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# **The Battle over Fire Support**

## **The CAS Challenge and the Future of Artillery**

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**Elie Tenenbaum**

*October 2012*



Laboratoire  
de **R**echerche  
sur la **D**éfense

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# Abstract

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Traditionally, maneuver units are designed for mobility and control of the ground, while supporting forces (artillery, aviation) deliver fires to protect the former and ensure their freedom of action. As a result of the introduction of mobile artillery in the XVIII<sup>th</sup> Century, and even more so with the development of an effective tactical aviation, fire support has played a crucial tactical role in the major conventional conflicts of the XX<sup>th</sup> Century. No longer subject to the marginalization imposed by the nuclear era, fire support has now come to the crossroads: while *Close Air Support* often proved decisive during operations in Afghanistan and Iraq, practical experience has nonetheless shown that artillery and mortars remain essential. The future of fire support will therefore depend on both budgetary constraints and strategic considerations: armed forces will have to define a new joint balance that takes into account the various components of fire support and is politically and financially sustainable.

\* \* \*

Les forces de manœuvre ont pour fonction traditionnelle la mobilité et la maîtrise du terrain, là où les forces d'appui (artillerie, aviation) ont pour mission d'appliquer les feux assurant la protection et la liberté d'action des premières. Suite à l'introduction de l'artillerie mobile au XVIII<sup>e</sup> siècle, et plus encore avec le développement d'une aviation tactique performante, l'appui-feu a été un facteur tactique crucial lors des grands conflits conventionnels du XX<sup>e</sup> siècle. Récemment sorti de la marginalité imposée par l'ère nucléaire, l'appui-feu se trouve aujourd'hui à la croisée des chemins : si, en effet, l'appui aérien (*Close Air Support*) a pu jouer un rôle décisif dans les opérations en Afghanistan et en Irak, la pratique a démontré que l'artillerie et les mortiers demeurent souvent indispensables. L'avenir de l'appui-feu se jouera ainsi à l'intersection des contraintes budgétaires et des considérations stratégiques : il va donc s'agir pour les armées de définir, entre les différentes composantes de l'appui-feu, des équilibres interarmées qui soient politiquement et financièrement tenables.





# Introduction

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*Oh, for a muse of fire that would ascend  
The brightest heaven of invention!*

William Shakespeare, *Henry V*

On 25<sup>th</sup> November 2001, a thousand American soldiers of the 10<sup>th</sup> Mountain Division landed at Mazar-e-Sharif as part of Operation Enduring Freedom (OEF). For the first time in recent history, Western troops were deployed without any support of field artillery, relying entirely on air power and light weapons. Although US leaders and planners claimed this choice was due to logistical constraints, it actually contributed to the emergence of a new operational model that took advantage of technological innovations while at the same time responding to new political taboos. Marginalized during part of the Cold War as a result of the primacy of indirect strategies, fire support became a cornerstone of the early 21<sup>st</sup> Century's operational debates.

Fire support is usually defined as “the application of fire, coordinated with the maneuver of forces, to destroy, neutralize or suppress the enemy”.<sup>1</sup> This concept is an excellent illustration of the tactical dialectics between destruction and movement, according to which forces are distributed on the battlefield.<sup>2</sup> In a traditional ground-oriented perspective, maneuver forces (infantry, cavalry) are primarily designed for mobility and ground supremacy while support forces (artillery, aviation) are designed to provide air cover and clear the ground for the former. For it slows down the enemy's advance and secures that of its partners, fire support is one of the battlefield's most crucial elements and, in all likelihood, the most perennial since the introduction of mobile artillery in the art of warfare.

While maneuver, in a classic sense, is a specific attribute of ground forces, support can stem from three different sources (ground, air, navy), each having its distinctive features and conferring a specific role to this mission. It should forthwith be stressed that, even though fire support is always provided by a specific branch, this is never the unique mission of such branch. Hence, in addition to close support requests, the air

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<sup>1</sup> NATO Standardization Agency (NSA), *Glossary of Terms and Definitions (English and French)*, AAP-6, 2010, p. 3-A-11.

<sup>2</sup> Michel Yakovleff, “Le concept de manœuvre”, in Christian Malis (ed.), *Guerre et manœuvre. Héritages et renouveau*, Paris, Economica, 2009.

component has many other missions of its own such as air superiority, interdiction, deep strike, transportation and, in the case of helicopters, airmobile maneuver.<sup>3</sup> In the same way, the ground component, traditionally identified as artillery, is also required to assume a role in such fields as anti-aircraft defense, counter-battery fire, or deep strike. Finally, the naval component has to handle submarine missions as well as surface operations, within which fire support is only one of several missions, which for many years was marginalized but recently brought back into fashion in Libya.

Accordingly, the question of fire support, its origin and its means of delivery cannot be reduced to that of interservice rivalry and of the future of field artillery as a very branch of the armed forces. While force structures and organizational issues must be taken into account, the subject goes much further as it questions the very concept of effect by fire, which still largely underlies Western military actions.

The innovative tactical and operational model that was shown to the world at the beginning of OEF and which heavily relies on close air support (CAS) capabilities should be analyzed in the light of the decade of the intense and costly engagements that followed. To begin with, and in order to grasp the issues at stake in this debate, it is necessary to examine this model's historical background by tracing back its origins to the introduction of the third dimension in warfare. One should then look into the records of the expeditionary fire support model adopted by a number of countries since the end of the Cold War. Finally, the lessons drawn should outline the prospects for overcoming the obstacles that have been met and for renewing the air-ground partnership.

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<sup>3</sup> On the use of rotary wing aircraft in support and maneuver, see Etienne de Durand, Benoît Michel and Elie Tenenbaum, "Helicopter Warfare. The Future of Airmobility and Rotary Wing Combat", *Focus stratégique*, No. 32 bis, January 2012, available at: <http://www.ifri.org/downloads/fs32aeromobilitite.pdf>.

# The Origins of the Debate

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Understanding the current challenges relating to fire support missions requires that they be set back in a debate which has been going on at least since the First World War. The nature and origin of firepower, the planning of its use on the battlefield or even its subordination to, or coordination with maneuver units are all questions which arise from past conflicts and which should be briefly presented in order to fully understand their implications for the present.

## ***The Third Dimension Revolution***

Firepower being an essential component of the “western model of warfare”<sup>4</sup> since the end of the Middle Ages, the question of its integration to maneuver rapidly arose. However, it was at the beginning of the 20<sup>th</sup> Century that the actual operational revolution of fire support occurred, since technology now called for the inclusion of the third dimension, with the successive introduction of indirect artillery fire (beyond visual horizon) and airborne fire on the battlefield. As a matter of fact, the General and historian Jonathan Bailey deems that “three-dimensional conflict was so revolutionary that the tumultuous development of armor and air power in 1939-1945 and the advent of the information age in the decades that followed amount to no more than complementary and incremental improvements upon the conceptual model laid down in 1917-1918”.<sup>5</sup>

## **The “Storms of Steel”**

Long confined to siege warfare, artillery was progressively introduced on the battlefield thanks to technological evolutions.<sup>6</sup> During the early modern era, once positioned, it remained most of the time immobile and played an essentially defensive role. It was not until Frederick II and Napoleon that “flying artillery” emerged, light enough to be of genuine support to maneuver units, sometimes as close as 300 meters to the engagement. Even though the extended range of individual weapons significantly devalued artillery throughout the American Civil War, the development by Krupp of steel and breech-loading guns endowed Prussia with modern

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<sup>4</sup> Laurent Fromaget, “Le feu dans le modèle occidental de la guerre”, *Focus Stratégique*, No. 17, June 2009, available at: [http://www.ifri.org/downloads/Focus\\_strategique\\_17\\_Fromaget.pdf](http://www.ifri.org/downloads/Focus_strategique_17_Fromaget.pdf).

<sup>5</sup> Jonathan B. A. Bailey, “The First World War and the Birth of Modern Warfare”, in MacGregor Knox and Williamson Murray (ed.), *The Dynamics of Military Revolution, 1300-2050*, Cambridge, Cambridge University Press, 2001, p. 147.

<sup>6</sup> On this subject, see Jonathan B. A. Bailey, *Field Artillery and Firepower*, Annapolis, Naval Institute Press, 2004, p. 174.

artillery, outclassing in terms of range and accuracy the old French muzzle-loading guns, and therefore facilitating counter-battery fire as well as direct support of attacking troops. This advantage played an important role in the French defeat of 1870. Drawing lessons from their setbacks, the French army designed and brought into service highest quality field artillery – forever embodied by the 75mm light gun – entirely devoted to mobility and the offensive support of troops. Nonetheless, it neglected the development of equivalent heavy artillery, unlike the Germans, who kept their lead in the field of indirect and counter-battery fire until 1916.

These significant improvements in terms of range and precision introduced a decoupling, that Bruce Gudmunsson described as the “great divorce”,<sup>7</sup> between the source of fire, *i.e.* artillery, and its beneficiary, *i.e.* infantry. Thus, the increasing attention that artillerymen devoted to the question of counter-battery fire tended to pull “resources away from the support of the infantry”.<sup>8</sup> While deep fire enabled by the greater range of heavy artillery helped, *in fine*, to protect infantry against defensive barrage fire, it left it powerless in the face of enemy trenches. This resulted in the German infantry deciding to develop its own trench artillery in the form of light mortars and mine throwers (*Minenwerfer*) capable of closely supporting its offensive moves. These mine throwers turned out to be helpful for the Germans’ limited attacks of 1915, but lacked operational impact: their short range as well as their weight thwarted them from fully supporting infantry as they advanced and from pursuing further the offensive momentum.<sup>9</sup>

When used as a support to maneuver, artillery resorted to barrages as its main mode of action. Brought into general use by the Allies as early as 1915, the barrage fire consisted of a hail of steel and fire preceding the infantry’s advance and forcing the defenders to hole up in their shelters.<sup>10</sup> Whatever the variant – standing, creeping or rolling –, barrages used to generate serious coordination problems with the infantry, whose pace of progression did not always keep up with to that of artillery. When lagging behind, infantrymen would lose its protection. When ahead, they would inevitably suffer from friendly fire incidents – in 1916, the French General Staff valued at 10% the proportion of losses caused by their own artillery.<sup>11</sup>

In practice, coordination between fire and maneuver was based on inflexible, timetables set up beforehand, and unlikely to adapt to the hazards and dangers of the no man’s land. Shelling was initially carried out “blindly”, and, at times, based on outdated maps. In France, the “eyes of artillery” were progressively developed “with the creation of dense transmission networks and, from 1915 onwards, the implementation of ‘liaison and observation detachments’ in all supported units”.<sup>12</sup> While artillery observation, in accordance with tradition, was carried out at battery

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<sup>7</sup> Bruce I. Gudmunsson, *On Artillery*, Westport, Praeger, 1993, p. 69.

<sup>8</sup> *Ibid.*, p. 73.

<sup>9</sup> *Ibid.*, pp. 74-78.

<sup>10</sup> Ian Hogg, *Barrage: the Guns in Action*, London, Macdonald, 1971, pp. 25-26.

<sup>11</sup> *Ibid.*, p. 21.

<sup>12</sup> Michel Goya, *La chair et l’acier*, Paris, Tallandier, 2004, p. 291.

level, usually from a high point,<sup>13</sup> the development of telephones and radios allowed for the creation of forward observers, stationed on the front line and in communication with the batteries to which they subjected support requests. The French army, who had started with nothing, had more than 50 000 telephone engineers and 200 transmitters per artillery regiment by 1918.<sup>14</sup>

The other major innovation was the introduction of aerial observation, enabling the British, as early as the Battle of Neuve Chapelle in 1915, to base their plans on precise photographic reconnaissance of enemy lines. On the other hand, real-time coordination required more time: while it was initially based on light signals, by the end of the war it had gone one step further with the arrival of on-board radio, which made possible “proper air-ground conversations”<sup>15</sup> in order to adjust fire. This new technique allowed for an improved precision of heavy artillery to strike the enemy in depth. This transformation fostered a revolution in the operational art, imported by Colonel Bruchmüller from the Eastern front, which aimed at attacking in a massive but brief and sudden way, and deep into enemy lines, unlike the long artillery preparatory shelling used by the Allies in 1915 and 1916, particularly at the Battle of the Somme.<sup>16</sup> Coupled with infantry infiltration tactics developed by Rohr and brought into general use by Hutier, this approach broke with the previous years’ linear stalemate and enabled the German breakthrough of 1918. Even though the absence of operative mobility prevented the offensive from bringing about decision, the very concept of a mobile and non-linear fire support had been firmly established. The advent of a mature technology (aviation and motorization) secured its eventual success.

### The Shaky Beginnings of Close Air Support

Predominantly employed for observation and reconnaissance missions, the use of air forces was diversified towards the end of the First World War as it started to include the use of fire. Once the platform had reached a certain level of technological maturity,<sup>17</sup> and only once air supremacy had been achieved, the German air force carried out ground strikes, in direct support of the infantry’s maneuver. During the battles of Gavelle in April and Passchendaele in July 1917, the German *Schusta* (protection squadrons)<sup>18</sup>

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<sup>13</sup> Gudmunsson, *On Artillery*, *op. cit.*, pp. 69-71.

<sup>14</sup> Bailey, “The First World War and the Birth of Modern Warfare”, in Knox and Murray (ed.), *The Dynamics of Military Revolution*, *op. cit.*, p. 147.

<sup>15</sup> Goya, *La chair et l’acier*, *op. cit.*, p. 296.

<sup>16</sup> With three artillery groups, Bruchmüller had planned to strike simultaneously three layers of the enemy lines: the *Infanteriebekämpfungsguppe (IKA)* stroked the trenches and first boyaus; l’*Artilleriebekämpfungsguppe (AKA)* targeted the enemy artillery batteries while the *Fernkämpfungsguppe (FEKA)* targeted command and communication centers. Gudmunsson, *On Artillery*, *op.cit.*, pp. 89-91.

<sup>17</sup> If machine-guns were rapidly added on biplanes, it was not until 1917 that the mechanism allowing them to shoot through the propellers and to carry small bombs appeared. On this subject, see Trevor N. Dupuy, *The Evolution of Weapons and Warfare*, New York, Da Capo, 1991, pp. 241-242.

<sup>18</sup> John McGrath, *Fire for Effect, Field Artillery and Close Air Support in the US Army*, Fort Leavenworth, Combat Studies Institute Press, 2007, p. 39. Also, see

were systematically strafing at British positions. Impressed by their record, the General Staff even renamed them in March 1918 *Schlasta* (attack squadrons) in anticipation of their participation in the spring offensive. On the other hand, the French, and later the Americans, developed a two-leg air force made up of fighter pilots and bombardiers. The latter were granted a role of direct support in the 1918 summer counter-offensive, and distinguished themselves notably during the Battle of Saint-Mihiel in September.<sup>19</sup>

Saint-Mihiel also witnessed the arrival of American aircrafts under the leadership of General Billy Mitchell, a founding father of air strategic thought. Though he applied the French principles of tactical aviation, Mitchell was a follower of General Trenchard, commanding the British Royal Flying Corps. Impressed by the psychological impact of dive-bombings on the retreating German troops, Trenchard sought to trigger the same kind of reaction on the rear by bombing cities. This is how the British, the Americans and later others, under Giulio Douhet's influence in the interwar period, established "strategic bombing" as the focal point of their operational conception.<sup>20</sup>

Only the Germans, entirely deprived of air power by the Treaty of Versailles, were not able to follow these trends, which implied industrial developments that they were forbidden to undertake. The creation of the *Luftwaffe* in 1935 established from the very start "air actions in support of the army forces on the ground as one of its primary missions", unlike its contemporaries, with the possible exception of the Soviets. The design of Junkers Ju-87 *Stuka* fighter-bombers and *Heinkel* light bombers markedly contrasted with British and American platforms, specialized in strategic bombings and air superiority. Dive-bombing attacks and close air support missions that were carried out during the Spanish Civil War arose enthusiasm among German air strategists.<sup>21</sup>

Nonetheless, the Germans' desire to employ their air force as fire support was more than an industrial policy or a technical choice. Indeed, the operational model selected by the *Wehrmacht* on the eve of the Second World War was based on maneuver warfare. Inspired by Bruchmüller and Rohr's tactical breakthroughs in 1917-1918,<sup>22</sup> the *blitzkrieg* offered a non-linear approach to operations in which the armored spearhead was to advance as fast as possible after breaking out the enemy lines. This model

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Rick Duiven and Dan-San Abbott, *Schlachtfliieger ! Germany and the Origins of Air Ground Support, 1916-1918*, Atglen, Schiffer, 2006, pp. 14-23.

<sup>19</sup> McGrath, *Fire for effect. Field Artillery and Close Air Support in the US Army*, *op. cit.*, p. 44.

<sup>20</sup> Robert Pape, *Bombarder pour vaincre*, Paris, La documentation française, 2011, pp. 79 ff.

<sup>21</sup> Brereton Greenhous, "Aircraft versus Armor: Cambrai to Yom Kippur" in Tim Travers and Christon Archer (ed.), *Men at War: Politics, Technology and Innovation in the Twentieth Century*, New Brunswick, Transaction, 1982, p. 96.

<sup>22</sup> On this subject, see Corentin Brustlein, "L'Apothéose de la manœuvre? Retour sur les fondements et les limites de la 'guerre-éclair'", in Malis (ed.), *Guerre et manœuvre*, *op. cit.*, pp. 46 ff.

made it difficult for artillery, still poorly motorized, to keep up with the pace of the *panzerdivisionen* – especially when these decided to cross the Ardennes, leaving a “colossal gridlock” behind them. The only platform offering fire support and capable of keeping up with the tanks’ speed was the aircraft, “brought into play by Guderian as the blitzkrieg’s vertical artillery”.<sup>23</sup>

Even if during the 1940 campaigns *Luftwaffe*’s primary role was one of interdiction, the use of close air support was a remarkable feature, as it diametrically opposed the line adopted by other armies, in which this type of mission “was greeted only half-heartedly and exceptionally”.<sup>24</sup> This air-ground bias demanded two prerequisites: air superiority and joint coordination. The former was guaranteed by surprise interdiction strikes (offensive counter-air) that enabled the destruction of “as many enemy aircraft as possible before they were able to take off”.<sup>25</sup> It was also considerably helped by the extreme parsimony of General Vuillemin, who refused to engage its whole fleet at once – the Germans were not as lucky in British skies.

Joint coordination, on the other hand, was ensured by the quality of the *Wehrmacht*’s radio equipment as well as the maintenance of close ties at all levels between ground and air forces. The *Luftwaffe* seconded liaison units to ground forces, accompanying them in motorized vehicles. According to German historian Karl-Heinz Frieser, “requests made to the *Luftwaffe* did not require more than 45 minutes to become effective on the battlefield”.<sup>26</sup> Even though the response time is much shorter today, this was impressive for the time given the speed of planes and communications.

Direct fire support, adopted on occasions by the Allies, was rare throughout the war as a result of the importance of air supremacy and strategic bombings missions.<sup>27</sup> In the 1943 FM 100-20 *Command and Employment of Air Power*, close air support (CAS) stood last in the list of priorities. In spite of such institutional reluctance, the Americans established Tactical Air Commands (TAC) which used to dispatch in each division Forward Air Controllers (FAC), sometimes grouped in Air Control Parties (ACP), motorized teams in radio contact with the flying units.<sup>28</sup>

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<sup>23</sup> Karl-Heinz Frieser, *Le mythe de la guerre-éclair*, Paris, Belin, p. 370.

<sup>24</sup> *Ibid.*, p. 372.

<sup>25</sup> *Ibid.*, p. 371. In 1967, Israel followed a roughly identical operative mode: after grounding the Egyptian air force, the Israeli air force supported armored vehicles practically devoid of artillery, charging across the Sinai Peninsula and causing its enemy to be paralyzed within a few days. See Pierre Razoux, *Tsahal. Nouvelle histoire de l’armée israélienne*, Paris, Perrin, 2008, pp. 210-212.

<sup>26</sup> Frieser, *Le mythe de la guerre-éclair*, *op. cit.*, p. 373-374.

<sup>27</sup> David E. Johnson, *Learning Large Lessons. The Evolving Roles of Ground Power and Air Power in the Post-Cold War Era*, Santa Monica, RAND Corporation, 2007, p. 13.

<sup>28</sup> McGrath, *Fire for effect. Field Artillery and Close Air Support in the US Army*, *op. cit.*, pp. 69-71.

General E.R. “Pete” Quesada, in command of the Tactical Air Command (TAC) of the Ninth United States Army, played a fundamental role in the incorporation of CAS by the Allies. During Operation *Cobra* above Normandy in July 1944, more than 2000 American aircrafts were diverted from their strategic bombing missions to support a ground offensive South of Saint-Lô. For once, the air force was bringing tactical compensation to artillery, which was lacking range and fire volume. However successful the offensive was, tragic mistakes were made as a result of bad communication and low-visibility conditions. Indeed, the prior formation of a line below which bombers were not allowed to drop bombs was insufficient to prevent the killing of soldiers by their own aviation: one battalion and three infantry companies disappeared under Allied bombs. After this incident, never again did Eisenhower use the air force so intensively in missions of close air support.

By the end of World War II, the revolution of fire support in the third dimension had come of age. Indirect artillery fire, introduced at the beginning of the century, was brought into general use during World War I and again in 1939-1945, although never as intensively. As for the return of maneuver and the war of movement, it raised the question of fire mobility. Part of the answer lied in the mechanization of artillery and the increase of its range, but above all in the use of close air support. Using the latter, however, turned out to be rather complex, as much in terms of command and control (C2) than in terms of accuracy. By 1945, therefore, the new terms of the debate had been set: the challenge of mobility for artillery and that of precision for aviation.

### ***Fire Support in an Era of Limited War***

The advent of the nuclear era and the Cold War deeply transformed military practices, dividing strategy in two layers: that of deterrence and mass destruction on the one hand, and that of limited war on the other, the latter being unable to follow the natural course of escalation – at least in terms of firepower – due to the nuclear threshold. In this peculiar strategic pattern, the place of fire support was considerably constricted between the two layers and thus got relegated to the bottom of the military’s priority list.

#### **When Tactics Tromped Strategy**

The dramatic end of World War II, with the atomic bombings of Hiroshima and Nagasaki, had the unanticipated effect of saving the doctrine of strategic bombing, whose implementation throughout the conflict had yet not produced decisive results.<sup>29</sup> This led, among other things, to the creation of the US Air Force (USAF) in 1947. Benjamin Lambeth therefore describes strategic bombing as the Air Force’s strategic identity and “*raison d’être*”.<sup>30</sup> Close air support, on the other hand, was often neglected by the Tactical Air Command (TAC), itself coming after the Strategic Air Command

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<sup>29</sup> Lawrence Freedman, *The Evolution of Nuclear Strategy*, London, Palgrave, 2003, p. 21.

<sup>30</sup> Benjamin S. Lambeth, *The Transformation of American Air Power*, Ithaca, Cornell University Press, 2000, p. 265.



(SAC), in charge of nuclear deterrence, and reaping from the early years more than 75% of USAF's budgets.<sup>31</sup>

It was therefore artillery, which, in theory at least, kept the prerogative of fire support. Combined arms combat was developed extensively between 1939 and 1945 and coordination with non-organic batteries was now entirely ensured by ciphered radio transmission. Each regiment or battalion had at its disposal an artillery liaison officer (ALNO) who helped with the planning, and each company received a forward observer (FO) capable of requesting, via the ALNO, or directly in urgent cases, immediate support to the Fire Direction Center (FDC). The latter, in charge of divisional batteries, could then fire for effect within a few minutes.

In the nuclear era, however, the Army appeared as the poor man in budgetary interservice strife. The personnel was largely demobilized, the war industry restructured and the surplus destroyed or sold. Hence, when the Korean War broke out in 1950, "the artillery park of the Western powers was but a shadow of what it had been at the end of World War II".<sup>32</sup> As early as July 1950, MacArthur asked for reinforcement, notably 155mm howitzers, to support each infantry regiment. The White House, however, had decided from the start that they would not go back to a war economy. The industrial restructuring meant that it was more than a year before the required quantity of tubes was obtained. Even once the gun shortage had been filled, the issue of ammunition stockpiles remained, notably for 105mm shells, which kept on lacking and ultimately triggering a serious crisis in the spring of 1952.<sup>33</sup>

In order to make up for this shortage, "orders required that, wherever possible, air support [...] be used instead of light and medium artillery".<sup>34</sup> The TAC, under the command of General Quesada, developed a new coordination system based on teams called Tactical Air Control Parties (TACP), usually seconded to a regiment. It soon turned out to be a difficult task, as most of the TACP came from the Army and had very little knowledge of terminal guidance systems. Furthermore, USAF's military culture promoted a very centralized command structure: support requests had to go through four echelons (while only one in the case of artillery), up to the Joint Operations Command, and were often refused. Such centralization was deemed excessive by the US Army chiefs like General Ned Almond, and caused the first severe tensions between the Army and

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<sup>31</sup> John Schlight, *Help from Above: Air Force Close Air Support of the Army, 1946-1973*, Washington, US Air Force History Program, 2003, pp. 58-59.

<sup>32</sup> Gudmunsson, *On Artillery*, *op. cit.*, p. 144. See also, Bailey, *Field Artillery and Firepower*, *op. cit.*, pp. 366 ff.

<sup>33</sup> This absence of organic firepower for ground forces was less problematic than it appeared since the Chinese and Korean were even more deprived of it: attacking in "human waves" and having been barely prepared, the Chinese were subject to mass casualties. See Janice McKenney, *The Organizational History of Field Artillery, 1775-2003*, Washington, Center of Military History, 2007, pp. 201-203.

<sup>34</sup> *Ibidem.*, p. 204-205.

Air Force, proving at the same time that the former had not fully accepted the institutional independence of the latter.<sup>35</sup>

Except in the specific case of the Marine Corps' air force, whose *raison d'être* was fire support and which rapidly demonstrated its mastery of air-ground integration,<sup>36</sup> the Korean War revealed important flaws in the application of CAS, that were to persist for decades.<sup>37</sup> The first disagreement had to do with mission priority: USAF preferring strategic strikes over tactical ones, and, within those, interdiction over fire support. The Army, on the other hand, considered support missions should be the main concern for air forces, which in general should be subordinated to ground maneuver, it alone in a position to bring about a decisive effect. The second stumbling block pertained to the level of coordination: USAF favored a centralized command at the highest level, while the Army deemed some degree of decentralization was necessary for good reactivity. The third point of disagreement had more to do with structure and reflected the lack of training and joint culture, which are necessary for an adequate air-ground integration. Finally, the fourth and last bone of contention was concerned with the absence of new aircraft designed for CAS: the advent of jet fighters, too fast to adjust their targets, and strategic bombers, too big to be used on theatre, rendered CAS much harder to implement. Acknowledging these disagreements, as well as the Air Force's refusal to give in to their requirements, the Army decided in 1954 to set up an Army Aviation branch, in spite of the distribution of roles agreed in the 1948 Key West Agreement.

### Fire Support in Irregular Warfare

With the nuclear standoff blocking the dynamics of conventional strategies, belligerents developed indirect strategies, in order to get around restrictions. It was in these circumstances that irregular warfare expanded rapidly through decolonization and wars of national liberation. Such wars however, brought new challenges to fire support, which had until then been developed for conventional combat.

By 1946 in Indochina, the Vietminh undertook a "*guerre de surface*".<sup>38</sup> The communist fighters implemented non-linear tactics made of

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<sup>35</sup> Etienne de Durand, "L'interarmées aux Etats-Unis. Rivalités bureaucratiques, enjeux opérationnels et idéologiques de la *jointness*", *Focus stratégique*, No. 3, November 2007, available at: [http://www.ifri.org/downloads/Focus\\_strategique\\_3\\_d\\_eDurand\\_interarmees.pdf](http://www.ifri.org/downloads/Focus_strategique_3_d_eDurand_interarmees.pdf).

<sup>36</sup> Among other things thanks to the Air Naval Gunfire Liaison Company (ANGLICO), in charge of air-ground cooperation (or air-sea, as in most cases the USMC's air force is loaded on aircraft-carriers). For further details, see John P. Condon and Peter B. Mersky, *Corsairs to Panthers. U.S. Marine Aviation in Korea*, Washington, U.S. Marine Corps Historical Center, 2002.

<sup>37</sup> All of these questions, which prevailed at the end of the Gulf War, are discussed in detail in Lambeth, *The Transformation of American Air Power*, *op. cit.*, pp. 260 ff.

<sup>38</sup> Paul Ely, *Les Enseignements de la guerre d'Indochine, Rapport du général Ely*, Tome 1, Vincennes, Service Historique de la Défense, 2011 (1955), p. 55. The French concept of "*guerre en surface*" refers to the total absence of linear fronts in irregular warfare, which implies operations on the whole area (*surface*). For a close

raids and ambushes meant to exhaust physically and mentally their enemy. Hence, fire support missions became even more complex. By separating batteries from the battlefield, indirect fire presupposed the existence of clear fronts and rears, which was precisely what was missing in these “twilight wars”. To cope with non-linear tactics, the French developed a “positional artillery, spreading its net across the vital points so it would always be ready to fire”.<sup>39</sup> This grid pattern naturally required more resources than France could afford at the time. Moreover, even if positional artillery attempted to respond to the infantry’s needs in the face of an adversary deprived of heavy weapons, it turned out to be extremely vulnerable whenever it proved able to combine mobility and firepower – as the tragic battle of Dien Bien Phu demonstrated. As a consequence, the French also developed an “artillery of intervention”, even though its mobility tended to be hindered by numerous terrain obstacles and distances.

By and large, the increasing non-linearity of the modern battlefield hampered ground fire support.<sup>40</sup> This problem was exacerbated by the psychological dimension of these wars, in which population soon appeared as the center of gravity. Given the low degree of accuracy at the time, firing on inhabited areas inevitably generated “collateral damage” resulting in the almost systematic loss of popular support to the enemy, thereby reinforcing its territorial control and increasing its resources.<sup>41</sup> Just as nuclear deterrence, irregular strategies imposed new limitations on fire support.

During the Vietnam War, the US found itself faced with the same problems as the French, in spite of incomparably superior means. Taking up the grid system from the French, the US Army covered Southern Vietnam with firebases, artillery nests capable of systematically supporting any company or platoon in their area, as their forward observer (FO) remained in permanent radio contact with the base.<sup>42</sup> As opposed to Bruchmüller’s neutralization principle (“artillery fixes, infantry kills”), fire support was used according to the motto “infantry finds, artillery kills”.<sup>43</sup> The term of firebase encompassed a wide variety of positions, ranking from the most permanent and most massive to the most temporary: *Forward Operating Base* (FOB), *Fire Support Base* (FSB), *Fire Support Patrol Base* (FSPB), etc.<sup>44</sup> – some of these terms such as the FOB were later reused in Iraq and Afghanistan. Bases were supposed to be within reach of each other to ensure mutual protection in the face of the numerous guerrilla raids they suffered. As it was the case with the French, their static nature made them ideal targets for the Vietcong harassment strategy. Some “sorties”

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study of this concept, see Marie-Catherine Villatoux, *La Défense en surface. Le contrôle territorial dans la pensée stratégique française d’après-guerre*, Paris, Service Historique de la Défense, 2009.

<sup>39</sup> Ely, *op. cit.*, p. 218.

<sup>40</sup> Jeffrey A. Braco, *Fire Support for Irregular Warfare*, Monterey, Naval Postgraduate School, 2008.

<sup>41</sup> Laurent Fromaget, “Le Feu dans le modèle occidental de la guerre”, *op. cit.*, pp. 18, 32.

<sup>42</sup> Randy E.M. Foster, *Vietnam Firebases, 1965-1973*, New York, Osprey, 2007, p. 14.

<sup>43</sup> Gudmunsson, *On Artillery*, *op. cit.*, p. 151.

<sup>44</sup> Foster, *Vietnam Firebases, 1965-1973*, *op. cit.*, p. 16.

were executed by mobile artillery pieces but, as always, the difficult nature of the terrain rendered such operations risky. It was for this reason that, when infantry units sank in areas that were out of FSB's reach, support was ensured by the Air Force through CAS missions.

As far as CAS was concerned, the problems already encountered in Korea were magnified. Fire support platforms were now all jet fighters, and their speed, a major asset for air superiority, became an obstacle when it came to targeting small and dispersed targets. In order to help with the targeting, USAF used "smoke rockets delivered by a Forward Air Controller [FAC] on a slow rotary-wing aircraft".<sup>45</sup> The growing need for air support with a high loitering time also prompted a generation of transport aircraft converted into gunships (AC-119 and later AC-130), equipped with a heavy machine gun or a 105mm cannon on the side and capable of bombarding a stationary target during hours in a pylon turn.

In terms of fire coordination, the chain was even more complex. The Fire Support Coordinator (FSCOORD), commanded the Fire Support Coordination Center (FSCC), at the battalion or brigade level.<sup>46</sup> Even though the company level FO could request emergency support at all times, it was the FSCOORD who was responsible for the fire support planning for each operation, whether it be from artillery, Army Aviation, US Air Force or US Navy (naval gunfire support). In spite of these coordination measures, the mistrust between the Army and Air Force since the Korean War was such that each had retained its own chain of command to "coordinate" CAS, without necessarily having common structures. As a result, TACPs inserted into battalions had no institutional link with the FSCC's artillerymen.<sup>47</sup> At the end of the day, the planning of air support still had to be validated at the very top of the hierarchy before being delivered to the crew.

As one of the longest wars of the 20<sup>th</sup> Century came to an end in 1973, the Western model of warfare, based on the massive and concentrated use of fire, was in a state of crisis. Its weaknesses, which appeared as early as 1918, were now blatant: the lack of mobility of artillery, as well as the lack of availability and precision of air power. Furthermore, the strategic value of fire in these irregular wars was questioned, as the political cost of collateral damage exceeded tactical benefits. However, a dramatic transformation of technical and operational capabilities was about to restore its effectiveness.

### ***Fire Support in the Information Age***

In addition to putting an end to the war in Vietnam, the year 1973 saw the outburst of the Yom Kippur War, which sparked a shock in the field of

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<sup>45</sup> Jean-Christophe Gervais, "L'avion à hélice dans la lutte antiguérilla, archaïsme ou avenir?", *Stratégique*, No. 93-96, June 2009, p. 466.

<sup>46</sup> David E. Ott, *Field Artillery, 1954-1973*, Washington, Vietnam Studies, Department of the Army, 1975, p. 47.

<sup>47</sup> McGrath, *Fire for Effect. Field Artillery and Close Air Support in the US Army*, *op. cit.*, pp. 118-120.

defense. The progress of Soviet armaments regarding anti-tank munitions (ATGMs) and surface-to-air missiles (SAMs) strengthened the Western view according to which traditional firepower was deficient.<sup>48</sup> The Israeli way of war, very similar to the German *Blitzkrieg* and entirely dependent on the tank-aircraft couple, with almost no artillery support, had reached its limits.<sup>49</sup> The end of the Vietnam War, the lessons drawn from Kippur and the nuclear stalemate, leading the United States to look for intermediate solutions that would avoid or delay mutual suicide, profoundly altered the strategic debate: the prospect of a conventional *Blitzkrieg* in Europe became once again the intellectual horizon of Western armies. This new framework reinstated the question of fire support, marginalized since 1945, at the heart of the debate.

### Close Support for Deep Attack: the Cold War's Legacy

The creation in 1973 of the Training and Doctrine Command (TRADOC) and the publication of the *Active Defense* doctrine in 1976 revived operational thinking about ways to counter Soviet firepower superiority. While *Active Defense* provided for an “elastic defense” counter-attacking on Soviet divisions’ flanks, its critics blamed a vision that was considered too focused on volume and that did not address the lack of strategic depth of the European theatre. In response, the TRADOC published in 1982 a new doctrine entitled *AirLand Battle*, which implied a strong involvement of air power, long-range artillery (MRLS, ATACMS) as well as special forces in order to block Soviet second and third waves before they even entered the theatre (deep attack). This new concept, ratified by the Pentagon, forced the Army and Air Force to achieve a level of cooperation “previously unseen in times of peace”<sup>50</sup> coherent with the jointness promotion of the 1986 Goldwater-Nichols Act.

While *Active Defense* had favored close support, whether it be air- or ground-based, *AirLand Battle* assigned to the air forces a role of interdiction. Acknowledging the shortcomings of Western firepower, it appeared at first sight that an important share of support should be delivered from the skies. Three material inventions reaffirmed the close air support trend: the development of attack helicopters with the AH-64 *Apache*<sup>51</sup>; the fielding of a CAS dedicated jet aircraft; and finally, the more global revolution of precision munitions.

The introduction of an aircraft devoted to ground attack was a first for the USAF, which had always shunned specialized platforms. The development of such an aircraft resulted from the Army’s permanent

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<sup>48</sup> In 1986, the USSR lined up 16,7 artillery tubes per thousand men, while it was only 6.7 for the US and 2.5 for France. Source: Bailey, *Field Artillery and Firepower*, *op. cit.*, p. 493.

<sup>49</sup> Pierre Razoux, “La manœuvre aéroterrestre dans l’armée israélienne”, in Malis (ed.), *Guerre et manœuvre*, *op. cit.*, pp. 56-66.

<sup>50</sup> Etienne de Durand, “Maneuver warfare entre Vietnam et Transformation”, in Malis (ed.), *Guerre et manœuvre*, *op. cit.*, p. 70.

<sup>51</sup> The airmobile dimension of fire support was discussed extensively in Etienne de Durand, Benoît Michel and Elie Tenenbaum, “Helicopter Warfare. The Future of Airmobility and Rotary Wing Combat”, *op. cit.*

pressure for more CAS missions during the Vietnam War. It is often said that the Air Force only accepted to support the program to prevent the Army from developing its own platform and thus secure its monopoly on fixed-wings, reasserted in the 1966 Johnson-McDonnell Agreement. Launched in 1967, the A-X program finally led to the advent in 1984 of the A-10 *Thunderbolt II*, already nicknamed “warthog”, as a result of its rather bulky shape. Still at a very early stage by the end of the Vietnam War, the program was reoriented from an anti-guerrilla to an anti-tank role – as armor was then perceived as the major threat on the European theatre. In addition to 30mm guns capable of breaking through most Soviet armors, and significant bomb and missile payload capabilities, the A-10 also demonstrated increased survivability thanks to a high-performance armor allowing it “to operate at low altitude”.<sup>52</sup>

The second major technical innovation was the gradual introduction of precision-guided munitions (PGMs) starting at the end of the Vietnam War, in the form of laser-guided bombs.<sup>53</sup> These improvements rendered the implementation of CAS far less risky in terms of fratricides and collateral damage. While artillery had had, until then, a relative advantage over air forces in terms of precision, the introduction of PGMs reversed the trend and put behind the “carpet bombing” tactic traditionally associated with air-to-ground strikes.<sup>54</sup>

Finally, with the expansion of the Tactical Air Command and the growing influence of the fighter pilots mafia,<sup>55</sup> the Air Force put greater effort in the training and professionalization of TACP units at the end of the 1970s: the FAC – later called Terminal Attack Controller (TAC) – within the TACP became the Air Liaison Officer and was no longer necessarily a pilot; other corps received this training, and the role of radio operators (ROMADs) was reinforced.<sup>56</sup>

In addition, and in spite of the “maneuver style” promoted by some strategists, the 1970s and 1980s also witnessed a more traditional development of firepower, especially in the realm of artillery, which still represented “one-third of all new US Army systems”.<sup>57</sup> The post-Vietnam era was characterized by intensive discussions on the future of artillery, with the creation in 1975 of a Close Air Support Study Group in charge of examining the issue. Its main recommendations led to the creation of Fire

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<sup>52</sup> Jean-Louis Promé, “L’A-10 *Warthog*, l’avion dont l’USAF n’a jamais voulu”, *Défense et sécurité internationale*, No. 32, November 2008, pp. 78-81.

<sup>53</sup> During Operation Linebacker (1972), 70% of the damage was caused by precision attacks. Source: Lambeth, *The Transformation of American Air Power*, *op. cit.*, p. 27.

<sup>54</sup> Douglas Musselman, *Joint Fires Battlespace Deconfliction: Doctrinal Emphasis to Eliminate Airborne Fratricide*, Maxwell Air Force Base, Air Command and Staff College, Air University, 2002, pp. 6-9.

<sup>55</sup> Mike Worden (Colonel), *Rise of the Fighter Generals, The Problem of Air Force Leadership 1945–1982*, Maxwell Air Force Base, Air University Press, 1998, pp. 211 ff.

<sup>56</sup> McGrath, *Fire for Effect. Field Artillery and Close Air Support in the US Army*, *op. cit.*, p. 133.

<sup>57</sup> Bailey, *Field Artillery and Firepower*, *op. cit.*, p. 496.

Support Teams (FIST), which were designed to form joint fire support units at the battalion level. It brought together Forward Observers for artillery and Air Controllers for CAS – even though the Air Force decided to retain its own TACP chain in parallel. The FISTers, as they came to be known, would operate in *Bradley*-type armored vehicles (Fire Support Vehicles) that were replaced by *Strykers* in 2001. Fire support was equally affected by the introduction of automatic calculating systems such as the TACFIRE in the US from 1982 onwards (or the ATILA in France), which simplified the job of Fire Direction Centers as firing parameters were now computed through coordinates transmitted by the observer.<sup>58</sup>

Finally, the precision revolution also affected artillery, with the development of new acquisition systems (ISTAR) as well as improved means of communication (C4I) allowing for the transfer of heavier data. The emergence of precision artillery resulted from these initial advances, notably with the first cannon-launched guided projectile in 1984 (*Copperhead*). This laser-guided 155mm shell implied that forward observers be equipped with laser designator that were still lacking technological maturity. This advancement was accompanied by the development of cluster munitions, the multiple launch rocket system (MLRS), designed to deliver M26 rockets capable of dispersing hundreds of grenades designed to halt an armored column.<sup>59</sup> The appearance of rockets and army tactical missile systems (ATACMS) therefore provided artillery with a range of more than 70km, thereby restoring its access to operational depth, lost since Bruchmüller's FEKA.

At the end of the 1980s, the future of fire support depended on a three-layered conception of maneuver: *deep battle*, in which the air power would prevail (more than 100km behind the frontline); *rear battle*, where heavy precision artillery and multiple launch rocket systems could provide interdiction in cooperation with the air forces (up to 100km); finally *close battle*, in which maneuver forces were meant to dispose of sufficient organic fire thanks to rockets and new advanced mortar systems allowing the artillery to abandon, so to speak, its support mission.<sup>60</sup>

### Depletion or Transformation?

In 1991, the Gulf War illustrated the triumph of air power. Nevertheless, the decisive success of the air campaign had not been expected and fire support took an important place in the preparations for Operation *Desert Storm*: 43 artillery battalions, including 296 howitzers and 7 MLRS for 53 maneuver battalions, in other words a 4/5 “supporting-to-supported” ratio, which had never been reached before. In the first hours of the ground

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<sup>58</sup> McGrath, *Fire for Effect. Field Artillery and Close Air Support in the US Army*, op. cit., p. 134; Bailey, *Field Artillery and Firepower*, op. cit., p. 468.

<sup>59</sup> Bailey, *Field Artillery and Firepower*, op. cit., pp. 482-484.

<sup>60</sup> *Ibid.*, pp. 496-497.

offensive, field artillery delivered a massive barrage fire in “one of the most intense bombardments in modern warfare”.<sup>61</sup>

Close air support units were also present with A-10s – deployed for the first time –, AV-8B fighters and F/A-18, as well as AC-130 *Spectre*. General Chuck Horner, the Joint Forces Air Component Commander (JFACC), introduced the “push CAS” concept, in which air support would be planned from the command center and used to foster initiative and encourage the advance of ground forces in a kind of offensive barrage – in contrast with the more reactive “pull CAS”, sent at the request of a unit under attack. However, the incredibly successful air campaign greatly limited the utility of CAS, the huge artillery capability being more than enough to support the five days long ground campaign. In spite of this limited use and of an unexpected vulnerability,<sup>62</sup> CAS missions were deemed a success by both services.

From a political and organizational point of view, the triumph of American airpower triggered a decade of internal strife between the Air Force and the Army regarding the prerogatives of each. In an attempt to distribute the different roles, the USAF Chief of Staff, General Merrill McPeak, took up the division in “close, deep and high battles”,<sup>63</sup> and suggested the Air Force took over the last two, while operational control of close battle would remain the prerogative of “surface forces” (Army, Navy, Marines). This idea incurred the Army’s wrath, as its doctrine envisioned the entire depth of the battlefield (ATACMS, helicopters), and considered accordingly that, even beyond the Fire Support Coordination Line (FSCL), the Air Force’s duty remained to support ground forces.<sup>64</sup> The debate over air-ground partnership and the role of fire support remains largely unresolved today.

During the military engagements of the 1990s in the Balkans and in Africa, Western air forces demonstrated their ability to take responsibility for the entire “coercive phase” of a conflict, and therefore to sway the decision, at least militarily, while ground forces were reduced to an auxiliary role in post-conflict stabilization. This was typically the case for Operation *Allied Force* above Kosovo in 1999. Alongside this operation, however, the US Army suggested that be deployed Task Force *Hawk*, which comprised AH-64 *Apache* attack helicopters. In the end, these were never engaged, in spite of the 254 million dollars spent and the two aircrafts crashed in training.<sup>65</sup> This fiasco was a good illustration of the limitations of the “Powell doctrine”, which literally prohibited the use of ground forces short of an

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<sup>61</sup> Michael Gordon and Bernard Trainor, *The Generals’ War. The Inside Story of the Gulf Conflict*, New York, Little, Brown and Co, 1995, p. 379.

<sup>62</sup> Two A-10s were shot down on the 15<sup>th</sup> February by the Iraqi anti-aircraft defense, and one AC-130 was destroyed on 31<sup>st</sup> January by a SAM battery while supporting Marines in Kuwait. John Andreas Olsen, “Operation Desert Storm, 1991”, in *idem, A History of Air Warfare*, Dilles, Potomac Books, 2010, p. 196.

<sup>63</sup> Lambeth, *The Transformation of American Air Power*, *op.cit.*; p. 277.

<sup>64</sup> *Ibid.*, pp. 274-278.

<sup>65</sup> Benjamin S. Lambeth, “Task Force Hawk”, *Air Force Magazine*, vol. 85, No. 2, February 2002, p. 80.



overwhelming force.<sup>66</sup> In practice, whilst the armed forces were being significantly reduced under the Clinton administration, such a doctrine rendered US ground troops hardly usable as highlighted by State Secretary Madeleine Albright's quip at Colin Powell, then Chairman of the JCS: "What's the point of you saving this superb military for, Colin, if we can't use it?"<sup>67</sup>

Following the election of George W. Bush in 2000, the new Secretary of Defense, Donald Rumsfeld, opposed Powell's vision in order to recover some flexibility with regards to force projection. Sacrificing numbers to technology with his *Transformation* doctrine, he sought to rid the American armed forces of an Army that was "too heavy, took too long, and wanted to bring too much stuff with it to attain decisive force".<sup>68</sup> In order to go on this diet, artillery and organic fires were rapidly singled out as typical examples of the Army's obesity. Too heavy to be deployed, with the exception of 105mm cannons, the only air-transportable guns, artillery was also considered as lacking accuracy and thus bearing too much political risk in an era of intense media coverage and of high public expectations for precision. Finally, the deeply asymmetric nature of post-Cold War conflicts, the complete absence of artillery as well as of enemy air defense gave the impression that traditional know-how such as counter-battery fire had become obsolete. The cancelation, in May 2002, of the new generation *Crusader* self-propelled howitzer program, whose 43 tons would have severely crippled the logistical footprint of any projected ground force, was a good example of the drastic cure imposed on the Army by Donald Rumsfeld in the early 2000s.

By redeeming the utility of firepower, notably by significantly improving its accuracy, the Revolution in Military Affairs (RMA) put an end to the marginalization imposed by the nuclear era. Above all, it provided new opportunities to close air support in terms of precision and reactivity – notably with the introduction of Push CAS. Artillery, on the other hand, suffered from its logistical footprint and its bulk in a post-Cold War context characterized by expeditionary and peacekeeping operations and a strong aversion to risk. It was in these circumstances that the "Global War on Terror" was launched following the 9/11 attacks and that were deployed, for the first time in recent history, Western troops entirely deprived of field artillery, leaving the air component to bear full responsibility for fire support.

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<sup>66</sup> Conceptualized as early as 1983 by Caspar Weinberger, this "all or nothing" law in the use of force is the result of the rejection by the military elites of the gradualism judged responsible for the defeat in Vietnam. On this point, see Andrew Bacevich, *The New American Militarism. How Americans Are Seduced by War*, Oxford, Oxford University Press, 2005, pp. 48 ff.

<sup>67</sup> Colin Powell, *Un enfant du Bronx*, Paris, Odile Jacob, 1995, p. 502.

<sup>68</sup> McGrath, *Fire for Effect. Field Artillery and Close Air Support in the US Army*, *op. cit.*, p. 149.



# Fire Support and the Expeditionary Model

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Contrary to the general tendency of the military, throughout the 20<sup>th</sup> Century, to gradually increase its firepower, the end of the Cold War was characterized by a radically opposite trend. In 2005, a RAND Corporation study calculated the quantity and volume of ammunition at the disposal of a given brigade for a six-hour engagement and compared it in time. It appeared that the volume of fire devoted to support missions for a heavy brigade in 2005 was inferior by almost half to that of a light brigade during Operation *Restore Hope* in Somalia in 1993. While it counted 218 artillery battalions in 1989, the US Army had dropped to 141 by 2003, not to mention the fact that most batteries divided by two their number of tubes.<sup>69</sup>

This severe decrease in fire support has doctrinal as well as budgetary explanations. The desire, shared by all Western governments, to reap peace dividends by reducing defense expenditures was certainly one of the explanations. However, one should also take into account the post-Cold War strategic analysis which justified the advent of a military that would be more flexible and more adapted to force projection. The low mobility and general heaviness associated with artillery led to a quantitative reduction—ammunition lots allocated before projection was reduced by a third during the decade—as well as a qualitative one—material changes such as the fielding of *Stryker* vehicles from 2002 onwards reduced the overall weight of units.<sup>70</sup> Finally, the reduction of operational force structures down to the brigade level or even to the battalion level<sup>71</sup> probably impacted this evolution.<sup>72</sup> With this restructuring, American land forces were deprived of their reserve batteries, which had been attached to the corps, division or brigade level since WWI.

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<sup>69</sup> Bruce Pirnie *et alii*, *Beyond Close Air Support. Forging a New Air-Ground Partnership*, Santa Monica, RAND Corporation, 2005, pp. 107-108. See graphs in appendix 2.

<sup>70</sup> In fact, the *Stryker* has tended to weigh down light units, which used to be made up of *Humvees*. However, it also contributed to the relative marginalization of the heavy divisions in the US Army, thereby favoring the general reduction of the expeditionary forces. Frederick Kagan, *Finding the Target. The Transformation of American Military Policy*, New York, Encounter Books, 2006, p. 249.

<sup>71</sup> French battlegroups or GTIA, are increasingly becoming the basic unit structure for any French army operations.

<sup>72</sup> Richard W. Stewart (ed.), *American Military History, Volume II. The United States Army In A Global Era, 1917–2003*, Washington, D.C., Center of Military History, 2005, p. 425.

French land forces have suffered from the limitation of firepower since the end of the Cold War, as it now only owns 208 pieces in its artillery park, including 64 Caesar 105mm guns, and 80 heavy 120mm mortars. By way of comparison, it had 1022 pieces in 1997, on the eve of professionalization.<sup>73</sup> Of course, the qualitative improvements of the equipment should be taken into account: an increased mobility thanks to the CAESAR's motorized chassis, improved precision with the ATLAS' fire automation system, as well as a higher rate of fire. These, however, do not make up, in terms of the general volume of fire, for such an important quantitative reduction. Even though this has been a general trend, it has affected Western forces unevenly. For instance, the British Army still had 670 pieces in its artillery park in 2011 even after significant cuts were made.<sup>74</sup>

Given this major transformation, it is not surprising that close air support (CAS) has played an increasingly important role in military operations. While they were limited to approximately 6% of sorties during *Desert Storm* in 1991, missions designated as "CAS" by the US Air Force represented nearly 80% of *Iraqi Freedom's* air component in 2003.<sup>75</sup> Naturally, this genuine revolution of CAS should be examined against the background of an equally significant decrease of ground forces organic firepower. Together, these changes have led to a radical transformation of the source of fire and of the various contexts in which it is employed. It is therefore necessary to examine its benefits as well as the risks it comprises.

### ***The Operational Advent of Close Air Support***

The outbreak in November 2001 of Operation Enduring Freedom (OEF) embodied for many experts a breaking point in the Western "way of war".<sup>76</sup> In view of the hurry provoked by the need to answer quickly to the 9/11 attacks, the White House could not opt for a massive conventional deployment of troops as that of *Desert Shield*. The plan chosen was therefore that designed by George Tenet, then Director of Central Intelligence. It recommended that the Taliban regime be toppled by relying on the Northern Alliance's rebel forces, supported by precision air strikes, themselves guided by special forces that would be used as forward air controllers.<sup>77</sup> This operational pattern clearly demonstrated the will, already

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<sup>73</sup> 133 BF-50, 105 TR-F1, 264 AU-F1, to which one must add 520 120mm mortars. Source: International Institute for Strategic Studies, *The Military Balance 1997*, London, Routledge, 1997, p. 51.

<sup>74</sup> 130 AS-90 Braveheart (155mm); 118 L-118 Light gun (105mm); 51 GMLRS ; 371 mortars (various calibers). Source: International Institute for Strategic Studies, *The Military Balance 2011*, London, Routledge, 2011, p. 158.

<sup>75</sup> Michael H. Johnson, "Clear to Engage. Improving the effectiveness of Joint Close Air Support", *Air & Space Power Journal*, summer 2008.

<sup>76</sup> Max Boot, "The New American Way of War", *Foreign Affairs*, vol. 82, No. 4, July-August 2003, pp. 41-58; Richard B. Andres, Craig Wills, Thomas E. Griffith Jr., "Winning with Allies: The Strategic Value of the Afghan Model", *International Security*, vol. 30, No. 3, winter 2005/2006, p. 129.

<sup>77</sup> Stephen D. Biddle, "Afghanistan and the Future of Warfare", *Foreign Affairs*, vol. 82, No. 2, March-April 2003, p. 31.

displayed in 2000 by Donald Rumsfeld, to reduce the ground component of military campaigns.

### The “Afghan Model”, an Unbearable Lightness of Flying?

From the very first days of the offensive, air power was used at various levels. Strategic attacks were carried out effectively – even though limited, as the Taliban’s lack of infrastructure made them relatively resilient to this type of strikes. Interdiction missions were also conducted on the rear of their military. Nevertheless, close air support appeared from the very start as a crucial component of the Afghan model. To some extent, it was used according to the “push CAS” principle, in which air support takes the lead and acts as a rolling “barrage” in order to facilitate the advance of ground forces.

The level of coordination required by such a tight integration of fires was of course complicated by the employment of foreign troops, not well accustomed to US forces CAS procedures. Hence, during the battle at Bai Beche on November 5, 2001, the cavalry of Rashid Dostum, an Uzbek leader of the Northern Alliance, attacked Taliban defensive positions with massive air support, controlled by a detachment of special operation forces (SOF). The lack of coordination with Dostum’s men led them to mistake a warning sign sent by the SOF for a command to launch the assault. The attack began just as a series of Mk-82 laser guided bombs were dropped on the enemy. The astonished SOF team watched the Afghan cavalry sink in the cloud of smoke and dust, “convinced they had just caused a friendly fire incident”.<sup>78</sup> As it happened, the bombs hit the ground a few seconds before the cavalry arrived. The defenders’ surprise was complete and the breakthrough a major success, opening the way to Mazar for the Northern fighters. The result was most certainly commensurate with the enormous risk that was taken. It demonstrated the dangers of an operating method whose success depends on the presence of allies on the ground, capable of acting in a coordinated and efficient manner with air maneuver.

More recently, during the military intervention in Libya in support of the insurgency against Muammar Gaddafi, Western countries resorted once again to an operational pattern akin to the Afghan Model. In the first days of Operation *Harmattan*, France acknowledged having carried out in the Benghazi region “strikes against identified military targets on the ground which represented a threat to the civil population”.<sup>79</sup> Just as in Kosovo in 1999,<sup>80</sup> the absence of ground controllers was a major impediment to the

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<sup>78</sup> Stephen D. Biddle, “Allies, Airpower, and Modern Warfare. The Afghan Model in Afghanistan and Iraq”, *International Security*, vol. 30, No. 3, winter 2005-2006, p. 169.

<sup>79</sup> “Libye: point de situation opération Harmattan n°1”, *Defense.gouv.fr*, 25<sup>th</sup> March 2011, available at: <http://www.defense.gouv.fr/operations/autres-operations/operation-harmattan-libye/actualites/libye-point-de-situation-operation-harmattan-n-1>.

<sup>80</sup> Similar difficulties were encountered two years earlier in Kosovo during Operation *Allied Force* in 1999, which did not have any allied force on the ground. NATO pilots had to make sure they did not cause any kind of collateral damage during their strikes. These were not designated as CAS but were very similar. For

fluency of air support missions. In an urban context, easily conducive to collateral damage, the rule of aerial “positive identification” – i.e. visual confirmation of a target – proved necessary but was also a major obstacle when it came to “relieving allies held up by enemy fire”<sup>81</sup> and operationally intertwined with their adversary.

Even in its most “committed” version, with the presence of light troops or SOF capable of illuminating targets, the Afghan model generates problems. During the Lebanon War in 2006, Israeli Defense Forces (IDF) became aware of the limitations of standoff firepower-based operations. According to the Israeli researcher and former fighter pilot Ron Tira, the reliance of these FACs on permanent long-range C4I means raises the question of their survivability in the face of a hardened adversary, capable of breaking this link and isolating them at tens or even hundreds of kilometers of their base.<sup>82</sup>

In practice, the dysfunctions linked with the application of CAS appeared as early as March 2002 during Operation *Anaconda* in the Shah-e-Kot valley, southeast of Kabul. Its goal was to encircle al-Qaeda and Taliban forces suspected of attempting to escape to neighboring Pakistan. The Combined Joint Task Force Mountain, composed of units from 10<sup>th</sup> Mountain and 101<sup>st</sup> Airborne Divisions, had planned to transport by helicopter a number of light troops to a series of mountain passes in order to block the enemy’s way uphill whilst their Afghan allies combed the valley downhill.<sup>83</sup> No sooner had US troops landed that they found themselves caught under mortar, RPG and heavy machine gun fires, who had already taken over the heights. The preparatory air strikes, scheduled to last almost an hour, did not last more than five minutes, and, to add to the confusion, an AC-130 *Spectre* shot by accident a column of Afghan soldiers supposed to be closing the lower valley, causing the death of a non-commissioned officer and the retreat of the entire battalion. Whilst the HQ was crumbling under fire requests, the air assets seemed insufficient or inadequate. As a matter of fact, General Franklin Hagenbeck, commander of the Task Force, had neglected to involve the Air Force in the operation planning. There were no CAS cell set up, and Hagenbeck waited five days before the beginning of the operation to warn General Moseley, then Combined Forces Air Component Commander (CFACC) in Afghanistan, of the role he was to play in the upcoming events.<sup>84</sup> Even though the operation was

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want of terminal guidance on the ground, aircraft had to resort to Forward Air Controller-Airborne (FAC-A) in which the least cloud cover can hamper air targeting and cancel the mission. Interview with senior officer X, French Air Force, 6<sup>th</sup> October 2011.

<sup>81</sup> Interview with senior officer Y, French Air Force, Paris, 16<sup>th</sup> September 2011.

<sup>82</sup> Ron Tira, *The Limitations of Standoff Firepower-Based Operations: On standoff Warfare, Maneuver, and decision*, Tel Aviv, Institute for National Security Studies, Memorandum No. 89, 2007.

<sup>83</sup> Richard B. Andres and Jeffrey B. Hukill, “Anaconda: A Flawed Joint Planning Process”, *Joint Forces Quarterly*, No. 4, 2007, pp. 135-140.

<sup>84</sup> Already during the following week, USAF responded with an article entitled “After Leaving USAF Out of a Anaconda Planning, Army General Blasts Air Support”, *Air Force Magazine*, November 2002, p. 14; USAF finally published in 2005 the report: Headquarters United States Air Force, *Anaconda, an Air Power perspective*, 7<sup>th</sup>

deemed a success, it soured the American Forces who ended up with 8 men dead, 80 wounded and one CH-47 *Chinook* helicopter shot down by a RPG.<sup>85</sup>

Immediately, the US Army took hold of the event to underline the risks implied by too light a footprint, and lambasted the lack of financial resources. In a controversial interview granted to *Field Artillery* journal, General Hagenbeck put the blame on USAF for the mistakes and took advantage of the situation to reduce the importance of CAS, even declaring that its 120mm mortars had played a more important role than all of the air assets put together.<sup>86</sup> Beyond the Air Force's response and the usual interservice rivalry, it was air-ground coordination, rather than CAS itself, that was genuinely called into question.<sup>87</sup>

### From Conventional Achievement to Asymmetric Doubts

It would be a mistake to regard the confusion of *Anaconda* as representative of the current reality of close air support. Indeed, as early as 2002, US armed forces started a general review of CAS procedures, driven notably by the US Marine Corps, whose aviation has always had a strong tradition of ground support.<sup>88</sup> As jointness was being strengthened, CAS gradually became part of the daily life of combatants, first in Afghanistan, and later during Operation Iraqi Freedom (OIF), with the extensive use of A-10s – that some had deemed outdated just a few years earlier – during strikes in support of the rapid advance of maneuver forces.<sup>89</sup>

According to the 2003 After Action Report of the US Army 3<sup>rd</sup> Infantry Division, OIF demonstrated the considerable progress made by CAS whether in close combat or in “shaping operations”.<sup>90</sup> This concept of “shaping” implies that CAS moved from an auxiliary role – to which it had been reduced, to a lesser or greater extent, since the Second World War – to a decisive role on the theatre of operations. This qualitative evolution contributed to the idea that a genuine CAS revolution was on its way.

The information superiority resulting from satellite observation as well as new-generation UAV-mounted video, IR and radar surveillance

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February 2005; another interesting study is that of the RAND by Pirnie *et alii*, *Beyond Close Air Support*, *op. cit.*

<sup>85</sup> Headquarters United States Air Force, *Operation Anaconda, an Air Power perspective*, *op. cit.*, pp. 7 ff.; McGrath, *Fire for Effect, Field Artillery and Close Air Support in the US Army*, *op. cit.*, pp. 150-151.

<sup>86</sup> Franklin Hagenbeck, “Afghanistan, Fire Support for Operation Anaconda”, *Field Artillery*, September-October 2002, p. 8.

<sup>87</sup> Lambeth, “Operation Enduring Freedom, 2001”, in Olsen (ed.), *A History of Air Warfare*, *op. cit.*, p. 267.

<sup>88</sup> Aaron W. Clark, J. Brad Reeves, “Reality check. Close air support detractors are clinging to outdated concepts”, *Armed Forces Journal*, February 2011. The review of CAS procedures is analyzed in the third section.

<sup>89</sup> Anthony Cordesman, *The Iraq War. Strategy, Tactics and Military Lessons*, Westport Praeger, 2003, pp. 285-286.

<sup>90</sup> US Army Third Infantry Division (Mechanized), *Operation Iraqi Freedom After Action Report*, Ft. Stewart, United States Army, 2003, p. 138.

provided CAS with an accuracy that had hitherto been reserved for strategic strikes on static target sets planned well in advance. In urban combat, in which the risk of collateral damage is heightened, “CAS with precision munitions was always the first option, followed by dumb bombs from the Air Force and then cannons firing HE followed by DPICM with a converged sheaf. [They] would fire MLRS rockets as a last resort”.<sup>91</sup> Coming from infantrymen, this hierarchization radically overturned the Army military culture by presenting CAS as an interesting alternative to artillery – at least in the increasingly widespread case of urban combat.

However, as post-conflict violence turned into an insurgency, first in Iraq in 2004 and later in Afghanistan from 2005 onwards, fire support missions faced once again a daunting challenge. The gradual development of ambush tactics reinforced air forces’ servitude towards ground forces in a more reactive posture. Never knowing where the enemy is found, ground forces tended to adopt static positions or to provoke ambushes in order to bring to battle with an evanescent enemy. “Push CAS”, as a key operational tool, therefore became less frequent, whilst “emergency calls” became the new standard, demonstrating Western troops’ loss of initiative.<sup>92</sup>

Fixed-wings platforms’ lack of persistence soon emerged as the main issue in a conflict where combat was unpredictable and likely to occur anytime and almost anywhere. The reaction time turned out to vary greatly, depending on the degree of planning, on how urgent the request is and on the availability of the means.<sup>93</sup> As air assets management is centralized at the theatre level, it can happen that they are all mobilized in a couple of major operations, leaving all other operations “out in the open”. In Afghanistan, the average reaction time is of 7 minutes.<sup>94</sup> Ground troops’ expectations toward such immediate support are high, embodying the idea of an “air cavalry”, it alone being able to pull them out of a crisis. This reliance on the air component can occasionally justify a certain impatience, which is understandable when forces are under attack, but which can at times lead to privileging speed over the appropriate effect.<sup>95</sup>

Even when the air force arrives on time, the tactical features of irregular warfare do not always allow for an effective air support as demonstrated by the August 2008 ambush in Uzbin valley, Afghanistan. Attacked by surprise at 3.45 pm, the French platoon requested reinforcement at 3.52 pm, and emergency air support at 4.10 pm. Two USAF A-10s which were on routine mission arrived ten minutes later, but were unable to proceed with the strike given the melee of combatants.

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<sup>91</sup> *Ibid.*, pp. 113-114.

<sup>92</sup> Paul Grahame and Damien Lewis, *Appui feu en Afghanistan*, Paris, Nimrod, 2011.

<sup>93</sup> Interview with senior officer X, French Air Force, Paris, 6 October 2011.

<sup>94</sup> Interview with senior officer Y, French Air Force, Paris, 16 September 2011.

<sup>95</sup> In the same book, Paul Grahame explains how, caught in the crossfire, JTACs often give priority to a nearby aircraft, even if it is inadequate, rather than one that is further away and that has the munitions that would deliver the desired effect. See Grahame and Lewis, *Appui feu en Afghanistan*, *op. cit.*, p. 153.



Such tactics, which came to be known as “hugging”, are “a tactical maneuver of the Taliban who had anticipated the air support and had perfectly understood that by acting as such, they made it particularly complicated”.<sup>96</sup> It took therefore two hours and several additional French losses before the situation was unraveled and the A-10s could finally cover the withdrawal of the platoon.

Even more so than hugging tactics, the intertwining of combatants and civilians has appeared as a strategic challenge for fire support in irregular warfare. The development of strategic conceptions such as counterinsurgency (COIN) raises important questions regarding the use of firepower, notably in the case of the air component. It is difficult for COIN, which places population support at its center of gravity, to deal with an operating mode that inevitably causes “collateral damage” (especially civilian casualties or CIVCAS) whenever exercised in an urban context or near rural populations. CIVCAS are all the more unacceptable since accuracy has become a widespread expectation from Western public opinions.<sup>97</sup> In spite of advanced ISTAR capabilities and generalized use of PGMs, 116 Afghan civilians died during air strikes in 2006, 321 in 2007 and 395 in 2008.<sup>98</sup> In 2009, air strikes were still held responsible for 61% of the civilian losses caused by ISAF forces, despite an increasingly intensive use of artillery.

In spite of an improved accuracy, fire support-linked CIVCAS can generate a rallying movement for the insurgency and thus hamper the general strategy. For example, the death of 47 civilians in the province of Nuristan in 2008 during an erroneous strike triggered a tragic rapprochement between local populations and the rebels. To avenge their families, the villagers carried out a joint attack with the Taliban against the nearby American base of Wanat.<sup>99</sup> In order to curb such phenomena that are precisely supposed to be avoided in a proper counterinsurgency strategy, General McChrystal decided to issue a tactical directive during the summer of 2009, which “severely restricted the use of fixed-wing strike assets in support of combat operations”.<sup>100</sup> A significant decrease was witnessed: while in 2009 air strikes had killed 359 civilians,<sup>101</sup> this number

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<sup>96</sup> Commission de la défense nationale et des forces armées, “Audition du général d’armée Jean-Louis Georgelin, chef d’état-major des armées, sur les événements et la situation en Afghanistan”, Compte rendu No. 37, Wednesday 10<sup>th</sup> September 2008, available at: <http://www.assemblee-nationale.fr/13/pdf/cr-cdef/07-08/c0708037.pdf>.

<sup>97</sup> Fromaget, “Le feu dans le modèle de guerre occidentale”, *op. cit.*, pp. 31-32.

<sup>98</sup> Lara Dadkhah, “Close Air Support and Civilian Casualties in Afghanistan”, *Small Wars Journal*, 2008, pp. 5 ff.

<sup>99</sup> Eric Schmitt, “Afghan Officials Aided an Attack on U.S. Soldiers”, *The New York Times*, 3<sup>rd</sup> November 2008.

<sup>100</sup> Paul Darling and Justin Lawlor, “Updating close-air support. New doctrine and aircraft are needed for COIN”, *Armed Forces Journal*, November 2010.

<sup>101</sup> Afghanistan Independent Human Rights Commission (AIHRC), UNAMA, *Afghanistan Annual Report on Protection of Civilians in Armed Conflict 2009*, Kabul, January 2010.

had been virtually halved in 2010, with 171 deaths.<sup>102</sup> In addition to the drastic reduction in the number of sorties, ISAF used Small Diameter Bombs (SDB) whose explosive yield is reduced in favor of penetration capabilities.

This effort to reduce the use of CAS in an increasingly hostile environment required a important resilience effort for the coalition and has given rise, at times, to incomprehension – especially when these steps were thought to increase the risk to US soldiers' lives. As a result, General McChrystal's successor, David Petraeus, partially "loosened" these restrictions, with the result that, in spite of its efforts, air force-linked civilian losses increased by 9% in 2011 – i.e. 187 deaths representing 53% of CIVCAS.<sup>103</sup>

The expeditionary model adopted by most Western countries is based on precision-guided standoff air operations, followed by a light footprint sweeping ground phase, capable of guiding air strikes and of harvesting their effects. Undeniably, this operational pattern offers considerable political and logistical advantages as demonstrated by unprecedented tactical successes. Key to this "light footprint" approach, close air support gradually reverted its historical marginalization within air missions, and grew on as a "strength multiplier" and a central component of Western military.

The "Afghan model", however, had had to face learning and adapting adversaries, who have been able to dematerialize part of their C2 networks and to make strategic uses of hugging tactics, concealment and collateral damage. The decade of interventions that followed the 9/11 attacks subsequently confirmed that, if close air support is indeed a crucial tool to whom possesses it, it does not necessarily discard the need for ground fire support, whether it be organic or combined, which remains an invaluable asset for important operations.

### ***Artillery Tubes: Between Decline and Renewal***

If CAS has occasionally showed certain limitations, returning to a more traditional "surface" fire support can also raise concerns. The doubts regarding precision and the logistical footprint still induce political reluctance to engage artillery on the theatre. Initially focused on an organic integration of fire support, the Western – and especially the Europeans – armies have rediscovered the value of combined arms combat, capable of providing volume, persistence, and hence saturation, which is essential in medium to high intensity conflicts.

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<sup>102</sup> AIHRC, *Afghanistan Annual Report on Protection of Civilians in Armed Conflict 2010*, Kabul, March 2011.

<sup>103</sup> AIHRC, *Afghanistan Annual Report on Protection of Civilians in Armed Conflict 2011*, Kabul, February 2012, pp. 23-24.

### The mortarization of fire support

As OEF demonstrated, the lack of persistence of close air support can easily place maneuver forces in serious difficulty, even when they face few adversaries and when these are not well equipped. When CAS fails, it is usually organic support, in other words support that can be found directly within infantry units, that becomes the last resort. Mortars appear, as they did during WWI, as the organic support weapon *par excellence*, a genuine workhorse for power projection capability. Having long been the infantry's prerogative, mortars constituted, in France, a bone of contention between the different branches of the Army. The reduction in the number of guns and the low intensity of peacekeeping operations often prevented artillerymen from participating in overseas operations. It was finally decided that infantrymen would keep 51 and 81mm mortars, allowing the artillery to recover heavy 120mm mortars, which still represent today the most frequently employed means of support in Afghanistan.<sup>104</sup>

The stakes relating to this "mortarization" of ground fire support were revealed with *Anaconda*, during which General Hagenbeck, deprived of the 10<sup>th</sup> Mountain Division's usual M119 105mm light guns, only had at his disposal 120 mm mortars serving as heavy support, operated by FIST artillery teams, the very teams that were meant to use M119.<sup>105</sup> This swap is not without consequence, given that mortars are very different from traditional field artillery. While precision is similar (136 meters of CEP for a 120mm mortars and 492 for the M777<sup>106</sup>), their range is well below that of artillery with 7 to 8 kilometers for a heavy mortar against 20 to 40 kilometers for field artillery. This difference most certainly had an impact during *Anaconda*: a 120mm mortar battery, too close to the battlefield, only had the time to fire 16 shells before being challenged by enemy fire. Worse still, Americans had not expected their enemy to have artillery on their own: in addition to 107mm rockets and various mortars, jihadist fighters of the Shah-e-Kot valley also had a Soviet D30 122mm howitzer whose 15 kilometer range far exceeded that of US mortars. In spite of their incomparable material advantage, US troops were paradoxically outranged by a weaker opponent.<sup>107</sup>

Mortars are also less suitable when it comes to delivering support at a short distance from friendly forces, as their accuracy is at almost half of that of cannons or howitzers.<sup>108</sup> Lastly, the fact that artillerymen were left to operate on mortars possibly led to a loss of know-how in their core activity,

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<sup>104</sup> Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.

<sup>105</sup> Hagenbeck, "Afghanistan, Fire Support for Operation Anaconda", *op. cit.*, p. 6.

<sup>106</sup> The circular error probable (CEP) is the radius of a circle centered on the target within which 50% of the munitions are expected to fall.

<sup>107</sup> Joseph Jackson, "Moving Artillery Forward: A concept for the Fight in Afghanistan", *Small Wars Journal*, 2010, p. 9.

<sup>108</sup> Joshua D. Mitchell, "A case for howitzers in Afghanistan", *Field Artillery*, November-December 2003, p. 7.

as demonstrated by the number of artillerymen who failed their certification test after spending a long time without training with their equipment.<sup>109</sup>

In spite of major improvements in accuracy and non-linear tactics based on air power, the tactical reality remains rather unbending regarding certain operations aspects for which saturation fire through persistence and firepower in its strictest sense do not always offer an alternative. The ability to maintain over time a sufficient volume of fire is without a doubt the universally recognized advantage of artillery over other types of support associated with a light footprint approach – CAS having volume without persistence, and mortars persistence without volume.<sup>110</sup>

### The Return of the Dragon

From the very first stages of the 2003 campaign in Iraq, artillery support appeared as a necessity that could no longer be relinquished, in spite of a widely available air force.<sup>111</sup> During the advance towards Baghdad, the 3<sup>rd</sup> Infantry Division's artillery claimed to have neutralized half a thousand vehicles, 67 installations and nearly 3,000 enemy personnel.<sup>112</sup> By employing a wide range of munitions and detonators, tube artillery turned out to be one of the best ways of providing maneuver forces with the freedom of action needed to achieve victory. All the more so since artillery, often perceived as a "low tech" weapon, had made considerable progress since the 1990s. During Operation Iraqi Freedom, the US Army's self-propelled M109 *Paladin* 155mm howitzers were endowed with an increased reactivity compared with the Gulf War, thanks to the work of FISTers and to the improvement of fire automation systems. While response time was about 8 minutes in 1991, it dropped to 30 seconds in 2003.<sup>113</sup>

Alongside its reasserted relevance in conventional combined arms combat, artillery also emerged as much more useful than initially expected in the irregular operations that followed the initial stage of the war on terror. Hence, during the Second Battle of Fallujah in November 2004, the *Paladins* proved their worth in urban combat, one of the cases in which CAS was seen as undeniably superior to ground fire. Observing the infantry's advance from the city's roofs, FISTers set up a "rolling barrage" capable of "delivering suppressive or interdiction fire and, rather surprisingly, of clearing out areas that were mined or booby-trapped by explosive devices".<sup>114</sup> As contended by a Task Force report following the

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<sup>109</sup> Sean P. McKenna, "The Red Leg counterinsurgent. Field Artillery assets in Afghanistan are not being properly managed", *Armed Forces Journal*, May 2010.

<sup>110</sup> Joseph Henrotin, "Quelles mutations pour l'artillerie à l'aune de l'expérience afghane?", *Défense et sécurité internationale*, n° 62, September 2010, p. 77.

<sup>111</sup> Jonathan Bailey, "Artillery in Decline? The future of Field Artillery", *RUSI Journal*, autumn 2006, p. 70.

<sup>112</sup> James E. Unterseher, "The case for cannons. Success in current operations, new technology keep artillery in the fight", *Armed Forces Journal*, October 2007.

<sup>113</sup> Cordesman, *The Iraq War. Strategy, Tactics and Military Lessons*, op. cit., p. 358.

<sup>114</sup> Michel Goya, *Les Fantômes Furieux de Falloujah. Opération Al-Fajr/Phantom Fury (Juillet-Novembre 2004)*, Paris, Centre de Doctrine d'Emploi des Forces, Ministère de la Défense, 2006, p. 100.

battle, “a big lesson learned [in Fallujah] is that, even when responsive, close air support is not a substitute for artillery and mortars. It can be very effective, but it is not as responsive as our artillery and mortars”.<sup>115</sup>

However, one must acknowledge that the lack of precision of artillery, often brought to mind since the emergence of guided munitions, remains a major bottleneck. Its “danger zone” standing at approximately 600 meters and CEP fixed at 130 meters (for standard shells),<sup>116</sup> the use of artillery in an urban context continues to be problematic. It was only because Fallujah was emptied of its civilian population on the eve of the Second Battle that artillery could be used this way. Naturally, the use of the *Copperhead* precision-guided shell remains an option, but its complexity and high cost make it a second-best solution after an air-dropped JDAM – the 3<sup>rd</sup> Infantry Division’s report on OIF even suggested that its stockpile of *Copperhead* shells be reduced to increase that of “dumb” projectiles.<sup>117</sup>

Thanks to OIF lessons learned, the US Army recognized the usefulness of field artillery in Afghanistan and deployed in 2003 two batteries of M119 105mm mountain artillery guns.<sup>118</sup> Following the positional artillery concept applied in Vietnam, they established Forward Operating Bases (FOB) from which guns could support all infantry operations gravitating within their range.<sup>119</sup> As fighting intensified and air assets availability was reduced – the majority of the fleets being mobilized in Iraq – it gradually appeared that guns were helpful to support the infantrymen. Among all assets, the psychological potential of artillery, yet widely known by their elders, was rediscovered. In January 2009, for example, British forces stationed in Helmand carried on foot a L118 105mm light gun to the top of a rocky plateau, in order to establish a firebase intended to support a major cordon-and-search operation in the region. The prospect of a gun overhanging the plain and threatening them led the Taliban to dub it “the dragon” and to adopt a much more defensive attitude in their fight against the British soldiers.<sup>120</sup>

The French troops, seconded to the Kabul province (including the Surobi district) in 2003 and to Kapisa from July 2008 onwards, also adjusted to the requirement for close ground support, also based on FOB positions. Whilst in command of Task Force 700, from September 2008 to February 2009, Colonel Aragonés introduced the motto “not a step without support” requiring that “the first indirect strikes [then carried out by 120mm

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<sup>115</sup> Unterseher, “The case for cannons”, *op. cit.*

<sup>116</sup> James T. Cobb *et alii*, “TF 2-2 in FSE AAR: Indirect Fires in the battle of Fallujah”, *Field Artillery*, March-April 2005, p. 24.

<sup>117</sup> US Army Third Infantry Division (Mechanized), *Operation Iraqi Freedom After Action Report*, *op. cit.*, p. 122.

<sup>118</sup> Joseph Jackson, “Moving Artillery Forward: A concept for the Fight in Afghanistan”, *op. cit.*, p. 9.

<sup>119</sup> James A. Sink, “First Lethal FA Fires in Afghanistan: Lessons Learned at Firebase Shkin”, *Field Artillery*, November-December 2003, pp. 16-19.

<sup>120</sup> “Taliban fear the ‘Dragon’”, *Defence News*, 30<sup>th</sup> March 2009.

mortars] be delivered within 10 minutes of the request”.<sup>121</sup> This requirement led artillerymen to divide the heavy mortars into three platoons rather than into the usual duet, thereby losing firepower in favor of decentralization. The sending of additional troops led Paris to give way to the demand and to send in September 2009 two batteries of two *Caesar* 155mm guns, which settled in the FOBs of Nijrab and Tagab. With their 38km range, the guns could cover the whole area, thereby freeing the troops from their dependence on mortars and air power. Furthermore, their average response time is slightly lower than that observed for CAS, the first shot on target occurring after 3 to 5 minutes, depending on the request.<sup>122</sup>

In spite of this “revival” of artillery, some problems persisted. The extreme weather conditions that characterize Afghanistan, even if less problematic than for CAS, have sometimes caused incidents.<sup>123</sup> The mere geometry of the land has also been an obstacle, as a shell can hardly reach a target located on the other flank of a mountain or a concavity in the rock. On the other hand, an aircraft can go around it and use a wider range of munitions (missiles) capable of reaching targets that are inaccessible to ballistic trajectories. Finally, mobility has also, at times, been a source of problems: even if *Caesar* cannons have been able to carry out sorties up to 10 kilometers from the base during the summer of 2011,<sup>124</sup> artillery has nonetheless contributed to the general “FOBite” syndrome, *i.e.* the “bunkerization” of forces within the FOBs, described by some as “the fundamental tactical pathology of ISAF”.<sup>125</sup> Admittedly, the motorization of *Caesars* brings an enhanced mobility, but does not allow for all-terrain moves – notably in the particularly extreme case of Afghanistan. Hence, it is likely that the decision not to replace the HM2 105mm guns by Nexter’s LG1 Mark II (developed for the French Army and sold on the export market) deprived French forces of a caliber well adjusted to mountain warfare, as demonstrated by the British experience in Helmand.<sup>126</sup> In the case of the French, the limitations are not solely attributable to artillery but also to the absence of heavy-lift helicopters.<sup>127</sup>

Alongside this general evolution, the debate surrounding the return of guns has been recently extended to the naval component: during Operation *Harmattan* in Libya, the French Navy re-established naval gunfire support (NGFS), a technique it had not used since the Suez Crisis in 1956. In spite of decades of abstinence, it succeeded without much

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<sup>121</sup> Jean-Pierre Perrin, “Pas un pas sans appui...”, *Doctrine*, No. 17, July 2009, p. 45.

<sup>122</sup> Currently, the average response time of a CAS strike is of 7 minutes. Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.

<sup>123</sup> Some flare bombs, the detonator of which had not been calibrated properly for the Afghan altitude, exploded too late, causing collateral damage in villages on their trajectory. Interview with Sergeant Z, non-commissioned officer in Task Force La Fayette, June 2011.

<sup>124</sup> Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.

<sup>125</sup> “Et si on parlait d’Afghanistan?”, Interview with O. Entraygues, *Défense et sécurité internationale*, No. 52, October 2009.

<sup>126</sup> Joseph A. Jackson, “Moving Artillery Forward: A concept for the fight in Afghanistan”, *op. cit.*, 2010.

<sup>127</sup> De Durand *et alii*, “Helicopter Warfare...”, *op. cit.*

difficulty as the related skills had been maintained all along by regular training. Throughout Operation Harmattan, almost a hundred of NGFS missions were carried out, from shows of force to neutralization, harassment, interdiction and defensive barrages, when it came to halting the advance of the troops loyal to Gaddafi's regime. Subjected to intensive rocket attacks, the harbormaster from Misrata managed to reach the Commander of the French frigate *Forbin* that was in charge of enforcing the no-fly zone and the maritime blockade, to put an end to the attacks. Indeed, although priority had initially been granted to the air force, rocket launcher operators tended to foresee the riposte by hiding before the arrival of aircraft and by renewing their attacks as soon as they would fly out. Naval artillery was thus considered for its persistence, just as its ground counterpart.<sup>128</sup>

The French frigates, engaged from the very first days of the operation, fired more than 3,000 shells with their 100 and 76mm guns. Initially developed for air defense, this type of rapid-fire artillery has a limited range: between 12 and 15 kilometers. Not all navies have opted for this versatility, the US and Royal Navies preferring to maintain two distinct capabilities: a rapid-firing machine guns such as a *Phalanx* to counter aerial targets and a larger caliber guns to fire at ground objectives.<sup>129</sup> While the current frigate model and the maintenance of a secular know-how still allow for this type of shelling, the "missile only" trend that has been promoted for decades, does not seem to play in favor of naval artillery.

In spite of its substantial decline since the end of the Cold War, and regardless of the prevalence of an expeditionary model based on the light footprint approach, surface fire support – whether naval- or land-based – has succeeded in demonstrating its relevance and has proved indispensable throughout the last decade of engagements. As the only way of bringing together persistence and firepower, artillery has recovered its rightful role within combined arms combat.<sup>130</sup> However, some weaknesses persist, notably in the politically crucial field of precision, as well as in the fields of mobility and logistical footprint, which are also essential to decision-makers in times of growing risk aversion. These constraints highlight the strong complementarity between the air component and artillery and should encourage a progressive dialogue regarding joint fires integration.

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<sup>128</sup> Interview with Commander Rey, former commander in the *Forbin* frigate during Operation *Harmattan*, CICDE, Paris, 15<sup>th</sup> November 2011.

<sup>129</sup> American *Arleigh Burke* destroyers currently have 127mm guns capable, with the adequate munitions of reaching a target 70km inland.

<sup>130</sup> Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.





# Shaping the Future: Integration and Modernization

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Acknowledging the redistribution of fire support missions in the light of recent operations, the military has sought to adapt by revising its understanding of the air-ground partnership. As needed as it may be in terms of procedures and role distribution, jointness is not necessarily the silver bullet for all the challenges of fire support.<sup>131</sup> A prerequisite for a genuine renewal of this partnership is to take into account technological and industrial prospects, to achieve an effective procedure that integrates operational as well as budgetary and political constraints.

## ***Air vs. Ground: How Do They Converge?***

The difficulties encountered at the beginning of the decade in the field of joint fires integration, notably close air support, have paved the way for a major review of roles and procedures allowing to make full use of the tactical potential of each component. Nonetheless, these efforts should go beyond technical issues and encompass operational concepts of fire support, and even include an analysis of the very notion of air-ground maneuver.

### **The Reform of Terminal Control**

The first problem that comes to the minds of joint fire support practitioners is that of forward air controllers, JTACs or FACs depending on the country. The day after the end of *Anaconda*, General Hagenbeck complained that “because of the complexity of their precision munitions, [pilots would] not shoot JDAMs without either a GFAC (ground forward air controller) or ETAC (enlisted terminal attack controller) calling them in. There [were] not enough GFACs or ETACs in their inventory to support every ground maneuver element”.<sup>132</sup> In the same breath, he requested that FAC certifications be generously extended to as many Army personnel as possible – typically forward observers within FISTs – in order to obtain large numbers of “universal observers”.

The issue of air controllers is therefore quantitative as well as qualitative. On the quantitative front, a considerable effort was made in the

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<sup>131</sup> De Durand, “L’interarmées aux Etats-Unis”, *op. cit.*

<sup>132</sup> Hagenbeck, “Afghanistan, Fire Support for Operation Anaconda”, *op. cit.*, p. 9; Christopher Bentley, “Afghanistan. Joint and Coalition Fire Support in Operation Anaconda”, *Field Artillery*, September-October, pp. 10-14.

United States just as in other Western countries engaged in operations abroad. Whilst in 2003 there were on average only 18 JTACs per US Army brigade in Afghanistan, this number had doubled by 2011.<sup>133</sup> In France, where similar shortages had been noted, the *Centre de Formation à l'Appui Aérien* (CFAA, National Air Support Training Center) in Nancy sought to expand its capacities, from a few dozens to 56 in 2009, and then 64 FACs trained in 2010. The latter issues a certificate that meets NATO standards (STANAG). This is a crucial criterion for coalition operations in which requests are handled at a joint level by the Combined Air Operations Center (CAOC).<sup>134</sup> The terminal guidance between a TACP team and an aircraft is therefore carried out entirely in English, whatever the partner's language, even when they are both French.

At the same time training has evolved and become much more demanding than it was ten years ago. In France, FAC trainees coming from the ground component often find it difficult to master the air procedures established by pilots, which explains the 20% failure rate at the end of the course. Furthermore, there is a persistent shortage of training aircrafts. In the absence of modern aircrafts (usually mobilized in operations), old *Alpha Jets* are used, but these do not necessarily allow for a proper reproduction of operational conditions. Foreign partnerships, however, can mitigate this problem and should be encouraged.<sup>135</sup>

Regarding procedures, the introduction of differing types of missions has led to major transformations. Until then, CAS was limited to the terminal guidance of a FAC making direct visual contact with the target (type I). It now extends to indirect guidance, in which the FAC gives advice in coordination with an observation team in contact with the enemy (type II) or on board of the aircraft operating the mission (type III).<sup>136</sup> This way, FACs can mutualize their skills for various missions. The French have therefore opted for the creation of National Fire Observers (NFO), who receive a less intense training and whose role is to provide the necessary information to the FAC so he can forward them in more understandable terms to the pilot in charge of the attack. While FACs are usually trained for six weeks, in 2010, the CFAA was able to train 150 NFOs in a week and a half each.<sup>137</sup>

US armed forces went even further in terms of integration with the creation of Joint Fires Observers (JFO), arising from the "disaggregation of

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<sup>133</sup> Clark and Reeves, "Reality check. Close air support detractors are clinging to outdated concepts", *op. cit.*; Pirnie *et alii*, *Beyond Close Air Support*, *op. cit.*, pp. 144-149.

<sup>134</sup> Interview with senior officer Y, French Air Force, 16<sup>th</sup> September 2011; Centre Interarmées de Concepts et d'Expérimentation (CICDE), *Détachement de Liaison, Observation et Coordination (DLOC)*, PIA-3.3.5, 10 May 2011, pp. 17-18.

<sup>135</sup> Interview with senior officer X, French Air Force, Paris, 6<sup>th</sup> October 2011.

<sup>136</sup> CICDE, *Détachement de Liaison, Observation et Coordination (DLOC)*, *op. cit.*, pp. 45-46.

<sup>137</sup> Interview with senior officer Y, French Air Force, Paris, 16<sup>th</sup> September 2011.

the terminal attack function”.<sup>138</sup> This consists in separating this function into two tasks: on the one hand, guidance, which requires a moderately complex training but also a large personnel be deployed, up to the company or platoon level; on the other hand, deconfliction, *i.e.* the distribution of fires in the battle space, a much more complex task that could be pooled at a higher level of command. Mainly stemming from the ground component, JFOs have received the authorization, only granted to the Air Force’s JTACs until then, to guide type I CAS, in other words to communicate directly with the pilot, which is still impossible to French NFOs. Since 2006, more than 2000 JFOs have been trained in Fort Sill and have started to be fielded. Nonetheless, the quality of their training and consistency of their deployment in companies and platoons remains unsatisfactory and raises the question of the durability of such a transformation.<sup>139</sup>

Turning artillery observers into increasingly connected “universal observers” has implications for their tactical integration with the units they are meant to support. The weight of communications equipment has increased so much that observers now operate from specialized vehicles. While the capacity for “dismounted observers” exists, it is considered to be a degraded version to be avoided whenever possible, since it implies that the radio-operator travels with “50 kilos of equipment on his back”.<sup>140</sup> Among the equipment, an increasing array of complex devices are added to the forward observer’s already tricky operational context and raises the question of the limit to the multitasking capabilities of officers and NCOs in charge. The handling of laser rangefinders or the satellite transmission of GPS coordinates are all new skills which still require training and practice from artillerymen and that will have to be mastered if a genuine air-ground partnership is to arise.<sup>141</sup>

### The Deconfliction Issue

At the end of 2001, deconfliction already appeared as one of the major issues at stake. Still in his interview from 2002, F. Hagenbeck asserted that he had more than 200 Fire Support Controlling Measures (FSCM) at the same time during Operation *Anaconda*.<sup>142</sup> Indeed, the considerable increase of joint engagements rendered synchronization particularly complex: during *Anaconda*, the CAOC therefore had to handle “B-52s at higher altitudes dropping JDAMs; B-1s at lower altitudes; unmanned vehicles such as Predator flying through there; P-3s, aircraft contributing to the ISR assets; helicopters down at the ground; fast-moving aircraft, F-14s,

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<sup>138</sup> This idea was put forward in Pirnie *et alii*, *Beyond Close Air Support*, *op. cit.*, pp. 160-161.

<sup>139</sup> Clark and Reeves, “Reality check. Close air support detractors are clinging to outdated concepts”, *op. cit.*

<sup>140</sup> *Ibid.* On the weight imposed on dismounted soldiers, see Pierre Chareyron, “Digital Hoplites. Infantry Combat in the Information Age”, *Focus stratégique* No. 30 *bis*, December 2011.

<sup>141</sup> David S. Flynn, “Transforming FIST for the 21<sup>st</sup> century”, *Field Artillery*, March-April 2003, pp. 20-21.

<sup>142</sup> Hagenbeck, “Afghanistan, Fire Support for Operation Anaconda”, *op. cit.*, p. 8.

F/A-18s, F-16s, F-15Es; tanker aircraft<sup>143</sup> etc. One must add to this the ground fires (mortars, guns, rockets, ATACMS) that are often evolving at the same altitude as low-flying planes.

Traditionally, air-ground coordination was based on the establishment of a Fire Support Coordination Line (FSCL) separating the area where friendly forces were likely to be found (with a risk of friendly fires) from the forward combat area. This division, which implies the absence of friendly forces beyond a certain point, rapidly appeared as insufficient on non-linear battlefields such as Iraq or Afghanistan. Next generation technologies arising from battlespace digitization and C4ISTAR developments were deployed to manage this complexity. Developed separately, these modules become increasingly compatible, allowing for a smart battlespace management. In France, for instance, resorting to means of detection such as the French Army's HAWK module, soon to be replaced by the French Air Force's surface-to-air missile platform/terrain (SAMP/T), as well as the absorption of MARTHA coordination and deconfliction system into a joint module (CMD3D) illustrates the recent attempts at increasing computer-led coordination.<sup>144</sup> However, "in spite of all their capabilities, these types of equipment considerably weigh down a battlegroup [staff] for a mere visualization, and an incomplete one, of its air space".<sup>145</sup>

The people responsible for deconfliction therefore decided to resort to an *ad hoc* measure introduced for the first time in 1991 and known as the kill box.<sup>146</sup> This refers to a specific volume created around a given area "in which an important number of weapons is being used and where multiple actors intervene simultaneously in the third dimension".<sup>147</sup> Created to synchronize air- and land-based fires, kill boxes are, ideally, placed under the responsibility of a CAOC but can be relegated to the land forces' command, the idea behind it being that no aircraft can enter the area without an authorization of the coordinator in order to avoid friendly fire incidents. In many respects, kill boxes appear as efficient means to coordinate the battle space. For example, two superimposed boxes mean that an air strike above 30,000 feet can be carried out at the same time as an artillery strike whose maximum altitude is 20,000 feet. A temporal deconfliction allows for the completion of the system, thereby guaranteeing the principle "everyone at the same place but not at the same time, or everyone at the same time but not at the same place". Consequently, such simple measures, without major technological advances, effectively reduce the risks of friendly fire incidents. In practice, these precautions are not always carefully followed, as illustrated by Sergeant Grahame, a British JTAC in Helmand, who gave the example of a F/A-18 pilot, who took the

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<sup>143</sup> Headquarters United States Air Force, *Anaconda, an Air Power*, *op. cit.*, p. 39.

<sup>144</sup> Interview with senior officer X, French Air Force, Paris, 6<sup>th</sup> October 2011.

<sup>145</sup> Christian Vladich, "La coordination 3D aux petits échelons tactiques", *Doctrine*, No. 14, January 2008, p. 94.

<sup>146</sup> Douglas Musselman, *Joint Fires Battlespace Deconfliction*, *op. cit.*, pp.10-12; Karl E. Wingenbach, "Kill Box", *Field Artillery*, July-August 2005, pp. 13-15. Also, see appendix 1.

<sup>147</sup> Vladich, "La coordination 3D aux petits échelons tactiques", *op. cit.*, p. 94.

risk of entering a kill box of friendly mortars to complete a CAS mission successfully.<sup>148</sup>

More generally speaking, the issue of FACs and of who should be in charge of deconfliction directly raises the question of the divergence between the air and the land forces' operational conceptions. Such a divergence is more or less present in all Western armed forces today. While the debate is no longer as fierce as it was following the Gulf War, some antagonisms persist.

### Persistently Opposing Operational Concepts

In his classical work on *The Transformation of American Air Power*, Benjamin Lambeth notes that years after the 1986 Goldwater-Nichols law's good intentions regarding the reorganization of the military, "the four services [...] have produced anything but a common conception of how to organize, train, and equip their respective forces for joint operations".<sup>149</sup> The US Army, in particular, still deems that air power's main task is to support ground combat, the only element able to bring about decision on the battlefield. Without denying the importance and prestige of the ground component, airmen tends to comprehend their mission as a whole and as an instrument that alone is capable of, if not winning a war, securing the factors that are critical for success.

For ten years now, efforts have nonetheless been made to bring together the diverging perspectives of the two services. On the Army's side, acknowledging that CAS is an indispensable dimension of fire support allowed to press for more coordination. In 2002, the FSCOORD, coordinator of ground fires at the brigade level, was renamed ECOORD, Effects Coordinator,<sup>150</sup> in light of the Effects-based Operations (EBO) concept, which was very popular at the time.<sup>151</sup> The change of term was also meant to symbolize a change of perspective, in the sense that this position was no longer restricted to ground fires but sought to answer the need to obtain a tactical "effect" in the field. It is based on his knowledge of the available means and not on his branch specialty that the ECOORD would offer the theatre commander the required solutions. This is also the role of the French fire support coordinator (*Coordinateur des Appuis-Feux*, CAF), at the head of the Observation and Coordination Liaison Detachment (*Détachement de Liaison d'Observation et de Coordination*, DLOC), precisely in charge of coordinating the use of supporting fires at the battlegroup level. CAF and DLOC missions were recently reviewed by the joint publication PIA 3.3.5 published in June 2011. Initially trained as an

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<sup>148</sup> "I don't give a damn about mortars. The sky is big, I make a small target." (translated from the French edition), quoted in Grahame and Lewis, *Appui feu en Afghanistan*, op. cit., p. 30.

<sup>149</sup> Lambeth, *The Transformation of American Air Power*, op. cit., p. 286.

<sup>150</sup> Steven Sliwa and Robert Kirkland, "ECOORD vice FSCOORD", *Field Artillery*, March-Artil 2003, pp. 35-37.

<sup>151</sup> Philippe Coquet, "Opérations basées sur les effets: rationalité et réalité", *Focus stratégique*, n°1, October 2007, available at: [http://www.ifri.org/downloads/Focus\\_strategique\\_1\\_Coquet\\_EBO.pdf](http://www.ifri.org/downloads/Focus_strategique_1_Coquet_EBO.pdf).

artilleryman, the French CAF's duty is to offer the battlegroup commander global advice, based not on the means but on the desired effect.<sup>152</sup>

In spite of genuine efforts by the services to reconcile their perspectives, hierarchical and cultural allegiances endure, as illustrated by negotiations surrounding the writing of the PIA 3.3.5. Indeed, this document suggests that Air Force chain of command be complemented by inserting a module comprising a tactical air controller (*Contrôleur Tactique Air*, CTA).<sup>153</sup> The latter's role has been a source of fierce debate among the services. The Air Force initially wanted to see the CTA placed outside of the DLOC into a parallel chain, according to the "double chain" principle, which has been long-established even though it proved a source of problems in the past.<sup>154</sup> The Afghan experience and the increased dependence of ground forces on air support has enabled the French Army to promote the latter's integration into the DLOC "under the direction of the Fire Support Coordinator [CAF, commanding the DLOC]".<sup>155</sup> The term "direction" is a good example of the French Air Force's refusal to see an air officer under the command of a CAF, an artilleryman, and to solely obey to the battlegroup chief. Naturally, this does not necessarily mean that CTAs and CAFs cannot get along when advising the Commanding Officer.<sup>156</sup>

Despite genuine inter-service efforts, it appears difficult to overcome the distrust and to bring together the diverging operational conceptions. Whilst cultural rivalries and budgetary strife remain acute, any operational subordination of a service to another, even when limited to a specific theatre of operations, gives rise to significant reserves. Some have tried to overcome this cleavage by offering an even more radical response that would consist in abolishing the supported/supporting distinction, in which the supporting branch systematically appears as subordinated to the supported branch. Once it is established that CAS is henceforth much more than a mere support tool, maneuver should be planned within a truly air-ground perspective, in a concerted rather than imposed way.<sup>157</sup> Such a view, however, would probably not allow for more than a prudent – even vague – consensus, which might well prevent the making of more daring decisions.

Over the past ten years, major progress has been made in terms of training, decentralization and deconfliction of joint fire support procedures. These efforts have led to reconsider the marginalization of CAS, which has taken its rightful place amongst the most important missions and has even become within a few years "one of the centers of gravity of air forces'

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<sup>152</sup> Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.

<sup>153</sup> CICDE, *Détachement de Liaison, Observation et Coordination (DLOC)*, *op. cit.* p. 36.

<sup>154</sup> Interview with senior officer X, French Air Force, 6<sup>th</sup> October 2011. Also, see *supra*, first section.

<sup>155</sup> CICDE, *Détachement de Liaison, Observation et Coordination (DLOC)*, *op. cit.*, p. 36.

<sup>156</sup> Interview with Colonel Delion, French Army, Paris, 21<sup>st</sup> September 2011.

<sup>157</sup> Pirnie *et alii*, *Beyond Close Air Support*, *op. cit.*, pp. 84-86.

missions".<sup>158</sup> However, cultural differences continue to delay the common development of joint concepts. Finally, if they are to lead to a genuine renewal in the air-ground partnership, these operational considerations must be completed with an attention to platform developments, technological and industrial perspectives that will influence future political and budgetary choices.

### ***Ambiguous Perspectives***

In *Weapons Don't Make War*, Colin Gray notes that the weapons acquisition process is one of a four-corner dilemma with political directives, strategic analysis and technology (and industry) base.<sup>159</sup> In terms of fire support – whether air-, ground- or naval-based – this rule is even more true given growing pressure on budgets: strategic analysis must therefore appreciate the technical and operational issues in order to facilitate political decision-making.

#### **CAS: No *Ad Hoc* Platform**

The idea of a type of entirely air-based fire support was discussed several times since the Second World War, but the “flying artillery” dream never materialized. The reasons given are often related to the strategic culture of the air forces, naturally attached to their independence and therefore unwilling to be subordinated to ground forces through support.<sup>160</sup> As demonstrated by the industrial history of the A-10,<sup>161</sup> the *ad hoc* platform issue is a direct consequence of historical decisions made in favor of an autonomous air service. This aircraft, specifically designed for support missions, was never prevalent in fleets – 335 in 2008 – in spite of its rather glowing operational record. Indeed, in January 2012, the Pentagon announced that five A-10 squadrons would be cut, in other words that 102 aircrafts would not be replaced, which represents almost half of the total cuts in the US fleet number of jets.<sup>162</sup> Of course, no replacement program is planned for the time being. With the exception of this particular example, no other *ad hoc* platform is available to Western forces.

As a traditional weapon of air superiority and basic structure of new generation multi-mission aircrafts (*Eurofighter*, *Rafale*, *Gripen*, F-35), fighters have undeniably useful features for CAS. For instance, the CAS record of the *Rafales* in Libya was unanimously regarded as excellent.<sup>163</sup> Endowed with multiple weapon systems (laser designation pods, helmet

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<sup>158</sup> Interview with senior officer Y, French Air Force, 16<sup>th</sup> September 2011.

<sup>159</sup> Colin S. Gray, *Weapons Don't Make War. Policy Strategy and Military Technology*, Lawrence, Kansas University Press, 1993, pp. 65-66.

<sup>160</sup> Lambeth, *The Transformation of American Air Power*, *op. cit.*, pp. 265 ff. It seems that “the temptation also existed in France”, interview with senior officer X, French Air Force, *op. cit.*

<sup>161</sup> See *supra*, p. 20.

<sup>162</sup> David A. Fulghum, “U.S. Air Force Reveals Budget Cut Details”, *AviationWeek.com*, 3<sup>rd</sup> February 2012, available at: [http://www.aviationweek.com/a/w/generic/story\\_channel.jsp?channel=defense&id=news/awx/2012/02/02/awx\\_02\\_02\\_2012\\_p0-420642.xml](http://www.aviationweek.com/a/w/generic/story_channel.jsp?channel=defense&id=news/awx/2012/02/02/awx_02_02_2012_p0-420642.xml)

<sup>163</sup> Interview with senior officer Y, French Air Force, Paris, 16<sup>th</sup> September 2011.

mounted display, phased-array radar), they have increased accuracy and reactivity.<sup>164</sup> Their speed ensures that they arrive rapidly on the theatre of operations and guarantees a good survivability against air defense. It is also an asset in non-lethal modes of action such as “shows of force” (low-level passes with no firing intended to intimidate the enemy). However, this high speed causes target-adjustment problems in strafing techniques. During *Anaconda*, for instance, a Navy SEALs team was caught under mortar fire, whose battery was out of the reach of their light weapons. They called a F-15E to carry out a CAS mission. When it appeared, it charged with its 20mm gun, designed for dogfighting, and flew too quickly to focus on its target.<sup>165</sup> Its extremely limited fuel autonomy forced it to leave without having cleared the ground as hoped. This “loiter time” is the main criticism of ground troops regarding fighter-bombers.<sup>166</sup>

The major reason for resorting to gunship-type aircrafts, such as the AC-130 *Spectre* is that they offer an increased persistence thanks to their pylon turn maneuver and an autonomy of several hours. They are given priority as their heavy armament (20mm and 40mm guns, 105mm howitzers) makes them particularly useful to lightly armed troops such as special operation forces. However, gunships are hampered by their slow pace, which implies that careful planning is required before deployment and that it does not adjust well to urgent requests. Combined to its impressive size, this tardiness is also a weakness in the face of surface-to-air defense, as shown by the loss of an AC-130 above Iraq in 1991. After this incident, it was decided that these aircraft would only be used for nighttime missions.<sup>167</sup> Finally, cost and quantity must also be discussed, given that today the US Air Force is the only one to possess a fleet of approximately forty gunships – European air forces are not considering developing this type of aircraft.

The more traditional heavy bombers (B-52, B-1) have also played a major role in CAS, yet without being entirely satisfactory. With their long loiter time and considerable PGM payload, they have been particularly useful to US troops in Afghanistan and Iraq. Bomber pilots have also expressed their keen interest in CAS missions.<sup>168</sup> However, just as gunships, bombers have proved an expensive luxury that few countries can afford. Moreover, like fighters, their multitask capability sometimes implies a lack of availability that prevents them from representing a viable solution for close air support.

The last non-specialized platform likely to be employed for CAS missions is the unmanned combat aerial vehicle (UCAV) which has known spectacular development over the past ten years – notably via the use of MQ-1 *Predators* and MQ-9 *Reapers* in anti-terrorist missions against high value targets. The main advantage of UCAVs is their unrivaled aerial

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<sup>164</sup> Bill Sweetman, “CAS: What Works and What Doesn’t”, *Defense Technology International*, October 2008.

<sup>165</sup> Bailey, *Field Artillery and Firepower*, *op. cit.*, p. 426.

<sup>166</sup> Interview with senior officer Y, French Air Force, Paris, 16<sup>th</sup> September 2011.

<sup>167</sup> Sweetman, “CAS: What Works and What Doesn’t”, *op. cit.*

<sup>168</sup> Pirnie *et alii*, *Beyond Close Air Support*, *op. cit.*, pp. 157-158.



persistence, given that they can fly during 24 hours in a row. Furthermore, they combine surveillance and reconnaissance capabilities (ISR) with weapons, while traditional platforms are specialized, the latency between reconnaissance and air attack often leading to failure in the face of a mobile and furtive enemy. Finally, the absence of a pilot means that the loss of an aircraft is politically more tolerable – even if its cost remains too high to use it imprudently.<sup>169</sup> UCAVs, however, do have some drawbacks: their slow pace means they are rarely available for urgent requests, and are highly vulnerable to ground strikes; their tactical payload remains very limited and they do not possess a gun, a particularly useful weapon for CAS; finally, and above all, is the problem of the development of armed drones which remain extremely rare in Western forces, apart from US and Israeli armed forces. France, on the other hand, is not considering acquiring any before 2016-2020,<sup>170</sup> an already optimistic time horizon given that the funding program has still not been finalized to this day.

In the face of this relative inability to provide totally adapted platforms, and given the growing demand for CAS in the past ten years, many are saying that a new dedicated aircraft should be designed, especially in a low-tech counterinsurgency context.<sup>171</sup> For want of re-launching a program to succeed the A-10, which would be extremely costly and would compete with USAF financial priorities, it has been suggested that older aircraft models – cheap and with low technological content – be resurrected. The United States thus provided the Iraqi air force with single turboprop engine Cessna 208 *Caravan*, which they had equipped with laser designator pods and *Hellfire* missiles. In the same line of thinking, Brazil retrofitted several EMB-314 *Super Tucano* aircraft for internal defense missions, planning as early as 2012 the purchase of 200 aircrafts for a mere 9 million dollars.<sup>172</sup> Finally, the recent use of *Twin Otters* from the 1960s in Operation *Harpie* to combat illegal gold mining in French Guyana indicated that the French Air Force is not necessarily opposed to the use of this type of aircraft in low intensity conflicts.

In 2009, the proponents of counterinsurgency doctrine, US Army and US Marine Corps on the front line, encouraged the Air Force to launch, the Light Attack and Armed Reconnaissance (LAAR) Program for an *ad hoc* aircraft, just as they did with the A-X during the Vietnam War. At the time of the writing, the project was only at the stage of proposals and no invitation to tender had been issued.<sup>173</sup> At least six firms have expressed

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<sup>169</sup> Sweetman, “CAS: What Works and What Doesn’t”, *op. cit.*

<sup>170</sup> Interview with senior officer Y, French Air Force, 16<sup>th</sup> September 2011.

<sup>171</sup> Paul Darling, Justin Lawlor, “Updating close-air support. New doctrine and aircraft are needed for COIN”, *Armed Forces Journal*, November 2010; George H. Hock Jr., “Closing the Irregular Warfare Air Capability Gap”, *Air & Space Power Journal*, winter 2010, pp. 57-68; Bill Sweetman, “Keep it simple. Light aircraft play a bigger role in COIN operation”, *Defense Technology International*, February 2010, pp. 36-38; Gervais, “L’avion à hélice dans la lutte anti-guérilla”, *op. cit.*, pp. 461-475.

<sup>172</sup> Sweetman, “Keep it simple”, *op. cit.* For comparison, Dassault’s *Rafale* is valued at 82,3 million dollars.

<sup>173</sup> Stephen Trimble, “Irregular warfare offers new role for propeller driven aircraft”, *Flight International*, 26 October 2010.

their interest, among which Boeing, which suggests a resurrection of the OV-10 *Bronco*, the well-known artillery observation aircraft of the Vietnam War. Nonetheless, the adaptation cost of rustic planes to minimum C4ISTAR capabilities for a proper integration into the battlespace could rapidly limit the financial interests of such an aircraft.

As expected, the prospects of a *low tech* aircraft focused on CAS, have been widely criticized. For example, Richard Hallion asserts that investing in this type of platform would be “foolish, given the state of current air defense capabilities of even lightly armed insurgent forces”.<sup>174</sup> He cautions that terrible losses were inflicted on Israelis during the Yom Kippur War, in the course of which 60% of downed aircraft were shot during CAS missions. Rather than investing in potentially unusable platforms when faced with a threat, even a hybrid one, endowed with medium- to high-performance air defense, planners should instead, according to him, focus on ISR technology with UAVs capable of transmitting massive data to supporting units.

In the same line of thinking, US Army Colonel Julius Clark indicates that the remarkable availability of air forces for CAS missions in recent years is due to the historical exception of current Western air total dominance, with irregular adversaries devoid of air defense. It would hence be dangerous to develop a doctrine based on a usage that “should, in fact, be considered the exception vice the rule”.<sup>175</sup> CAS still having little priority in the list of fundamental air power missions – far behind air supremacy, strategic attacks or interdiction strikes – it would become extremely rare in a conflict against an adversary possessing superior means.

### **The Uncertain Future of Ground Fire Support**

The general challenge that fire support ground component will have to take up is of a quite different nature. Future artillery will have to retain the advantages that make them indispensable on the battlefield while at the same time benefiting, whenever possible, from the progress brought by technological advance. Two avenues for development are emerging, each presenting pitfalls and opportunities: that of precision and range.

Precision is without a doubt the first challenge ahead. Even if the FSO/FDO couple is working well, the development of network centric systems should help to bring artillery to the level of air forces. The acquisition of new ISTAR sensors (the use of laser rangefinders, transmission of GPS data), usually associated with the air component, would also contribute to blurring the boundaries between the training of forward air controllers and that of observers.

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<sup>174</sup> Richard Hallion, “Air and Space Power: Climbing and Accelerating”, in Olsen (ed.), *A History of Air Warfare*, *op. cit.*, p. 390.

<sup>175</sup> Julius E. Clark, “CAS, Myths, Realities and Planning Principles”, *Field Artillery*, July-August 2005, p. 21.

Precision artillery is no novelty: as early as 1984, the laser-guided *Copperhead* shell was fielded in the US Army, even though its prohibitive cost, in addition to functionality issues – the target had to be illuminated during more than thirty seconds – prevented it from being widely distributed.<sup>176</sup> Considerable progress has been made ever since and now makes it possible to envision the fielding of such systems on a larger scale. Consequently, the US Army purchased in 2006 the GPS-guided 155mm M982 *Excalibur* projectile, whose circular error probable (CEP) is inferior to 10 meters – while the minimum for “dumb” munitions is 150 meters. The French Army has followed a similar path and received in 2007 a first stock of “Bonus” 3750 anti-tank shell, equipped with two high precision GPS-guided submunitions.<sup>177</sup> Mortars have not been left behind since US troops in Iraq and Afghanistan were fielded in 2008 with the much awaited laser-guided XM395, which had been developed for more than thirteen years and whose succession is already ensured by the RCGM, announced in April 2011 with a GPS guidance – deemed preferable to laser, the beam of which can be interrupted by any minor obstacle, including dust.<sup>178</sup> Such equipment could become a crucial instrument in urban combat.

Even if these technological perspectives seem to ensure a bright future for the ground component of fire support,<sup>179</sup> they still raise questions regarding the cost of such modernization. For instance, the unitary price for an *Excalibur* is \$85,000, against less than \$300 for a classic shell.<sup>180</sup> After the cancellation in June 2009 of the US Army’s Future Combat System (FCS) and within the extremely strained budgetary context of Western public expenditure, it would be daring to propose munitions at prohibitive costs, given that their purchase could only be afforded through a drastic reduction of stockpiles – already well underway.

The development of modern projectiles to equip guns also raises the question of the increasingly unclear frontier between vehicle and payload, and, *in fine*, of the difference between shells, rockets and missiles. Hence, the traditional anti-tank guided missile (ATGM) proved to be well adapted to the more diverse fire support missions, notably counter-insurgency ones – possibly in the shape of a hollow charge, in order to minimize collateral damage – as the excellent record of the *Milan* missile in Afghanistan demonstrated.<sup>181</sup> By the end of the 2000s, discussions regarding the replacement of the *Milan* came to the fore. The MMP (*missile moyenne portée*, medium-range missile) project put forward by MBDA

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<sup>176</sup> Bailey, *Field Artillery and Firepower*, *op. cit.*, p. 522.

<sup>177</sup> André Dulait, *Projet de loi de finances pour 2007: Défense, Forces terrestres*, French Senate, Avis n° 81, 23<sup>rd</sup> November 2006, p. 30, available at: <http://www.senat.fr/rap/a06-081-5/a06-081-5.html>.

<sup>178</sup> “120mm Magic Arrives”, *StrategyPage.com*, available at: <http://www.strategypage.com/htm/htart/articles/20110405.aspx>.

<sup>179</sup> Bailey, “Artillery in Decline?”, *op. cit.*

<sup>180</sup> “Excalibur Gets Closer and More Expensive”, *StrategyPage.com*, available at: <http://www.strategypage.com/htm/htart/articles/20060417.aspx>.

<sup>181</sup> “Les principaux équipements de l’armée de terre”, February 2012, *Data.gouv.fr* available at: <http://www.data.gouv.fr/donnees/view/Les-principaux-%C3%A9quipements-de-l%27arm%C3%A9e-de-terre-30382601?xtmc=d%C3%A9fense&xtcr=7>.

competed with the Israeli-made *Spike* and the US-made *Javelin*. The latter was selected in spite of the demands of the military, which consider that the *Javelin* does not offer the best capabilities in terms of antipersonnel fire, now more useful than anti-tank fire. In September 2011, the French procurement agency (DGA) encouraged MBDA to further study a replacement of the *Milan* in the shape of a medium-range missile.<sup>182</sup>

While guidance technologies seem to converge, range appears to be the most relevant criterion of discernment. For centuries, this increase in range has been a constant trend in the evolution of artillery and has embodied the refusal of ground forces to be boxed by the air force in a narrow “close battle”. Some even believe that the diffusion of heavy MRLs is “an alternative to air strikes”.<sup>183</sup> With the order on the 8<sup>th</sup> September 2011 of thirteen Unitary Missile Launchers (*Lance-Roquettes Unitaire*, LRU) and a first set of 252 munitions, French artillery has now the capacity to strike from 15 to 70km deep with a five meter precision.<sup>184</sup>

Such an evolution towards missile or rocket artillery questions the future of fire support. Admittedly, recent operations have shown that rocket-launchers could be used efficiently in close support missions, and could even compete on an equal footing with CAS, as during the battle of Sadr City.<sup>185</sup> It seems however unlikely that projectiles of such quality and sophistication will be used extensively in this type of tactical missions. In the same way that fifth generation fighters cannot be used for CAS only, rockets and ATACMS capabilities may seem an unnecessary capital lockup that would increase the opportunity cost of its firing.

The naval component has already gone through a similar debate since the mid-1990s and the decommissioning of the USS Missouri, the last battleship with heavy artillery capable of providing autonomous naval gunfire support. A navy solely equipped with missiles and anti-aircraft guns, and therefore confined to the high seas, was inevitably going to worry the Army, and above all, the Marines, whose core activities are amphibious operations, likely to require NGFS. US Navy DDG-1000 program, the future of which is still uncertain, had indeed suggested reverting to the former version of the battleship, with substantial naval artillery in the shape of 155mm long range land attack projectiles on board, in addition to its own missile capabilities. Nevertheless, the successive cuts experienced by the

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<sup>182</sup> Jean-Dominique Merchet, “Missile moyenne portée, le coup est parti”, 19<sup>th</sup> January 2012, available at: <http://www.marianne2.fr/blogsecretdefense/Missile-moyenne-portee-le-coup-est-parti-a491.html>.

<sup>183</sup> Stéphane Delory, “Lance-roquettes lourds et missiles balistiques à charge conventionnelle: une alternative à la frappe aérienne?”, in Grégory Bouterin and Camille Grand (ed.), *Envol vers 2025. Réflexions prospectives sur la puissance aérospatiale*, Paris, La documentation française, 2011, pp. 203-216.

<sup>184</sup> Jean-Dominique Merchet, “Avec le LRU, l’artillerie va entrer dans une nouvelle dimension”, *Secret Défense* (blog), available at: [http://www.marianne2.fr/blogsecretdefense/Avec-le-LRU-l-artillerie-va-entrer-dans-une-nouvelle-dimension-actualise\\_a370.html](http://www.marianne2.fr/blogsecretdefense/Avec-le-LRU-l-artillerie-va-entrer-dans-une-nouvelle-dimension-actualise_a370.html).

<sup>185</sup> David E. Johnson *et alii*, *The 2008 Battle of Sadr City*, Santa Monica, RAND Corporation, 2011, pp. 18, 24; also, see Jeffrey A. Braco, *Fire Support for Irregular Warfare*, Monterey, Naval Postgraduate School, 2008, pp. 69-70.



program have particularly affected the artillery component, whose future is still unpredictable.<sup>186</sup>

Air support and surface artillery alike seem to have reached a crossroads. In both cases, the modernization process, based on precision, operational depth and network-enabled capability might drive them away from fire support function. Just as the third dimension revolution had caused in 1914 a “great divorce” between fire and maneuver, the information revolution could renew this separation. To avoid such a situation, decision-makers must make sound choices so that modernization can be pursued without abandoning these key capabilities, which have proved extremely relevant over the past decade.

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<sup>186</sup> Government Accountability Office, *Information on Options for Naval Surface Fire Support*, Washington, D.C., 19<sup>th</sup> November 2004, p. 5.



# Conclusion: Time to Decide

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In view of the foregoing, the main criteria determining the choice of fire support vehicles must be recalled. These factors are three-fold: tactical, budgetary and political. Tactical requirements can no longer be isolated given how strained the budgetary and political framework is today. More than ever, the role of decision-makers is to avoid bureaucratic strife, always detrimental to fire support missions that are joint by definition. In return, only a very good knowledge of military capabilities can make way for judicious financial arbitrations and enlighten political choices.

## ***Operational Effects and Tactical Choices***

Today, all insist on the complementarity of means and the diversity of effects implemented for each of the fire support components. One way or another, everybody stress how quickly forgotten are petty rivalries whenever the lives of fellow soldiers are at stake. While it is possible to doubt the doctrinal future of the effects-based operations (EBO), now downplayed by the Pentagon, the “effect-based mindset” and its integration to the planning process have gradually settled. Logically, the choice of the fire support component follows from the formulation of the expected effect, allowing to define the array of means likely to achieve it. There should not be a competition between artillerymen, helicopter or aircraft pilots. The logic to be followed must not be that of the ambit (ground, air, sea) or of the branch (artillery, naval guns, helicopters, aircrafts), but rather that of the mission to be accomplished: providing the ground combatants with the support necessary to prevail in the best conditions.

Behind this ideal principle, a stubborn reality remains, which follows a “proximity bias”, supported forces always tending to look for the closest support provider: first mortars in organic support, then artillery guns or helicopters in combined arms support, and only then joint CAS. The reasons put forward for this intuitive hierarchization are cultural propinquity, the acquaintance between branches but above all reactivity, perceived as commensurate with proximity.<sup>187</sup>

The availability criterion is another element, which sometimes hampers the effect-based approach. In this respect, one should avoid to “afghanize” fire support thinking. French troops in Afghanistan benefitted from two enablers that will not necessarily be found in future conflicts: the presence of supporting US forces and the absence of serious enemy air defense. US forces CAS capabilities are an exception rather than the rule

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<sup>187</sup> Interview with senior officer Y, French Air Force, Paris, 16<sup>th</sup> September 2011.

and, even if the French Air Force is aiming at 50 sorties per day for a two months operation, it is very unlikely that these support conditions will recur in the foreseeable future. In the meantime, the persisting absence of challenging enemy air defense might very well take an end in the near future. Ground support remaining, with good reason, the last priority of air forces after vital air superiority and strategic attack, an air-only model of fire support does not appear to provide a full-spectrum solution.

Beyond these general considerations, tactical criteria leading to choose one form of support rather than another now appear quite clearly to anyone who has learnt from recent operations. Organic support in the shape of the mortar is used for its almost immediate reactivity but has important drawbacks in terms of range and precision as much as in terms of firepower. These shortcomings imply an examination of the question of the protection of support, notably in the case of irregular warfare, where there is no clearly defined front, and where standing at 7 kilometers from the fighting does not guarantee one's safety.

For all of the above reasons, the reduction process of firepower launched at the end of the Cold War has now reached a new threshold, whilst the "hardening" of operations in Afghanistan and elsewhere has led to a "re-discovery" of fire and its tactical utility. Campaign artillery provides a persistence and volume that make it an indispensable ally on the battlefield, whenever the adversary becomes aggressive, seasoned, and adaptive. There exist, however, important limitations. Although militarily satisfactory, its precision – as far as unguided munitions are concerned – is politically insufficient – notably in the case of combat among populations. In that sense, artillery has little cause for contentment when it compares with aviation, which has systematized recourse to guided munitions. If the prospect of new intelligent ground munitions could make up for this shortcoming, it is uncertain that budgetary margins will allow it. Furthermore, and in spite of a constant effort to increase it,<sup>188</sup> mobility remains a constant challenge for ground fire support. Fire mobility is limited by a range which hardly exceeds 40 kilometers, but above all by relief and the many natural obstacles which can decrease the reach and which a "telluric" adversary can use to take shelter from strikes. The mobility of the guns themselves is the only answer to this challenge. However, even if vehicles such as the *Caesar* or *Archer* were to be motorized, they are not airborne and cannot thread their way to African runways and mountainous tracks, thereby calling to mind the loss of light guns such as the LG1 Mark II, in spite of a national industrial know-how in France.

Surely, close air support offers both an increased tactical and strategic deployability – as long as there are air bases nearby – which allows for a training on terrains which are extremely hard to access and that even artillery cannot reach (steep-sided valleys, rocky cavities on hill sides, etc.). For the time being, air power remains superior in terms of precision,

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<sup>188</sup> Paul McLeary and Nicholas Fiorenza, "Hit and Run. Mobile Artillery Gains Traction with Expeditionary Units", *Defense Technology International*, September 2009.



thereby responding to the now strategic imperative to reduce drastically collateral damage and friendly fire incidents. However, the lack of persistence, inherent to fixed wing aircraft,<sup>189</sup> does not allow for a saturation effect, necessary to handle numerous and evasive adversaries. Its reactivity, although generally satisfactory (around 7 minutes in Afghanistan), remains independent of the number and proximity of air bases and can even present genuine problems in the case of a shortage of available aircraft.

However, and even if this overview underlines the complementarity of the various means to provide fire support, the present political and budgetary situation, at least Europe-wide, will probably not allow defense devices to acquire, to a sufficient extent, the array of assets required for a proper and permanent CAS capability. The tactical dimension must therefore be put in perspective with the budgetary dimension.

### ***Budgetary Sustainability of the Fire Support Model***

The analysis of defense expenditure is a particularly complex undertaking due to procurement programs duration, lack of information transparency and difficulty to evaluate opportunity costs. With regard to fire support missions, it is possible however to distinguish between three types of expenditure, respectively linked to the development of weapons systems, their deployment and, finally, their use and maintenance.

The running and maintenance costs are certainly the easiest to evaluate, close air support coming unquestionably before ground elements. In 2007, the annual maintenance cost of the *Rafale* was valued at 3 million euros per aircraft, against 1,5 million euros for the *Tiger* attack helicopter and 1 million for the older French jetfighter *Mirage 2000*. These numbers far exceed that of ground fire equipment, which only amount to tens of thousands of euros annually for each piece.<sup>190</sup> The wide array of capabilities of the *Rafale* must of course be taken into account in a general perspective, but the analysis only applies here to fire support missions. The maintenance cost of shells and air bombs must also be integrated, including for the destruction of out-of-date munitions. Then again, however, the costs relating to the air component are far greater than that relating to ground forces' equipment – even if in the latter's case costs could significantly increase with the prospect of a general evolution towards precision shells.

Deployment costs, which notably include the logistics footprint, are even more difficult to assess. They include the cost of strategic and tactical lift for artillery, and hence that of the platforms necessary for their deployment. The prospect of cost reductions encouraged the US Army to construct its new M777 howitzer, entirely made of titanium, in order to make

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<sup>189</sup> Rotary-wing aircraft have the capacity to hover but suffer from a problematic vulnerability, see E. de Durand, *et alii*, *op. cit.*

<sup>190</sup> Commission des Finances (Sénat), Rapport d'Information n°352, by M. Yves Fréville, senator, Session ordinaire du Sénat 2007-2008, p. 54, available at: <http://www.senat.fr/rap/r07-352/r07-3521.pdf>.

it transportable by helicopter. The Caesar gun also enjoys an integrated motor so that no additional costs – with the exception of gasoline – are generated by its tactical moves. Regarding aviation, the actual cost of maintaining air bases close to theatres of operation should also be integrated, even if they are difficult to evaluate.

Finally, the costs linked to the purchase and research and development illustrate the stakes and problems common to the whole defense industry. While prices have kept rising, budgets have stagnated or decreased. The only solution found until now – financing modernization by reducing quantities – is not an sustainable model for fire support, which requires, in certain cases at least, volume and persistence that cannot be met by emaciated fleets and munitions stockpiles, however sophisticated.

In the case of aviation, even if the development of dedicated platforms does not appear realistic, one should not completely dismiss the prospect of low-cost fleets whose spending would be more commensurate to the mission expected of them. Adopting such an approach could prefigure the constitution of more adjustable mixed fleets. Artillery either, should not yield to technological mirages. While the quest for precision cannot be abandoned, it should remain reasonable. For instance, one can call into question the employment of precision shells that cost 100,000 dollars rather than a 12,000 dollars JDAM, and whose precision is equivalent or even superior. The path to extended precision and for range must therefore be followed carefully not to deprive artillery of its main asset: saturation fire, enabled by fire volume and persistence. In both cases, one solution would be to promote the emergence of mixed fleets and stockpiles. This would consist in maintaining small quantities for precision munitions and advanced platforms, while retaining in parallel relatively rustic instruments but employable in reasonable quantities so as to not lessen capabilities.

### ***The Political Challenge of Limited War***

Such proposals only make sense if the political framework of our engagements maintains current ambitions, which would imply taking into account a criterion even more crucial than budgetary margins, that is to say political cost, the ultimate arbitrator in a context of limited war.

Although it may seem at first absurd to add a political dimension to the choice of fire support, there is a genuine link between the highest levels of government and purely tactical choices.<sup>191</sup> At the time of the “strategic corporal” and the extreme media coverage of armed conflicts, the decision to resort to wings rather than guns is not insignificant.

Following the example of the tank, albeit to a lesser extent, artillery still sends a strong political message of reasserted national commitment. It was probably what was conveyed when French AU-F1 self-propelled guns

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<sup>191</sup> André Thiéblemont, “Incidences d’une culture de paix sur les cultures de combat de l’Armée française”, *Défense et Stratégie*, No. 25, winter 2008.

were sent to Lebanon during the reinforcement of the UNIFIL following the 2006 war.<sup>192</sup> By its very nature, ground intervention implies a potential loss of lives, and consequently an inescapably bigger political risk. For all of these reasons, and many more, guns remain to date the ultimate political resort, thereby confirming by an odd reversal French royal artillery's motto: *ultima ratio regum*.

By contrast, air power remains, as Operation *Harmattan* demonstrated once again in Libya, the standoff tool *par excellence*, a guarantee of relative minimization of political risks. The current political framework of Western military engagements seems to be increasingly characterized by this tendency to stand back. In spite of the problems triggered by such a "hands off" conception – notably in the field of post-conflict, which can hardly be run from a distance – states seem to favor this option as it appears to have less far-reaching consequences.<sup>193</sup> Finally, if decision-makers in democratic countries continue to prefer this option, it will have to be enlightened by an honest and realistic appraisal of the operational limits it entails.

As a central and perennial component of operational art, fire support finds itself at a crossroads. On the technical and operational front, close air support has known a genuine revolution, even providing glimpses of a transformation of the modern way of war. With a view to covering the entire spectrum of conflicts, practice has shown that surface support remains an indispensable tool. The limited budgetary context, however, hangs over this two-fold tactical truth and imposes arbitrations that will require sooner or later an adaptation towards a model of technological and industrial development that is financially sustainable. Ultimately, however, it is in the political arena that will be settled the question of fire support. It will logically follow from the strategic and military model that Western societies will decide to adopt.

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<sup>192</sup> Since January 2011, the AUF1 of the FINUL were replaced by *Caesars*. "Liban: le Caesar est arrive", *Defense.gouv.fr*, 2<sup>nd</sup> February 2011, available at: <http://www.defense.gouv.fr/terre/actu-terre/liban-le-caesar-est-arrive>.

<sup>193</sup> John Mearsheimer, "Pull Those Boots Off The Ground", *Newsweek.com*, 31<sup>st</sup> December 2008. Also, see Robert A. Pape and James K. Feldman, *Cutting the Fuse: The Explosion of Global Suicide Terrorism and How to Stop It*, Chicago, University of Chicago Press, 2010, pp. 334 ff.; as well as Philippe Moreau-Defarges and Thierry de Montbrial (eds.), *RAMSES 2012*, Paris, Dunod, 2011, pp. 55-85.



# Appendices

## Appendix 1

### Abstract representations of deconfliction kill boxes<sup>194</sup>

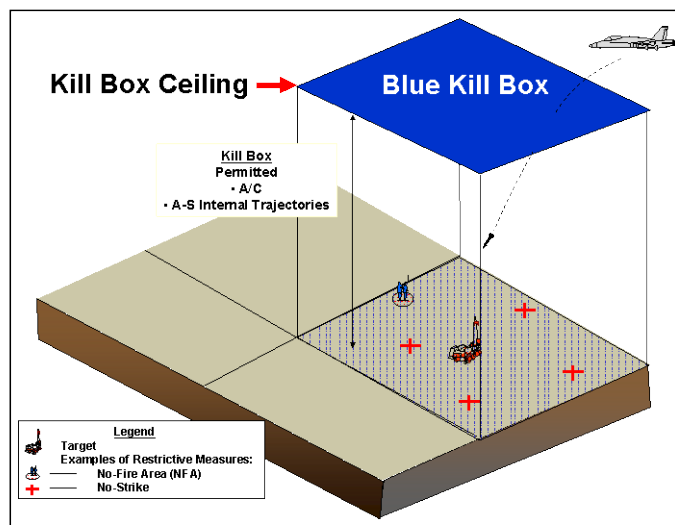


Figure II-1. Notional Blue Kill Box

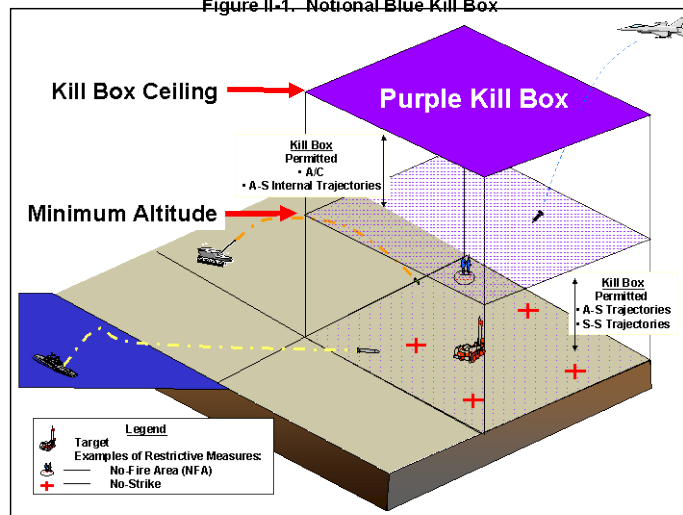
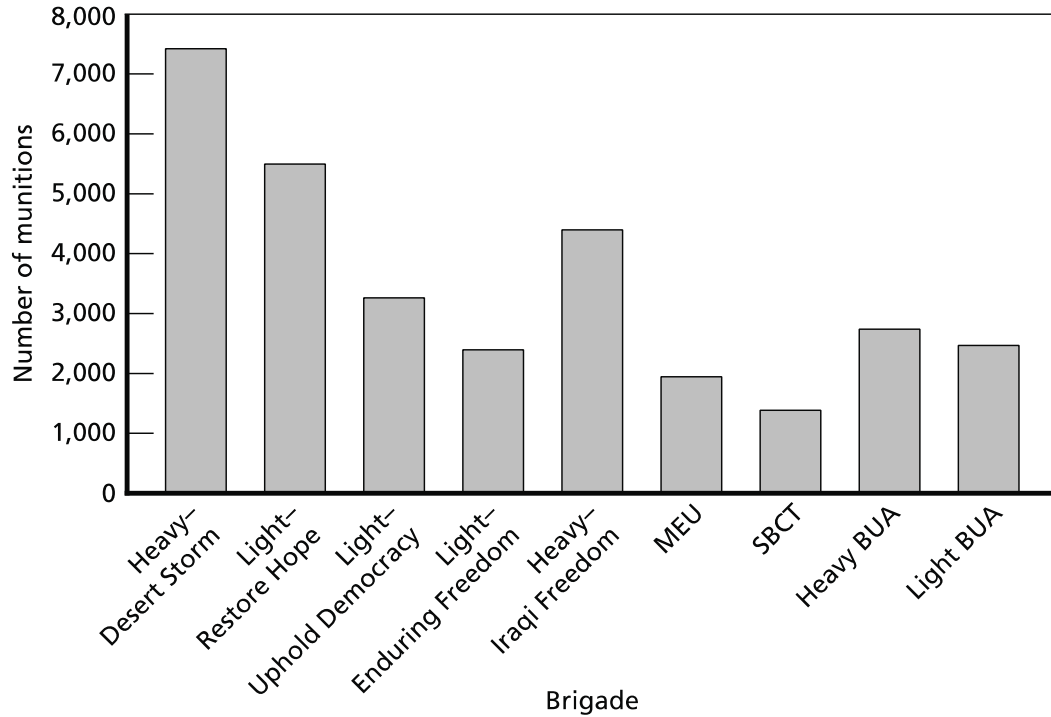


Figure II-2. Notional Purple Kill Box

<sup>194</sup> Air Land Sea Application Center, *Multi-Service Tactics, Techniques, And Procedures For Kill Box Employment*, FM 3-09.34, MCRP 3.25H, NTP 3-09.2.1, AFTTP(I) 3-2.59, June 2005, p. II-4-5.

## Appendix 2

**Brigad-level Firepower since 1991, by Number of Munitions<sup>195</sup>**



NOTE: Each bar represents one brigade from the sample. Brigades are identified by type (heavy, light, Stryker, etc.) and historical operation, if applicable. Heavy = armor or mechanized brigade, Light = light infantry brigade, MEU = Marine Expeditionary Unit, SBCT = Stryker Brigade Combat Team, Heavy BUA = Heavy Brigade Unit of Action, Light BUA = Light Brigade Unit of Action.

RAND MG301-4.1

<sup>195</sup> Bruce Pirnie *et alii*, *Beyond Close Air Support. Forging a New Air-Ground Partnership*, Santa Monica, RAND Corporation, 2005, p. 107.

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