NOTIONAL FIGHTER DEPLOYMENT

The withdrawal of many U.S. Air Force units from overseas bases and their redistribution to CONUS locations have made force deployments to theaters of operations more stressful as well as time-consuming. When fighters deploy to a theater, over-the-water flight from CONUS to theater locations and en route refuelings are required. In such deployments, the availability of emergency divert fields and the use of U.S. tankers are essential. Further, overflight rights and basing support granted by allies are important to minimize stress and operational risk.

This appendix documents an analysis of the impact of the preceding factors on deploying additional fighter forces to SWA to augment in-place fighter forces as part of a notional halt-the-invasion operation analyzed in Chapter 11.

METHODOLOGY AND ASSUMPTIONS

For this analysis, we assume that a notional force of 294 fighters and 150 supporting airlifters are deployed from CONUS (four squadron equivalents from the Mountain Home AFB area and the rest from Shaw AFB in South Carolina and Seymour Johnson AFB in North Carolina) to the Middle East with a nominal destination of the Doha, Qatar, area. The fighters are deployed in squadron-size packages of 18 or 24 aircraft. From nine to twelve airlifters, depending on squadron size and composition, fly from each squadron's home base and precede each squadron by two hours at en route stops and at the destination.

In our analysis, we considered two alternative routing schemes: one representing a notional deployment with NATO partners' support and the other without the support of NATO partners or any other nation.

1. In the supported case,

- The fighter squadrons notionally positioned in the Shaw and Seymour Johnson area are assumed to fly a great-circle route along the eastern coast of the United States and Canada, over the North Atlantic Ocean and England, and into air bases in Germany (nominally, Bitburg). Following refueling and a crew rest period of 17 hours, they fly over eastern France into the Mediterranean (to avoid overflight of Switzerland and Austria), over Sicily into the Eastern Mediterranean Sea, and over Egypt, the Red Sea, and Saudi Arabia to air bases in the Doha area. This route provides several divert fields in case of emergencies during the open-ocean leg from the eastern United States to Germany. A similar route was used routinely during Operation Desert Shield and other deployments of CONUS fighters to SWA. The distance of this route is about 6845 nmi.

- The fighter squadrons nominally based in the Mountain Home area fly to the Shaw area, remain overnight, and fly the same route as above. Their airlifters fly a great-circle route over the Northern United States and Canada to Germany and then, on the second leg, along the same route discussed above. This route is about 7660 nmi.

- The A-10 squadrons deploy from the Shaw area to Lajes, remain overnight, fly to a Sicilian airfield, remain overnight, and finally fly to the Doha area. Without an autopilot and at over a quarter slower airspeed than the fighters, three legs versus two are postulated as reasonable to minimize aircrew stress. Having to overlap the fighter flow of two squadrons per day to arrive immediately following the last fighter squadron increases the tanker requirements for the mission.

2. In the nonsupported case,

- The fighter squadrons fly from the Shaw and Seymour Johnson area via a great-circle route over the Atlantic Ocean through the Strait of Gibraltar, over the Mediterranean Sea, and over Egypt, the Red Sea, and Saudi Arabia to air bases in the Doha area. This route poses more operational risk because of aircrew fatigue and the lesser availability of divert fields while flying over the Atlantic Ocean. However, a similar route has been used on occasion by individual units (squadrons).[1] The distance of this route is about 6700 nmi.

- The notional Mountain Home fighter forces fly to the U.S. East coast, remain overnight, and then fly the route of the Shaw forces above. The airlifters fly a great-circle route across the United States, over the Atlantic Ocean, through the Straits of Gibraltar, and then along the same route as above. The distance of this route is about 7635 nmi.

Another key distinguishing factor between the two cases, besides the availability of divert fields, is that the nonsupported case requires fighter aircrews to fly continuously for about 16.7 hours. This is doable but stressing for the aircrews, whereas the routes for the supported case are divided into two shorter flight segments (9 and 7.5 hours). In addition, without the stopover in Germany, it is difficult to compensate during the long nonstop flights for any problems that may occur at the destination airfields (e.g., landing clearance, delivery of support, allocation of beddown facilities, or munitions availability) or with diplomatic clearances.

Several other factors are important in determining a reasonable flow of fighters from CONUS to SWA. Among them are (1) the number of tanker assets available to provide the necessary refuelings, (2) the physical support infrastructures (air base capacity, fuel, etc.) available en route and at destination airfields and the willingness of host nations to make them available, and (3) the availability of weapons and specific support required for fighter operations in theater locations. In general, these factors can vary widely depending on

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[1]A similar route was flown for initial fighter deployments during Desert Shield (Allister, 2000).

location. In particular, the physical infrastructure of the United States, NATO allies, Saudi Arabia, and Qatar are capable of supporting large numbers of fighters, airlifters, tankers, and C3ISR aircraft.

However, in the past, national interests of host nations have limited the availability of their key assets or use of their airspace. For example, in Operations Nickel Grass and El Dorado Canyon, NATO allies refused to permit U.S. forces to transit their airspace or use their facilities while en route to theater; in Operation Desert Shield, Saudi Arabia allowed coalition members access only to selected airfields, which delayed the buildup of air forces; and in Operation Desert Fox, both Saudi Arabia and Turkey, where the United States had the largest concentration of deployed assets, denied U.S. requests to launch strikes from their territory, forcing the United States to develop alternate plans.[2]

Because of the preceding factors and because the focus of our study is to determine the effect of support from the United States' NATO allies, we chose to examine the notional fighter deployments under two conditions. The first case (the supported case) uses the CONUS-through-Germany route with support from NATO allies (with the notional deployment force listed in Table D.1), with a flow of two

Table D.1

**Notional U.S. Air Force Fighter Deployment Force
(Year 2010)**

Type	Quantity[a]
F-117	18
F-22	48
F-15C	18
F-15E	66
F-16CJ	18
F-16CG	84
A-10	42
Total	294

[a]There is a mix of 18- and 24-aircraft squadrons.

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[2]For a more complete discussion of a range of issues related to en route and in-theater access and basing, see Shlapak et al. (1999).

fighter squadrons per day into theater. The second case, the non-supported case, uses the CONUS-through-Gibraltar route (i.e., no support from NATO or North African allies), with the flow of forces into the theater constrained to one fighter squadron per day. Given that the flow of fighter squadrons was set for the two cases, the calculations included determining the arrival time of the first squadron and the number of tankers and airlifters needed to support the deployment.

For the supported flights, we postulate that all fighters except the F-117 are deployed in flights of six with a single drag tanker.[3] For nonstop flights in the nonsupported case, F-22s and F-15s are deployed in flights of six, F-16s in flights of four, and F-117s in flights of two, with all flights deploying with a single drag tanker. In both cases, the flights in an 18/24-fighter package are clustered within an hour block for refueling management. Following arrival in theater, the drag tankers are used to support theater operations. Airlifters are assumed to fly in flights that permit the servicing of multiple airlifters by tankers in one-hour periods. The number of airlifters varies between nine and twelve for each package: two C-5A/B/Cs, one C-17 (except two for 24 A-10s), and four to eight C-141s; this is a mix that applies the same general ratio of total primary aircraft authorized (PAA) by aircraft type to each package. They are assumed to carry from 320 to 430 short tons (st) of cargo—a postulated minimal initial support slice requirement for each 18/24-fighter package.[4] Cargo capacities used for the long flights are C-5A/B (67 st), C-17 (47 st), and C-141 (26 st).[5]

For the supported deployment, we used KC-10s from McGuire AFB, New Jersey, and KC-135s stationed or positioned at Seymour Johnson, Pittsburgh, McGuire, Niagara Falls, Pease, and Bangor in the eastern United States; Fairchild, Salt Lake, Lincoln, Grand Forks,

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[3]The F-117 is currently limited to a ratio of only two F-117s per tanker (Office of the Secretary of the Air Force, 1998, p. 19). This is true for both the supported and nonsupported cases.

[4]Based on sampling of actual deployments: 24 F-16s (3- and H-series equipment) and 22 A-10s to developed airfields—333 st and 420 st, respectively; 18 A-10s to a bare base—488 st (John Surovy, Operations Noble Anvil TPFDD, 1999) and 24 F-15Es to a developed airfield—421 st (4th Fighter Wing).

[5]These values are from the Air Force Scientific Advisory Board (1997), p. 60.

O'Hare, and Selfridge in the Midwest; and Mildenhall, Fairford, Rhein Main, and Ramstein in Europe. Use of KC-135RTs (the refuelable KC-135s) is not required. For the nonsupported case, tankers are assumed to be based at the CONUS airfields listed above and in SWA. In addition, the total fleet of KC-135RTs and the rapid turnaround and return of some drag tankers from Doha would be required to meet a one-squadron-a-day schedule.

In both the supported and nonsupported cases, Pease, New Hampshire, was used extensively and almost to excess in the nonsupported case because of its maximum on the ground (MOG), its mission as an Air National Guard base, and the fact that it is the eastern most military airfield within CONUS. We realize that significant ground support from active forces and additional airlift would be necessary to achieve a high-tempo operation at Pease for augmentation tankers.

Parameters for aircraft performance were drawn from *Air Mobility Planning Factors*.[6] Comparisons with some of the technical orders for the aircraft involved showed the fuel burn parameters to be conservative, so these parameters were used for hourly burn throughout without computing climbs and descents.[7] To simplify our calculation of the refueling burden, we calculated hourly fuel consumption for fighters, airlifters, and tankers that were refueled. Fighters were assumed to be refueled hourly by nondrag tankers or by accompanying drag tankers along the route (rather than at preplanned tanker orbits and dedicated tanker tracks). Airlifters and drag tankers do not require frequent (hourly) refueling and were thus refueled during hours when the radii of tanker flights from takeoff airfields to hourly points on the en route tracks of the packages were minimal and offload was most efficient. Fuel required for fighters, airlifters, and tankers included fuel to the destination plus 40 minutes for divert to an alternate field and about eight minutes at the alternate field.[8]

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[6]See Office of the Secretary of the Air Force (1998).

[7]Technical Orders 1F-15E-1 and 1F16C/D-1.

[8]There are sufficient alternate airfields within 40 minutes (or 250 nmi) of Bitburg and Doha.

Movement of refueling operations from the assumed hourly points would require additional tanker offload sorties (sorties during which fuel offload occurs). Tanker and airlift aircrews were augmented and assumed available for 24 hours without formal aircrew rest, and minimum tanker turnaround times were included when needed.

Note that this analysis was not intended to be an accurate representation of the very complex planning for an actual operational deployment as it would be conducted today, but rather to highlight the potential *relative difference* between two levels of allied support.

ANALYTICAL RESULTS

Arrival times in the Qatar area for each 18/24 package are shown in Table D.2. Fighter deployment from CONUS to theater in the supported case takes about nine days (eight days without the A-10s), with the first squadron arriving in 62 hours, and requires a total of 243 tanker offload sorties using 65 tankers (including spares).[9] The use of KC-135RTs is not required.

Table D.2

U.S. Fighter Arrival Times in the Qatar Area

Type	Number	Supported Case Arrival Time (hr)	Nonsupported Case Arrival Time (hr)
F-22	24	62	62
F-117	18	70	86
F-15E	24	86	110
F-16CJ	18	94	134
F-22	24	110	158
F-15E	18	118	182
F-16CG	18	134	206
F-16CG	24	142	230
F-15C	18	158	254
F-15E	24	166	278
F-16CG	18	182	302
F-16CG	24	190	326
A-10	24	206	—
A-10	18	214	—

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[9]The two squadrons of A-10s require almost 60 hours en route, so if they are to arrive on the day following the fighters, they cost additional tanker availability.

In the nonsupported case, it takes almost 14 days to complete deployment and requires a total of 504 tanker offload sorties using 210 tankers (including spares). Because of the direct route, fighters could arrive in 42 hours and all subsequent squadrons 20 hours sooner than shown in Table D.2; however, for this comparative analysis, first arrival time was held the same as for the supported case (62 hours). The total fleet of KC-135RTs would be required to meet a one-squadron-a-day schedule. A-10s are unable to participate because of excessive aircrew fatigue from flying over 24 hours without en route stops.