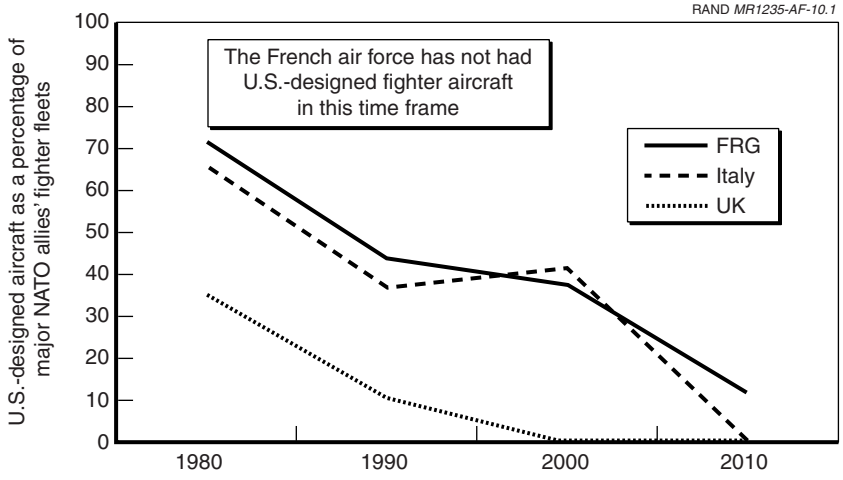
Chapter Ten

FIGHTERS AND WEAPONS

For much of the Cold War, allied interoperability was enhanced by the predominance of U.S.-designed fighters in the air forces of the NATO allies. This commonality of platforms guaranteed some familiarity and provided a shared experience base for planning and executing operations. The fact that the different air forces were flying the same aircraft ensured an understanding of performance characteristics (e.g., cruise speed and altitude, weapon carriage, signature) and may have enhanced the likelihood that they would be effectively employed (e.g., similar weapon employment concepts, increased fungibility). It may also have provided some advantages in terms of reduced logistical requirements and lower costs associated with operating fewer types of aircraft.

As late as 1980, U.S. designs made up the vast majority of the fighter components of all the NATO allies' air forces except those of France, the United Kingdom, and Portugal. Even in the U.K.'s Royal Air Force, over a third of the fighters were of U.S. origin.

Multinational European aircraft manufacturing efforts in the 1970s and 1980s reduced this dominance among the four largest NATO allies' air forces (see Figure 10.1). Over the next ten years, U.S.-designed aircraft will become a small percentage of NATO fighter fleets as the EF-2000 (Typhoon) comes into service. The lack of system commonality between the U.S. Air Force and the larger NATO allies' air forces, both in their fighters and in the munitions that they carry, is of particular concern in that the larger allies tend to participate most frequently in coalition operations. On the other hand, with the consolidation of the European aerospace industry, there will be



SOURCE: International Institute for Strategic Studies, *Military Balance* (various years) and RAND estimates.

Figure 10.1—U.S. Fighter Aircraft Becoming Less Common in Major NATO Allies' Air Forces

fewer types of combat aircraft in the allies' inventories. This trend toward fewer platform types should make it easier to achieve interoperability.

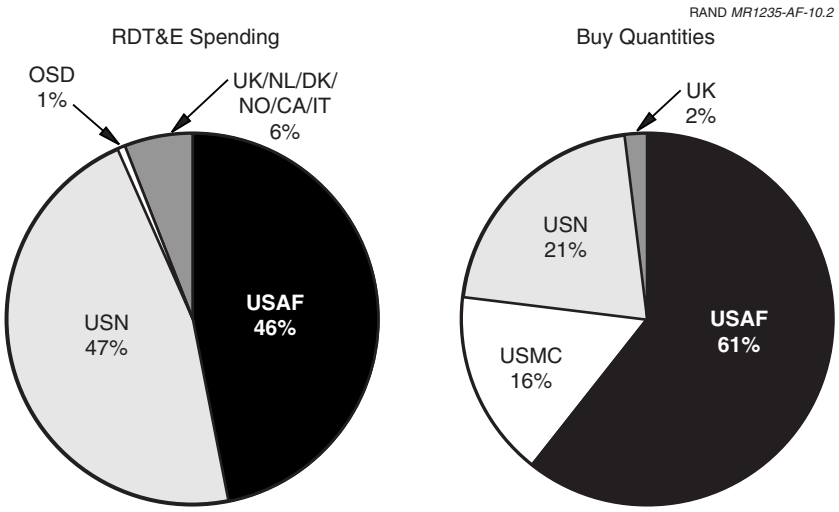
In this case study, we discuss trends in European fighter and weapon systems and their effect on the interoperability of U.S. and NATO allies' air forces. The focus of the discussion is on the ability of these forces to operate effectively in coalition operations. We begin with a discussion of a cooperative fighter development program and then summarize the current and future capabilities of U.S. and NATO allies' air forces. We end with suggested actions for enhancing interoperability.

COOPERATIVE FIGHTER DEVELOPMENT

In 1996 the United States began to develop the Joint Strike Fighter (JSF). The program grew out of two earlier DoD programs addressing advanced aircraft designs and advanced strike technologies. The

U.K. joined the program as a collaborative partner later that year, and the Netherlands, Denmark, and Norway joined the program as observers in 1997. Italy has been involved as well. In total, the partners and observers are expected to fund approximately 6 percent of the system development cost, as shown in Figure 10.2.[1] The JSF appears to offer promise for enhancing interoperability through the use of a common system. The early interest shown by European nations is indicative of this potential.

However, a preliminary look at the fighter acquisition plans of the NATO nations suggests that this promise is limited. The largest NATO nations have already made substantial investments in other systems. The U.K., Germany, Italy, and Spain have invested approximately $19 billion in developing the EF-2000 and plan to procure



SOURCE: Joint Strike Fighter Program Office (1998).

Figure 10.2—Allies Playing Limited Role in JSF Program

[1]See Joint Strike Fighter Program Office (1998).

several hundred of them over the next 15 years. France has spent about $9.5 billion developing the Rafale and plans to procure 320 over the next decade.[2]

The U.K. does plan to procure 60 JSFs for its aircraft carriers. That amounts to about 2 percent of the total buy.[3] Italy and Spain could conceivably follow suit, as they also operate ship-based short takeoff/vertical landing (STOVL) aircraft. The small number of ships in this class suggests that the ultimate size of these buys will probably not exceed 200. Thus, prospects for substantial JSF buys for the major European air forces appear limited over the next 10 to 15 years.

The smaller NATO nations (the Netherlands, Belgium, Norway, Canada, etc.) may ultimately buy the JSF, though probably not before 2015. Norway, the Netherlands, and Belgium recently completed the Mid-Life Upgrade (MLU) for their F-16 fleets and will not face a major fighter acquisition decision for the next 10 to 15 years. Plans for the air forces of Poland, Hungary, and the Czech Republic are uncertain. Although the JSF is planned to be affordable, its costs may grow over time. In that case, the relatively small defense budgets of many of these nations may limit their ability to procure even modest numbers of JSFs. Greece and Turkey are still procuring F-16s and thus may not procure JSFs or other new fighters in the next decade.

Although the JSF offers the promise of greater interoperability through system commonality, that promise may not be realized for some years. It is not planned to go into full-rate production until after 2010 and is unlikely to come into widespread use before 2015. The long-term picture is therefore uncertain. Future coalition operations will probably be characterized by less commonality between U.S. and allied fighter forces than has been the case in the past. This lack of commonality may create additional interoperability challenges for planners to address.

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[2]See Teal Group Corp. (1999a).

[3]After this research was completed, additional information became available suggesting that the U.K. may procure an additional 90 JSFs for the Royal Air Force to replace their Harriers (Braybrock, 2000).

ALLIED CAPABILITIES

Projections for the fighter components of the air forces of NATO allies in the year 2010 are shown in Table 10.1. Countries were selected for inclusion based on their pattern of participation in coalition operations to date. These estimates are derived from the open-source literature and are thus approximate. They include only fighters that could be deployed operationally.

Allied Air-Superiority Capabilities

The NATO allies' air forces have an air-to-air capability. Most of the larger air forces have dedicated air-superiority squadrons equipped

Table 10.1

Fighter Aircraft Projections for Selected NATO Allies' Air Forces (Year 2010)

Country	Platform	Primary Mission	Number (Combat-Coded)
Belgium	F-16AM	Multirole	60
Denmark	F-16AM	Multirole	45
Netherlands	F-16AM	Multirole	89
Norway	F-16AM	Multirole	38
U.K.	EF-2000 (Typhoon)	Air superiority	105
U.K.	Tornado IDS	Ground attack	84
U.K.	Harrier	Ground attack	48
Germany	EF-2000 (Typhoon)	Air superiority	88
Germany	Tornado IDS	Ground attack	178
Germany	Tornado ECR	SEAD	35
Italy	EF-2000 (Typhoon)	Air superiority	59
Italy	Tornado IDS	Ground attack	45
Italy	Tornado ECR	SEAD	15
France	Rafale	Multirole	116
France	Mirage 2000C/N	Multirole	136
France	Mirage 2000-5	Multirole	37
Spain	EF-2000 (Typhoon)	Air superiority	43
Spain	EF/A-18A	Multirole	55

with modern aircraft and missiles. These capabilities will only increase as the EF-2000 (Typhoon) and Rafale come into service over the next decade. Both aircraft combine signature reduction[4] with advanced avionics. The EF-2000 will first go into service in dedicated air-superiority units. Advanced missiles like the U.K.'s Beyond Visual Range Air-to-Air Missile (BVRAAM) could further advance these capabilities.

The U.K. and France also operate fleets of AWACS aircraft, as does NATO itself. These aircraft are a critical enabler for effective force employment for OCA and DCA missions. The availability of AWACS for peacetime training creates opportunities for NATO allies' air forces to train as they would operate in combat.

Allied Precision Strike Capabilities

The contribution of NATO allies' air forces in the precision strike mission is more limited. Historically, precision engagement has required that the aircraft be able to find and engage enemy systems autonomously through the use of optical and/or infrared target acquisition systems with laser-guided weapons. This combination allowed aircraft to engage nonmoving targets such as bridges, industrial facilities, or parked vehicles. The NATO allies have traditionally procured relatively few systems designed for this mission; their ability to attack fixed targets with precision strike weapons has been limited.

Although exact numbers are difficult to obtain, even the largest NATO allies' air forces appear to have only a few thousand direct attack guided munitions. However, as a consequence of their experience in Operation Allied Force, most of the allies that took part plan to expand their inventories of precision-guided munitions (PGMs). Long-term plans are uncertain, but recent announcements suggest that allied stocks of direct attack guided munitions will exceed pre-Operation Allied Force levels. These weapons are listed in Table 10.2.

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[4]Open source reports on the Rafale and EF-2000 note that both aircraft have lower signatures than conventional aircraft such as the Tornado but that neither design is in the same class as the F-117 or F-22.

Table 10.2

Air-to-Ground Precision Munition Capabilities Projections for Selected NATO Allies' Air Forces (Year 2010)

Country	Platform	Precision SR Missile	Precision SR Bomb	Precision SO Weapon	Antiradiation Missile (ARM)
NE	F-16AM (MLU)	Maverick	Paveway II/III	JDAM, JSOW	(—)
NO	F-16AM (MLU)	(—)	(—)	(—)	(—)
DE	F-16AM (MLU)	(—)	(—)	(—)	(—)
UK	Tornado IDS	Brimstone Maverick	Paveway II/III JDAM-like weapon	Storm Shadow	ALARM
GE	Tornado IDS	Maverick	Paveway II/III	KEPD Taurus	AGM-88
	Tornado ECR	Kormoran Maverick	Paveway II/III	KEPD Taurus	AGM-88
IT	Tornado IDS	Maverick	Paveway II	(—)	AGM-88
	Tornado ECR	Maverick	Paveway II	(—)	AGM-88
FR	Mirage-D	AS-30L	Matra BGL1000/PW II JDAM-like weapon	Apache SCALP	ARMAT
	Mirage-2000N	AS-30L	Matra BGL1000/PW II	(—)	ARMAT
	Mirage-2000-5	AS-30L	Matra BGL1000/PW II JDAM-like weapon	Apache SCALP	ARMAT
	Rafale	AS-30L Maverick	Matra BGL1000/PW II	Apache SCALP	ARMAT AGM-88
UK/GE/IT/SP	EF-2000	(—)	Paveway II/III JDAM-like weapon	Apache SCALP Storm Shadow KEPD Taurus	ALARM

NOTES: (—) = none planned; SR = short range; SO = standoff; PW = Paveway; ALARM = Air-Launched ARM; AGM = air-to-ground missile; ARMAT = antiradiation missile (French).

The capability to find and engage moving targets with precision weapons was traditionally provided through the use of guided weapons that contained narrow-field-of-view optical or infrared sensors. Although several NATO nations have this capability, few

have procured large numbers of these weapons. Thus, NATO allies' ability to use precision strike against moving targets is limited as well.

As noted earlier, collateral damage concerns and the need for increased sortie effectiveness have driven coalition campaign planners to increasingly rely on PGMs. For example, in Operation Desert Storm less than 10 percent of the weapons dropped by U.S. Air Force fighters and bombers were precision guided;[5] in Operation Allied Force, approximately one-third were.[6] In Operation Deliberate Force—a much smaller action—over 90 percent of the munitions used by U.S. fighters were precision guided.[7] There is little reason to suspect that these concerns will be less important in the future.

As a consequence, the ability of the NATO allies' air forces to contribute to future combat operations will depend on the number of aircraft capable of employing precision munitions in their air forces and their inventories of these weapons. Should the allies fail to procure adequate numbers of these systems, their contribution to future operations will be constrained with important implications for burden sharing, especially during long-duration conflicts. This capability shortfall was clearly illustrated in Operation Allied Force. In assessing the lessons learned in Operation Allied Force, U.S. Secretary of Defense William Cohen noted that

> Because few NATO allies could employ precision munitions in sufficient numbers, or at all, the USA conducted the preponderance of the strike sorties during the early stages of the conflict . . . Such disparities in capabilities will seriously affect our ability to operate as an effective alliance over the long term.[8]

Technological developments are creating new opportunities to enhance NATO precision strike capabilities. The advent of GPS-guided

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[5]See Office of the Secretary of the Air Force (1993).

[6]See USAFE/SE (2000).

[7]Paul Kaminski, Under Secretary of Defense for Acquisition, Technology, and Logistics, quoted in Tirpak (1997).

[8]See Lopez (1999), p. 23.

weapons[9] and offboard targeting systems should create ways to expand the number of platforms that can employ precision weapons at a relatively low cost. GPS-guided weapons do not require the launching aircraft to find the target or guide the weapon. Thus, targeting pods are no longer required. GPS guidance can be used with weapons designed to attack fixed targets (e.g., Joint Direct Attack Munition [JDAM] and Joint Air-to-Surface Standoff Missile [JASSM]) as well as those designed to attack moving vehicles (e.g., Joint Standoff Weapon [JSOW]). At the same time, development of offboard targeting systems has enabled aircraft to engage nonmoving vehicles without acquiring them.

Finally, some of these GPS-guided weapons are considerably less expensive than previous-generation systems, which means that NATO nations may be able to afford them. For example, the current procurement for a JDAM is about $21,000 per unit, representing a substantial decrease from about $77,000 for a GBU-24, a laser-guided bomb with the same warhead.

As NATO nations take advantage of some of these developments, their precision strike capabilities should improve. In recent years, the U.K., Germany, and Italy have put their Tornado strike aircraft through an extensive modernization program that will give them the ability to use both targeting pods and GPS-guided weapons.[10] Similarly, Norway, the Netherlands, and Denmark have invested in the F-16 MLU program to provide the same capabilities. As these modernization programs are completed and additional pods are delivered, the allies' ability to employ precision weapons will increase.

Besides aircraft modernization, some of the NATO nations are increasing the number of precision weapons in their inventories. The U.K., France, and the Netherlands have added to their inventories of laser-guided bombs and other precision weapons in recent years and have decided to procure GPS-guided weapons over the next several

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[9]Technically, the GPS system does not "guide" the weapon. The information from the GPS signal is used by the weapon to update its inertial navigation system (INS). The weapon's guidance computer then uses the target's coordinates (provided to the weapon before it is launched) and the weapon's current position and velocity (provided by the INS) to develop guidance commands. Often, these weapons are referred to as "GPS-aided INS weapons." Here we use the term "GPS-guided weapon."

[10]See Jackson (1999).

years. These new weapons will increase the number of aircraft able to employ precision weapons against both fixed and stationary mobile targets. The weapons will also greatly enhance their ability to employ weapons in adverse weather, as GPS-guided weapons are relatively unaffected by cloud cover, rain, and other environmental conditions.

However, some difficulties remain. Most of these nations do not have enough targeting pods with optical or infrared sensors and laser designators to equip substantial numbers of the aircraft that are capable had employing them. Further, as of the end of 1999 most NATO nations had not announced plans to procure GPS-guided weapons and thus will not be able to take advantage of their aircraft's abilities to employ such weapons. In addition, these countries lack direct attack weapons containing antiarmor submunitions—such as sensor-fuzed weapons (SFWs)—and have no plans to procure them. These shortfalls may not be a problem in limited operations such as Deliberate Force but could create difficulties in an MTW such as Operation Desert Storm.

Standoff-Attack Capability. NATO allies' air forces currently have little in the way of standoff-attack capability. The U.K. recently purchased 61 U.S. Tomahawk cruise missiles, some of which it used in Operation Allied Force. Further, few nations have plans in place to procure standoff weapons. The U.K. and France are cooperating on the development of Apache/Storm Shadow, a new standoff weapon that is in the same class as JASSM. Germany is developing Taurus, which is also in the same class. However, the high cost of these weapons (approximately $1 million) will likely limit their procurement to only a few countries. Even the U.K. and France plan buys of only several hundred weapons each,[11] and the smaller NATO allies may not procure them at all. Further, the British and German weapons are primarily designed to attack fixed targets such as bunkers and runways rather than armored systems. None of them contain advanced antiarmor submunitions. As a consequence, they might not be able to participate in the halt phase of a campaign in a high-threat environment in which standoff antiarmor weapons may be needed to ensure platform survivability.

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[11] See Teal Group Corp. (1999b).

The shortfall in European standoff weapons does not lend itself to an easy solution. The high cost of these weapons effectively limits their procurement to the larger NATO nations. Even then, the buy quantities are limited and could quickly be used up in a major contingency.

Allied SEAD Capabilities

NATO allies' capabilities in the SEAD mission area are limited as well. Germany and Italy are the only nations to operate specialized SEAD aircraft. The German and Italian Tornado ECRs are designed to locate, track, and engage enemy air defense systems.[12] Unfortunately, these aircraft are few in number, with just over 50 aircraft between the two countries, and neither nation has plans for further buys. The relatively small size of these units has placed a greater burden on U.S. air forces, which must provide this support in coalition operations. In addition, none of the NATO allies have an electronic jamming platform such as the U.S. Navy's EA-6B. Air forces that lack specialized platforms for SEAD retain some ability to perform the mission at a reduced level of effectiveness. However, campaign planners have shown a preference for using specialized aircraft for this mission, and there is little to suggest that this will not be the case in the future.

Enhancing the allied contribution in the SEAD area may be difficult. Specialized SEAD aircraft are expensive to build and operate, limiting the ability of fiscally constrained NATO allies' air forces to acquire them. One relatively inexpensive way to enhance allied SEAD capabilities would be for the United States to encourage NATO countries operating the F-16 MLU to procure the AN/ASQ-213 High-Speed Anti-Radiation Missile (HARM) Targeting System (HTS). These nations could then dedicate some portion of their fleets to the SEAD mission. Such systems would provide some of the NATO allies' air forces with SEAD capabilities similar to those of the U.S. Air Force at a relatively modest cost (approximately $1 million per unit).

Exporting the HTS pod could conceivably expose the system to greater risk of compromise and exploitation. The desire to enhance

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[12] See Streetly (1999).

NATO allies' SEAD capabilities would have to be balanced against these risks. Over the long term, SEAD variants of the EF-2000 and/or Rafale could be developed, but they probably would not be available until after 2010.

U.S. CAPABILITIES

Our review of U.S. fighter force capabilities provides the context for assessing the relative importance of the interoperability enhancements that we describe below. Currently, the U.S. Air Force fighter force includes almost 300 highly capable air-superiority aircraft. Moreover, the introduction of the stealthy F-22 over the next decade will substantially increase U.S. air-superiority capabilities.

U.S. Air Force precision strike capabilities are formidable as well. They consist of almost 400 fighters equipped for all-weather/night precision strike missions and an inventory of tens of thousands of precision weapons. They also include over 100 long-range bombers that can deliver large payloads over intercontinental ranges. Current Air Force precision strike capabilities should also improve as next-generation weapons—such as the Wind-Corrected Munitions Dispenser (WCMD)/SFW, JDAM, JSOW, and JASSM—are brought into service in large numbers.

The Air Force has almost 200 F-16 Block 50 aircraft (F-16CJ) available for the SEAD mission. These aircraft are equipped with the HTS) pod and thus have an enhanced ability to engage adversary air defense systems. These numbers will increase over the next few years as additional aircraft are delivered.

The U.S. Navy also has large numbers of highly capable fighter aircraft. The Navy fighter fleet is made up largely of multirole aircraft. Carrier air wings are currently composed of F-14s and F/A-18s, although this will change as the F-14 is retired and the F/A-18E/F is introduced into service. All these aircraft are precision strike capable. The F/A-18s can employ HARM, JSOW, laser-guided bombs, and a variety of other conventional weapons.

Each of the Navy's 11 aircraft carrier air wings deploys with a total of 48 fighter aircraft. The Navy could deploy carriers to the theater in a short-warning scenario (the number of carriers available in a given

contingency is a function of a host of factors, including the location of the conflict and the disposition of the existing fleet when the conflict occurs). The carriers also have four EA-6Bs on board. These aircraft provide a unique standoff jamming capability and can launch HARM missiles as well. However, the Navy may face difficulties in maintaining this capability through 2010 as these aircraft age, and plans for replacing the capability are uncertain. The Navy also has four E-2C aircraft that provide airborne warning and control.

Finally, the U.S. Marine Corps has over 200 F/A-18s with the same capabilities as their Navy counterparts. They often deploy as part of carrier air wings. In addition, they have over 100 AV-8B aircraft for the close air support mission. Small detachments of these aircraft deploy on Navy amphibious assault ships.

Tables 10.3 and 10.4 list the projections for 2010 of U.S. fighter/bomber inventory and the types of precision weapons they can employ. All will be precision strike capable except the F-15C (the A-10 will be limited to Maverick and the F-22 to JDAM). The Air

Table 10.3

U.S. Fighter/Bomber Aircraft (Year 2010)

Aircraft	Primary Mission	Total Number (Combat-Coded)
F-16C/D	Multirole	600[a]
F-16CJ (Block 50)	SEAD	219
F-15E	Ground attack	132
F-117	Ground attack	36
A-10	Ground attack	204
F-15C	Air superiority	120
F-22	Air superiority[b]	171
F/A-18C/D (USN+USMC)	Multirole	349
F/A-18E/F (USN)	Multirole	316
B-1	Ground attack	70
B-2	Ground attack	16
B-52	Ground attack	44

[a]Only about 252 of these aircraft are equipped with LANTIRN or LANTIRN-like systems and are thus capable of finding and engaging targets autonomously. All 600 can carry GPS-guided weapons.

[b]F-22 will have limited ground attack capability.

Table 10.4

U.S. Air-to-Ground Precision Munitions (Year 2010)

Platform	Precision SR Missile	Precision SR Bomb	Precision SO Weapon	ARM
F-16C/D	Maverick	Paveway II/III, WCMD	JDAM, JSOW, JASSM	AGM-88
F-15E	Maverick	Paveway II/III, WCMD	JDAM, JSOW, JASSM	
F-117	Maverick	Paveway II/III, WCMD	JDAM, JASSM	
A-10	Maverick			
F-18A-D	Maverick	Paveway II/III	JDAM, JSOW, JASSM	AGM-88
F-18E/F	Maverick	Paveway II/III	JDAM, JSOW, JASSM	AGM-88
F-22			JDAM	
B-1		WCMD	JDAM, JSOW, JASSM	
B-2		WCMD	JDAM, JSOW, JASSM	
B-52		WCMD	JDAM, JSOW, JASSM	

NOTE: SR = short range; SO = standoff.

Force fighter force composition will change over the next decade as the F-22 is introduced. In addition, deliveries of the F-16 Block 50 (F-16CJ) will continue at a low rate. Both of these aircraft were incorporated in our 2010 force structure projection.

Deliveries of the JSF will also begin in this time frame, with the first deliveries planned for FY 2007. However, many of the initial aircraft will become part of training and test units and thus would not be part of an operational deployment. A few squadrons may be available in the 2010 time frame. Note that the program is still early in its development, and it may experience delays. A delay of even a year or two could reduce or eliminate the number of squadrons available for operational deployments. Given this uncertainty, we elected not to include the JSF in the tables.

OBSERVATIONS

The U.S. Air Force has historically enjoyed the advantages of working with NATO allies' air forces equipped with U.S.-designed fighter aircraft. Over the next ten years, the largest of these forces plan to complete their transition to European designs, creating additional interoperability challenges for planners to address.

The U.S. and NATO allies' air forces have substantial air-to-air capability, with the larger nations operating dedicated air-superiority squadrons equipped with modern aircraft and missiles. These aircraft proved more than adequate to meet the limited challenge presented by Yugoslavia during Operation Allied Force. These capabilities should only increase over the next decade as next-generation fighters and weapons are introduced into service.

The precision strike capabilities of these air forces are much more limited. Most of these air forces will soon have large numbers of night attack and precision-strike-capable platforms, but only one will have enough targeting pods to employ these aircraft in this role on a large scale. Relatively modest investments in targeting pods could enhance this capability considerably.

NATO allies' air forces also have limited numbers of advanced strike munitions. In recent conflicts, collateral damage concerns have placed an increasing emphasis on precision munitions, and aircraft survivability concerns have placed an increasing emphasis on standoff weapons. There is little to suggest that this will not be the case in future conflicts. Allied participation in such conflicts could be constrained by a lack of these weapons. This circumstance should improve over the next several years as new European weapons go into production. However, the preference of the larger NATO nations for developing European weapon systems has resulted in higher costs and lower buy quantities than those of comparable U.S. systems, which are already expensive in absolute terms. Thus, the high cost of precision and standoff weapons, be they of European or U.S. origin, may limit the ability of NATO allies to procure significant quantities of these weapons.

SEAD capabilities are similarly limited. Only the German and Italian air forces field a specialized aircraft for this mission. The high cost of these platforms limits the ability of other nations to procure them. A near-term solution might be for the United States to export pod-mounted systems to selected NATO nations for use on their multirole aircraft in SEAD missions. The value of the resulting enhancement to allied SEAD capabilities would have to be weighed against other national security concerns associated with system transfers. Over the long term, dedicated SEAD variants of the EF-2000 and Rafale could be developed, but they are not currently planned.

Enhancing the capabilities of NATO allies' air forces in each of these mission areas will enable them to participate more fully in future coalition operations. Absent these improvements, NATO allies' participation in these missions will continue to be limited, with subsequent implications for burden sharing.

Beyond these mission-oriented enhancements lies a second set of challenges in ensuring that these forces have systems to allow them to work together. This second set of challenges involves systems as well as practices and procedures. Systems that can enable and enhance interoperability include communications, and combat identification. For example, the introduction of tactical data link capabilities, such as the MIDS terminal, should greatly enhance situational awareness of NATO allies' fighter aircraft, allowing for increased mission effectiveness and reduced risk to those systems. This in turn may encourage participation in future coalition operations.

A final challenge lies in developing and practicing procedures so that C3ISR assets can effectively control and manage fighter operations. As the NATO AWACS fleet is enhanced and the AGS is introduced, new procedures may be needed to ensure that these C3ISR assets are able to work effectively with the fighter aircraft of the different NATO nations.

SUGGESTED ACTIONS

The extensive fighter capabilities of the United States are clearly the "realization" of a key tenet of national military strategy—maintaining the ability to confront adversaries alone if critical interests are at stake. Nonetheless, allied fighter contributions are important, as discussed in Chapter Three and Appendix B. These contributions could be enhanced with improvements to their strike and C3ISR capabilities.

Enhancing allied precision strike and SEAD capabilities will greatly increase the fungibility of NATO allies' air forces, allowing fighters from European nations to substitute for U.S. aircraft in multiple mission areas. This should create opportunities to distribute the burdens of major operations more evenly across NATO members of the coalition. Enhancing allied fighter effectiveness would also

provide greater flexibility in allocating forces to ongoing peacetime contingencies. These enhanced capabilities could prove crucial if simultaneous major crises occur.

This review of NATO nations' air forces suggests that the United States should continue to encourage allies to procure more capable air-to-ground targeting and weapon capabilities. The relatively modest costs of the targeting pods and direct attack munitions should put them within the reach of most NATO nations. Further, the United States should continue to encourage its NATO allies to acquire advanced precision munitions. GPS-guided weapons are particularly promising in that they are relatively inexpensive and can be employed without a targeting pod. Large-scale procurement of GPS-guided weapons would enhance NATO allies' fixed-target attack capabilities considerably. The United States should also encourage its allies to procure the targeting pods[13] needed to acquire mobile targets and the weapons needed to engage them.

Encouraging more NATO nations to procure standoff weapons or weapons carrying antiarmor submunitions would probably be more difficult. The high cost of these advanced systems will probably prevent most NATO nations from acquiring them. Even the larger NATO allies' air forces may not be able to procure them in large numbers. Even so, the United States should encourage the allies to acquire standoff weapons to ensure platform survivability in a high-threat environment and standoff antiarmor weapons so they may participate in the halt phase of a campaign.

Enhancing NATO allies' SEAD capabilities may be even more difficult than enhancing their standoff weapon capabilities. The high cost of special mission aircraft limits the ability of most NATO allies' air forces to acquire them. SEAD capabilities could be greatly enhanced in the near term through integration of the HTS pod on F-16 MLU aircraft. Adding this capability would also enhance the fungibility of U.S. and NATO allies' air forces. The benefits and risks associated with exporting the HTS pod would have to be assessed before a decision was reached (such an assessment is beyond the scope of this re-

[13]The word "pod" is used for convenience, as it would likely be the basis of any near-term solution. Sensor/designator systems could also be integrated on the aircraft and thus not take the shape of a pod at all.

port). Over the long term, the United States may wish to encourage France and the nations in the EF-2000 consortium to develop SEAD variants of their next-generation aircraft. These new aircraft could then perform more of the SEAD missions in future coalition operations, reducing the burden on U.S. aircraft.

Finally, the United States should continue to encourage NATO nations to acquire systems that enhance situational awareness (through the addition of MIDS, IFF systems, etc.) and improve communications of their fighter fleets. They should also continue to develop practices and procedures to ensure that C3ISR assets such as AWACS and future systems such as AGS are able to work effectively with the NATO allies' fighter forces.