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**AUTHOR:**

Major BRIANÇON-ROUGE Guillaume, CG13  
French Army Aviation  
AY 16-17

Mentor and Oral Defense Committee Member:

Dr. Paul Gault

Approved: [Signature]

Date: 5/11/2017

Oral Defense Committee Member: Dr. Bradford Wineman

Approved: [Signature]

Date: 5/11/17

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## **Executive Summary**

**Title:** The utility of employing attack helicopter raids during operation HARMATTAN (French Army Aviation, Libya 2011).

**Author:** Major BRIANÇON-ROUGE Guillaume, CG13  
French Army Aviation

### **Thesis:**

French Operation HARMATTAN (OH) clearly demonstrated the utility of attack helicopters in conducting deep air strikes from an amphibious base, due to its effectiveness, absence of collateral damage or friendly casualty, and overall capacity of shouldering a significant proportion of the targeting effort.

### **Discussion:**

Operation HARMATTAN, led between March 17 and October 31, 2011, was a regular warfare operation involving bombing by fighters, but also a very innovative use of attack helicopters for deep air-to-ground strikes. OH was eventually a tactical and operational success, but from the start it was a new COA for the French Army Aviation doctrine. It faced strong resistance among NATO planners and French Air Force commanders alike. This paper addresses the concept of how the HSG was to be tasked, what procedures were to be used, how the helicopters were to take off from naval ships at night, and lastly how the Helicopter Strike Group (HSG) would help dislodge Operation UNIFIED PROTECTOR (OUP) as it had come to a standstill. Most importantly, this paper analyzes these challenges for the French Army Aviation (FAA), and what consequences they have on its doctrine.

### **Conclusion:**

With over 600 military targets destroyed in four months, zero civilian casualties along with no helicopters shot down, the operation was an overall success. It did rely on numerous strategic, operational and tactical factors of paramount importance that are underlined in this paper, as well as recommendations to improve HSG operations that are submitted in the end.

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## Preface

On 17 March 2011, the United Nations (UN) Security Council adopted the UN resolution 1973 for the situation in Libya. The resolution, triggered by France and the United Kingdom, recalled its resolution 1970 (2011) of 26 February 2011. The 1973 resolution increased the range of actions against Libya and opened the possibility for the use of force in order to protect the population. Acting under Chapter VII of the UN Charter, the resolution demanded the immediate establishment of a cease-fire as well as a complete end to violence against civilians.<sup>1</sup> It enabled the conduct of a no-fly-zone above Libyan air space and authorized members of the UN to take all necessary means in order to protect the civilian population. By Saturday, 19 March 2011, under President Sarkozy's direct order, the Joint Chief of Staff of the French Armed Forces officially launched Operation HARMATTAN (OH). This was the French participation to the international community's military operations conducted in order to protect the Libyan population against the attacks of the regime of Muammar Gaddafi. Task Force (TF) 473 would be headquartered from an amphibious landing platform ship, the Landing Platform Dock (LPD) TONNERRE and afterwards the LPD MISTRAL. The TF would consist of four navy ships (two frigates- the *Cassard* and the *La Fayette*, one nuclear attack submarine, and a supply ship) and a Helicopter Strike Squadron (HSSq<sup>2</sup>) with eighteen helicopters from the French Army Aviation (FAA).<sup>3</sup> The purpose was to support OUP and to assure the enforcement of all measures decided by the *Elysée*.

The engagement of the HSSq in high-intensity combat operations with a volume never used before in the FAA has been a "tremendous success."<sup>4</sup> Such operations garnered results many doubted feasibly possible in the first place: 602 military targets were destroyed during OH with 426 HOT missiles, 13,500 30mm rounds, three MISTRAL missile, 1,828 20mm rounds, and 1,511 rockets.<sup>5</sup>

More importantly than ammunition figures, it displayed a system of men rather than just a system of machinery that enabled mission success. With highly trained air-crews that gained experience with years of overseas operations in Africa, Afghanistan, and Eastern Europe, the HSSq maintained a very specific *état d'esprit*. The HSSq techniques, tactics, and procedures (TTPs) had to be consistently defended in the NATO environment, as assault operations were part of a very biased French Air Force procedure of planning. TTPs were questioned before the first mission was flown and the Army had to break through inter-service rivalry proving that helicopters were essential to a change of situation. Destruction had to be surprising for the enemy, brutal, precise, and reoccurring night after night in order to counter Gaddafi's regular forces who understood how to hide their positions from traditional fixed-wing air strikes.

Under the pressure of operational readiness and sustainment of a tiresome battle rhythm (generally two missions two nights in a row, sometimes three with only 24 hour to rest), the HSSq prepared and conducted 41 raids and 316 sorties with textbook coordination with the French Navy that provided support to the squadron by way of logistical support and intelligence gathering. The operational planning team (OPT) had a high level of expectation within a rather complex naval environment (one LPD, one SNA, up to two aerial defense frigates and 1 ATL2). Finally, the presence of two Air Force Paratrooper teams, the CPA 30, who adapted their own procedures to those of the FAA and to the immediate extraction (IMEX) procedures, was of paramount importance. This operation was one of a kind, and the lessons learned developed in this paper will underline the complexity of the strikes, from the top to the bottom of the chain of command, but also for the crews themselves.

### Timeline and Area of Operation

- 17 February: beginning of the rebellion in Libya.
- 17 March: the UNSC votes resolution 1973 authorizing the use of military assets to protect the Libyan population.
- 19 March: beginning of OH.
- 19 May: the first operations of the LPD TONNERRE and the FAA are launched.
- 3 June: the first strikes of the HSG are conducted on the airport of Brega.
- 10 July: the turnover between the LPD TONNERRE and the LPD MISTRAL takes place, so as the turnover between regiments (HARMATTAN II).
- 20 August: the opposition forces enter Tripoli.
- 22 September: beginning of HARMATTAN III on the LPD BPC TONNERRE.
- 20 October: death of Muammar Gaddafi.
- 31 October: end of OH.

Phase 1 of OH: situation on May 19, 2011. The FAA arrives with the LPD and the first strikes will take place on June 3<sup>rd</sup>.



FPK = Pro-Gaddafi Forces / FDO = Opposition Forces / In Red are the disputed areas

Situation on July 15, 2011.



Situation on September 15, 2011.



## MISSION ANALYSIS

### *From the President's order to the deployment of French Resources*

Immediately after the Paris Summit on Libya, the Joint Chief of Staff of the French Armed Forces officially launched Operation HARMATTAN (OH) on Saturday, 19 March, 2011. The French Forces were under US command up until 31 March, when OUP was launched under NATO direction. In France, the bulk of the forces fell under the command of the Joint Operations Planning and Command & Control Center in Paris (*Centre de Planification et de Conduite des Opérations* - CPCO). Immediately, the US Air Force focused on logistical and refueling support of the French operation. The objective was to enforce the no-fly-zone (NFZ) and prevent Gaddafi's regular army to bomb civilians or attack populations. The air strikes during March and April were very efficient as well as the embargo on weapons. The maritime control enforced by OUP and CTF 473 during that time was also effective.

Nonetheless, in the middle of May, unable to seize the city of Benghazi, the pro-Gaddafi forces adopted a posture to protect themselves from the vertical strikes conducted by the Air Force and Naval fighters. In order to create a tactical breach, France and Great Britain decided to send attack helicopters to create a gap. This was a challenge for the FAA because the Combined Air Operation Center (CAOC) of Poggio Renatico in Italy was staffed with 300 NATO aviators that were uncomfortable with dealing with rotary wing aircraft engaging targets of opportunity. While the British decided to commit four Apache helicopters from the HMS OCEAN, the French wanted to commit 18 helicopters from the LPD TONNERRE (eight Viviane HOT Gazelle, two Canon Gazelle, two Mistral Gazelle, two EC665 Tigre, and four SA330 Puma).<sup>6</sup>

The tactical scenario that was proposed by the FAA seemed audacious, as they only operated at night with little illumination, while infiltrating at an altitude of 90 feet. Once inside the kill box, the aircraft would conduct strike coordination and armed reconnaissance in order

to deliver close air attacks with HOT missiles, 30 mm and 20 mm guns, and rockets. Neither the CAOC nor the NATO HQ in Naples seemed enthusiastic about the concept due to apparent inter-service rivalry and platform bias towards fixed wing aircraft. There was a fear that a chopper might go down, and everyone at the CAOC was unwilling to assume that risk, especially if it were to be broadcasted on social or mainstream media. On top of that, a helicopter down meant there was a need for a Combat Search and Rescue Team (C-SAR). Indeed, due to Libya's flight conditions and high temperatures, not every aircraft had the capacity of landing and picking up their wingman. This was most of all true when the helicopters were feet wet. Despite these fears, the FAA was very aware of the risks, and it considered that the strategic objective did not allow to back down. The Colonel in charge of presenting the COA to the NATO HQ explained that the Army Aviation's scenario and predictions on this mission were a potential loss of one to two helicopters during the first month. The final agreement came from Lieutenant-General Charles Bouchard (a Canadian-French speaking helicopter pilot), in charge of Operation Unified Protector for NATO, who understood what the FAA wanted to do<sup>7</sup>.

*A very short notice to move without preparation*

On 14 May 2011, after four months of an exclusive aerial campaign, President Sarkozy took the decision of massively engaging the FAA helicopters in Libya. Between the moment the decision was made and the moment the HSSq embarked on the TONNERRE only three days had elapsed. The embarkment was very discrete, even though a few specialized journalists noticed movements in Toulon that were not officially part of an exercise. A Task Force of 170 men and women with 18 helicopters was about to conduct more than 30 raids in four months behind enemy lines. Directly supported by the fire support and intelligence collection of the Navy, the HSSq was a major asset for the rebellion in Libya. Colonel Pierre Verborg, in command of the HSG, received a phone call from General du Bouëtiez de Kerorguen, commander of the helicopter division, on 13 May, telling him he had to pack his bags the next

day for a 24 hour short notice movement.<sup>8</sup> He had only 24 hours and a night march scheduled that night to think about his maneuver. He decided not to cancel it, and ended up warning his men the next morning: “pack your bags, in 24 hours we will be in the Luc en Provence<sup>9</sup>, and in a few days, we hit Tripoli.”<sup>10</sup> His night march in the French *Pyrénées* enabled him to conceive his COA. He had organized an exercise a few years ago where a dozen helicopters were to attack Saint-Jean-de-Luz after having taken off from two LPD. This exercise, Operation CAÏMAN (OC), had been played with the FAA tactical flight simulator named EDITH, but had never been actually flown.<sup>11</sup> The COA was nevertheless successful on computers as it showed low altitude infiltrations in order to escape from the radars were successful as well as silenced radio communications among the crews. Everything was under NVG and with low-level illumination.

#### *Integration of the Helicopter Strike Group's actions into the UOP<sup>12</sup>*

OUP was an aerial campaign and the very strict rules of coordination and missions could have limited the action and effectiveness of the HSG. The HSG was able to be properly integrated into the 3D layout of the operation. Four liaison elements for the COM HSG had been sent to the COM CJTF OUP in Naples, the COM CAOC 5 in Poggio Renatico, the COM TF 473 in the JOA on board of the *Charles-de-Gaulle*, and to the COM TG COUGAR (UK) in the JOA (on board the HMS *ALBION* then the HMS *OCEAN*).

The targeting plan that was conducted by NATO was nevertheless quite inefficient when it came to the fixed-wing actions. The enemy had learned how to camouflage vehicles from vertical strikes and only a horizontal point of view at a very low altitude (under 300 feet) could change the outcome of the strikes. This was a great asset for the FAA as its crews are trained from basic school in Dax and Le Luc en Provence to fly nap of the earth, under NVG and with thermal camera self-guidance. “Facing the aerial raid, the pro-Gaddafi forces had dissimulated

their artillery capacities and were still capable of being threatening. At the altitude where the jet fighters fly, a formal identification was therefore made very difficult.”<sup>13</sup>

The HSSq was very autonomous and could prepare its own scheme of maneuver, as well as rehearsals before every strike. Basically, TF 473 developed a concept of operations (CONOPS) and each phase of the CONOPS was then developed into an operational order (OPO) written and produced by the HSG. Each air-combat operation included four to five sorties in the same night. Each action was given to be studied with a FRAGO, and each FRAGO was sent to the CPCO in Paris and the OUP CJTF in Naples. The timeline that was produced during the conduct of a strike was:

- D-96 hours: Orientation of the intelligence assets
- D-72 hours: Orientation and Decision by the COM HSG
- D-48 hours: FRAGO/Mission Brief
- D-24 hours: Backbrief
- D: Strike Day with ATO =
  - o Preparation meeting with a Go/NoGo Brief (around 10:00 or in the middle of the afternoon)
  - o FRAGO NGFS reception
  - o Go/NoGo Brief (around 17h00)

*Can History help us achieve our mission?*

Colonel Verborg’s OC exercise, which had been played on the French tactical flight simulator named EDITH, was actually the only background the FAA had to conceive this maneuver. Interviewed by mail, he confirmed having built everything from scratch, and having absolutely no knowledge of any unit performing this kind of mission. Searching for any form of historical precedents, some operational concepts may come close to OH. For example, the Rhodesian Counterinsurgency Campaign of 1962 to 1980. During its second phase (1972-74),

the Rhodesians had to deal with many constraints, the most important being the vastness of the operational area and the small number of troops available at that time. The need for high mobility and combined effectiveness made them invent a very interesting procedure. They acquired French Matra 151 20mm canons and mounted them on their French Alouette III helicopters. These helicopters were named K-Car gunships, and became the central element of their rapid reaction force, which could trap and destroy the elusive enemy. With an outstanding kill rate of 80:1, the Fire Force units (K-Cars flying alongside G-Cars, Alouette IIIs with four embarked infantrymen) exploited the agility of the helicopter and its troop-carrying capacity. What resembles the most with the 2011 French operation is that there was always one K-Car that carried the Army Fire Force commander (like the AMC in HARMATTAN) that flew alongside with three G-Cars (4 helicopters seems to be the appropriate figure of what constitutes a helicopter patrol).

Also, another common point is the targeting procedure. Targets were secured and prepared thanks to observations, patrolling, photo reconnaissance, and intelligence. This operation does seem pretty close to HARMATTAN with the use of dynamic targeting, an AMC persistently flying the missions and capable of giving orders, the exploitation of helicopters for raid-type kill operations. This procedure enabled the Rhodesians to liberate themselves from the constraint of terrain.<sup>14</sup> Despite common points with the Rhodesian case, too many differences make it difficult to estimate that it was an actual precedent for OH. It is nevertheless interesting to compare what the French and the British did during the same operation. Their courses of action were dramatically different, mostly because of the material employed. Where France had to combine old and new generation helicopters, TIGREs and GAZELLEs, leveling the standards to the most challenging performances, Britain was using AH-64 APACHEs. Therefore, they did not have any endurance issues, were appropriately protected against small arms fire, and were flying at 3000 feet above sea level. Their overall results proved less effective

than the FAA when comparing the kill ratio, and despite having more modern HELLFIRE missiles.

*Analysis of the total destructions by nation, during operation UP*

	FR HSG	UK HSG	Total
<b>Opérations</b>	41	21	62
Sorties	316	46	362
Missiles (Hot /Hellfire)	426	95	521
Obus (20/30 mm)	13519	4002	17521
Roquettes	1555	16	1571
<b>Total des Destructions</b>	<b>602</b>	<b>81</b>	<b>683</b>
Véhicules légers	311	23	334
Véhicules logistiques	94	18	112
Chars	10	3	13
VBCI	9		9
Canons / LRM	6	2	8
Moyens du génie	12		12
Embarquations légères	1	2	3
Infrastructures militaires	159	33	192

This graphic compares British and French actions that took place during the HSG's actions in OUP. France is the first contributing nation with 23% of the destruction, before Great-Britain and the United (Graphic 3), the FAA alone destroyed 22% of the coalition's targets, just through dynamic targeting (Graphic 1 in Appendixes). In total, the FAA destroyed 1 entire brigade (5 battalions) and neutralized 1 brigade (4 battalions), in the areas of: Brega, Tawurgah, Zuwarah, Syrte, Zitan and Bani Walid. In total, 41 air-mobile raids have been conducted, with 316 flights, 602 targets have been destroyed with absolutely no collateral damage. French helicopters destroyed 90% of the targets destroyed by the coalition helicopters<sup>15</sup>.

## **THE WIND OF HARMATTAN**

### *From the first intelligence reports to the Target Room*

The Navy was a very strong asset for HARMATTAN because of the complimentary actions they were taking. The helicopters had intelligence support from the ATLANTIQUE 2 airplane. The Navy was conducting its own maneuver with the nuclear attack submarine and the anti-aerial frigates in charge of protecting the LPD. The HSG had its own intelligence cell, a G2, completely dedicated to the AH crews. “Our missions are prepared on a two day period. They began with the tactical thoughts of the AMC which equated to an open discussion with the patrol leaders. Once the crews were tasked and the battle order was determined, pilots used the intelligence with the G2, analyzing the terrain, the targets, the infiltration itineraries, and the exfiltration routes.”<sup>16</sup> An important preparation was then organized with the LPD to determine its position, and a synchronization matrix was created where everything was predetermined in 2 ½ hour missions. Once the attack helicopter crews had set everything up, the utility helicopter crews could determine where they would hold their patterns in order not to conflict with the AH routes. The day the mission was supposed to be led was dedicated to the preparation of the machines, and most importantly the setup of each chopper on the deck. Only five to six landing slots were available on the TONNERRE and MISTRAL, but more than 10 to 12 helicopters had to take off for the mission. Generally, one mission would last 2h30min, with 1h30 of infiltration and exfiltration and 30 minutes to 1 hour within the kill box. Helicopters had to be taken out from the inside of the LPDs (see appendix). Last but not least, at the end of the afternoon, the COM HSG led a huge rehearsal where each crew, in one of the parkings, would rehearse the whole mission from start to finish. Once the mission was

finally complete, the Target Room was the mandatory *rendez-vous* point for every pilot to conduct the debrief. The recordings of the mission were given to the G2 to analyze the battle damage assessment (BDA). A compilation was made every night and sent to the CPCO in Paris.

*Infiltration techniques, Target Engagement Authority, and the use of Kill Boxes*

The enemy in Libya will first react very rapidly to the repeated waves of assault of the French attack helicopters, proving its capacity of reacting and pursuing the fight. With a very high morale, the enemy will suffer severe casualties from these strikes but still maintain their geographic positions, the only thing that will change are the areas they would be stationed in. The HSG was hence obliged to maneuver to search and find the enemy, especially their artillery or tanks, force him to react and seize all opportunities possible. An example given by Captain Erbland, who personally led 17 raids in Libya and destroyed more than 70 combat vehicles, in *Dans les Griffes du Tigre*<sup>17</sup> occurred during one of his strikes.

*“In the region of Brega, the pro-Khadafy units used to park their vehicles under electrical pylons, preventing vertical air strikes from hitting them. During one of my infiltrations in the region of Syrte, I couldn’t find any (...). I had destroyed my target (a tower with a maritime radar on the beach) and we were all very low on fuel. Thinking it was incoherent not to find anyone or anything, I kept screening the area. All of a sudden my camera spotted a hot spot at the base of a palm grove. I immediately gave it to my wingman on the radio who already was on his fuel reserve, “Go back north under the palm grove, a tank, there’s a tank!”. My voice betrayed my enthusiasm, and we eventually destroyed a T-72 with a HOT missile”.*

In a very classical way, a helicopter patrol was dedicated to the screening the infiltration route, followed by another patrol dedicated to cover/destruction, and finally a last patrol was used as a reserve in order to exploit the enemy’s reaction to the first attacks. In this way, the crews attacked the fronts, the flanks, and the rear of the enemy in both desert and urban areas. Libyan forces were regularly using small arms fire, SA 7 and SA 3A against the French helicopters. “After the eighth raid, we knew the *pro-Gaddafi* units were fed up with being targeted and not seeing where it came from. Our intelligence cell reported that during communication interception they could hear radio quotes saying “*hit those French bastards,*

*the dogs of Sarkozy*”<sup>18</sup>. The maneuver was based on night flights that took place only on the darkest nights, ideally with the lowest level of light (new moon), and this tactic paid off. Most of all, it enabled the helicopters to exploit the full-spectrum of their technical capacities, with two different thermal images (the TIGRE helicopter has a green/black image; the GAZELLE helicopter has a grey/white image), and to apply the principles of modern combat: maneuver, deception, surprise, reconnaissance, cover, reserve. The reserve was actually the strongest asset and eventually had the best results. The overall mission was commanded by an air-mission commander (AMC, the COM HSG), on board a UH, a French PUMA. One important aspect of the strikes was the use of Kill Boxes and Cockpit Delegation. Every patrol was mixed (at least one AH TIGRE and two to three AH GAZELLEs) and was given a Kill Box, in which the pilots had full Target engagement authority, meaning they did not need any authorization from the AMC to open fire. It was their responsibility to positively identify vehicles or combatants as targets, and to engage them. The Kill Boxes’ size could vary, depending on the playtime the helicopters had, but they generally were square boxes of 50x10 km.

#### *Battle Damage Assessment*

It is interesting to compare the sources that are available online or from open source military magazines, blogs, and articles written on operation HARMATTAN, with the figures that were given to me via the COM HSG or the French MOD. More than the overall number of destructions due to the FR HSG (which is impressive for an operation never tried before), the comparison with fixed-wing air strikes and foreign nations underlines the level of commitment the French MOD dedicated to this operation, despite major challenges on their manpower or the availability of helicopters (France was at that time deployed in Afghanistan, Côte d’Ivoire, on naval ships, and permanent helicopters were stationed in Djibouti).

## **WHAT COULD POSSIBLY GO WRONG?**

### *A logistical challenge for a rather small Amphibious Assault Ship*

Providing an average of 90 to 94% of helicopter availability, the mechanics of the HSG did a tremendous job, but the conditions of deployment were rough. When the order was given in France, the CSS only had 72 hours to gather every material necessary for the mission. Cooperative work was the word of the day for the J4, the S4 and the naval dockers to count, unload and gather the ammunitions, the NRBC gear, the spare parts and the documentation. Almost 36 hours of non-stop work had been necessary to transform a Navy storage depot into an organized Army hangar for the next few months. One of the most difficult challenges was that for every mission, one spare helicopter had to be available (one TIGRE, one GAZELLE, one PUMA) but only five landing spots were operational and that meant that the spares had to be prepared inside the LPD with their blades folded. In the end, only a very narrow and cooperative management allowed the HSG to never have a shortage of ammunition, fuel, or spare part.

### *What if a helicopter goes down? Immediate Extraction (IMEX)*

The success of the operations relied on the capacity of the helicopters to perform as much damage as possible on the pro-Gaddafi forces, but most importantly it relied on the fact that the HSG could immediately recover a crew that would get shot down or that landed in enemy territory in case of a mechanical failure. This was a great constraint on the maneuver, and everything had to be adopted so that an Immediate Extraction (IMEX) was possible, on the ground but also in case of a sea crash. This was made possible by commando units of the *30th commandos parachutistes de l'air* (CPA 30) who were embarked in the UH IMEX PUMA, flying in holding patterns at the rear of the formation. IMEX is nothing like the SAR or RESCO helicopters operated by the French Navy and the French Air Force helicopters. SAR and RESCO were dedicated to rescuing fixed-wing pilots shot above enemy territory, whereas

the FAA decided to rely on its procedures applied in Africa, Europe and Afghanistan: immediately rescue the crew without any delay. This was not only a security requirement for the COM HSG, it was even more importantly a huge factor of cohesion within the HSSq. “Knowing that if you go down, a group of highly trained commandos will have your back, enabled audacity and intrepidity within the unit, and made us without a doubt push our limits”<sup>19</sup>. One of the reasons for the IMEX PUMA to take off second and land last is that not only did its radios have enough range to enable communications between the Kill Boxes and the LPD, there would most of all always be a medic or a doctor on board. In case of a crash and the necessity to bring back a wounded pilot on the LPD’s hospital, the 30-minute long flight back between the coast and the ship were crucial for preparing the wounded soldier. That could make a difference between a category A or B.

### *Recommendations*

This study of the operation HARMATTAN, through lessons learned, personal testimonials, email interviews with both of the COM HSG, and after action reports can underline a certain number of recommendations, for any national or foreign military who wishes to train and prepare for future operations. Air-mobile operations conducted by helicopters from a naval ship into enemy lines is not something to be improvised, and the successful outcome for the FAA (no casualties, a huge BDA, an absence of any CIVCAS or collateral damage) was mostly due to the continuum of formation, training and recent overseas experience, not only for the crews but also for the commanding officers<sup>20</sup>. Creating an exhaustive list may be incomplete but a certain number of points can and should be underlined:

- Intelligence is essential for the mission. The RAFALEs with recce capabilities were capable of giving very accurate information to the aircraft carrier *Charles de Gaulle* or the Solenzara French Air Force Base. Nevertheless, French officers had a tremendous

difficulty accessing American intelligence according to a French National Assembly report of 2012<sup>21</sup>, because not being part of “Five-Eyes”.

- The ADA threat has to be very accurately estimated and is the major threat for such an operation. Unlike Syria who has purchased modern ADA systems in order to be able to deny air space access to foreign troops, Libya only had obsolete ADA from the 1980s-1990s. The bulk of the threat for the airplanes had been neutralized in the first 24 hours thanks to the American intervention with the Suppression of Enemy of Air Defense (SEAD). USAF bombardments and US Navy missiles targeted radars and ADA batteries, as well as airfields and C2 assets. It enabled the coalition to “kick down the door” and consolidate the advantage with the ongoing air strikes<sup>22</sup>.
- It is of paramount importance to possess drone assets that are immediately available. France only had four HARFANG-type MALE drones (Middle Altitude Long Endurance) to perform intelligence missions, reconnaissance missions, and surveillance. This figure is too low to sustain intense battle rhythms and American PREDATOR-type drones eventually performed most MALE missions<sup>23</sup>.
- Last but not least, it is first of all a system of men who is responsible for the success of the operation. The commanding officers, crews, mechanics and controllers behind the operation were all very experienced and when pilots were considered too young, they would fly with a much more experienced co-pilot. It is of paramount importance to insist on the continuum of formation, training and recent overseas experience. French Army pilots are trained to fly nap of the earth with NVG and a thermal camera as soon as they receive their wings. UH crews fly behind Gazelles and Tigers performing nap of the earth thermal camera flights on a regular basis, and the FAA requirements for crews is of 140 hours of flight minimum per year, 20% of which has to be under NVG. Instrumental flight is systematically practiced day and night. This does not mean the crews were in their

comfort zone flying 90 feet above sea level during more than 30 minutes one-way, without seeing anything but their instruments, but it underlines that practice makes perfect and that no battle can be fought easily without hard training.

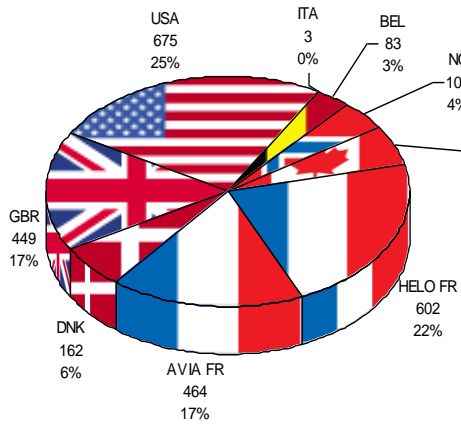
## CONCLUSION

The coalition gathered under Operation UNIFIED PROTECTOR, and France in particular with Operation HARMATTAN, obviously enabled the overthrow of the Gaddafi regime and prevented the annihilation of the civilian rebellion. With an overall cost that was very closely controlled – such as all the other operations in Africa and in the Middle East – and is estimated at 368.5 million euros (394 million dollars), OH was a very cost-effective operation. More importantly, it proved that there are limits to the use of fixed-wing targeting, and that certain missions absolutely require attack helicopters and air mission commanders who delegate their authority. Nevertheless, if OH clearly demonstrated the utility of attack helicopters in conducting deep air strikes from an amphibious base, due to its effectiveness, absence of collateral damage or friendly casualty, and overall capacity of shouldering a significant proportion of the targeting effort, it raises a question for operations in the close future: if helicopters were so effective, could unmanned tilt-rotor aerial vehicles obtain such results? Can the Armed Forces operate without modern helicopters and their crews? These questions will most certainly need to be answered by the French Army Aviation but also any modern military, in the upcoming years.

APPENDIXES

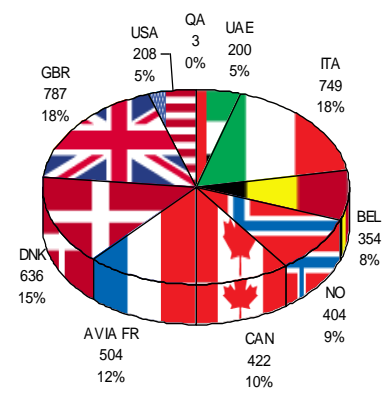
DYNAMIC

DELIBERATE



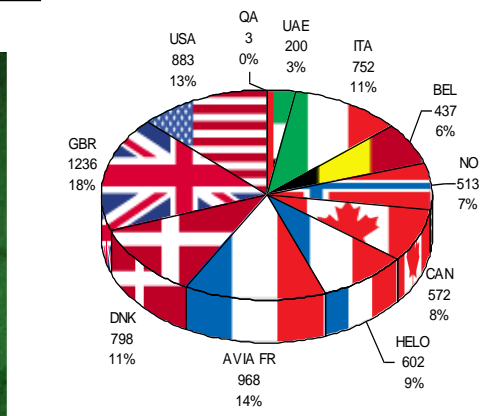
Graphic 1

ers are missi



Graphic 2

TOTAL



The AH EUROCOPTER EC665 TIGRE under NVG.



Pilots getting equipped and briefed right before the mission.



A SUD AVIATION SA342 GAZELLE before take-off.

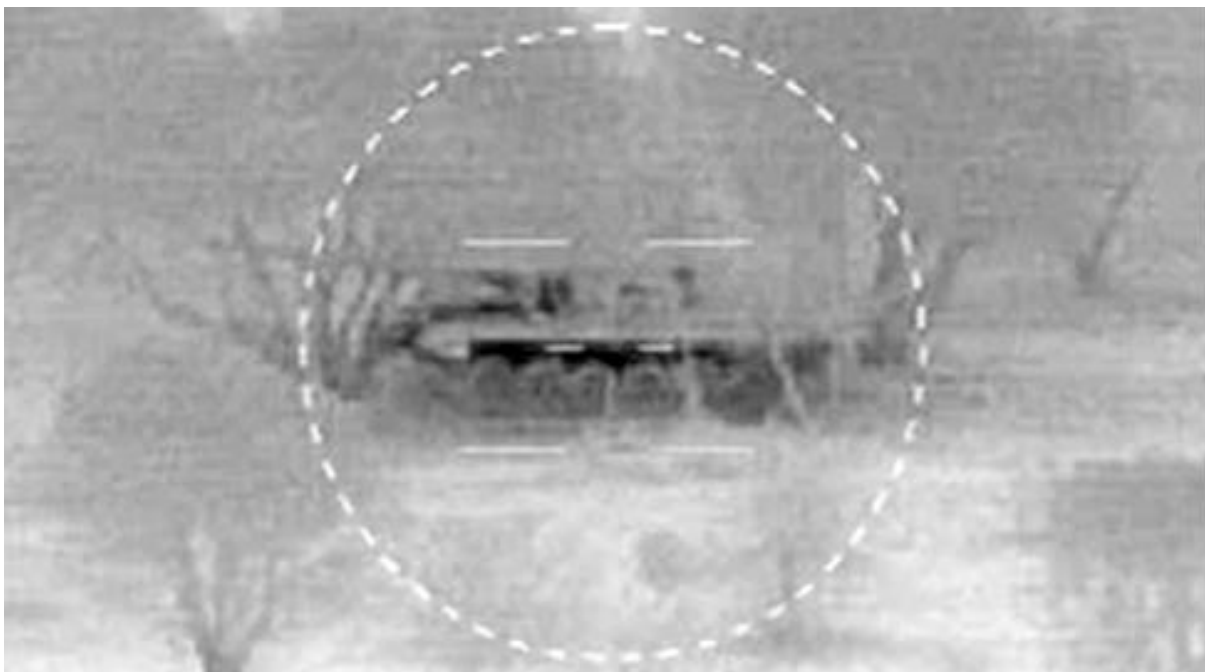




French helicopters on deck, armed and fuelled: the HOT VIVIANNE GAZELLE has HOT missiles and a VIVIANNE thermal camera mounted on top, and the TIGRE has a 30mm gun and rockets.



5 Pro-Khadafy soldiers get out of their vehicle before the TIGRE engages them.



A T-72 just under one of the GAZELLEs.



30 mm rounds are fired at the pick-up.



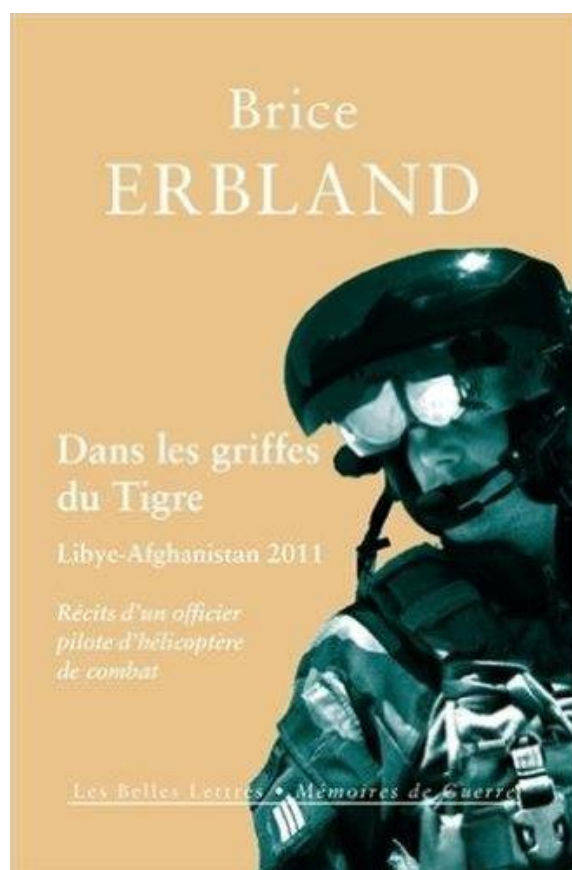
The EDITH tactical flight simulator developed by THALES and in service in every FAA regiment and flight school.



The EDITH map of Afghanistan used for pre-deployment training, here the province of Kapisa.



The EDITH simulator operated by an instructor during urban training.



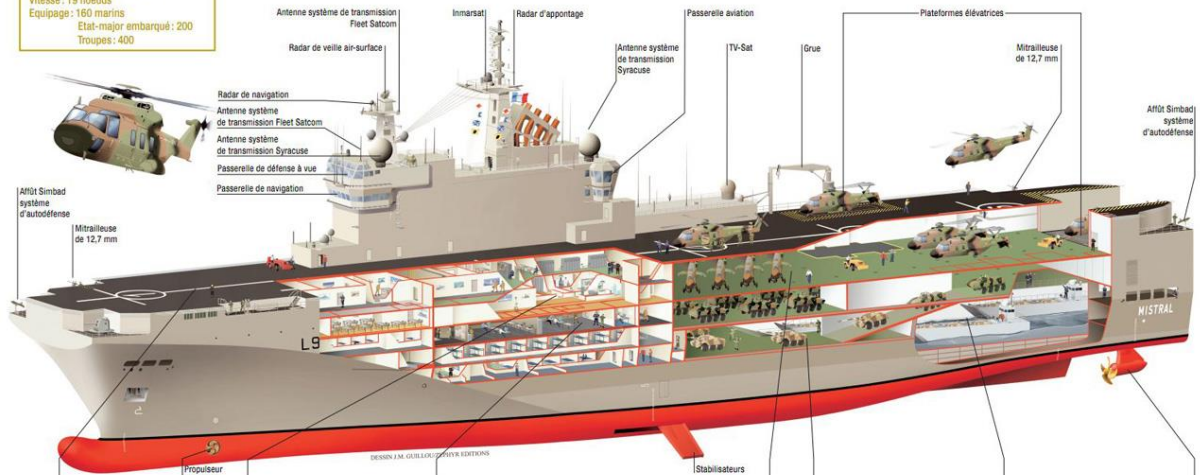
Two contributions written by a TIGRE squadron leader and the COM HSG, *Dans les Griffes du Tigre*, and *Envoyez les Hélicos!*.

**LES BATIMENTS DE PROJECTION ET DE COMMANDEMENT**

Les BPC MISTRAL et TONNERRE présentent une polyvalence exceptionnelle qui leur permet de couvrir un large spectre de missions : opérations amphibies, missions de gestion de crises, opérations aéromobiles, transport opérationnel, soutien santé, transport de fret, évacuation massive de ressortissants, assistance aux populations.

**MISTRAL ET TONNERRE**

Longueur : 199 mètres  
 Déplacement : 21 500 tonnes  
 Vitesse : 19 nœuds  
 Equipage : 160 marins  
 Etat-major embarqué : 200  
 Troupes : 400



**Point d'envol**  
 La pontée de 3200 m<sup>2</sup> comprend 8 spots permettant la mise en œuvre d'hélicoptères de tous types. La capacité d'embarq du BPC est de 16 hélicoptères. Le groupe aérien type est formé de 8 NH90 et 8 H135.

**Hôpital**  
 Sur 100 m<sup>2</sup> de pont, l'hôpital comprend une vingtaine de lits dont 2 salles d'opération, une salle de radiologie, 60 lits dont 16 médicalisés (extension possible à 50 autres lits). La capacité de cet hôpital peut être accrue par l'embarquement dans le hangar d'hélicoptères d'équipements techniques modulaires : ETR - du Service de Santé des Armées.

**Poste de commandement - PC NOE**  
 Le Poste de Commandement de Niveau Opératif Embarqué - PC NOE - accueille les états-majors embarqués qui commandent depuis la mer les opérations interarmées, nationales ou internationales. Cette salle de 800 m<sup>2</sup> peut accueillir 150 postes de travail. Elle est conçue selon le concept "Plug and Play" (brancher et utiliser) : chaque mission armée avec son matériel spécifique et se connecte au réseau mis à disposition.

**Hangar à hélicoptères**  
 Les hélicoptères sont stockés et entretenus dans un hangar de 1800 m<sup>2</sup>. Deux plateformes élévatrices, d'une capacité de 13 tonnes chacune, permettent le mouvement d'hélicoptères entre le hangar et le pont d'envol.

**Hangar à véhicules**  
 Le hangar à véhicules de 2000 m<sup>2</sup> est aménagé sur deux ponts. Des rampes intégrées permettent les mouvements de véhicules entre ces ponts et les charriots. L'accès des véhicules au BPC s'effectue par une porte-rampe latérale ou la porte-rampe radier.

**Radier**  
 Le radier est un bassin intérieur de 60 m de long, immergé sous plusieurs mètres d'eau, par enfouissement du béton. Il accueille le COF - Châssis du Transport de Matériel - qui transporte les blindés et autres véhicules d'infanterie. Une porte arrière basculante met le pont d'eau du radier en communication avec la mer pour permettre l'entrée et la sortie des charriots. Le radier peut accueillir des LCGC - Landing Craft Air Cushion - engins de débarquement sur coussin d'air - pour accroître l'imperméabilité avec les marées hautes.

**POD**  
 Les BPC sont les premiers bâtiments militaires à être équipés d'un système de propulsion par POD. Le POD est un moteur électrique orientable logé dans une nacelle suspendue sous la coque. Avec deux PODs à l'avant et un propulseur à l'arrière, les BPC peuvent travailler en quasi-tour au feu-mécanique, rester en position fixe... Cette capacité à réaliser des manœuvres de manière totalement autonome est essentielle pour un bâtiment armé à multiplier les opérations d'embarquement ou de débarquement dans les zones côtières et dans les ports faiblement équipés.





The LPD MISTRAL from inside and outside.



The IMMEDIATE EXTRACTION PUMA with the CPA 30 commando TF.



A CPA 30 commando gunner in the IMEX PUMA.



The COM HSG giving his orders in the Command UH.



The ATLANTIQUE 2 naval airplane.

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<sup>1</sup> United Nations Security Council, Resolution 1973, 2011.

[http://www.nato.int/nato\\_static\\_fl2014/assets/pdf/pdf\\_2011\\_03/20110927\\_110311-UNSCR-1973.pdf](http://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2011_03/20110927_110311-UNSCR-1973.pdf)

<sup>2</sup> The Helicopter Strike Squadron (HSSq) is the Aviation Element composed of the aircrews. It is a part of the Helicopter Strike Group (HSG), which is composed of the HSSq, the command and control elements, the mechanical support, and the logistical team.

<sup>3</sup> French MOD official website, <http://www.defense.gouv.fr/actualites/operations/l-operation-harmattan>

<sup>4</sup> French National Assembly Report: Mme Marguerite Lamour, in *Compte-Rendu n°10 de la Commission de la défense nationale et des forces armées*, October 25, 2011.

<http://www.assemblee-nationale.fr/13/cr-cdef/11-12/c1112010.asp>

<sup>5</sup> FAA report: Rapport de fin de mission HARMATTAN GAM 1 n°3/HSG/COMHSG, 27 July 2011, French DOD. French Restricted Diffusion (can be quoted if filtered by the author, not accessible for non-French DOD agents).

<sup>6</sup> Secretary of State for Defense, Dr Liam Fox, said: « this was the first operational mission flown by British Army Apaches at sea ».

<sup>7</sup> Colonel (06) Pierre Verborg, in command of the HSG, author of *Envoyez les hélicoptères*, Editions du Rocher (April 2, 2015).

[https://www.amazon.com/Envoyez-hélicoptères-Carnets-guerre-d'Ivoire-ebook/dp/B01N7NNTP3/ref=sr\\_1\\_1?ie=UTF8&qid=1484352691&sr=8-1&keywords=envoyez+les+helicopteres](https://www.amazon.com/Envoyez-hélicoptères-Carnets-guerre-d'Ivoire-ebook/dp/B01N7NNTP3/ref=sr_1_1?ie=UTF8&qid=1484352691&sr=8-1&keywords=envoyez+les+helicopteres)

<sup>8</sup> Ibid, chapter 1.

<sup>9</sup> Le Luc en Provence is one of the two FAA schools located in the South East of France, where the HSSq pre-deployed before the embarkment in Toulon on the TONNERRE.

<sup>10</sup> *Envoyez les Hélicoptères !*, chapter 1, Editions du Rocher (April 2, 2015).

<sup>11</sup> See appendix EDITH.

<sup>12</sup> FAA Publication of 2012: Revue d'Information de l'ALAT, *Au coeur des opérations*. Revue n°22, publication du COMALAT – Janvier 2012.

<http://fr.calameo.com/books/0000097792f1b73e57750>

<sup>13</sup> Contre-Amiral Cointreau, COM TF 473, quoted in the French DOD website, <http://www.defense.gouv.fr/layout/set/print/operations/autres-operations/operations-achevees/operation-harmattan-2011/actualites/libye-l-efficacite-des-operations-combines>

<sup>14</sup> Dr J.R.T. Wood, *Counterinsurgency in Modern Warfare*, Osprey Publishing, 2008, p 195.

<sup>15</sup> Colonel Pierre M., COM HSG during HARMATTAN II, in *CDEF Retex, Libye : l'aérocombat dans un environnement interarmées*. French Restricted Diffusion (can be quoted if filtered by the author, not accessible for non-French DOD agents).

<sup>16</sup> Lieutenant Gallineau, in The FAA Publication of 2012: Revue d'Information de l'ALAT, *Au coeur des opérations*. Revue n°22, publication du COMALAT – Janvier 2012.

<sup>17</sup> Capitaine Brice Erbland, *Dans les Griffes du Tigre*, 2015.

<sup>18</sup> Ibid.

<sup>19</sup> FAA Publication of 2012: Revue d'Information de l'ALAT, *Au coeur des opérations*. Revue n°22, publication du COMALAT – Janvier 2012.

<http://fr.calameo.com/books/0000097792f1b73e57750>

<sup>20</sup> Ibid.

<sup>21</sup> French National Assembly Report: Avis n°256, tome 4, fait *Au Nom de la Commission de la Défense Nationale et des Forces Armées sur le Projet de Loi de Finances pour 2013*, enregistré à la Présidence de l'Assemblée nationale le 10 octobre 2012.

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<http://www.assemblee-nationale.fr/14/budget/plf2013/a0256-tVI.asp>

<sup>22</sup> Ibid, page 47.

<sup>23</sup> Ibid, page 50.