

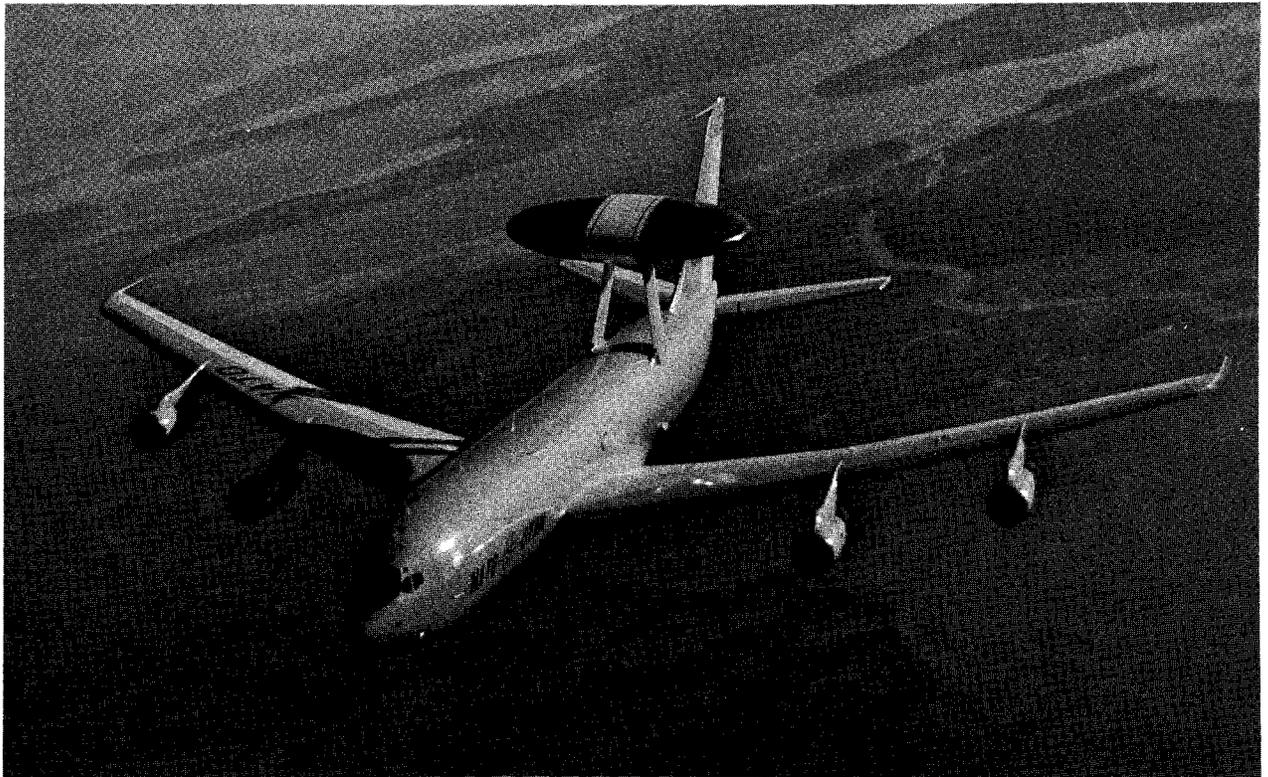
# Recent AWACS Sales: A Case Study of the Impact of Offsets in Defense-Related Exports

By

The Office of Management and Budget

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This case study reviews the sales of AWACS [Airborne Warning and Control System aircraft] to the U.K. and France, and the offsets associated with these sales. The emphasis is on the short-term and potential long-term impacts of these transactions on U.S. industrial competitiveness. The information for this analysis was obtained by surveying public and private literature, field visits to Boeing and Westinghouse, and consulting with other subcontractors and government agencies.



One of 18 Boeing E-3A AWACS aircraft sold to NATO

The AWACS sales to Britain and France in early 1987 each involve offsets of 130 percent of the sales contract value. This amount is unprecedented for Boeing, the prime contractor, and was a primary reason for the selection of these cases for analysis. The sales are very recent, and so most of the offset transactions have not yet been fulfilled or even determined. However, broad areas of potential cooperation in high technology and aerospace are specified, enabling preliminary review of the potential effect of the offsets on certain sectors of the U.S. industrial base.

The Boeing E-3 AWACS is a long-range, high-endurance, four engine commercial jetliner (Boeing 707) modified for early warning missions. The aircraft is distinguished by its 30 foot Westinghouse rotating surveillance radar system (AN/APY-2). Other major subcontractors for the system are as follows.

<u>Subcontractor</u>	<u>Component</u>
• IBM (CC-2 Computer)	Data Processing and Storage
• Hazeltine/Siemens AG	Data Displays
• Northrop	Navigation Computer
• Teledyne Ryan	Doppler Radar
• Delco	Inertial Navigation
• AIL Div., Eaton Corp	Identification
• Rockwell-Collins	HF/VHF Radios/TADIL "A"
• E-Systems	UHF Radio
• RF Products	UHF Filter
• Singer-Kearfott	JTIDS

The AWACS is capable of furnishing tactical air threat detection, and surveillance and countermeasure direction in both strategic defensive and tactical operations under all weather conditions and above all types of terrain. The AWACS provides comprehensive surveillance out to a range of 200 nautical miles (230 statute miles) for low-flying targets, and still further for targets at higher altitudes. It also can operate as a self-contained survivable force management center or as an adjunct to an established ground control network.

AWACS was developed in response to a U.S. Air Force requirement for airborne early warning, first proposed in 1963. The first production AWACS was delivered to the Tactical Air Command in 1977. Since then, the Air Force has purchased a total of 34 AWACS, the last delivered in 1982; 18 [additional aircraft] were sold and delivered to eleven North Atlantic Treaty Organization (NATO) countries over the period 1978-1985; and five others were recently delivered to Saudi Arabia.

This chart shows the status of recent AWACS sales as of September 1, 1987.

#### AWACS Sales to the UK and France

	<u>(Units)</u>			<u>Dollars in Millions</u>					
	<u>Number of Aircraft</u>			<u>Value of Sale</u>			<u>Value of Offsets</u>		
	<u>Firm</u>	<u>Option</u>	<u>Total</u>	<u>Firm</u>	<u>Option</u>	<u>Total</u>	<u>Firm</u>	<u>Option</u>	<u>Total</u>
UK	7	1	8	1,172	144*	1,316	1,524	187	1,711
France	4	2	6	600	260**	860	780	338	1,118
TOTAL	11	3	14	1,772	404	2,176	2,304	525	2,829

\* To be exercised by October 1988

\*\* To be exercised by August 1988

In December, 1986 the British Ministry of Defence announced selection of the Boeing AWACS to satisfy that nation's airborne early warning requirement and replace its aging fleet of Shackeltons. The Shackeltons have been in service for over 40 year, and are the oldest first-line aircraft in British service. Boeing AWACS won the bid over a number of competitors, most significantly the British-built Nimrod AEW.3. The Nimrod AEW.3, an airborne early warning version of the British Aerospace Nimrod maritime reconnaissance aircraft, had been under development since 1977 by GEC/Marconi. However, the Nimrod AEW.3 experienced technical difficulties and never became operational; the program was cancelled after selection of AWACS.

The Royal Air Force ordered six Boeing AWACs and initial spares and took options for an additional two systems. Subsequently, the UK added one additional system to the order. The aircraft will be delivered to an as yet undetermined British company for final outfitting starting in 1989. Delivery will begin in 1991.

In February, 1987, just two months after the British decision, and after extensive consultation with the U.K. on the system, the Government of France announced its decision to order three AWACS, also with an option for an additional two. Subsequently, France added one additional system to the order, and took options for two more. Delivery will begin in the early 1990s.

## UNITED KINGDOM

Although there is no stated British Government policy on offsets, based on past transactions and information obtained from the Department of Commerce's Foreign Commercial Service, offset arrangements do not normally enter into government-to-government [i.e., U.S. to U.K.] sales. However, in industry-to-government sales, such as the AWACS case, the U.K. seeks to strengthen its local industrial base by requiring offsets. In general, negotiated offsets have equaled one hundred percent of the contract value.

Recent U.K. defense purchases from the U.S. include Sundstrand Corporation torpedoes and participation in the Trident missile program, with Litton Industries as prime contractor. Both of these sales involve offsets. In addition, the U.S. purchased from Britain the British Aerospace Harrier and the Rapier Airfield Defense Missile System, and mandated a large percentage of coproduction of these items in the U.S.

In the summer of 1986, the British Government opened a competition for a system to fulfill its early warning needs. Seven companies submitted bids to the Ministry of Defence: Boeing (AWACS), Grumman (E-2 Hawkeye and Nimrod fitted with U.S. avionics), Lockheed (P-3 Orion), Airship Industries, Pilatus Britten-Norman, MEL (a subsidiary of Philips Electronics), and GEC Avionics (Nimrod AEW.3). It is important to note that had the British been successful in developing their own early warning system, the Nimrod AEW.3, the radar for which has been under development at GEC since 1977, there probably never would have been any competition at all. The Nimrod was to have provided for Britain's early warning needs, and would have been compatible with the NATO AWACS. However, the Nimrod suffered from serious technical flaws and major cost overruns.

When the U.K. opened its airline early warning competition, Boeing submitted a preliminary offset bid of 35 percent of the contract value. But in July, 1986 this offer was increased to 100 percent of the contract value, which is the normal minimum acceptable to the British Government. In September, 1986, the Ministry selected two of the seven bidders as semi-finalists, the GEC Nimrod and the Boeing AWACS, stressing that only these two had the potential to meet all of the Royal Air Force's requirements. According to Lord Trefgarne, British Minister of Defence for Acquisition, the selection of the two finalists was based on demonstrated capabilities, the amount of risk foreseen in completing development, cost, and the amount of time needed for completion.

At this time, France, which was also considering an early warning purchase, joined Britain in the evaluation of the two early warning systems.

In November, 1986 Boeing and its subcontractors (including Westinghouse, G.E. and SNECMA) again upped the offset offer to 130 percent of the contract value over eight years if AWACS were selected. This figure is the highest ever made by Boeing in an international competition. By this time, Boeing had already negotiated participation agreements with three British avionics companies--Plessey, Ferranti, and Racal--and these firms publicly supported AWACS over the Nimrod. These firms were not participants in the Nimrod program. The "agreements" were vague, simply stating the intent to cooperate in any offsets that may result if the AWACS were eventually selected by the U.K. However, the fact that three of Britain's largest aerospace-related firms favored the AWACS played the important role of making an American buy seem less onerous.

The Risk Assessment Group of the British Ministry of Defence, an internal committee which studies technical risks in new programs, also came out in favor of the AWACS. In December, the Ministry of Defence announced selection of the Boeing AWACS despite the fact that over \$1.37 billion had already been spent by the Government to research and develop the Nimrod. The AWACS will cost Britain \$1.2 billion for seven, plus an option for an additional unit that would, if exercised, bring the price to \$1.3 billion. Although the initial cost of the AWACS is significantly greater than that of Nimrod, lower operating costs over the 30 year lifetime of the AWACS compensate for this difference.

According to the British Government, the decision was made solely on the system's proven ability to meet the country's defense requirement. This decision resulted in public "outrage", especially by GEC, that the negative implications were "tremendous" for the British electronics industry, including loss of over 2,500 prime and subcontractor jobs and a substantial future export market for early warning devices. But the British Minister of Defence, George Younger, in announcing the AWACS decision to the House of Commons, held that the gains for other British firms will equal or even exceed losses to GEC.

Britain signed a formal contract for AWACS aircraft in February, 1987. These guidelines for the adjunct offset agreement were included:

- Offsets are to be fulfilled over an eight year period. If not met within this timeframe, Boeing and its subcontractors will continue to implement offsets until the 130 percent is reached.
- Only approximately 10 percent of the offsets will be directly related to the AWACS program; the remainder are to be indirect in "high technology defense and aerospace product areas;"
- Boeing is to report to the British Government on a semi-annual basis regarding progress toward offset fulfillment;
- Bids by British firms to the U.S. prime and subcontractors are to be evaluated "competitively" among all bidders. Awards to competitive British firms will be counted toward the offset.

Thus, the terms of the offset agreement which Boeing signed with the British government are very imprecise and open to interpretation. There are no specific requirements beyond the 130 percent value and that the offsets are to be in "high technology defense and aerospace products," but within that general description the possible applications cover a wide range. Most important, there are no penalty provisions to insure that offsets are accomplished in accordance with a specific

schedule. Further, there is no definition of the term "competitive" as it applies to British bidders. What qualifies as an offset while specified in the contract according to Boeing is subject to evaluation and acceptance by the British government in the view of the U.K. MOD.

The stated purpose of the British offset program is "to facilitate the development of 'high Technology' in the U.K. defense and aerospace industry and to simulate innovative and imaginative projects for venturing and contacting. This involves the placing of work for high technology defense and aerospace products in the U.K." "High Technology" refers to "work of the kind involved in AWACS," "innovative mechanical, electronic, or microwave technology," or "precision engineering or sophisticated manufacturing techniques which encourage the U.K. companies concerned to consolidate and advance their capabilities, broaden their product base, or improve their competitiveness."

The overall aim is to make British firms more "competitive in the U.S. and other markets." According to Lord Trefgarne, the British are "prepared to be patient in order to see the highest quality of [offset] work placed" toward this goal. This implies that the British may be quite selective in approving offsets. Although the offset package does not contain a commitment to provide jobs, it was touted by Boeing during the AWACS sales campaign as able to provide 50,000 man-years of work in Britain over the eight year offset period.

The offset burden will be shared by Boeing's eleven major subcontractors, including Westinghouse, IBM, Northrop, Hughes, and Seimens of West Germany. The percentage that each of the subcontractors takes on will be based roughly on the percentage of the value they contribute to the AWACS. Boeing expects to be able to meet most of its share of the indirect offset requirements by purchases of British-made equipment, such as engines from Rolls Royce and aerospace-related items from other firms, for use in its commercial airplane line. Boeing believes that some of these purchases would likely be made regardless of offset commitments. However, the British government is interested in obtaining new business for its firms, acquiring new technologies, and breaking into new markets. This is one of the issues that will be negotiated in the context of the open-ended contract language on offsets.

The installation and checkout of the aircraft will account for a substantial portion of the direct offsets, which will be approximately 10 percent of the contract value. This involves outfitting of the AWACS according to the Royal Air Force's specifications, flight testing, and ground maintenance---services normally provided by the prime contractor. British firms with the capability to perform system installation and checkout work were briefed on offset contract possibilities in London in February, 1987 by Boeing. A formal request for proposals was scheduled to be issued in late 1987 and the contract is to be awarded in mid-1988. Boeing has not yet decided which consortium will be responsible for installation and checkout.

Other direct offsets already under contract include:

- Boeing has selected the British firm Rediffusion Simulation to build a dynamic flight simulator for the British AWACS in a contract that will exceed \$12 million.
- Boeing signed a \$2 million contract with C. F Taylor (Hurn) Ltd. to provide wing fillet flaps for both the British and French AWACS as well as the Navy E-6 communications aircraft.
- Siemens of West Germany (a Boeing Subcontractor) has awarded subcontracts valued at over \$6 million to Racal Defense Radar and Displays for advanced color monitors and to Page Aerospace for power supply equipment.

Other potential direct offset opportunities exist regarding use of British built avionics and communications in the aircraft, as well as the refueling probe and ground support. For example, Ferranti's involvement in development of a mission system software support facility is under consideration.

Boeing has identified a number of areas that have a great deal of potential for new business opportunities with the U.K. to potentially satisfy the large percentage of indirect offsets. These areas include: high resolution radar, ASW trainer, millimeter wave guidance systems, C3 and air traffic control programs, Satcom telecommunications systems, fly-by-wire flight computers, automatic flight controls, airframe structures, and electronic warfare system. Negretti Aviation Life Support Division, Harlow, Essex, has been awarded a \$100,000 contract by Boeing as part of the U.S. Air Force's life support system study. Negretti's air crew life support engineering equipment is among six candidate systems competing for final system selection.

Plessey is eyeing a number of projects such as supplying avionics for the Boeing Brave 3000 remotely piloted vehicle, air defense ground environments, avionics, and dunking sonars for V-22 Osprey aircraft, but there are no specific contracts or plans for these to date. In addition, Plessey will get a share of Westinghouse's offset commitment based on a 1986 agreement between the two firms. This will include cooperation in the field of advanced air-based and land-based radars, air traffic control systems, advanced technical research and electronic warfare.

Westinghouse's total offset commitment, including arrangements with Plessey, could amount to up to one quarter of the total U.K. offset package. Direct offset work may involve Plessey support of radar test equipment, radar program management, engineering support during test phases, and appointment of Plessey as the post-design support authority for the AN/APY-2 radar. Plessey will also collaborate with Westinghouse in the future development of airborne early warning system modifications and improvements, including development of a new dual-band radar for the aircraft, which would be able to transmit both in the present S-band and at a lower frequency, probably in the UHF spectrum. Furthermore, Westinghouse has agreed that all airborne early warning radars to be sourced in Britain will be handled by Plessey, and that the value of orders placed with Plessey for other equipment will be maximized.

Other areas under consideration for Westinghouse/Plessey offset cooperation (or in cooperation with other U.K. firms) include a wide range of high technology programs such as:

- U.S. SDI research program
- phased array radar technology
- fiber optics technology
- air traffic control systems
- solid state transmit/receive modules
- airship systems
- advanced signal processing
- automatic self-test and self-heating systems
- surface radar technology
- gallium arsenide technology
- electronic support measures
- airport systems management
- simulation and training
- electronic warfare technology
- sensor systems integration

These areas will likely make up a substantial part of Westinghouse's committed indirect offsets. A joint organization has been formed to study and identify other areas of cooperation and other British companies that can be involved. Personnel for this organization will be provided mostly by Plessey Avionics of Hampshire, England. In addition to providing offset opportunities to Plessey, Westinghouse will be involved in offset fulfillment in a number of other areas with various British firms through joint ventures, teaming, subcontracting, material procurement, technological development, and service agreements. Potential areas include composite materials, optics, and advanced electronics.

As of June 30, 1987, in the first of the semi-annual reports to the British Government, Boeing and its subcontractors claim to have accomplished \$141 million in offsets. Some of this is accounted for by Boeing's commercial purchases from Britain, including wing components from Westland Aerospace for use in the Boeing 737, and thyratrons for advanced laser technology research programs from English Electric Valve. The remainder is accounted for by the Westinghouse Airship Industries Navy Blimp program, valued at \$79 million. Both the Boeing transaction and the Airship Industries program are being challenged by the British government as not meeting the offset criteria. Although placed after the effective date of the offset agreement, Boeing's commercial purchases are disputed because they do not represent "new" business. The U.K. government has given provisional approval to Westinghouse for about half of the Airship Industries purchase, or about \$40 million, but has not yet given final approval to Boeing for this or for Boeing's commercial purchases.

Boeing has held symposia in the U.K. to highlight potential areas of cooperation between British and U.S. firms to satisfy the offset commitment, as well as technical preparation seminars for the installation and checkout work. In addition, over 200 British firms have visited Boeing's Seattle facilities in an attempt to identify possible areas for indirect offset work. Similarly, Westinghouse has visited British firms, and held a "Vendor Day" in the U.K. It has also created a database detailing capabilities of British industry which can potentially be used to fulfill offset commitments.

The U.K. aerospace industry manufactures a complete array of sophisticated equipment. Until recently, most of Britain's aerospace industry was Government-owned. However, in recent years the UK has pursued a policy of privatization, and major defense firms, including British Aerospace and Rolls Royce, have been sold. The Conservative government has encouraged open competition among British and allied industries for U.K. defense contracts. Britain currently exports about 60 percent of its aerospace output, and has doubled exports in real terms over the past decade. The industry enjoys a healthy overall trade surplus, which reached almost \$3 billion in 1986, the largest surplus ever.

As a further indication of the trade and competitiveness position of the U.K. relative to the U.S., the next table presents data on overall merchandise trade between the two countries. The U.S. has been in a deficit situation with Britain for the entire period and the size of this deficit has increased substantially over the period. Moreover, preliminary data for the beginning of 1987 indicates that the British surplus will be maintained or expanded. It is important to note, however, that the U.S. has run sizeable merchandise trade deficits with the world at large over the last several years and that the U.S. runs a surplus in military trade with Britain.

**U.S. Merchandise Trade with the United Kingdom**  
(millions of dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Exports	12,439	10,645	10,621	12,210	11,273	11,418
Imports	12,835	13,095	12,470	14,492	14,937	16,033
Balance	- 396	-2,450	-1,849	-2,282	-3,664	-4,615

British firms that are expected to take part in the AWACS offset program are among that country's most sophisticated and competitive aerospace and defense concerns. Most of the offsets are expected to take the form of subcontracting, teaming, technological development and purchasing. Boeing is taking its commitment of 130 percent seriously and expects that this level will be reached. The British Minister of Defence has praised that company's "excellent record for honoring undertakings of this kind."

The direct offsets associated with the U.K. AWACS purchase, though representing only a small portion of the total offset package, are nevertheless significant because they have immediate implications for U.S. industry. As a part of the offset deal, Siemens will be subcontracting with Racal for the displays and controls for the AWACS. A U.S. firm, Hazeltine, previously manufactured these parts for AWACS. Siemens originally acquired Hazeltine's direct offset connection with the earlier NATO AWACS sale. Boeing indicated that a primary reason for selection of Siemens for the British/French AWACS work over Hazeltine was this firm's ability to take on a substantial offset burden. Hazeltine's product is still competitive based on price and quality, but Siemens is in a better position to absorb offset burdens. As remaining direct offsets are determined and assigned to British and French firms, additional U.S. firms may be impacted.

The amount and types of technology transfer from the U.S. to Britain that may occur as an outcome of the indirect offset commitment is not known at present. However, given the areas that are under consideration for cooperation, there is the potential that technology transfer could affect U.S. industrial competitiveness relative to Britain. For example, British participation in programs for the next-generation AWACS avionics and radar (for future export and upgrading present AWACS) could lead to the future displacement of current U.S. suppliers.

Even if little or no technology transfer occurs as a result, the offset program will nevertheless provide significant benefits to British industry. The participating British firms may be able to take advantage of the AWACS to increase their business opportunities in the U.S. and in third country markets with lower overhead costs and in a much shorter timeframe than without the offsets. Despite the fact that the offset transactions are to be accomplished through "competitive" bidding and teaming arrangements, they may serve to open the door to the U.S. markets through the greater exposure given to participating firms by Boeing and its major subcontractors.

Another benefit that these companies will receive through the offsets is access to Boeing's and especially Westinghouse's worldwide marketing networks. This is significant due to the relatively small size of the British industry and its dependence on export markets for growth. Over the long term, this could serve to weaken the position of U.S. competitors (including Westinghouse in some product lines) in both U.S. and global markets.

## FRANCE

Since France is a major exporter of defense equipment, the French government generally prefers that offsets not be a part of defense sales. However, to meet offset requirements mandated by foreign governments or to meet the competition, the French are heavily involved in offering offsets to promote defense exports. France relies heavily on export markets to support its defense industry due to its relatively small domestic requirement.

The U.S. made two significant purchases of military items from France in the past several years. The first is the Durandal Anti-Runway bomb, a direct purchase by the Air Force from Matra of France which involved no offsets. The other is the RITA, a multiple subscriber tactical radio system. The French firm Thomson-CSF teamed with GTE to win this contract, valued at \$4.7 billion of which \$3.5 billion will be spent in the U.S. Recent French defense purchases from the U.S. have been relatively small and involved no offsets.

The AWACS order ends years of French Government consideration of an airborne early warning system to augment its presently limited ability to track low-flying aircraft and cruise missiles. France first expressed interest in the AWACS program in the late 1970s. Other alternatives to the AWACS under consideration were Grumman's E-2 Hawkeye, Lockheed's P-3 Orion, the British Nimrod, and the possibility of developing its own platform by integrating a radar system in one of its own aircraft. Comparative flight evaluations between the Boeing AWACS and

Grumann's E-2C Hawkeye were completed in 1982. The Hawkeye, a smaller system mounted aboard a turboprop aircraft was determined inadequate to support France's needs.

Boeing's AWACS was supported by the French Air Force as the only aircraft that would fulfill its operational requirements. However, concerned over the AWACS high cost, the French examined the possibility of furnishing their Transall C-160 transports with indigenous electronics. High cost and a lengthy development period eventually forced abandonment of this option. In September 1986, France entered a joint test and evaluation program with the U.K. for both the Nimrod and AWACS systems. The French were particularly interested in examining the British Nimrod aircraft after improvement made by GEC Avionics to the system's mission avionics system; if the Nimrod were selected, France would receive only the avionics, which would be installed on either the Airbus 320 transport aircraft, Aerospatiale's C-160 Transall airlifters, or Dassault-Breguet's Atlantic Maritime Patrol aircraft. Besides providing partial production in France, selection of the Nimrod would produce an early warning aircraft of primarily European origin.

In light of the political nature of arms procurement, this option was very attractive even though it would have been extremely expensive, would have taken years to create, and might not have been as effective as the system already built and proven by Boeing. Moreover, like Britain, France has a small home defense market (relative to the U.S.) over which to spread development costs. British selection of Boeing in December 1986, however, left France with little choice. By electing to purchase AWACS at about the same time, the Governments of France and the U.K will be able to obtain the aircraft at a lower per unit price than would have been the case with individual procurements because of the resulting economies of scale.

In late February 1987, France and Boeing signed a contract for the purchase of three aircraft, associated spares, a crew training simulator, and maintenance equipment. In August 1987, the French Defense Ministry announced its decision to procure a fourth AWACS. This contract reportedly includes an option for two additional AWACS, bringing to six the total for possible acquisition, but these options need not be exercised until late 1988. The fourth aircraft will be bought under the same conditions as the first three. The aircraft are scheduled to be delivered starting in late 1990.

While most of the electronic systems will be produced by Boeing's regular subcontractors, a good deal of Boeing's money will be spent in France instead of the U.S. as a result of the offset deal struck between the Government of France and Boeing. Offsets were agreed to in February 1987 by representatives of Boeing and GIFAS, the French aerospace industry's trade association. The agreement later received the requisite approval of the French Defense Minister, Andre Giraud. This agreement calls for Boeing to buy equipment and technology worth 130 percent of the contract value from French companies over an eight year period. The agreement identifies the kinds of business French firms are interested in, and outlines a framework for managing the offset package. Boeing will coordinate AWACS offset contracts from a new office in Paris. Offsets will be achieved by offering competitive bid opportunities to French firms. Unlike the British offset, if within the eight years the target of 130 percent has not been reached, Boeing will be excused from the offset commitment as long as sufficient opportunity was provided for French firms to bid.

Eighty percent of the contract value will be offset by use of the partially French-made CFM-56 engines to power the aircraft. The CFM-56 is produced by the 50-50 joint venture firm of General Electric and France's SNECMA, CFM International. This figure takes into account not only SNECMA's share of orders for CFM-56 engines on the AWACS purchased by France (50 percent of the engine value) but also SNECMA's share of those purchased by Britain, new orders from the U.S. Air Force for its KC-135 re-engining program, and perhaps for future commercial orders by Boeing. Also, the value of CFM-56's on the U.S. Navy E-6 and the AWACS ordered by Saudi Arabia in 1981 will be counted in the offset figure. even though this order has already

been delivered. This is because France agreed in 1984 when the Saudi purchase was made that the value of CFM-56's would be included in an eventual offset package if and when the French approved an AWACS purchase of their own. French industry officials said the CFM-56 portion of France's offset package will be achieved relatively quickly.

For the remaining 50 percent of the contract value to offset, Boeing "committed to provide opportunities" to the local French aerospace and defense industry to bid on the kind of equipment Boeing requires for its aircraft. The largest direct opportunity for the 50 percent of the offsets that are non-engine aerospace technology and services is for the AWACS installation and checkout, work normally done by the prime contractor. This work, which may be ordered by the French Government under contract options, involves installation of the mission equipment in the airframe, flight testing, and final delivery, and will be carried out by the French firm UTA Industries. UTA was designated to perform this function by the French government if contractual options are exercised. UTA is qualified to do the work in Boeing's estimation.

The remainder of the offset package will likely be for contracts unrelated to the AWACS aircraft. Emphasis is to be placed on aircraft, helicopter, missile, and space technologies, including:

- Microwave technology
- Structures (forgings, composites and machining)
- Cockpit Equipment
- Survival Equipment
- Electrical/electronic components
- Wire and connectors
- Maintenance, simulation and test equipment
- Airborne and ground radar systems
- Services-software, documentation, translation
- Avionic systems, displays, radio communications, navigation, landing gear, brakes, seats, machine tools

Aerospatiale, Thomson-CSF, Dassault-Breguet, and ESD are among the French companies that will likely have a role in these offsets. As yet however, very little of the offset has been fulfilled or even determined by Boeing or its subcontractors. According to Westinghouse, that firm's portion of the French offset will probably be fulfilled in a manner similar to their British offset--through teaming, joint ventures, subcontracting, technology development, materials purchasing, and service contracts.

In actuality, the French offset package is much less than the British package, even though both are nominally 130 percent of the contract value. This is due to the fact that 60 percent of the offsets (or 80 percent of the contract value) are accounted for by use of the CFM-56 engines, including those on the Saudi planes delivered several years ago. However, the final package is substantially more lucrative than the one the French industry originally agreed to in the fall of 1986. That deal was valued at \$192.5 million, including \$156 million for CFM-56 engines, leaving a new offset value of only \$36.5 million versus \$300 million under the present agreement (50 percent of \$600 million).

It is no coincidence that the French offset is nominally the same as the British offset. The French, who generally prefer that offsets not be part of defense sales, reacted to the precedent set by the British just two months earlier and requested the same treatment. Hence, a compromise was struck between the French need to receive the same concessions as the British and the need to avoid further expanding France's trade surpluses with the U.S., which have grown substantially over the past several years. In the defense area, the U.S. has purchased a number of systems from the French that have contributed to their trade surplus.

France's aerospace industry is one of the largest and most sophisticated in the world. It provides state of the art, high technology and high quality world class products to a broad range of customers, both civil and military. Close to 130,000 people are employed directly in the French

aerospace sector, about the same number as in Great Britain (and about one-sixth of the U.S. aerospace employment).

Like the British market, the domestic French market for aerospace items is limited, and thus can never be the major market which the French aerospace industry needs to maintain and develop business and technological capabilities or achieve production economies. For this reason, the French industry has historically relied heavily on export markets. About 60 percent of total sales is exported versus less than 20 percent of output for the U.S., making aerospace France's preeminent export industry. Over a quarter of all U.S. imports of aerospace products come from France.

According to Jacques Benichou, former president of the French industry association which was involved in deriving the offset agreement, the French aerospace industry currently sells the U.S. ten times more defense-related goods than the U.S. sells to France. U.S. Defense Department data for fiscal year, 1986, however, indicates the ratio of French-U.S. bilateral defense trade is 4:1 in terms of dollar value. Prominent purchases from French industry include CFM-56 engines for military and commercial use, Durandal runway-cratering bombs for the Air Force; the RITA mobile subscriber communications network for the Army; Thomson-CSF sonars for use in the Navy's new class of mine countermeasure vessels; and Dolphin helicopters for the U.S. Coast Guard.

With respect to merchandise trade between the two countries, the U.S. has gone from a trade surplus position as recently as 1982 to a chronic bilateral trade deficit position. However, in its merchandise trade with the world as a whole, France ran a considerable deficit from 1980 to 1986.

**U.S. Merchandise Trade with France**  
(millions of dollars)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Exports	7,341	7,110	5,961	6,037	6,096	7,216
Imports	5,851	5,545	6,025	8,113	9,482	10,586
Balance	1,490	1,565	-64	-2,076	-3,386	-3,370

Most of France's major aerospace firms are at least partially owned and controlled by the French Government. For example, Aerospatiale, the single largest aerospace concern in France and a major player in Airbus, has 99.96% of its equity owned by European governments. Thomson-CSF, SNECMA, and Dassault-Breguet are also all or partially owned by the French Government. These are the very same firms which will likely play a large role in the French AWACS offset program.

One of Prime Minister Chirac's main goals is to make French industry more competitive by 1992, specifically by breaking into the U.S. and Japanese markets. Part of this plan involves the military component of French industry. According to Andre Giraud, the Defense Minister, France should spend its efforts to "develop weapons systems that are not too tailored for specific requirements and so are good for export." Today, the international military market is at a standstill, and the number of suppliers is growing faster than demand. The U.S. defense market, because of its size, is an obvious target for French exports. The stated purpose of the offsets are to help gain entry into this huge market, by forcing purchases of French goods and services and by transfer of technology and know-how that will increase the competitiveness of French firms.

French industry is responding to the current competitive challenge by making even further inroads in international markets, and by forming relationships with foreign firms to promote their products. The AWACS offset program will allow French firms opportunities to carry out these goals. Despite the fact that the offset agreement specifies that the firms must be "competitive," it provides opportunities for French industry that would not have existed without the offset.

## CONCLUSION

Boeing obviously benefits from AWACS sales, as do its subcontractors. Boeing estimates that it has approximately 2,000 employees employed in the AWACS program. Their employment is now guaranteed for several years. Had the sales not occurred, Boeing indicated that these employees would likely have been reassigned within the firm after completion of the Saudi Arabian AWACS production. Similarly, the AWACS sales have stabilized the employment of approximately 700 workers at Westinghouse. These workers would also likely have been transferred to other programs within Westinghouse had the recent AWACS sales not occurred.

The British and French decisions to purchase AWACS are also beneficial to allied defense preparedness. Introduction of AWACS into the British and French fleets strengthens NATO's airborne early warning capabilities. It brings to 29 (possibly 32 with options) the number of AWACS deployed in Europe. The Royal Air Force plans to have two AWACS in the air at all times. They will cover Britain's "back door" over the North Sea between Britain and Norway, and will operate in conjunction with NATO AWACS to cover the northwest approach to the country.

In France, AWACS can be used to detect planes or missiles that cannot be reliably spotted in time by ground-based radar systems. Moreover, according to the Giraud, the AWACS will provide an important element of France's defense against low-level attack and will help protect France's nuclear bombers. The AWACS will also be used to cover French naval forces in the Mediterranean Sea. The AWACS deal is also a step toward greater French defense cooperation with the other Western allies. Since AWACS can be operated either independently or in conjunction with NATO and U.S. systems, France is able to both move closer to NATO and at the same time maintain its military independence. The fact that the AWACS buy was coordinated with the British buy is another indication of this increased cooperation.

As a result of the British and French decisions to purchase the AWACS, the sale of AWACS to other nations become more likely, thus assuring Boeing a production of AWACS extending well into the 1990s. Boeing has already met with Italian government officials to discuss the possibility of a sale of up to six AWACS. Other countries, including Spain, Japan, Australia, Sweden, and Pakistan have shown interest in the AWACS. The sales to Britain and France, and the consequent elimination of Nimrod, of course, increases the likelihood that the Boeing AWACS will be selected by these countries because of the potential for interoperability and the economies of scale that ensue.

But the high face value of the British and French offset packages may have created a precedent which will put Boeing and other U.S. defense prime contractors in a more difficult situation for future foreign sales negotiations. Countries such as Spain and Australia are already demanding higher percentages of commercial "offsets" (countertrade) because of the publicity surrounding the 130 percent in offsets given to Britain and France for the AWACS. This is despite the fact that GATT Civil Air agreements specifically prohibit the government-mandating of "offsets" for commercial aircraft sales.

As we have seen, the fact that Britain obtained 130 percent offset from Boeing was a primary factor in France's offset package determination. However, Boeing has said that it could only achieve 130 percent offsets with these two countries, which have highly developed aerospace industries. This is because these countries already produce aerospace products in the quantities and qualities required by Boeing and its subcontractors to reach the required offset dollar figure.

Most of the fulfillment of the AWACS offsets will likely be in the form of contracts with a relatively few major aerospace systems firms in the U.K and France. However, foreign subcomponent suppliers may benefit indirectly since the larger foreign systems producers purchase

parts and components from their established sources. This would reduce sales for American parts suppliers.

The details of the AWACS offset agreements indicate some potential concerns for the competitiveness of some individual U.S. subcontractors. Foreign systems manufacturers might benefit not only from the additional sales emanating from the offsets, but also from the formation of new market patterns, some of which may be lasting, and from the "learning experience" derived from working within the American aerospace market place. If offsets arrangements afford foreign firms wider market positions as a result of these offsets, U.S. firms would find it more difficult to compete against them.

Another important consideration is the impact that the numerous advanced aerospace technologies associated with major systems development have on related subcomponent industries. For example, the U.S. aerospace forging industry is currently at the forefront of high-technology forging applications. Continuing technological developments in this sector represent the leading technological edge for future progress in the forging industry as a whole. The industrial forging section has lost ground to foreign competition in the last decade, in both the automotive and aerospace sectors. To remain competitive, forgers have incorporated new technologies, including CAD/CAM, isothermal forging, hot isostatic pressing, robotics, CNC die making machinery, cast technology, and numerous improved material formulations.

In recent years, the French have made rapid gains in aerospace forging. In 1977, the French government purchased a 87,500 ton forging press from the Soviet Union. The use of this press has enabled the French forging sector to produce at lower cost large aircraft structural forgings closer to finishing shape and with less scrap, relative to U.S. capabilities, while using harder to work materials. The French aerospace forging sector has become a formidable competitor in the global aerospace forging markets. The French AWACS offset might provide this sector with additional sales which could further displace U.S. firms.

Many other industries can be impacted in a similar manner. Composite materials manufacturers, for example, rely on aerospace applications for in excess of 50 percent of their sales, and for an even high percentage of research and development funds. However, there is already some question whether U.S. firms have maintained their technological lead. Westinghouse cited a small British composite firm as having a superior composite material (for some applications) than anything available in the United States. If offsets in this sector are used to satisfy the requirements of the AWACS offset agreement, this could diminish the future development of this technology by U.S. firms, not only in the aerospace sector, but for other applications as the technology matures.

Other industries which may experience long term adverse impacts either directly or indirectly from offsets include the investment casting, precision bearing, microwave tube, machine tools, fasteners, and electronic component industries. These relative small industries have followed the major aircraft and aircraft engine companies into the global aerospace markets, forming foreign subsidiaries or licensing technologies in foreign countries, in some cases because of offsets. The aerospace portions of these subcomponent industries perform much of the research and development, employ a major share of the scientists and engineers, and introduce a disproportionate share of the technology that underwrites much of these sector's technical advances and competitive capabilities. Thus, offsets in these sectors can have long term competitive consequences for firms in these industries.

Not only manufacturing firms can experience the impact of offsets. Although difficult to quantify, U.S. service industries (including maintenance and technology development) are also affected. There may be a tendency for Boeing and other subcontractors to place service contracts with British and French firms even if they are not truly competitive. Competitiveness is extremely

difficult to determine objectively in the case of services, because quality cannot be assessed in advance as it can in the case of hardware. In addition, the shifting of service provisions to foreign firms can be viewed as less painful than shifting goods procurement. Since services can generally not be inventoried, the service employee is not hired or needed until the service is to be performed. Failure to obtain a new service contract will not usually jeopardize the jobs of existing workers because typically, as in the case of AWACS, there are continuing service contracts. It will simply prevent the hiring of more U.S. workers. This may be considered a "painless" alternative to the unemployment which may result from switching hardware sources abroad from the U.S.

Absent the political considerations that attend all defense procurement decisions, the AWACS should be able to sell itself based on its demonstrated capabilities, and there would be no justification for offsets. Both the British and the French defense communities acknowledged the superiority of the AWACS over other systems. Boeing and Westinghouse concede that the offsets will increase the price of AWACS for our allies due to the economic inefficiencies attendant to such arrangements. From an industrial competitiveness standpoint, the NATO alliance would be better served without offsets, and this would help strengthen allied defense preparedness, particularly in a time of limited defense budgets.

Moreover, in the British/French AWACS case, less than 50 percent of the offsets are directly related to the AWACS program, or other defense programs for that matter. Since the majority of the offsets are unrelated to the AWACS program, there are very limited direct defense benefits that arise from them. Rather, the AWACS offsets in this analysis are required by the purchasing governments in order to achieve openly stated economic and industrial competitiveness goals. Through offsets, Britain and France can subsidize indirectly growth and development of important or fledgling high technology industries. Yet, Britain and France are already formidable competitors in the international defense and commercial aerospace arena.

In the final analysis, it is clear that the high level of offsets was essential for Boeing to capture the sale in the British case, and was clearly very important in the French case. Use of AWACS by NATO, Britain, and France certainly enhance defense preparedness and makes additional AWACS sales possible. Moreover, these sales have benefitted Boeing, Westinghouse and other U.S. firms. However, the full implications of such high levels of offsets on U.S. competitiveness are as yet undetermined.