

# Allied Air Power over Libya

## A Preliminary Assessment

Dr. Christian F. Anrig\*

In a private meeting during the Libya crisis summit at the Elysée Palace, French president Nicolas Sarkozy informed US secretary of state Hillary Clinton and British prime minister David Cameron that French combat aircraft were en route to the Libyan coast to enforce United Nations Security Council Resolution (UNSCR) 1973. With none of them objecting, the Armée de l'Air (French air force) opened the allied campaign in the afternoon of 19 March 2011.<sup>1</sup> In these opening strikes, Rafale and Mirage fighter-bombers destroyed several armoured vehicles at the outskirts of Benghazi, the rebel stronghold in eastern Libya.

The initial strikes highlighted specific characteristics of the air operations over Libya. In contrast to the practice found in conventional Western air power doctrine, the campaign did not begin with offensive counter-air strikes to take down the Libyan integrated air defence system (IADS) but sought to produce an immediate impact on the ground. It is also the first allied air campaign of the post-Cold War era in which selected European air forces shouldered a significant portion.

One can argue that French and British decision makers diplomatically and militarily confronted their counterparts with a *fait accompli* before reaching consensus. From a French and British perspective, the situation on the ground dictated the pace, requiring immediate action that only air power could deliver. Finally, on 31 March

2011, 12 days after the initial air strikes, the North Atlantic Treaty Organization (NATO) took over the allied air operations.

### The Opening Diplomatic Moves

In the run-up to the air strikes against Col Mu'ammar Gadhafi's military machine, which was violently oppressing the domestic anti-government movement, France and the United Kingdom forced the diplomatic pace. In late February 2011, Cameron unambiguously stated, "We do not in any way rule out the use of military assets, we must not tolerate this regime using military force against its own people." He went on to add, "In that context I have asked the Ministry of Defence and the Chief of the Defence Staff to work with our allies on plans for a military no-fly zone."<sup>2</sup> For his part, Sarkozy was the first Western leader to acknowledge the Libyan National Transitional Council on 10 March 2011, 21 days after the popular uprising began in Benghazi on 17 February 2011.

Although the United Kingdom and France displayed unusual unanimity, the European Union's view on tackling the crisis in Libya was far from homogeneous. A union summit in early March ended without support for military intervention. On the diplomatic front, a crucial turning point was the Arab League's endorsement of a no-fly zone over Libya on Saturday, 12 March 2011. Amr Moussa, secretary-general of the Arab League, indicated after a six-

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\*Dr. Anrig, who holds a PhD from King's College London, University of London, is deputy director of doctrine research and education, Swiss Air Force. The author of *The Quest for Relevant Air Power* (Air University Press, 2011), he has also published various articles and book chapters covering topics from European military transformation to modern airpower and its ramifications for small nations.

hour-long meeting that “the Arab League has officially requested the United Nations Security Council to impose a no-fly zone against any military action against the Libyan people.”<sup>3</sup> Reportedly, Algeria, Sudan, Syria, and Yemen opposed the Arab League’s vote for a no-fly zone.

While diplomatic support for a no-fly zone gradually grew, the unorganised Libyan rebel forces continued to lose ground to the superior firepower of Gadhafi’s forces, which, after the initial shock of the revolution, started to reorganise and seize the initiative. Besides heavy tanks and artillery, Gadhafi’s forces had a decisive advantage in airborne and shipborne firepower. On 12 March, when the Arab League declared its support for a no-fly zone, forces loyal to Gadhafi reconquered the oil port of Ras Lanuf in eastern Libya, at the gates to the rebel stronghold Benghazi. As a consequence, the situation for the Libyan opposition movement became drastically serious. Gadhafi’s son Saif al-Islam confidently predicted that loyalist forces would soon thwart the revolution, announcing no negotiations with the rebels but a war to the end.<sup>4</sup>

Support for a no-fly zone by Arab nations and the deteriorating situation of the anti-Gadhafi forces on the ground encouraged the United Kingdom and France to step up their diplomatic efforts. Along with Lebanon, the two permanent members of the UN Security Council came up with a draft resolution, increasing the pressure for military intervention.<sup>5</sup> Finally, in the evening of 17 March 2011, the council adopted resolution 1973 by a vote of 10 in favour, with five abstentions (Brazil, China, Germany, India, and Russia). UNSCR 1973 authorised member states, “acting nationally or through regional organizations or arrangements, to take all necessary measures to protect civilians under threat of attack in the country, including Benghazi, while excluding a foreign occupation force of any form on any part of Libyan territory.”<sup>6</sup> Hence, UNSCR 1973 relegated any potential military intervention to the predominant use of air power, avoiding the presence of Western

militaries on the ground of yet another Arab nation.

Two days after the Security Council adopted UNSCR 1973, Sarkozy ordered fighter-bombers to take off towards hard-pressed Benghazi. Critics of the French president argue that he primarily acted on domestic reasons. Whatever Sarkozy’s motivations, the threat of a massacre in Benghazi was imminent in the second half of March 2011 and required immediate military action.

In contrast to the British and French, former US secretary of defense Robert M. Gates used cautious rhetoric at a press conference on 1 March 2011: “All of the options beyond humanitarian assistance and evacuations are complex. . . . We also have to think about, frankly, the use of the U.S. military in another country in the Middle East.”<sup>7</sup> Gates’s words unambiguously signalled scepticism within the Obama administration about militarily intervening in Libya. Adm Mike Mullen, former chairman of the Joint Chiefs of Staff, and Gen James N. Mattis, head of US Central Command, publicly shared his concerns. Accordingly, the secretary of defense might primarily have had humanitarian assistance and evacuation operations in mind when he ordered the two amphibious assault ships USS *Kearsarge* and USS *Ponce* from the Red Sea into the Mediterranean. The focus on evacuation operations and humanitarian relief is underlined by the absence of a carrier strike group and by the fact that 400 additional Marines deployed from the United States to the *Kearsarge* while the 1,400 Marines assigned to the ship were fighting in Afghanistan.<sup>8</sup> In short, Gates questioned the wisdom of militarily intervening in yet another Muslim country.

According to Washington-based commentators, the Obama administration’s passive stance in the opening diplomatic moves partly stemmed from a concern that Arab leaders would have difficulty sanctioning an American-led operation, not to mention the spectre of another protracted military involvement.<sup>9</sup>

## Where Is the Raptor?

On Saturday, 19 March 2011, French combat aircraft entered Libyan airspace at 1:30 p.m. Seeking to obtain an immediate impact, the aircraft aimed at armoured vehicles just outside Benghazi.<sup>10</sup> At night, US Navy ships and Royal Navy submarine HMS *Triumph* launched 112 Tomahawk land-attack missiles (TLAM) against critical nodes of Libya's IADS and fixed-site surface-to-air-missile systems. These cruise missile strikes were followed by three B-2 offensive counter-air sorties against key airfields in Libya. With the Libyan air defences having absorbed serious losses, US Air Force F-15Es from Royal Air Force (RAF) Lakenheath, United Kingdom, and F-16CJs from Spangdahlem Air Base, Germany, as well as US Marine Corps AV-8B Harrier IIs, supported by US Navy EA-18 Growler stand-off jamming aircraft, flew follow-on attacks against Gadhafi's forces outside Benghazi.<sup>11</sup> Given their proximity to the Libyan coast, the *Kearsarge's* six AV-8Bs could fly two sorties per night, demonstrating the advantages of seaborne air power in the opening of the campaign.<sup>12</sup>

During the initial strikes, significant confusion arose about command and control arrangements. According to French official sources, national general staffs commanded their respective assets, and the sorties were coordinated amongst the allies.<sup>13</sup> According to American sources, however, US Africa Command directed coalition operations.<sup>14</sup> The fact that the Norwegians held back their six F-16s on Crete pending clarification of the command and control structure reflected the lack of clarity in command arrangements.<sup>15</sup> Only after NATO had taken over air operations on 31 March did command and control become more integrated. Operations thus shifted from Operation Odyssey Dawn, essentially a coalition of the willing, to Operation Unified Protector, led by NATO.

On Thursday, 17 March, two days before the initial air strikes, Gen Norton Schwartz, chief of staff of the US Air Force, testified

before Congress. Reportedly, he anticipated up to a week's preparation to impose the no-fly zone. Moreover, it was understood that the F-22 Raptor would play an essential role in kicking in the door. Yet the absence of the most advanced fighter aircraft prompted widespread speculation, also by retired US Air Force generals, that the F-22 would have made any allied contributions obsolete and that, for this particular reason, it had to stay away.<sup>16</sup> Given Schwartz's timeline for preparing offensive operations and Gates's focus on evacuation operations, the French might simply have surprised their allies in the afternoon of 19 March 2011. As a consequence, the United States did not have enough time to bring the Raptor into place or to deliberate about the corollaries of an F-22 deployment for US allies.<sup>17</sup> Undoubtedly, the Raptor is the world's premier air superiority fighter, but allied air operations went beyond establishing a no-fly zone, the real challenge having to do with influencing events on the ground. In such an environment, aircraft such as the AV-8B might actually have proven more suitable.

Although one should not take for granted Western, particularly American, capabilities to take down an IADS, the coalition swiftly dealt with air threats. On 24 March, Libyan forces launched a Galeb jet aircraft over Misrata. After it landed, French Rafales destroyed the aircraft on the ground.<sup>18</sup> On a later occasion, Gadhafi's forces reportedly employed agricultural aircraft to bomb fuel tanks in Misrata, but these remained singular incidents.

## A Common European Defence Identity?

The intervention in March put into concrete action what American, British, and French leaders had deliberated in the preceding months. In particular, a new *entente cordiale* was emerging in 2010. In November, for instance, the United Kingdom and France signed treaties foreseeing military cooperation in various areas such

as common support of A400M airlifters, cross-deck operations of aircraft carriers, or maintenance of nuclear warheads. This rapprochement was underlined by increased cooperation between the RAF's Eurofighter Typhoons and the French air force's Rafales.<sup>19</sup> According to Liam Fox, the United Kingdom's secretary of state for defence, cooperation with France was desirable because it met two key criteria: the willingness to deploy and the willingness to spend on defence.<sup>20</sup>

Unlike his predecessor Jacques Chirac, Sarkozy wishes to reinforce French ties with his Anglo-Saxon counterparts. Under his presidency, France returned to NATO's integrated military command structure in 2009. One also sees France's new attitude on an air force level. The US Air Force, RAF, and

in a letter signed by US president Barack Obama, British prime minister Cameron, and French president Sarkozy. Leading newspapers of the three countries published the letter with the intent of demonstrating continued resolve and a united front against Colonel Gadhafi. It even went beyond UNSCR 1973, stating unambiguously that "it is impossible to imagine a future for Libya with Gaddafi in power."<sup>23</sup> The letter appeared after the US military officially ceded its leading role and pulled all combat aircraft from operations in early April. Consequently, doubts emerged, particularly in the United States, about whether NATO air strikes could succeed with US aircraft such as the A-10 Warthog or the AC-130 gunships grounded.<sup>24</sup>

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French air force established strategic studies groups staffed by officers from each organization. According to General Schwartz, this exchange of ideas concerns "how the best air forces in the world mix and match their capabilities for the best defense."<sup>21</sup> These ties were borne out during the campaign itself. In particular, the French and British exchanged and mixed aircrews on the dual-seat Tornado GR4 and Mirage 2000D fighter-bombers. Accordingly, Gen Jean-Paul Palomeros, chief of staff of the French air force, argued in June, "I can tell you the level of confidence with the Royal Air Force is very, very high."<sup>22</sup>

One month after the start of operations, the troika became especially apparent again

Although the United Kingdom and France are willing to make substantial contributions, the situation in Europe as a whole remains very heterogeneous. With regards to Libya, one finds basically three categories of NATO countries: those that conduct offensive air operations; those that relegate their actions to air policing, effectively a non-combat role; and those which fail to appear at all. As of mid-April, only six alliance countries, including France, the United Kingdom, Canada, Belgium, Denmark, and Norway, were conducting strike missions, influencing events on the ground.<sup>25</sup> Canadian forces undertook a particularly swift overseas deployment when six CF-18 and two tanker aircraft departed

from Canada on 18 March, and Canadian combat aircraft reportedly engaged a target near Misrata on 22 March.<sup>26</sup>

Interestingly, the Koninklijke Luchtmacht (Netherlands air force), formerly at the vanguard during the Balkan air campaigns and a significant participant in operations over Afghanistan, was restricted to imposing the no-fly zone. Since early 2010, a marked shift seems to have occurred in Dutch policy, which also led to the Netherlands armed forces pulling out of Afghanistan. In contrast, Belgian aircraft operated across the spectrum of military force. Usually, the role of the two countries had been reversed, the Netherlands military taking a more proactive stance. Belgium's proactive involvement and the active lobbying for an air campaign by Guy Verhofstadt, the liberals' leader in the European Union parliament, put into question remarks made by a prominent British defence scholar in 2004—that Belgium is the most conspicuous example of a European tendency to use military force only reluctantly.<sup>27</sup>

Italy offered lukewarm support of the campaign. Though it provided seven of its air bases, its active military contribution to the air campaign was limited. Having maintained extensive economic ties with Libya, Italy felt uneasy about resorting to military force. In the early stages, eight Italian combat aircraft—four Tornados and four F-16s—reportedly took part in enforcing the no-fly zone.<sup>28</sup> According to an interview with the chief of staff of the Aeronautica Militare Italiana (Italian air force) in mid-June, the Tornados were interdiction strike variants, conducting intelligence, surveillance, and reconnaissance (ISR) missions with Reccelite pods, thus refraining from carrying out air strikes.<sup>29</sup> Yet the Italian air force could have made a much more substantial contribution in the early stages of the campaign. It has a dedicated suppression of enemy air defences (SEAD) variant of the Tornado in its inventory, equipped with AGM-88 high-speed anti-radiation missiles (HARM). The Tornado electronic combat/reconnaissance (ECR) aircraft is in fact one of the world's

most sophisticated SEAD platforms. Interestingly, development of the latest HARM version, the AGM-88E advanced anti-radiation guided missile, originated with a joint venture between the Italian Ministry of Defence and the US Department of Defense. To the author's knowledge, there are no disclosed reports on Italian Tornado ECRs firing anti-radiation missiles against Libya's IADS in the opening of the campaign. By not unleashing the full potential of these dedicated SEAD aircraft, the Italian air force missed an opportunity to punch above its weight. Only from late April onwards did that air force become involved in offensive strike missions, using almost the complete inventory of precision-guided munitions (PGM). After the Italian air force's MQ-9 Predator B/Reaper remotely piloted aircraft achieved initial operational capability, Italy again found itself in a position to provide a special capability to the campaign.<sup>30</sup>

Yet the global financial downturn had a severe effect upon Italy's budget. As a cost-saving measure, Italy removed its aircraft carrier *Giuseppe Garibaldi* from the operational theatre in July. Earlier, in late June, Italian decision makers called for a ceasefire, manifesting Italy's ambiguous position towards the allied campaign.<sup>31</sup> Since the Italians could not afford not to shape Libya's future, they were literally forced to participate in the operations. Doing so rather reluctantly, they attempted to mitigate military operations.

It is also interesting to look at the European non-contributors, Germany foremost amongst them. A dilemma between its strong emphasis upon NATO as the bedrock for German security and the country's reluctance to employ its armed forces across the spectrum of military force—a prerequisite for making credible contributions to alliance operations—will likely persist. Germany's historical legacy still exerts tremendous inertia upon a proactive defence policy. For the foreseeable future, the use of military force will remain a sensitive issue for the German constituency. Nevertheless, the German military has developed into bal-

anced forces in the post-Cold War era, particularly in the last decade. As such, Germany has evolved as a key player in several air and space dimensions, including synthetic aperture radar satellite reconnaissance/surveillance, theatre ballistic missile defence, or deep strike by acquiring an impressive number of indigenous air-launched cruise missiles. Moreover, it has retained niche capabilities such as a very sophisticated and proven SEAD capability. In 1999 a lean Luftwaffe (Bundeswehr) (German air force) SEAD component, including 10 Tornado ECR aircraft, released approximately one-third of all HARM missiles expended during Operation Allied Force.<sup>32</sup> By opting out of military operations against Gadhafi, Germany missed a further opportunity to translate the German air force's new potential into effective operational output.

Equally interesting is the absence of the new NATO countries—the former Warsaw Pact nations, in particular Poland, which operates an advanced F-16 attack force. One might speculate three reasons for their absence: lack of operational preparedness, lack of funding for deployed fighter operations, or lack of political willingness to contribute—the latter due perhaps to Gates's lukewarm support for operations against Gadhafi. Eastern European nations, particularly Poland, put a premium upon staying in line with American goals—hence their support in 2003 for Operation Iraqi Freedom. With the United States ceding its leading role in Unified Protector, Poland might have felt less inclined to get involved.

Besides the NATO allies, Sweden, Qatar, the United Arab Emirates, and Jordan have taken part in the operations. For Sweden this meant the first deployment of combat aircraft to a real operation since the early 1960s, when Swedish fighter-bombers supported UN operations in the former Belgian Congo. Initially, this Nordic country with a legacy of neutrality deployed eight JAS 39 Gripen aircraft, their employment relegated to air policing and reconnaissance. On 1 May, Mirage 2000-9s of the United Arab Emirates, up to that time restricted to air

policing, reportedly were carrying PGMs and targeting pods. Actual strikes, however, could not be confirmed at the time.<sup>33</sup> For its part, Qatar deployed six Mirage 2000-5s to Crete and flew that country's first air-policing sorties on 25 March alongside French Mirage 2000-5s, marking the first combat mission of an Arab League nation against the backdrop of operations over Libya.<sup>34</sup>

To conclude, Europe's defence political fragmentation will persist, and Libya has offered the latest examples of this political reality. Historical national experiences are too different when it comes to the use of military force. Yet as the Libya campaign aptly highlights, no carved-in-stone patterns about particular national behaviours exist. Who could have foreseen the reversed roles between Belgium and the Netherlands or, even more tellingly, the “renewal” of the entente cordiale between Britain and France, particularly after the fierce debates against the backdrop of the invasion of Iraq? In early 2003, Donald Rumsfeld, former US secretary of defense, divided Europe into the new and old. Establishing such fixed patterns, however, does not adequately address the problem. National historical experiences as well as the context of a particular campaign, regarding both domestic and foreign policies, will likely determine European contributions and the resulting European force mix. As such, it is also highly unlikely that Europe as a whole will ever bring to bear its full military potential for a specific political purpose.

Accordingly, the author argued in an article published in 2009 that, although one cannot expect all European alliance partners to contribute to a particular operation, it is realistic to assume that any two of the larger European air forces, combined with a number of smaller air forces, will commit themselves. Hence it is vital that the RAF, the French air force, or the German air force retain a balanced core of air power capabilities that the smaller European air forces can augment.<sup>35</sup> Provision of this European core of air power capabilities by the RAF and the French air force could success-

fully sustain the air operations over Libya. Yet as this article further analyzes below, a significant imbalance exists between combat air assets and force enablers such as air-to-air refuelling. This disequilibrium between the spear and the shaft will likely hamper European operations in the future. In the case of Libya, significant US support in the domain of force enablers and the geographical proximity of Libya could mitigate the problem.

### Depleted Munitions Stocks?

On 15 April, less than a month into the Libyan air campaign, the *Washington Post* published an article entitled “NATO Runs Short on Some Munitions in Libya.” Observers quickly concluded that the Libyan campaign lay far beyond French and British capabilities. Probably the most prominent of those critics, John Pike, director of GlobalSecurity.org, argued that Libya “has not been a very big war. If [the Europeans] would run out of these munitions this early in such a small operation, you have to wonder what kind of war they were planning on fighting. . . . Maybe they were just planning on using their air force for air shows.” The *Washington Post* article founded its assertion on vaguely citing senior NATO and US officials, and it prominently highlighted long-standing controversies over transatlantic burden sharing.<sup>36</sup>

In response to this article, the chairman of NATO’s military committee as well as British and French officials denied any reports on depleted munitions stocks. Current consumptions of British and French PGM stocks reportedly did not inhibit the conduct of the air campaign.<sup>37</sup> Unlike the United States, which maintains a relatively constant production flow, the United Kingdom and France buy munitions in batches and stockpile them. Depletion of the stocks means that production lines must restart, and the retooling of factories consumes additional money and time.<sup>38</sup> In the case of the British Brimstone PGM, the

European missile manufacturer MBDA started to equip the United Kingdom’s existing stockpiles with upgraded dual-mode seekers. The company also noted that if the tempo of the campaign slowed down, the “high tempo” of conversion would decrease significantly.<sup>39</sup> In a statement as of 23 June 2011, Dr. Liam Fox, secretary of state for defence, estimated the United Kingdom’s costs of replenishing munitions for a six months’ campaign at £140 million (approximately \$220 million).<sup>40</sup>

In the air-to-ground role, the RAF has so far used a complementary mix of PGMs, consisting of Paveway II, Paveway IV, and dual-mode-seeker Brimstone munitions. In the second half of May, the RAF also deployed Paveway III, a 2,000-pound bunker-buster weapon, to Gioia del Colle Air Base in southern Italy.<sup>41</sup> While the service readied the Typhoon to release Paveway II in the early days of the campaign, its Tornado GR4s normally carried a mix of the lighter Paveway IV together with up to six dual-mode-seeker Brimstone munitions. The latter provided the RAF with extra leeway to engage mobile targets. The weapon was originally designed as a “fire and forget” anti-tank missile for use against massed enemy armour using a millimetre wave seeker. Since avoiding collateral damage is pivotal in operations in Afghanistan, an objective that requires a “man in the loop,” some Brimstone munitions came fitted with a semiactive laser. According to *Jane’s Defence Weekly*, French defence officials were impressed with the performance of the dual-mode-seeker Brimstone. US officials reportedly showed similar interest.<sup>42</sup> Given its limited size, Brimstone allows conducting surgical strikes in areas having significant potential for collateral damage.<sup>43</sup> As such, RAF Tornado GR4 fighter-bombers employed the weapon effectively not only against main battle tanks and armoured personnel carriers but also against targets such as surface-to-air-missile launchers or military radar stations.<sup>44</sup>

In the opening strikes of the Libyan campaign, a Rafale reportedly destroyed a Libyan

tank at a stand-off range of 55 kilometres (km) by means of an *armement air-sol modulaire* (AASM), or modular air-to-surface armament, essentially an all-weather PGM propelled by a rocket booster. Depending on its release altitude, it can engage targets at close or medium ranges exceeding 50 km with various options of terminal impact angles. Currently, two guidance systems are available; the more sophisticated one integrates an infrared imager seeker with a combined inertial measuring unit/Global Positioning System receiver navigation kit. Delivery of a third guidance system specifically adapted for engaging mobile targets is expected for 2012. In April 2008, Rafale fighter-bombers engaged Taliban positions with AASMs for the first time.<sup>45</sup> Like Brimstone, the weapon has thus proved effective in both the Afghanistan and Libya theatres. Yet with the third guidance system not yet operational, current AASMs are not suited for engaging mobile targets—hence France's interest in the United Kingdom's dual-mode-seeker Brimstone. French forces have also extensively relied on Paveway II and enhanced Paveway II kits of US provenance.<sup>46</sup>

In the light of operational needs, the French arms supplier Sagem had sped up AASM production since the start of the air campaign.<sup>47</sup> Not only has the French industry's ability to respond to urgent and unforeseen requirements improved but also larger stocks of PGMs have accrued since Allied Force in 1999. "Since the Kosovo campaign," General Palomeros mentioned in a June 2011 interview, "we knew we could not afford a shortfall in munitions, so we gradually built up stocks. That's why we started this campaign, with Afghanistan going on, with reasonable stocks. We thought it could be a long-term campaign, so we started to optimize stocks with an eye to the future. There was no crash program to execute this campaign. In the past, we had to go for crash programs because we ran dramatically short." Also with regards to aircraft serviceability, General Palomeros was very confident in his air force's ability to run a protracted campaign.<sup>48</sup> Despite these im-

provements, French industrialists perceive the need to further optimise their ability to deal with sudden surge requirements, combined with their customers keeping even larger stocks.<sup>49</sup>

In line with the French armed forces' overall good performance in keeping up with the operational pace of Libyan operations, on 12 July the French parliament authorised, with an overwhelming majority, an extension of France's military involvement.<sup>50</sup> A month earlier, Gen Sir David Richards, the United Kingdom's chief of the Defence Staff, declared that British operations in Libya could continue for as long as necessary.<sup>51</sup> Unlike their British and French counterparts, however, smaller nations involved in the campaign have found it more difficult to keep pace with the air campaign. Both Norway and Sweden confirmed on 15 June that they meant to scale back their contributions.<sup>52</sup> The Flyvevåbnet (Danish air force), which had dropped in excess of 500 PGMs by mid-June and faced severe shortages, expected to have its stocks topped up by purchases from the United States and the Netherlands.<sup>53</sup> Given the limited size of Denmark, the number of PGMs expended is impressive. Yet smaller nations which lack an industrial base for indigenously producing munitions find that engaging in protracted offensive air campaigns represents a major challenge for their air forces. One cannot establish whether the RAF's dispatching four additional Tornado GR4 fighter-bombers in July represents a direct response to the Norwegian and Swedish announcements. Nevertheless it effectively made up for their decreased involvement.<sup>54</sup>

Libya also saw the employment of cruise missiles by European air forces. During the first night of operations, British Tornado GR4 fighter-bombers flew long-distance sorties from RAF Marham, their home base in the United Kingdom, to deliver Storm Shadow cruise missiles, dubbed "Scalp" in France, against unspecified targets.<sup>55</sup> Within a couple of days, fighter-bombers from both the French air force and navy attacked an

isolated air base 250 km south of the Libyan coast by means of Scalp cruise missiles.<sup>56</sup> Like its French counterpart, the Italian air force also used Storm Shadow cruise missiles operationally for the first time.<sup>57</sup> Libya thus provided the first occasion in which Continental European air forces employed these air-launched weapons. Yet, unlike the Royal Navy, which contributed to the initial cruise missile strikes against Libya's IADS, the French navy was not in a position to do so. In contrast to their British counterparts, French decision makers put a premium upon French defence industrial autonomy in strategic key areas. Instead of purchasing TLAMs of US provenance, France embarked upon its own naval cruise missile programme. On 8 June 2011, an underwater platform fired a prototype of the Scalp naval (maritime Scalp), simulating a submarine launch. This policy allows the French to develop and retain key competencies, but it does not immediately address operational requirements—the weapon was not ready in time for operations in Libya. A future campaign, however, will see a European maritime cruise missile capability.

## The Air Campaign Unfolds

Prior to NATO's taking over air operations in support of UNSCR 1973, America essentially led the campaign, with the US Air Force bringing to bear a vast array of capabilities. As such, units participating in Odyssey Dawn included B-2 stealth bombers from the 509th Bomb Wing at Whiteman AFB, Missouri; F-15Es from RAF Lakenheath, United Kingdom; F-16CJs—dedicated SEAD aircraft—from Spangdahlem Air Base, Germany; or EC-130 Commando Solo psychological operations aircraft from the 193rd Special Operations Wing, Pennsylvania Air National Guard.<sup>58</sup> Although each of these aircraft offered unique capabilities, KC-135 tanker aircraft were about to make the US Air Force's key contribution for the remainder of the campaign. According to the chief of staff of the French air force, they should

dered approximately 70 per cent of NATO's air-to-air refuelling, highlighting the European gap in this important domain of air power.<sup>59</sup> In light of the United Kingdom's expecting its new Airbus tankers, the RAF managed to muster just three of its 1960s-vintage VC10 air refuelling aircraft to support air operations over Libya.<sup>60</sup>

Just prior to the United States' pulling out all combat aircraft from operations over Libya in early April, the Department of Defense announced that the A-10 and AC-130 had begun operations over Libya on 26 March.<sup>61</sup> Both aircraft, especially suited for this particular campaign, thus made only brief appearances.

NATO's assumption of operations over Libya on 31 March 2011 coincided with the adaptation of Gadhafi regime forces to the air strikes by shifting to non-conventional tactics. Libyan government forces started to blend in with civilian road traffic and to use civilians as a shield for their advance. On many occasions, they used pick-up trucks and technicals instead of main battle tanks and armoured personnel carriers. Moreover, weather conditions deteriorated for a few days. Against this backdrop, Gadhafi's regime forces partly seized the initiative again and recaptured territory in eastern Libya, once more posing a threat to the rebels in Benghazi.<sup>62</sup> At the time, many Western commentators blamed NATO for not dealing with the situation. Yet the regime forces' gradual shift to non-conventional tactics was a natural consequence of the air strikes insofar as they aimed to mitigate the effectiveness of Western air power.

As a result, allied air power had to adapt to the regime forces' non-conventional tactics—witness the efforts of the French armed forces. From 7 to 14 April, French air force and naval aviation flew 20 per cent of the overall NATO sorties and 25 per cent of the offensive sorties, neutralising slightly more than 20 targets, of which 15 were military vehicles and five artillery pieces, including one multiple rocket launcher.<sup>63</sup> One and a half months later, from 26 May to 2 June, the French

conducted 30 per cent of the overall offensive sorties, enabling them to take out twice as many targets.<sup>64</sup> From 23 June to 1 July, French efforts neutralised approximately 100 targets, of which 60 were military vehicles, including tanks and armoured personnel carriers, and 10 were artillery positions.<sup>65</sup> Just prior to the pulling out of the French aircraft carrier *Charles de Gaulle*, from 3 to 11 August, targets destroyed by French aviation peaked at 150, among them 100 military vehicles and 20 artillery pieces, including multiple rocket launchers.<sup>66</sup>

In the initial strikes, French combat aircraft operated from the French mainland and from Corsica. To save transit time, those aircraft gradually forward-deployed to Souda Bay, Crete, and later to Sigonella, Sicily.<sup>67</sup> The composition of the French contingent changed over time. In mid-August, after pulling out the *Charles de Gaulle*, France had eight Mirage 2000D, four Mirage 2000N, and four Mirage F1 strike aircraft at Souda Bay. Five Rafale multirole aircraft were stationed at Sigonella.<sup>68</sup> According to official French sources, with these aircraft in place at forward-deployed bases, French armed forces continued to conduct one-third of the offensive sorties.<sup>69</sup>

The *Charles de Gaulle* supported combat operations from 22 March until 12 August, when it returned to its home port Toulon in southern France. Counting its previous deployment to support operations in Afghanistan, it operated more than eight months at sea with a brief break at the beginning of March. The carrier's air component included Rafale and Super Etendard Modernisé strike aircraft, E-2C Hawkeyes, and a combat search and rescue component.<sup>70</sup>

Naval gunfire complemented the air strikes, with British and French navy vessels contributing to lifting the siege of Misrata. In the night from 7 to 8 May, for instance, the French navy frigate *Courbet* detected rocket launchers firing into the city and, after receiving authorisation, effectively engaged the targets.<sup>71</sup> Royal Navy vessels supported air strikes by firing illumination rounds, al-

lowing fixed-wing aircraft to engage regime targets accurately, and like their French counterparts, they engaged artillery positions along the shoreline.<sup>72</sup>

In mid-April, after the United States had ceased its lead in offensive operations against Gadhafi's regime, the *Washington Post* claimed that the US armed forces were doing virtually all of the ISR and "thus are chiefly responsible for targeting."<sup>73</sup> True, the United States continued to make significant contributions to ISR, but the newspaper's claim completely ignores European ISR assets involved in the campaign.

Accordingly, the chief of staff of the French air force put into perspective American contributions in an interview of June 2011. Although he acknowledged the vital US support in air-to-air refuelling, European reliance upon American ISR was less severe. In particular, he highlighted the French air force's and navy's role in supplying the coalition with imagery intelligence by means of the Rafale's advanced digital reconnaissance pod.<sup>74</sup> The French navy also deployed maritime patrol aircraft to Souda Bay, those platforms performing surveillance and guiding coalition strike aircraft.<sup>75</sup> Moreover, the Harfang—the French medium-altitude, long-endurance remotely piloted aircraft (MALE RPA)—conducted its first sortie over Libya on 24 August.<sup>76</sup> Finally, one should note that France is the European key player in military satellite ISR.

Within the first 24 hours of Odyssey Dawn, the RAF's Sentinel R1 Airborne Stand-Off Radar aircraft, essentially an equivalent of the E-8 Joint Surveillance Target Attack Radar System, began to conduct wide-area surveillance.<sup>77</sup> Given the size of Libya, it provided NATO with a unique capability. In particular, it proved instrumental in cueing the US Air Force's MALE RPAs, which then identified targets and cleared them for air strikes.<sup>78</sup> During the siege of Misrata, US Air Force MQ-9 Predator RPAs were crucial in identifying regime forces in built-up areas.<sup>79</sup> In the ensuing sensor-to-shooter loop, NATO, US Air Force, RAF, or

French E-3 Airborne Warning and Control System aircraft relayed attack authorisations from the combined air operations centre at Poggio Renatico in northern Italy to NATO's strike aircraft.<sup>80</sup>

According to a statement by Brig Gen Mark van Uhm, chief of allied operations at NATO's Supreme Headquarters Allied Powers, Europe in late April, only 10 per cent of the daily sorties represented designated targets; dynamic strikes dealt with the remainder. In these cases, strike pilots regularly loitered for a couple of hours in search of targets.<sup>81</sup> Hence, a vast proportion of air strikes must have taken place within the framework of armed reconnaissance missions along the main lines of communications and, as such, must not have required an extensive ISR network.

About a month after NATO had taken charge of the air operations, it claimed to have degraded Gadhafi's military machinery by one-third.<sup>82</sup> Against the backdrop of an apparent stalemate, these claims seemed to lack credibility. The target sets consisted of military headquarters; communications nodes; ammunition bunkers; defence radar sites; artillery pieces, including multiple rocket launchers; tanks; armoured personnel carriers; armed vehicles; and other military assets. The French effort, as examined above, concentrated on fielded forces that immediately threatened the civil population. This focus, however, did not preclude taking out operational- and strategic-level headquarters. Unlike Allied Force, this operation included no dispute about the most effective centres of gravity. In 1999 some military leaders were not inclined to emphasize the destruction of Serb forces in the field.<sup>83</sup> Despite NATO's continued focus on fielded forces, better-armed regime troops have forestalled rebel advances. As of late June, the Western Mountains south of Tripoli represented the only front where the rebels had steadily advanced.<sup>84</sup>

The extremely fluid situation on the ground in the early stages of the campaign complicated the synchronization of ground manoeuvres and air strikes. Unlike the

early phases of Operation Enduring Freedom, during which American special operations forces tightly synchronised air strikes with Northern Alliance movements, the political situation dictated that NATO air power not serve as the immediate air arm of the rebels.<sup>85</sup> Thus NATO air power occasionally hit rebel forces, particularly when they used tanks.<sup>86</sup> Synchronisation also proved difficult because the rebel forces lacked effective organization.

By early June, coordination of air and ground manoeuvres had reportedly improved.<sup>87</sup> Yet one might attribute this to the fact that the front lines had become less fluid and more rigid. Due to the UN mandate, NATO confirmed that the coalition forces and rebels still had no direct-line communications between them.<sup>88</sup> Coalition aircraft also minimised collateral damage by using only PGMs, a landmark for Western air power.<sup>89</sup>

Like its French counterpart, the RAF shouldered a heavy burden of the air attacks and proved its effectiveness once more. Over the weekend of 9 to 10 April, for instance, NATO reportedly destroyed 61 armoured vehicles and air defence assets, the RAF engaging one-third of the targets.<sup>90</sup> In the second half of May, RAF attack aircraft also engaged Gadhafi's navy. On 19 May, they destroyed two corvettes at the naval base at Al Khums, the nearest military harbour to the port of Misrata, as well as a facility in the dockyard that constructed fast, inflatable boats. By means of the latter, regime forces intended to mine the harbour of Misrata and attack nearby vessels.<sup>91</sup> The RAF particularly excelled through demanding targeting. On 17 August, RAF attack aircraft engaged a small tugboat under way at sea with a laser-guided Paveway bomb. This action required the aircrew to track the moving target with the laser designator.<sup>92</sup> According to sources in the United Kingdom, the RAF had flown approximately 90 per cent of its combat missions against dynamic targets, which are more demanding than pre-planned static objectives.<sup>93</sup> As of 24 August 2011, UK forces had destroyed

over 890 former regime targets, including several hundred tanks, artillery pieces, and armed vehicles.<sup>94</sup> When the street fighting started in Tripoli, RAF aircraft maintained a presence over the city, destroying military intelligence facilities in a pre-dawn strike on 21 August or engaging heavy weapons such as main battle tanks on the outskirts of Tripoli.<sup>95</sup> Interestingly, British attack aircraft staged a mini Scud hunt on 24 August, destroying three Scud-support vehicles near Sirte, a site from which former regime forces launched Scud ballistic missiles against the city of Misrata.<sup>96</sup>

As in the case of the French air force, the RAF contingent changed over time. Originally, the UK fighter force consisted of 10 Typhoons in the air defence role and eight Tornado GR4s in the attack role. Libya was a first for the Eurofighter Typhoon. Two days after the start of the air campaign, on 21 March 2011, RAF Typhoons patrolled the Libyan no-fly zone, their first-ever combat mission. However, the air-to-air component gradually decreased in favour of the attack component. In early April, two Typhoons returned to the United Kingdom, while the addition of four aircraft boosted the Tornado GR4 component to a total of 12. Simultaneously, four of the remaining eight Typhoons had shifted from air defence to ground attack. The resulting 16 ground-attack aircraft allowed the RAF to provide a quarter of NATO's ground-attack assets.<sup>97</sup> In the second half of July, the RAF once more boosted its attack and reconnaissance capabilities by deploying another four Tornado GR4s, one of them equipped with a reconnaissance pod. Henceforth, the RAF operated 16 Tornado GR4s and six Eurofighter Typhoons from Gioia del Colle Air Base in southern Italy.<sup>98</sup> Notably, the combat-proven Tornado GR4 remained the RAF's preferred aircraft.

## Task Force Hawk Coming of Age

During the course of Allied Force, Gen Wesley Clark—supreme allied commander,

Europe—assembled Task Force Hawk in Albania, intending to bring more pressure to bear against Slobodan Milošević, then president of the former Federal Republic of Yugoslavia. Task Force Hawk's main manoeuvre element was its Apache combat helicopter component. After Clark's several attempts to request permission to employ the Apaches, Washington finally turned him down. The Joint Chiefs of Staff had severe concerns about risking sophisticated combat helicopters to attack tactical forces. According to Clark, though, the Apaches could identify targets from across the border that fixed-wing aircraft had not struck.<sup>99</sup>

Twelve years later, in May 2011, the resolve to deploy combat helicopters gradually grew both in the United Kingdom and France in order to further restrain the ground manoeuvres of Gadhafi's forces. In the night from 3 to 4 June, French and British combat helicopters for the first time engaged ground targets. British Army Apache helicopters, launched from helicopter carrier HMS *Ocean*, operated in the area of Brega, helping to soften the front deadlock in eastern Libya. They reportedly faced incoming fire.<sup>100</sup> Despite the threat, *Ocean* again launched its combat helicopters the next night to engage multiple-launch rocket systems.<sup>101</sup> French and British combat helicopters operated in close cooperation with fixed-wing aircraft, the latter gathering intelligence both to select targets and to provide assessments of potential surface-to-air-missile threats. They also remained on stand-by to launch complementary strikes.<sup>102</sup>

British Army Apache helicopters engaged both ground and maritime targets in the area of Misrata. On a raid in early June, they first destroyed high-speed inflatable boats attacking the harbour of Misrata and then opened fire on a ZSU-23-4 self-propelled anti-aircraft gun near Zlitan as well as a number of armed vehicles, displaying the flexibility of helicopter operations in this particular theatre.<sup>103</sup>

Launched from the amphibious assault ship *Tonnerre* in the night from 3 to 4 June,

Tigre and Gazelle combat helicopters engaged approximately 20 ground targets.<sup>104</sup> Like their British counterparts, the French army combat helicopters reportedly faced incoming fire by man-portable air defence systems. In the first week of French helicopter operations, the number of destroyed military vehicles increased. Amongst the 70 targets destroyed by French forces from 2 to 9 June, approximately 40 were military vehicles, two-thirds of them destroyed by helicopters.<sup>105</sup> In mid-August, French attack helicopters, launching from the amphibious assault ship *Mistral*, conducted a major interdiction strike. Ten of them struck at two choke points along the lines of communications west of the front deadlock at Brega, destroying several vehicles, surveillance radars, and defensive positions.<sup>106</sup>

Unlike the Americans in 1999, the British and French might have perceived their combat helicopters as an important means of making up for their limited fixed-wing assets in order to run a sustained and protracted air campaign. General Clark also noted a profound difference in the ways of war. Specifically, the United States musters overwhelming force to produce decisive results at the least cost of lives. In contrast, former European colonial powers have a history of fighting outgunned and outnumbered. Thus in 1999, “European officers saw a leaner campaign, focused on Kosovo, characterized by more flexible and daring tactics. They were prepared to take greater risks with their troops and to ask for less from the supporting arms such as artillery and airpower.”<sup>107</sup> This attitude is also reflected in the French air force’s initial strikes on 19 March 2011. Some commentators were quick to play down the risks involved, arguing that the French had identified a gap in the fixed-site air defence system, but the threat of mobile surface-to-air missiles undoubtedly remained.

## Drawing upon Comparative Advantages

In his book *The Causes of Wars*, renowned British scholar Sir Michael Howard outlined four dimensions of strategy: the social, operational, logistical, and technological. In his view, “no successful strategy could be formulated that did not take account of them all, but under different circumstances, one or another of these dimensions might dominate.”<sup>108</sup> The German Wehrmacht of World War II, for instance, is a prime example of an armed force that attempted to exploit the operational dimension. On most occasions outgunned and outnumbered, it nevertheless remained confident of achieving victory by virtue of superior skills in the operational dimension. Yet as the logistical dimension started to dominate, superior allied resources both in equipment and manpower undermined this German strategy. The technological dimension very much shaped the battle of the Atlantic. The British achievement in breaking the Enigma code, combined with US and British advances in anti-submarine warfare, gave the Western allies the decisive advantage to secure a safe passage across the Atlantic and to mitigate the German U-boat threat to a “tolerable” level. Counterinsurgency campaigns, such as France’s or the United States’ involvement in Vietnam are by their very nature dominated by the social dimension while one strives for success in the operational dimension. As recent campaigns have borne witness, winning hearts and minds is extremely difficult. Can Western armed forces effectively bring across their benign intentions in a culturally alien environment?

Hinging upon air and naval power, the Western alliance could confine its intervention to the operational and technological dimensions as the predominant ones, both with regards to Libya, the wider Arab community, and their domestic constituencies. Support for the campaign in France and the United Kingdom did not wane. The zero own-casualty toll, enabled by air power’s

superior technology, might have significantly contributed to this public backing. In the absence of ground troops in Libya, France disclosed on 29 June its having air-dropped weapons to rebel fighters in the Western Mountains south of Tripoli—the first time that a Western country acknowledged arming the rebels.<sup>109</sup> Qatar, for its part, reportedly supported the rebels by funnelling arms into Benghazi from where they were further distributed to the various fronts, also by air. Moreover, various allied countries sent military-liaison advisory teams to support the National Transitional Council, and Western alliance special forces evidently offered immediate advice to rebel front-line forces. All of these measures fall short of deploying regular ground forces with a large footprint into the theatre.

By staging successive offensives, Western forces have repeatedly attempted to turn the Afghan conflict into a situation dominated by the operational dimension. Though most of these offensives have been militarily successful, the conflict remains dominated by the social dimension, making it nearly impossible for the West to effect decisive results at the strategic level, even after 10 years of continuous deployments.

In the 1970s and the 1980s, the United States confined its military involvement in the Persian Gulf to carrier strike groups and naval air power without a single boot on the Arabian Peninsula. “Offshore balancing” allowed the United States to secure its oil interests effectively at the least price. Against the backdrop of Michael Howard’s theory on the dimensions of strategy, the reason for this becomes obvious. By concentrating on the maritime and air environments, the United States could draw upon comparative advantages while at the same time managing to avoid becoming an occupying force and arousing grievances in the local populations. This was no longer the case in the 1990s. Osama bin Laden’s speeches and sermons drew attention to the massive Western, particularly American, military presence on the Arabian Peninsula. In this regard, the American scholar Robert Pape,

author of *Bombing to Win: Air Power and Coercion in War* and the more recent book *Dying to Win: The Strategic Logic of Suicide Terrorism*, argues that the presence of American ground troops in Muslim countries is the main factor driving suicide terrorism. According to this logic, Islamic fundamentalism is not the principal driving factor of suicide terrorism against the United States’ interests, thus explaining the absence of al-Qaeda terrorists from Iran or Sudan, which harboured bin Laden in the 1990s. Suicide attacks aimed against the West, however, surged in Iraq after Western forces with a different religious background occupied that country. This difference in religion between the occupier and the occupied community is—according to Pape—the key reason for suicide attacks. Prior to Iraqi Freedom, Iraq reportedly had never experienced a suicide terrorist attack.<sup>110</sup>

From this vantage point, arguments made by various commentators like retired general Henning von Ondarza, former commanding officer of Allied Forces Central Europe, that called for ground troops to control the situation in Libya do not take account of all dimensions of strategy.<sup>111</sup> Although such an approach might have delivered swift military results in the operational dimension, “infidels” on the ground scoring decisive victories and “occupying yet another Muslim country” might have led to strategic backlashes, with the great potential of the social dimension becoming the predominant one. Western boots on the ground, also not backed by the Arab League, would likely have caused massive grievances, including suicide terrorism. The very fact that the Western alliance refrained from deploying ground units helped retain the intervention in a situation that placed the operational and technological dimensions at the forefront, despite concerns about collateral damage and international objections to issues such as air-drops of weapons supposedly violating UNSCR 1973.

Most interestingly, making sure that the operational and technological dimensions remain predominant helps to prevent sig-

nificant strains in the logistical dimension of strategy. According to the UK Defence Committee's fifth report as of 19 July 2011, estimates of additional costs of operations in Afghanistan during the current year amount to just over £4 billion (approximately \$6.3 billion). Yet the report admitted that the total costs of operations in Afghanistan remain unknown.<sup>112</sup> In contrast, Secretary of State for Defence Fox estimated the costs of six months of military operations in the framework of Operation Ellamy, the United Kingdom's contribution to the allied effort in support of UNSCR 1973, at £260 million (approximately \$410 million). This figure includes the cost of replenishing munitions.<sup>113</sup> Accordingly, one can estimate an entire year at approximately £520 million (approximately \$820 million). Even though very rough estimates, these figures by no means fail to reveal the large discrepancy between the costs of UK operations in Afghanistan and Operation Ellamy in Libya.

To put the UK costs involved into perspective, the RAF was providing about a quarter of the ground-attack assets as of mid-April.<sup>114</sup> Given the estimated yearly UK costs of \$820 million and its estimated 25 per cent share of the offensive air campaign, about \$3.3 billion would theoretically cover the costs of an entire operation at the current pace for a year's duration. Particularly expensive were TLAMs launched from US Navy ships to shut down Libya's IADS and other strategic key targets at the onset of the campaign. The approximate cost of missiles and other American munitions expended from 19 to 28 March comes to \$340 million.<sup>115</sup> The above figures combined would be significantly less than the United Kingdom's estimated additional costs of operations in Afghanistan during 2011.

Towards the end of Operations Northern and Southern Watch over Iraq, Gen John P. Jumper, then the Air Force chief of staff, argued that the air blockades caused his service to fly some aircraft longer than the average amount of time. However, he was not certain whether doing so would actually result in more wear and tear on the fleet

since the majority of missions did not involve violent manoeuvring.<sup>116</sup> The degree to which European air forces in Libya will feel the effects of increased wear and tear and additional costs involved remains to be seen. Based upon Jumper's comments on the US Air Force's experience in Iraq, though, these additional costs are unlikely to be excessive.

Not only are costs in treasure significantly lower in comparison to those associated with operations in Afghanistan but also—and even more importantly—the human cost is dramatically reduced. For instance, in the first half of 2011, the British armed forces suffered 27 fatalities in Afghanistan, not to mention the number of wounded and maimed. The 108 fatalities in 2009 and 103 fatalities in 2010 made the two previous years the bloodiest for British troops in Afghanistan.<sup>117</sup> As of August 2011, however, the allies had suffered no fatalities in Libya. Unlike the situation in Afghanistan, the allies could fully draw upon their asymmetric advantages in the technological dimension of strategy, significantly improving force protection.

This article does not contend that the use of ground forces is too costly in modern warfare. In fact, joint manoeuvre warfare, as conducted by the West's most advanced forces, has proven extremely effective and powerful in conventional campaigns, sweeping away conventional resistance. Yet in stabilisation operations, Western allies should shape their involvement in ways that allow them to effectively draw upon the comparative advantages in the operational and technological dimensions. In contrast, winning hearts and minds is excessively difficult, highlighting the extreme challenges for Western intervention forces in the social dimension.

As a rule, warfare does not lend itself to a recipe, and the weight and characteristics of each dimension of strategy depend upon its context. In Bosnia in 1995, deployment of a heavy multinational brigade did not undermine the West's standing in the social dimension. Together with air power, it pro-

duced synergistic joint effects against the Bosnian Serbs' ground manoeuvres, thereby providing significant combined-arms leverage that Allied Force lacked in 1999. Hence, ground forces strengthened the operational dimension of strategy during Operation Deliberate Force, which led to the Dayton Peace Accords in late 1995.

Due to the specific circumstances, however, the West made air power its weapon of choice against Mu'ammar Gadhafi. However protracted the campaign seemed, it proved significantly cheaper in both resources and lives than current or recent stabilisation operations in Iraq and Afghanistan that demanded a great influx of ground forces.

## Conclusion

The Libyan campaign stands as a successful example of how Western air power shifted the balance of power in favour of a resistance movement against superior armed regime forces. Essentially, it levelled the playing field. Nevertheless, the Libyans themselves must make the final decision. Without intervention from the West's air power, forces loyal to Gadhafi could have inflicted tremendous carnage on both Benghazi and Misrata. The siege of Misrata was terrible, but without air power, it most certainly would have become another dark chapter in Europe's history.

During the course of the campaign, renowned commentators made various claims. Against the backdrop of the air campaign's becoming protracted, one of them argued that the West should have better armed and trained the rebels before intervening militarily. Aside from political concerns, this proposed course of action completely ignores the time-sensitivity of this operation. The overrunning of the rebel strongholds in late March would have left no time for such arming and training. Other commentators downplayed the intervention as a rather small campaign. Yet assessing a campaign by assets involved is

not the most sophisticated approach. At the end of the day, the effect is important. Probably the most frequently raised claim involved the need for ground forces to effectively turn the table in Libya. Granted, this strategy might have produced swift military effect, but at the strategic level of warfare, it might have caused backlashes—allowing the social dimension of strategy to dominate the conflict.

Moreover, commentators raised concerns about a protracted air campaign, implicitly referring to the excessive costs involved. Both the Iraqi no-fly zones of the 1990s and the Libya campaign, however, bear witness that relegating an intervention to air power—if circumstances permit—is far less costly than, for instance, ongoing operations in Afghanistan. For some unjustified reason, interventions by air power attract criticism that they consume vast amounts of treasure. Yet air power, combined with its ability to reduce collateral damage significantly, helps keep an intervention in the operational and technological dimension of strategy, where the West can draw upon its comparative advantages. In particular, the technological dimension yields an asymmetric advantage in force protection that can reduce allied fatalities to a minimum. Short of deploying ground troops, the British and French deployed combat helicopters. After their first missions in the night of 3 to 4 June, commentators expected casualties. These daring attacks undoubtedly and visibly demonstrated NATO's resolve and thereby generated additional coercive leverage.

Other critics charged that, instead of conducting a shock-and-awe campaign, the West used air power only gradually, thus dissipating its true value. Even if the coalition had staged massive air strikes, who could have actually exploited their effects in the early phase of the conflict? As much about protecting civilians, this campaign was about a contest of will between Gadhafi's regime and NATO, whose willingness and ability to conduct a protracted air

campaign slowly ground down the dictator's forces and denied him the use of superior conventional weapons on the ground. As it proved, NATO occupied a position to do so. The French air force's contingent on Crete, for instance, contained about a tenth of the entire French Mirage 2000D and 2000N fleets, a ratio perfectly suited for a prolonged air campaign.

However, the campaign once more revealed the European imbalance between shaft and spear, the effects of which could be mitigated only through significant American support and Libya's geographical position. This imbalance will likely persist—witness the RAF's and French air force's acquisition of or plans to acquire 14 modern multirole transport tanker aircraft each and the remainder of Europe placing even less emphasis on air-to-air refuelling, a situation that will hamper Europe's reach and mobility in the future. Luckily, Europe's only true aircraft carrier, the *Charles de Gaulle*, was immediately ready for action, but France had to pull it out of operations on 12 August after more than eight months of almost continuous service. Clearly, the West could have waged the Libyan campaign without naval air power, but the geographical position of the next contingency might require the availability of more seaborne flight decks.

The campaign has also shown the limits of force specialisation within Europe. With countries such as Germany opting out or others, such as Italy, offering only hesitant support, the campaign kicked off without vital European capabilities (both Germany and Italy operate the most advanced Euro-

pean SEAD forces). To secure political discretion, the larger European countries need to retain balanced air forces. Smaller European air forces that are willing to deploy could punch above their weight by reinforcing Europe's force enablers. A willingness to take risks could also make up for the absence of certain capabilities. Thus French fighter-bombers opened the campaign on 19 March with no dedicated SEAD aircraft, and the employment of combat helicopters effectively compensated for limited numbers of fixed-wing aircraft.

The campaign will likely reshape European force transformation. For example, the authors of the United Kingdom's *Strategic Defence and Security Review* of late 2010 undoubtedly wrote that operation against the backdrop of ongoing operations in Afghanistan. The RAF earmarked such assets as the Sentinel wide-area surveillance aircraft, which saw only limited use in Afghanistan but proved extremely valuable in Libya, for phasing out in the coming years. Consequently, decision makers might need to reconsider certain plans. At the least, the RAF deferred retiring its last Nimrod R1 signals intelligence aircraft by three months, extending its service to support Operation Ellamy—the United Kingdom's contribution to NATO's air campaign.

Overall, even though the military gap across the Atlantic undoubtedly remains, the Libyan campaign demonstrates that the gap has narrowed, not only in terms of equipment but also in terms of willingness to intervene. ✪

*Triesen, Principality of Liechtenstein*

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## Notes

1. Pierre Tran and Andrew Chuter, "U.K., France Vault to Center of Euro Defense," *Defense News* 26, no. 14 (11 April 2011): 1.

2. "Cameron: UK Working on 'No-Fly Zone' Plan for Libya," *BBC News*, 28 February 2011, <http://www.bbc.co.uk/news/uk-politics-12598674>.

3. Colin Freedman, Nick Meo, and Patrick Hennessy, "Libya: Arab League Calls for United Nations No-Fly Zone," *Telegraph*, 12 March 2011, <http://www.telegraph.co.uk/news/worldnews/africaandindianocean/libya/8378392/Libya-Arab-League-calls-for-United-Nations-no-fly-zone.html>.

4. Ibid.
5. "Libya: UK No-Fly Zone Proposal to Enter UN Talks," *BBC News*, 16 March 2011, <http://www.bbc.co.uk/news/uk-politics-12755896>.
6. Security Council, "Security Council Approves 'No-Fly Zone' over Libya, Authorizing 'All Necessary Measures' to Protect Civilians, by Vote of 10 in Favour with 5 Abstentions," SC/10200, 6498th Meeting (night) (New York: United Nations, Department of Public Information, News and Media Division, 17 March 2011), <http://www.un.org/News/Press/docs/2011/sc10200.doc.htm>.
7. "Gates: Libyan No-Fly Zone Would Require Attack," *CBSNews.com*, 2 March 2011, <http://www.cbsnews.com/stories/2011/03/02/501364/main20038352.shtml>.
8. Craig Whitlock, "Pentagon Hesitant on No-Fly Zone over Libya," *Washington Post*, 2 March 2011, <http://www.washingtonpost.com/wp-dyn/content/article/2011/03/01/AR2011030105317.html>.
9. Richard Leiby and Scott Wilson, "Arab League's Backing of No-Fly Zone over Libya Ramps Up Pressure on West," *Washington Post*, 13 March 2011, <http://www.washingtonpost.com/wp-dyn/content/article/2011/03/12/AR2011031205484.html>.
10. Ministère de la Défense [Ministry of Defence], "Libye: point de situation opération Harmattan no. 1" [Libya: Progress report on Operation Harmattan no. 1], 25 March 2011, <http://www.defense.gouv.fr/actualites/operations/libye-point-de-situation-operation-harmattan-n-1>; and Ministère de la Défense, "Libye: point de situation opération Harmattan no. 2" [Libya: Progress report on Operation Harmattan no. 2], 25 March 2011, <http://www.defense.gouv.fr/actualites/operations/libye-point-de-situation-operation-harmattan-n-2>.
11. Doug Richardson, "Air Strikes Target Libyan Defences," *Jane's Missiles and Rockets* 15, no. 5 (May 2011): 1-3.
12. Tom Kington, "Harrier Ops Making Case for F-35B," *Defense News* 26, no. 12 (28 March 2011): 9.
13. Ministère de la Défense [Ministry of Defence], "L'opération Harmattan" [Operation Harmattan], 27 September 2011, <http://www.defense.gouv.fr/actualites/operations/l-operation-harmattan>.
14. Jeremiah Gertler, *Operation Odyssey Dawn (Libya): Background and Issues for Congress*, CRS R41725 (Washington, DC: Congressional Research Service, 30 March 2011), 13, <http://fpc.state.gov/documents/organization/161350.pdf>.
15. Ibid., 20.
16. Dave Majumdar, "Why the F-22 Sat Out Libya," *Defense News* 26, no. 12 (28 March 2011): 4, 6.
17. An RAF officer confirmed to the author that the UK contingent was taken by surprise in the afternoon of 19 March 2011.
18. Ministère de la Défense [Ministry of Defence], "Libye: point de situation opération Harmattan no. 6" [Libya: Progress report on Operation Harmattan no. 6], 25 March 2011, <http://www.defense.gouv.fr/content/view/full/112817>.
19. Pierre Tran and Andrew Chuter, "French, U.K. Air Forces Boost Cooperation," *Defense News* 25, no. 43 (15 November 2010): 8.
20. Pierre Tran and Andrew Chuter, "Cross-Channel Cooperation," *Defense News* 25, no. 33 (6 September 2010): 1.
21. John Reed and Pierre Tran, "Leading Air Forces Cooperate: France, U.K., U.S. Work Strategy, Doctrine, Systems," *Defense News* 25, no. 35 (20 September 2010): 1.
22. Pierre Tran, "[Interview with] Gen. Jean-Paul Palomeros, Chief of Staff, French Air Force," *Defense News* 26, no. 25 (27 June 2011): 22.
23. "Libya: Obama, Cameron and Sarkozy Vow Gaddafi Must Go," *BBC News*, 15 April 2011, <http://www.bbc.co.uk/news/world-africa-13089758>.
24. See, for instance, Devin Dwyer, "Doubts about NATO in Libya as U.S. Takes Backseat," *abcNews*, 1 April 2011, <http://abcnews.go.com/m/story?id=13274607&sid=77>.
25. "Libya: Gaddafi Must Go."
26. "Deployment of CF-18s to Enforce a No-Fly Zone over Libya," Royal Canadian Air Force, 21 March 2011, <http://www.airforce.forces.gc.ca/v2/nr-sp/index-eng.asp?id=11599>; and Gertler, *Operation Odyssey Dawn*, 19.
27. Lawrence Freedman, "Can the EU Develop an Effective Military Doctrine?," in *A European Way of War*, ed. Steven Everts et al. (London: Centre for European Reform, 2004), 16, [http://www.cer.org.uk/pdf/p548\\_way\\_ofwar.pdf](http://www.cer.org.uk/pdf/p548_way_ofwar.pdf).
28. Gertler, *Operation Odyssey Dawn*, 19.
29. Luca Peruzzi, "Italian Air Force Chief Details Libyan Operations," *Flight International*, 17 June 2011, <http://www.flightglobal.com/articles/2011/06/17/358044/italian-air-force-chief-details-libyan-operations.html>.
30. Ibid.
31. David Brunnstrom, "Analysis: French Arms Move Shows Libya Pressure on West," Reuters, 30 June 2011, <http://af.reuters.com/article/libyaNews/idAFLDE75T18L20110630>.
32. Christian F. Anrig, "The Quest for Relevant Air Power—Continental Europe," *Royal Air Force Air Power Review* 12, no. 1 (Spring 2009): 84, [http://www.raf.mod.uk/rafcms/mediafiles/CA6EA006\\_1143\\_EC82\\_2E796A6FC58BA05B.pdf](http://www.raf.mod.uk/rafcms/mediafiles/CA6EA006_1143_EC82_2E796A6FC58BA05B.pdf).

33. Robert Hewson, "United Arab Emirates Signals Shift to Attack Role," *Jane's Defence Weekly* 48, no. 19 (11 May 2011): 6.
34. Ministère de la Défense [Ministry of Defence], "Libye: point de situation opération Harmattan no. 7" [Libya: Progress report on Operation Harmattan no. 7], 26 March 2011, <http://www.defense.gouv.fr/content/view/full/112895>.
35. Anrig, "Quest for Relevant Air Power," 86–87.
36. Karen DeYoung and Greg Jaffe, "NATO Runs Short on Some Munitions in Libya," *Washington Post*, 15 April 2011, [http://www.washingtonpost.com/world/nato-runs-short-on-some-munitions-in-libya/2011/04/15/AF3O7EID\\_story.html](http://www.washingtonpost.com/world/nato-runs-short-on-some-munitions-in-libya/2011/04/15/AF3O7EID_story.html).
37. Pierre Tran et al., "NATO Denies Reported Bomb Shortage," *Defense News* 26, no. 16 (25 April 2011): 16.
38. DeYoung and Jaffe, "NATO Runs Short."
39. Matthew Bell, "MBDA Missile Export Prospects Boosted by Libyan Operations," *Jane's Defence Weekly* 48, no. 23 (8 June 2011): 19.
40. Ministry of Defence, "Cost of Libya Operations," 23 June 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/DefencePolicyAndBusiness/CostOfLibyaOperations.htm>.
41. Ministry of Defence, "Enhanced Paveway III Bombs Ready for Action in Libya," 31 May 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/EnhancedPavewayIiiBombsReadyForActionInLibya.htm>.
42. Bell, "MBDA Missile Export Prospects," 19.
43. See, for instance, Ministry of Defence, "RAF and Navy Continue to Strike at Gaddafi Regime," 21 July 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafAndNavyContinueToStrikeAtGaddafiRegime.htm>.
44. Ministry of Defence, "PM Visits RAF Crews Deployed on Libya Operations," 5 April 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/PmVisitsRafCrewsDeployedOnLibyaOperations.htm>; and Ministry of Defence, "RAF Destroys Military Vehicle Depot in Libya," 26 May 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafDestroysMilitaryVehicleDepotInLibya.htm>.
45. Henri-Pierre Grolleau, "French Precision: Rafale's Lethal Punch," *Air International* 76, no. 4 (April 2009): 21–22, 25; and Armée de l'Air [French air force], "Commande de 680 kits d'AASM" [Order of 680 AASM kits], 18 February 2010, <http://www.defense.gouv.fr/air/breves-migration/commande-de-680-kits-d-aasm>.
46. Tran et al., "NATO Denies Reported Bomb Shortage," 16.
47. Tom Kington and Gerard O'Dwyer, "Small Bombs Loom Big as Libya War Grinds On," *Defense News* 26, no. 25 (27 June 2011): 4.
48. Tran, "[Interview with] Gen. Jean-Paul Palomeros."
49. Kington and O'Dwyer, "Small Bombs Loom Big," 4.
50. Ministère de la Défense [Ministry of Defence], "Libye: le Parlement autorise la prolongation de l'opération" [Libya: Parliament authorizes extension of the operation], 13 July 2011, <http://www.defense.gouv.fr/actualites/articles2/libye-l-operation-harmattan-prolongee>.
51. Gerrard Cowan, "UK Libya Operations 'Are Sustainable,'" *Jane's Defence Weekly* 48, no. 25 (22 June 2011): 13.
52. Gerard O'Dwyer, "Libya Operations Threaten Nordic Budgets," *Defense News* 26, no. 24 (20 June 2011): 1.
53. Kington and O'Dwyer, "Small Bombs Loom Big," 1.
54. Ministry of Defence, "Additional RAF Tornado Jets Arrive in Italy," 20 July 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/AdditionalRafTornadoJetsArriveInItaly.htm>.
55. Richardson, "Air Strikes Target Libyan Defences," 3.
56. Ministère de la Défense [Ministry of Defence], "Libye: point de situation opération Harmattan no. 6" [Libya: Progress report on Operation Harmattan no. 6].
57. Peruzzi, "Chief Details Libyan Operations."
58. John A. Tirpak, "Odyssey Dawn Units Identified," *Air Force Magazine*, 22 March 2011, <http://www.airforce-magazine.com/DRArchive/Pages/2011/March%202011/March%2022%202011/OdysseyDawnUnitsIdentified.aspx>.
59. Tran, "[Interview with] Gen. Jean-Paul Palomeros," 22.
60. Tim Ripley, "UK RAF Looks to Slow VC10 Drawdown Rate," *Jane's Defence Weekly* 48, no. 31 (3 August 2011): 12.
61. Gertler, *Operation Odyssey Dawn*, 8.
62. Ministry of Defence, "NATO Delivers Update on Libya Operations," 7 April 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/NatoDeliversUpdateOnLibyaOperations.htm>; and Ministry of Defence, "Typhoon Joins Tornado in Libya Ground Attack Operations," 13 April 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/TyphoonJoinsTornadoInLibyaGroundAttackOperations.htm>.
63. Ministère de la Défense [Ministry of Defence], "Libye: point de situation hebdomadaire no. 21" [Weekly progress report no. 21], 18 April 2011,

<http://www.defense.gouv.fr/actualites/operations/libye-point-de-situation-hebdomadaire-n-21>.

64. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 28" [Libya: Progress report no. 28], 6 June 2011, <http://www.defense.gouv.fr/content/view/full/121771>.

65. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 32" [Libya: Progress report no. 32], 7 July 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-point-de-situation-n-32>.

66. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 38" [Libya: Progress report no. 38], 11 August 2011, <http://www.defense.gouv.fr/content/view/full/130650>.

67. Ministère de la Défense [Ministry of Defence], "Libye: point sur le dispositif Harmattan" [Libya: Brief on Harmattan deployment], 19 July 2011, <http://www.defense.gouv.fr/operations/actualites/libye-point-sur-le-dispositif-harmattan>.

68. Ministère de la Défense [Ministry of Defence], "Libye: réorganisation du dispositif militaire français" [Libya: Reorganization of the French military deployment], 17 August 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-reorganisation-du-dispositif-militaire-francais>.

69. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 40" [Libya: Progress report no. 40], 29 August 2011, <http://www.defense.gouv.fr/operations/actualites/libye-point-de-situation-n-40>.

70. Ministère de la Défense [Ministry of Defence], "Libye: réorganisation du dispositif militaire français" [Libya: Reorganization of the French military deployment]; and Ministère de la Défense, "Libye: qu'est-ce que la Task Force 473?" [Libya: What is Task Force 473?], 29 March 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-qu-est-ce-que-la-task-force-473>.

71. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 25" [Libya: Progress report no. 25], 16 May 2011, <http://www.defense.gouv.fr/content/view/full/119212>.

72. Ministry of Defence, "RAF and Navy Continue to Strike."

73. Edward Cody, "French, British Leaders Meet about West's Role in Libyan Uprising," *Washington Post*, 14 April 2011, [http://www.washingtonpost.com/world/france-britain-call-for-summit-on-natos-role-in-libyan-uprising/2011/04/13/AFy71qVD\\_story.html](http://www.washingtonpost.com/world/france-britain-call-for-summit-on-natos-role-in-libyan-uprising/2011/04/13/AFy71qVD_story.html).

74. Tran, "[Interview with] Gen. Jean-Paul Palomeros," 22.

75. Ministère de la Défense [Ministry of Defence], "Libye: arrivée des Atlantique 2 à la Sude" [Arrival of

the Atlantique 2 at Souda], 4 August 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-arrivee-des-atlantique-2-a-la-sude>.

76. Ministère de la Défense [Ministry of Defence], "Libye: premier vol du Harfang au profit d'Harmattan" [Libya: Harfang's first flight for Harmattan], 25 August 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-premier-vol-du-harfang-au-profit-d-harmattan>.

77. Ministry of Defence, "RAF ISTAR Squadrons Keep Watch over Libya," 1 April 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafIstarSquadronsKeepWatchOverLibya.htm>.

78. See, for instance, Tim Ripley, "AWACS Provides Key Link for NATO Strikes over Libya," *Jane's Defence Weekly* 48, no. 31 (3 August 2011): 7.

79. Tim Ripley, "USAF Predators Direct Tornado Strikes," *Jane's Defence Weekly* 48, no. 20 (18 May 2011): 6.

80. Ripley, "AWACS Provides Key Link," 7.

81. Brooks Tigner, "NATO Cripples Ghadafi Forces, C2 Capabilities," *Jane's Defence Weekly* 48, no. 17 (27 April 2011): 8.

82. Ibid.; and Brooks Tigner, "More Work to Be Done' in Libya, Reports NATO," *Jane's Defence Weekly* 48, no. 19 (11 May 2011): 6.

83. Gen Wesley K. Clark, *Waging Modern War: Bosnia, Kosovo, and the Future of Combat* (New York: PublicAffairs, 2002), 303.

84. Anis Mili, "Libya Rebels Prepare for Fight over Strategic Town," Reuters, 30 June 2011, <http://af.reuters.com/article/libyaNews/idAFLDE75TIS220110630>.

85. See Stephen Biddle, *Afghanistan and the Future of Warfare: Implications for Army and Defense Policy* (Carlisle Barracks, PA: Strategic Studies Institute, US Army War College, 2002), 38–39.

86. See Brooks Tigner, "NATO Blames 'Fluid' Situation for Allied Airstrikes on Rebels," *Jane's Defence Weekly* 48, no. 15 (13 April 2011): 7.

87. Lauren Gelfand, "NATO Extends Operation in Libya for 90 Days," *Jane's Defence Weekly* 48, no. 23 (8 June 2011): 4.

88. Ibid.

89. Andrew Chuter and Julian Hale, "NATO's Libyan Air War Uses Only Precision Bombs," *Defence News* 26, no. 28 (25 July 2011): 3.

90. Ministry of Defence, "Typhoon Joins Tornado."

91. Ministry of Defence, "RAF Strikes Gaddafi's Navy," 20 May 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafStrikesGaddafisNavy.htm>.

92. Ministry of Defence, "RAF Destroys Gaddafi Command Post," 18 August 2011, <http://www.mod.uk>

/DefenceInternet/DefenceNews/MilitaryOperations/RafDestroysGaddafiCommandPost.htm.

93. Gareth Jennings, "Royal Air Force Downplays Carrier Aviation," *Jane's Defence Weekly* 48, no. 30 (27 July 2011): 12.

94. Ministry of Defence, "NATO Mission Not over Yet in Libya," 24 August 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/NatoMissionNotOverYetInLibya.htm>.

95. Ministry of Defence, "RAF Ready for Further Action over Tripoli," 23 August 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafReadyForFurtherActionOverTripoli.htm>.

96. Ministry of Defence, "RAF Strikes Targets Near Tripoli and Sirte," 25 August 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafStrikesTargetsNearTripoliAndSirte.htm>.

97. Ministry of Defence, "RAF Typhoons Patrol Libyan No-Fly Zone," 22 March 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafTyphoonsPatrolLibyanNoflyZone.htm>; Ministry of Defence, "PM Visits RAF Crews"; Ministry of Defence, "Action in Libya Has Prevented 'Humanitarian Catastrophe,'" 6 April 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/ActionInLibyaHasPreventedHumanitarianCatastrophe.htm>; and Ministry of Defence, "Typhoon Joins Tornado."

98. Ministry of Defence, "Additional RAF Tornado Jets."

99. Clark, *Waging Modern War*, 303, 337, 367.

100. "Libya: UK Apache Helicopters Used in NATO Attacks," *BBC News*, 4 June 2011, <http://www.bbc.co.uk/news/uk-13651736>.

101. Ministry of Defence, "HMS Bangor En Route to Libya," 7 June 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/HmsBangorEnRouteToLibya.htm>.

102. Ministry of Defence, "Good Progress Seen in Libya Operations," 24 June 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/GoodProgressSeenInLibyaOperations.htm>.

103. Ministry of Defence, "RAF Destroys Nine of Gaddafi's Underground Storage Bunkers in Libya," 13 June 2011, <http://www.mod.uk/DefenceInternet/DefenceNews/MilitaryOperations/RafDestroysNineOfGaddafisUndergroundStorageBunkersInLibya.htm>.

104. Ministère de la Défense [Ministry of Defence], "Libye: engagement des hélicoptères français depuis

le BPC Tonnerre" [Libya: Use of French helicopters from BPC Tonnerre], 4 June 2011, <http://www.defense.gouv.fr/actualites/operations/libye-engagement-des-helicopteres-francais-depuis-le-bpc-tonnerre>.

105. Ministère de la Défense [Ministry of Defence], "Libye: point de situation no. 29" [Libya: Progress report no. 29], 11 June 2011, <http://www.defense.gouv.fr/actualites/operations/libye-point-de-situation-n-29>.

106. Ministère de la Défense [Ministry of Defence], "Libye: les hélicoptères français en opération dans le secteur de Brega" [Libya: French helicopters operating in the area of Brega], 25 August 2011, <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-les-helicopteres-francais-en-operation-dans-le-secteur-de-brega>.

107. Clark, *Waging Modern War*, 450.

108. Michael Howard, "The Forgotten Dimensions of Strategy," in *The Causes of Wars and Other Essays*, 2nd ed., enlarged, ed. Michael Howard (Cambridge, MA: Harvard University Press, 1983), 105.

109. Mili, "Libya Rebels Prepare for Fight."

110. Robert Pape, "The Logic of Suicide Terrorism: It's the Occupation, Not the Fundamentalism," *American Conservative*, 18 July 2005, <http://www.theamericanconservative.com/article/2005/jul/18/00017/>.

111. F. Solms-Laubach and J. Reichelt, "Warum packt die NATO Gaddafi nicht?" [Why doesn't NATO seize Gaddafi?], *Bild.de*, 30 July 2011, <http://www.bild.de/politik/ausland/muammar-gaddafi/warum-packt-die-nato-ihn-nicht-19129868.bild.html>.

112. Defence Committee, *Fifth Report: Ministry of Defence Main Estimates* (London: Defence Committee, 19 July 2011), <http://www.publications.parliament.uk/pa/cm201012/cmselect/cmdfence/1373/137302.htm>.

113. Ministry of Defence, "Cost of Libya Operations."

114. Ministry of Defence, "Typhoon Joins Tornado."

115. Gertler, *Operation Odyssey Dawn (Libya)*, 21–22.

116. John A. Tirpak, "Legacy of the Air Blockades," *Air Force Magazine* 86, no. 2 (February 2003): 50, <http://www.airforce-magazine.com/MagazineArchive/Documents/2003/February%202003/02legacy03.pdf>.

117. "British Dead and Wounded in Afghanistan, Month by Month," *Guardian.co.uk*, 2011, <http://www.guardian.co.uk/news/datablog/2009/sep/17/afghanistan-casualties-dead-wounded-british-data>.