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## SELECTED OPTIONS AND COSTS FOR A NO-FLY ZONE OVER LIBYA

By Todd Harrison & Zack Cooper

US policymakers and other world leaders have watched intently as civil war has erupted in Libya. In recent days, reports of air strikes on Libyan rebels and civilians have led some in the international community to call for a no-fly zone. Some argue that since US vital interests are not at stake, America should not become engaged in yet another military operation while the conflicts in Afghanistan and Iraq remain unresolved.<sup>1</sup> There are also those who argue that given the United States' declining fiscal position, those African and European states whose interests are directly involved in Libya should step-up and implement a no-fly zone. The Pentagon has weighed in, urging caution, and noting that the costs and difficulties of no-fly zones are generally higher than perceived.<sup>2</sup>

What are some possible options and how much would each cost? The analysis below examines three options: first, an extensive "Full No-Fly Zone" covering all of Libya; second, a "Limited No-Fly Zone" focusing on the northern third of Libya, above the 29<sup>th</sup> parallel; and third, a "Stand-Off No-Fly Zone" protecting coastal areas using air and naval vessels operating beyond Libyan territory. Using data from previous no-fly zone operations, this analysis projects the likely costs of each option.

### Comparison to Previous Military Operations

Over the past two decades, the United States has been involved in several air campaigns that included creating and enforcing no-fly zones over hostile territory. Following the 1991 breakup of Yugoslavia, the United States took the lead in NATO air operations to quell the violence that erupted in Bosnia-Herzegovina. In addition to enforcing the no-fly zone established over the region, the air campaign provided aerial surveillance and air drops of humanitarian relief supplies in support of the United Nations Protection Force (UNPROFOR). Following the 1995 Dayton Peace Accords, the United States expanded its

<sup>1</sup> See David Lerman, "No-Fly Zone Over Libya Urged by McCain, Kerry as Gates, Mullen Have Doubts," *Bloomberg*, March 7, 2011, at <http://www.bloomberg.com/news/2011-03-06/no-fly-zone-over-libya-urged-as-mccain-kerry-downplay-risks.html>.

<sup>2</sup> "US Defense Chief: Libya No-Fly Zone a 'Big Operation'," *Voice of America*, March 2, 2011, at <http://www.voanews.com/english/news/US-Defense-Chief-Libya-No-Fly-Zone-a-Big-Operation-117251993.html>.

role by providing ground forces in support of NATO peacekeeping operations.<sup>3</sup> According to the Congressional Research Service, the annual cost of peacekeeping operations (both air and ground operations combined) peaked in FY 1996 at \$2.5 billion (or \$3.4 billion in today's dollars).<sup>4</sup> In 1999, the United States again led a NATO air campaign in Kosovo. Operation Noble Anvil, the US portion of the operation, was designed to destroy Serbian military infrastructure, including its air defenses. The air campaign, which lasted nearly three months and cost a reported \$1.9 billion (or \$2.4 billion in today's dollars) was followed by a deployment of ground forces.<sup>5</sup>

The no-fly zones the United States and its allies enforced over Iraq from 1991 to 2003 also provide a useful comparison. The two components of the Iraq no-fly zone, known as Operation Northern Watch and Operation Southern Watch, covered a combined land area of some 104,600 square miles. As shown in the tables below, the no-fly zones in Iraq cost the United States an average of \$1.0 billion per year from 1996 to 2001, or \$1.3 billion in today's dollars.<sup>6</sup>

**Cost of Iraq No-Fly Zones in Millions of Constant Year FY 2011 Dollars**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	Average
<b>Operation Northern Watch</b>	\$120	\$124	\$178	\$202	\$182	\$184	\$165
<b>Operation Southern Watch</b>	\$779	\$793	\$1,962	\$1,235	\$958	\$1,194	\$1,153
<b>Total</b>	<b>\$899</b>	<b>\$916</b>	<b>\$2,140</b>	<b>\$1,437</b>	<b>\$1,140</b>	<b>\$1,378</b>	<b>\$1,319</b>

The no-fly zones over Iraq also provide insight into the scalability of the costs involved. The northern and southern operations were substantially different in terms of the areas covered, with the northern no-fly zone covering 16,871 square miles compared to 87,729 square miles in the southern no-fly zone. The two operations also used different bases and aircraft and were managed separately, with Operation Northern Watch falling under the jurisdiction of US European Command and Operation Southern Watch conducted by US Central Command.<sup>7</sup> Although the northern no-fly zone operated out of Turkey and primarily used US Air Force aircraft and the southern no-fly zone operated out of Saudi Arabia with support from carriers in the Persian Gulf, the two operations had a similar annual cost per square mile. While operating costs of carrier-based aircraft are higher than those of land-based aircraft, cost figures show that this difference does not seem to be a

3 Nina M. Serafino, "Peacekeeping and Related Stability Operations: Issues of U.S. Military Involvement," CRS Report RL33557, January 24, 2007, p. 3.

4 Ibid., p. 20.

5 Ibid., p. 19.

6 Ibid., p. 19.

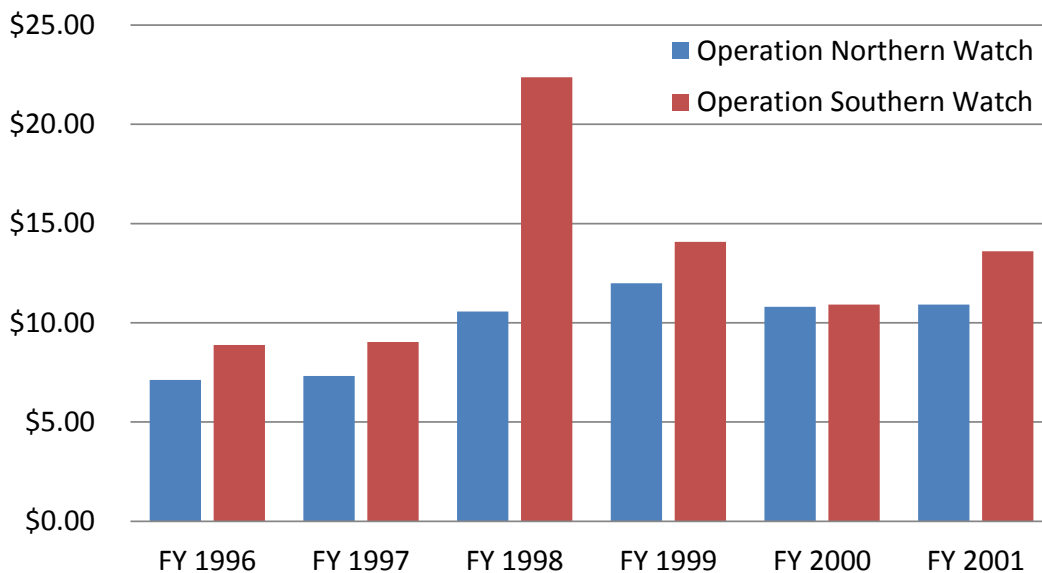
7 Alfred B. Prados, "Iraq: Former and Recent Military Confrontations With the United States," CRS Report IB94049, September 6, 2002, pp. 2, 9.

major factor in the overall cost of the operations.<sup>8</sup> Because pilots flew patterns over the no-fly zone for long periods of time, the transit time to and from the no-fly zone was less of a cost factor. Therefore, the proximity of bases in a no-fly zone is less important from a cost perspective than it would be for normal strike missions.

Despite the significant difference in size between the two no-fly zones, with the southern no-fly zone more than 5 times the size of the northern no-fly zone, the cost per square mile covered was roughly equal. This suggests that, generally speaking, the cost of a no-fly zone scales linearly with the size of the no-fly zone. As shown in the chart below, the cost per square mile varied significantly from year to year within each area of operation, indicating that the cost of maintaining the no-fly zones was highly sensitive to the operational tempo. The spike in costs for Operation Southern Watch in FY 1998, for example, was due to increased activity in the lead up to Operation Desert Fox.<sup>9</sup>

### No-Fly Zone Costs per Square Mile

*(in thousands of FY 2011 dollars)*



### Examining a Range of Options for Libya

A range of options exists for how the United States and its allies could establish a no-fly zone over Libya. Below are three examples that illustrate the variety of options available and the estimated costs of each.

<sup>8</sup> Note: cost figures from the Congressional Research Service reflect only the incremental cost of operating the no-fly zones. If a forward deployed carrier would have been in the Persian Gulf region regardless of the no-fly zone, then the fixed cost of having the carrier in the Gulf would not be counted as part of the no-fly zone cost—only the additional cost of operating aircraft more frequently from the carrier.

<sup>9</sup> Operation Desert Fox was 72 hour air campaign launched in December 1998 against suspected Iraqi chemical, biological, and nuclear sites. The \$93 million cost of Operation Desert Fox is not included in the cost of the no-fly zones.

### Full No-Fly Zone:

The most resource intensive option for establishing a no-fly zone over Libya would be to cover the entire country. Libya is some 680,000 square miles in size, which is significantly larger than the 104,600 square miles covered by the northern and southern no-fly zones in Iraq. Assuming an operational tempo similar to that of the no-fly zones in Iraq, the on-going cost might be in the range of \$100 to \$300 million per week.<sup>10</sup> Because US and allied aircraft would be flying directly over hostile territory and would be within range of Libyan surface-to-air missiles, establishing this no-fly zone could require a series of coordinated strikes to degrade Libyan air defense systems. Depending on the number of ground targets, this one-time strike operation might cost between \$500 million and \$1 billion.<sup>11</sup>



- 10 The lower bound of this cost estimate was determined using the lowest annual cost per square mile observed from FY 1996 to FY 2001 in Iraq divided by 52 weeks, and the upper bound was determined using the highest observed annual cost per square mile divided by 52 weeks. Both figures are rounded to the nearest \$100 million.
- 11 This figure assumes the number of targets would range from 250 to 500 with an average cost of approximately \$2 million per target, since many targets would require multiple cruise missiles or bombs to destroy.

### Limited No-Fly Zone:

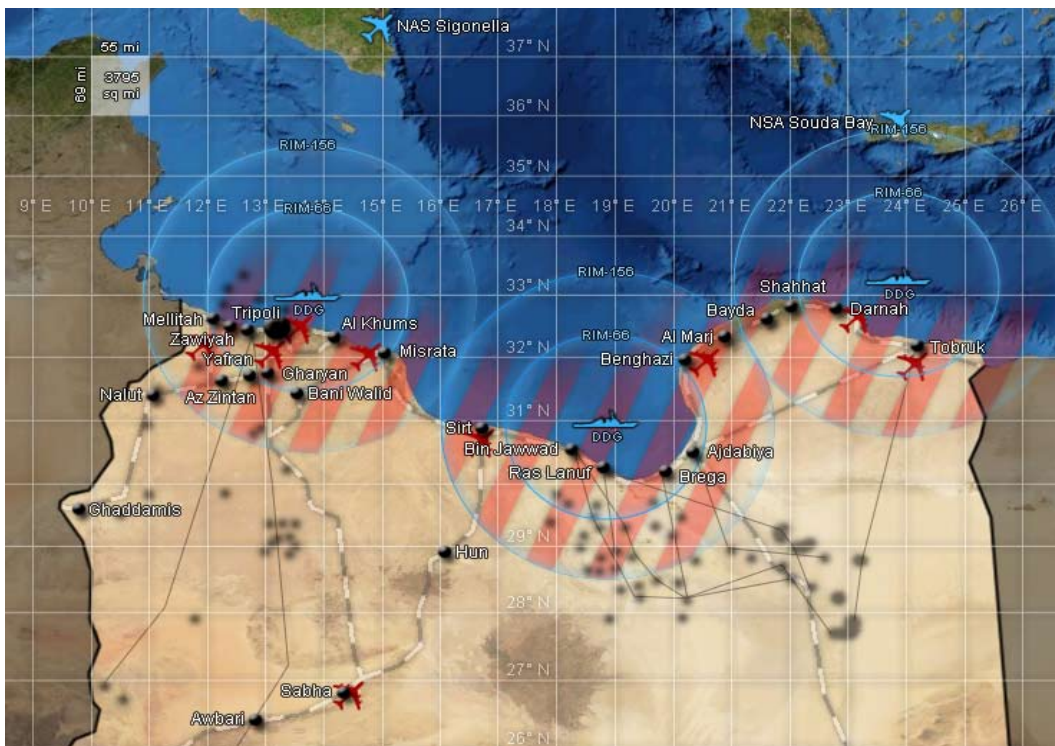
A similar but less resource intensive option would be to establish a limited no-fly zone over the country, covering the major population centers and the locations of reported air strikes against rebels. A no-fly zone extending north of the 29<sup>th</sup> parallel, for example, would cover some 230,000 square miles of Libyan territory—roughly one-third of the country. The on-going cost of maintaining this smaller no-fly zone might be in the range of \$30 million to \$100 million per week. But as in the case of the full no-fly zone option, establishing this type of no-fly zone over hostile territory would require an upfront campaign to degrade Libyan air defenses. Since Libyan air defenses are concentrated along the coastal areas, an area that would be covered by a limited no-fly zone, the number of targets would only be slightly less than in the case of the full no-fly zone and might cost between \$400 million and \$800 million.<sup>12</sup>



<sup>12</sup> This cost figure assumes the number of targets would range from 200 to 400 with an average cost of approximately \$2 million per target.

### Standoff No-Fly Zone:

A third option would be to establish a partial no-fly zone using standoff systems that would take advantage of the fact that the vast majority of Libya's population centers and air bases are located near its coastline. A combination of sea and air assets operating off the coast could enforce a no-fly zone covering most of Libya's contested cities, including those hit by recent airstrikes. Ship-based Aegis radars and land-based AWACS aircraft could identify and track hostile aircraft at long range. Aircraft violating the no-fly zone could be intercepted using ship-based SM-2 surface-to-air missiles or land-based fighter aircraft armed with beyond-visual-range AIM-120 air-to-air missiles. This approach differs substantially from those employed in the Balkans and Iraq, and thus there is no historical cost basis upon which it can be compared. A notional plan would use three Aegis destroyers positioned off the coast in combination with persistent day and night coverage from AWACS aircraft and an associated combat air patrol. Given the operating cost of these systems and related munitions, this approach could cost in the range of \$15 million to \$25 million per week.<sup>13</sup> Importantly, since the aircraft involved would remain off the coast of Libya and US forces would use standoff missiles to intercept aircraft violating the no-fly zone, strikes on Libyan air defenses may not be necessary.



<sup>13</sup> This cost estimate is based on the operating cost of a destroyer (~\$45 million per year), the operating cost of a 24/7 AWACS orbit (~\$330 million per year), and an average hourly operating cost of \$10,000 per fighter. It also assumes that in order to keep three destroyers on station at all times a total of nine destroyers would need to be dedicated to this mission, as is the case with estimates of the European missile defense mission. In addition, it assumes \$2 million to \$8 million per week in munitions. The cost of munitions would likely be higher in the first days and weeks of a conflict and decrease thereafter. For reference an SM-2 cost approximately \$4.7 million per missile and an AIM-120 costs approximately \$1.2 million per missile.

## Conclusion

This analysis reviews the costs of three selected options available to the United States and its allies and partners, should they wish to impose a no-fly zone in Libya. These options, however, should only be considered after political leaders answer a host of critical questions: What is the end-state of the Libyan conflict? How would a no-fly zone achieve this end state? Which nation(s) should take the lead in establishing a no-fly zone and through what international organization, if any, would such an operation be authorized? Over what timeframe would coalition forces be expected to maintain a no-fly zone? Would a no-fly zone be accompanied by additional measures to assist Libyan rebels and civilians, such as supplying limited military aid, intelligence data, or food and medical supplies? Under what rules of engagement would US and coalition forces operate? What legal authorization would such an operation require? Finally, what are the anticipated costs, in personnel and equipment, of establishing and sustaining a no-fly zone? These are among the questions that should be addressed prior to arriving at a decision.

If the United States and its partners decide to impose a no-fly zone, political leaders will have a range of options from which to choose. The options addressed here vary both in terms of the level of coverage involved and the methods used to enforce a no-fly zone. In each case, the costs to the United States could be substantially less if allies and other partner-nations contribute forces to the operation. Although the cost of each option is only one of many factors that should influence the decision on going forward with a no-fly zone, in the current fiscal environment considerations of cost are likely to play a significant role in determining whether and how a no-fly zone is established.

### Summary of Projected Costs for Selected No-Fly Zone Options

	Full No-Fly Zone	Limited No-Fly Zone	Stand-Off No-Fly Zone
<b>Initial Cost</b>	\$500 to \$1,000 million	\$400 to \$800 million	\$0
<b>Weekly Cost</b>	\$100 to \$300 million per week	\$30 to \$100 million per week	\$15 to \$25 million per week
<b>Six Month Total (illustrative)</b>	\$3.1 to \$8.8 billion	\$1.18 to \$3.4 billion	\$0.39 to \$0.65 billion

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