rafale scheduled to begin this spring. European desires to maintain a strong workforce, limit dependence on US technology, and avoid potential export restrictions on technology, will severely limit US opportunities to participate in the EFA program. Nevertheless, we believe there remain some candidates for US participation including flight control software, weapons system integration, and communications equipment.** [redacted] 25X1

---

This memorandum was prepared by [redacted] Defense Industries Branch, Office of Global Issues. The information contained herein is updated to 19 February 1986. Comments may be directed to [redacted] Chief, Technology and Industrial Competitiveness Division, [redacted]. 25X1 25X1 25X1

GI M 86-20054

[redacted] 25X1

[redacted] 25X1

[redacted] 25X1

## The European Fighter Aircraft (EFA) Program: Opportunities for US Participation

### West European Technical Capabilities

1. West European manufacturers have a broad base of indigenously developed, highly advanced aerospace technologies to apply to next-generation military aircraft including the European Fighter Aircraft (EFA). We believe the Europeans, if they choose to aggressively apply these technologies, have the capability to produce an indigenous fighter superior in performance to current front-line US fighters such as the F-15 and F-16. This superior performance would result from a close-coupled canard airframe incorporating 30 to 40 percent composites, an avionics suite based on a digital fly-by-wire control system and relaxed static stability, and a propulsion section with a 10:1 thrust-weight ratio. We believe European efforts will, however, fall short of the US ATF; the EFA, for example, will not apply advanced stealth technology, nor will it be able to cruise supersonically for a sustained period. [redacted] 25X1

### Advanced Airframe Technologies

2. We believe Western Europe's greatest strength in the production of next-generation military aircraft will be in airframe technologies. The Europeans are well positioned to apply a wide range of leading-edge airframe technologies--advanced composites, diffusion bonding, three-dimensional CAD, flexible manufacturing systems, and advanced aerodynamics--to future programs without the need for US participation. [redacted] 25X1

3. British Aerospace (BAe) is a technology leader in the application of airframe composites. The all-composite wings on the Experimental Aircraft Program (EAP) demonstrator, made jointly with Italy's Aeritalia, are "co-bonded" or glued together, eliminating mechanical fastners and effectively creating a one-piece structure, according to BAe officials. The wings are also aeroelastically tailored, optimizing wing twist under aerodynamic load to improve performance, a technology just recently tested on the US X-29. British Aerospace has also developed the composite wing for the new Swedish fighter, the Gripen, according to industry journals. [redacted] 25X1

4. Technical excellence is also displayed in the new French fighter demonstrator, Dassault's Rafale. The Rafale includes a more extensive use of advanced materials than the British EAP, [redacted] and benefits from the strong 3-D CAD experience at Dassault. Many US airframe manufacturers, in fact, use the same CAD software package designed by Dassault, CATIA. We believe these two French strengths--experience with 25X1

GI M 86-20054

[redacted] 25X1



[redacted] 25X1

Sanitized Copy Approved for Release 2011/01/19 : CIA-RDP86T01017R000100420001-3

[redacted] 25X1

SUBJECT: The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1

advanced materials and CAD--would reduce EFA development time and costs and are likely areas of French participation in the EFA program. [redacted] 25X1

5. In advanced computational aerodynamics, Western Europe has followed the US lead in applying supercomputers to model the airflow around entire aircraft. Advanced computer modeling cuts down on much of the need for wind tunnel testing which is both time-consuming and expensive. To underscore the region's commitment, Western Europe has four Cray supercomputers dedicated to aerospace research, one each in the UK, France, West Germany and Sweden. [redacted] 25X1

Emphasis on Avionics

6. Aggressive avionics R&D programs, particularly in France and the UK, are leading to advances in attack radar, cockpit technologies, inertial navigation sensors, and advanced control systems. We believe the EFA radar will be based on the British Foxhunter, although [redacted] the British Red Fox and the Hughes AN/APG-65 are also being considered. The Foxhunter, built by GEC avionics, is one of the most advanced airborne radars in production [redacted]. Specifically developed for a European theater fighter, the Foxhunter incorporates features found on front-line US radars: all digital processing, sophisticated ECCM (Electronic Counter-Countermeasures), track-while-scan capability, and a range of 100+nm. Open source information also indicates the Foxhunter will be AMRAAM (Advanced Medium Range Air to Air Missile) and ASRAAM (Advanced Short Range Air to Air Missile) compatible. [redacted] 25X1

7. We believe advanced cockpit avionics represents a special area of West European technical excellence, often exceeding US capabilities. Examples include Britain's production of heads-up displays for the F16 (GEC) and three-color multifunction displays for the EAP (Smith Industries). French capabilities in this area are also strong, as evidenced by the advanced display suite in the Rafale jointly outfitted by Thomson-CSF and SFENA. We expect that the French will make a contribution to EFA in this area. [redacted] 25X1

8. We believe the EFA active fly-by-wire control system will rely on sophisticated sensors to provide flight-critical information. These sensors, such as ring-laser (RLG) and fiber optic gyroscopes (FOG), are areas of intensive R&D investment in Western Europe. British Aerospace recently devoted some $3



[redacted] 25X1

[redacted] 25X1

SUBJECT: The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1

million in company funds in expanding its laser gyro facility, according to open sources. BAe's laser gyro was selected for the EH-101 helicopter making it the first aircraft outside the US to use a ring-laser gyro. Other British firms, including Plessey and Ferranti, are also working on RLGs and FOGs. Open sources indicate the West German firms SEL and AEG-Telefunken are both developing FOGs, claiming accuracies of .01 degree per hour, which is suitable for fighter aircraft. We believe the French firm SFENA, currently producing 12 ring laser gyros a month, will attempt to enter the lucrative EFA market to recover some RLG and FOG development costs. [redacted] 25X1

Propulsion

9. Development of advanced jet powerplants, along with their increasingly sophisticated control systems, is the single most expensive feature of new military aircraft--requiring investments of $1 billion or more, according to US industry experts. Each of the new Euro-fighters will require new engines having significantly better thrust-weight ratios than those now produced in Western Europe. In order to achieve this level of performance, European firms, particularly Rolls-Royce and SNECMA, are developing advanced hot-section technologies. Rolls-Royce's next-generation fighter engine demonstrator, the XG-40, will be a twin-shaft, 20,000lb thrust, high turbine inlet temperature design. The XG-40, jointly funded by the UK Ministry of Defense, is claimed to have a thrust-to-weight ratio of ten, and is scheduled for test in about a year. [redacted] 25X1

10. We believe a derivative of the Rolls' XG-40 is the current leading contender for the EFA powerplant, although the GE F404 and the Turbo-Union (consisting of Rolls-Royce, MTU, and Fiat) RB199-104 are also under consideration. West German Ministry of Defense officials are promoting the GE F404 over the RB199-104 engine as the interim EFA powerplant, we believe at the urging of MBB. The RB199-104 is the 16,000lb thrust baseline engine for the Tornado F.2 which will also power the EAP. We believe the British, however, would strongly reject the German suggestion that EFA be equipped with a US GE F404 engine. [redacted] 25X1

11. Consortium members are concerned over the high development cost of the XG-40. Since the XG-40 will not be in production before the early 1990s, a lower performance interim engine, most likely the RB199, will be used initially. [redacted] some consortium members, particularly the Germans, fear that the interim engine will become the final engine by default if XG-40 costs become prohibitive. [redacted] 25X1 25X1 25X1



[redacted] 25X1

[redacted] 25X1

SUBJECT: The European Fighter Aircraft (EFA) Program: Opportunities for US Participation [redacted] 25X1

Opportunities for US Participation

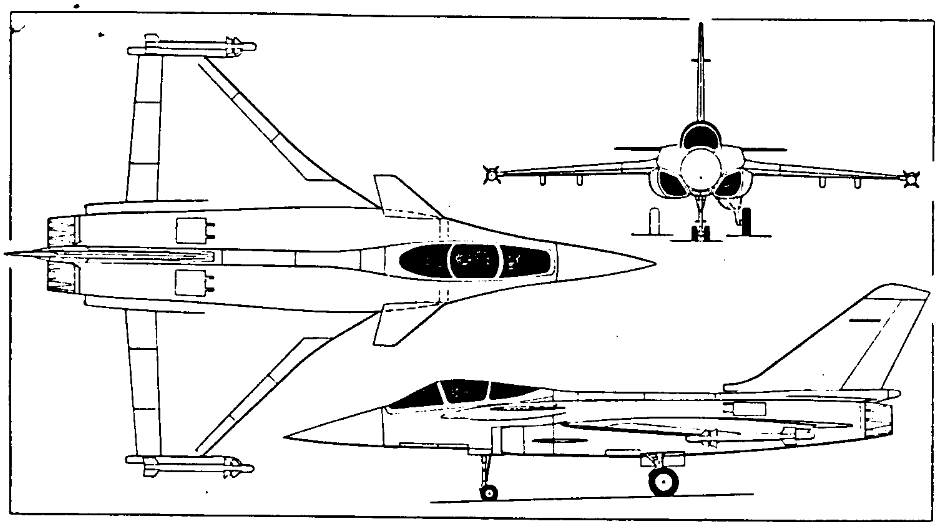
12. European desires to maintain a strong workforce in the aerospace sector, limit dependence on US technology, and avoid the potential export restrictions that have often accompanied US technology will act to minimize opportunities for US participation in future European military aircraft programs. The weight of these factors can be clearly seen in Western Europe's handling of the Westland affair and the anti-American sentiment which emerged following Sikorsky's attempt to enter the European helicopter market. [redacted] 25X1

13. We believe the most promising opportunities for US participation in the EFA program include weapons system integration, communications equipment, and flight control software. In weapons system integration and communications equipment, the consortium members are likely to request US participation in the interest of NATO Air Force interoperability. Efforts by MBB and GEC to develop the EFA fly-by-wire control system may also be in trouble and US assistance may be sought. [redacted] 25X1

[redacted] 25X1

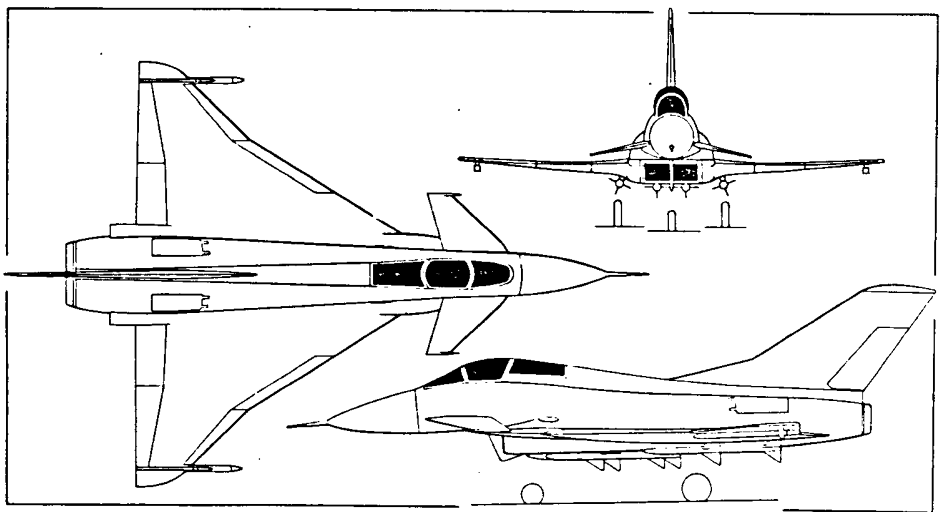


[redacted] 25X1



**Dassault-Breguet Rafale experimental combat aircraft** *(Pilot Press)*

DIMENSIONS, EXTERNAL:
Wing span 11·2 m (36 ft 9 in)
Length overall 15·8 m (51 ft 10 in)
AREA:
Wings, gross 47·0 $m^2$ (506 sq ft)
WEIGHT:
Combat weight, with 4 Mica and 2 Magic missiles 14,000 kg (30,865 lb)
PERFORMANCE (estimated):
Max level speed Mach 2 (800 knots; 1,480 km/h; 920 mph IAS)
Approach speed under 120 knots (223 km/h; 138 mph)
T-O run: at 14,000 kg (30,865 lb) AUW 400 m (1,313 ft)
at 20,000 kg (44,100 lb) AUW under 700 m (2,300 ft)
g limit +9



**Provisional three-view drawing of BAe EAP demonstrator** *(Pilot Press)*

DIMENSIONS, EXTERNAL:
Wing span 11·17 m (36 ft 7¾ in)
Length overall 14·70 m (48 ft 2¾ in)
AREA:
Wings, gross 52·0 $m^2$ (560 sq ft)

**Mockup of British Aerospace's design submission for the European Fighter Aircraft (EFA)** *(Brian M. Service)*

AREA:
Wings, gross 50·0 $m^2$ (538 sq ft)
WEIGHTS (approx):
Weight empty 9,750 kg (21,495 lb)
Internal fuel load 4,000 kg (8,818 lb)
External stores load (weapons and/or fuel) 4,500 kg (9,920 lb)
Max T-O weight 17,000 kg (37,480 lb)
DESIGN PERFORMANCE:
Max level speed more than Mach 1·8
T-O and landing distance with full internal fuel and two AMRAAM plus two ASRAAM or Sidewinder missiles, ISA + 15°C 500 m (1,640 ft)
Combat radius (estimated) 250-300 nm (463-556 km; 288-345 miles)
g limits with full internal fuel and two AMRAAM missiles +9 −3

From Jane's All The World's Aircraft, 1985-1986