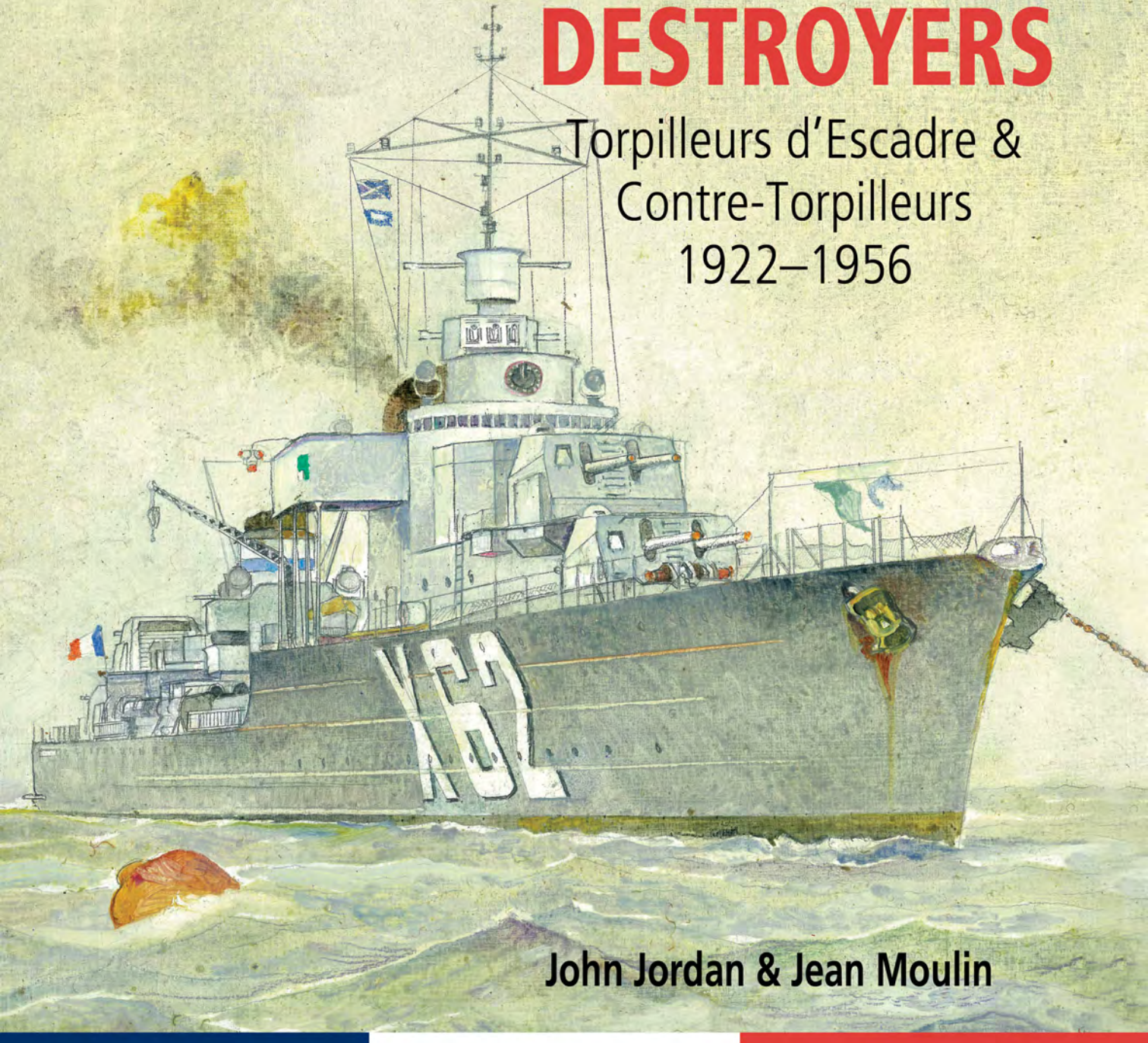
FRENCH DESTROYERS

Torpilleurs d'Escadre & Contre-Torpilleurs 1922–1956



John Jordan & Jean Moulin

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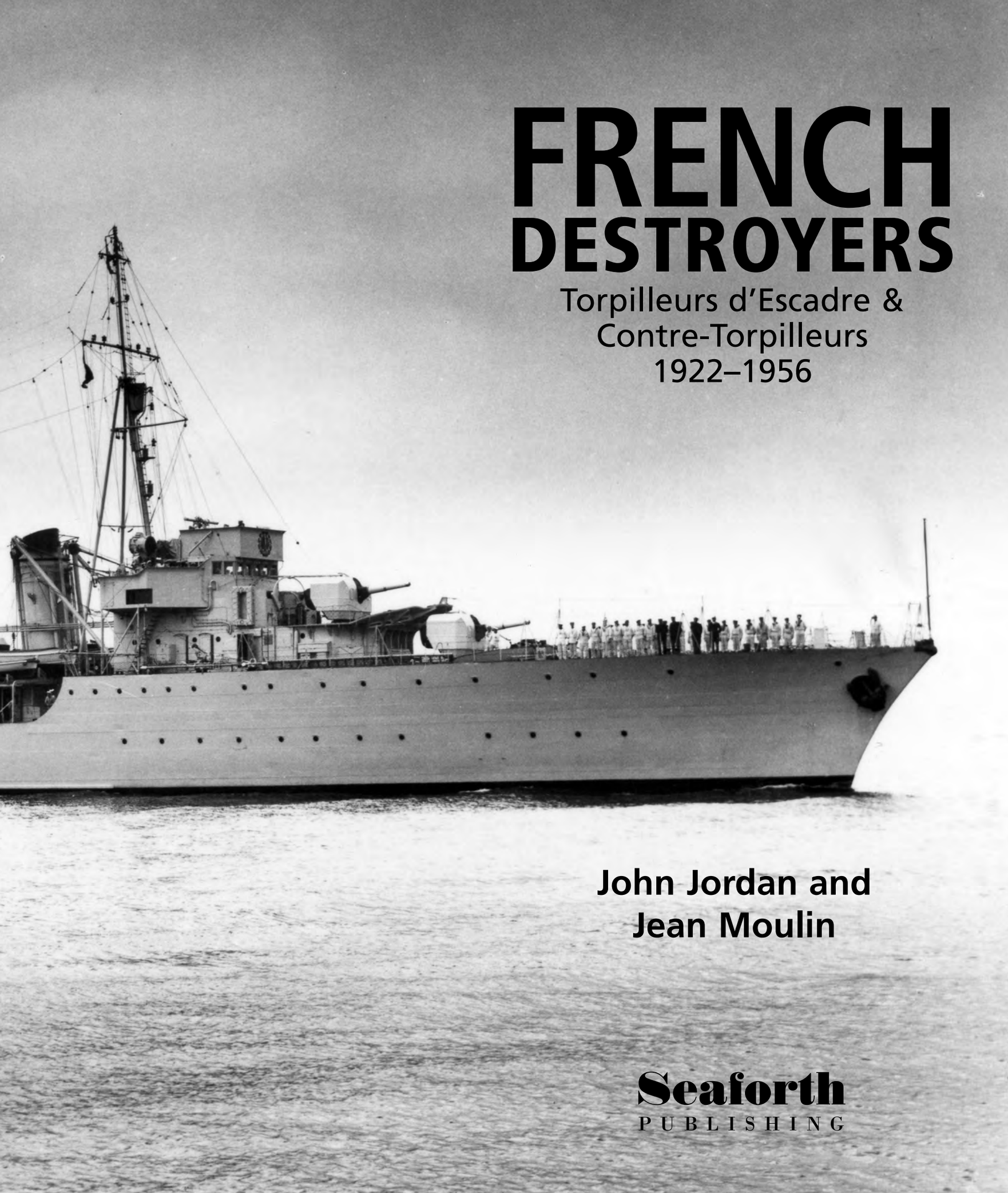

FRENCH DESTROYERS

Torpilleurs d'Escadre & Contre-Torpilleurs 1922–1956

John Jordan and Jean Moulin

Seaforth
PUBLISHING

Overleaf: *Chacal* arriving in Portsmouth with her sister *Léopard* on 26 August 1936. The ships had recently been assigned to the Officer Training School, the *Ecole Navale* (see Chapter 11), and were conducting a series of visits to major European ports as part of the training programme.

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PREFACE

THIS BOOK IS EFFECTIVELY THE SEQUEL TO *French Battleships 1922–1956*, written with Robert Dumas, and *French Cruisers 1922–1956*, with Jean Moulin, published by Seaforth Publishing in 2009 and 2013 respectively. The authors thought long and hard about the coverage of the book. It would have been easier in many respects to focus exclusively on the more glamorous *contre-torpilleurs*, the development of which spanned little more than ten years and marked a clearer and more coherent progression than that of the French 'fleet torpedo boats' (*torpilleurs d'escadre*), which fell into two distinct groups with very different characteristics; it would have also greatly simplified the service histories of these two categories of ship, which were deployed for quite different tasks, particularly during the early part of the Second World War. However, a follow-on book dealing only with the *torpilleurs d'escadre* would have been difficult to justify in commercial terms, so this would have remained a significant gap in English-language coverage of the type. More compellingly, the technological and developmental links between the *contre-torpilleurs* (CT) and the *torpilleurs d'escadre* (TE) of the interwar period were closer than has been acknowledged: the TE of the *Bourrasque* and *L'Adroit* classes were designed by the same 'small ships' department of the Service Technique des Constructions Navales (STCN) which designed the CT of the *Jaguar* class, and had similar propulsion and common weapons systems, while the later TE of the *Le Hardi* class had many of the design characteristics of the last of the *contre-torpilleurs* of the *Mogador* class, of which they were close contemporaries. The late Henri Le Masson recognised these close developmental links when he wrote his seminal *Histoire du Torpilleur en France*, published by the Académie de la Marine in 1967.

French Destroyers 1922–1956 follows the same approach and organisation as the authors' earlier book on French cruisers. A general introduction is followed by nine chapters detailing, in chronological sequence, the conceptual development, construction and characteristics of each of the nine classes of *torpilleur* and *contre-torpilleur* covered in the book. This 'technical' section of the book covers the period 1926–1942 and is largely the work of John Jordan with the support and advice of Jean Moulin. The second part of the book, which is divided into four chapters, is a detailed account of the service lives of the ships during the four periods covered by the book: the prewar era (1926–1939), the early war period (1939–1943), the late war period when French naval forces rejoined the Allied cause (1943–1945), and the postwar era (1945–1956). Jean Moulin has again provided this 'historical' section, which has been translated from the French by John Jordan. One significant change to the format adopted for the cruiser book has been the insertion between the technical and historical sections of a new chapter dealing with paint schemes and recognition markings, which were an important recognition feature for both types of French flotilla craft; this chapter is a collaboration between both authors. Another is the provision of appendices at the end of the historical chapters dealing with the extensive modifications made to some ships during their service alongside the Allies from June 1940 to late 1945, and the conversion of the *contre-torpilleur Albatros* to serve as a gunnery training ship after the war; these are primarily the work of John Jordan.

The present book aims to summarise for English-speaking readers the considerable quantity of information, backed up by recently-released official documentation, made available in a series of monographs on the *torpilleurs* and *contre-torpilleurs* published in France since the mid-1990s (see Sources p.292). In addition to the technical and historical aspects of destroyer development in France between the wars, the book focuses closely on issues of infrastructure, tactical organisation and even national culture, which are not always well understood on this side of the Channel. It is hoped that this book will give the reader a better understanding not only of the design philosophy and technical characteristics of these ships, but also of the history and traditions of the Marine Nationale during the twentieth century.

THE DRAWINGS

The line drawings and labelled schematics by John Jordan, most of which have been specially prepared for this book, are based on official plans and other documentation currently held by the Centre d'Archives de l'Armement (CAA) at Châtellerault; many of the plans have been openly published on the website of the Service Historique de la Défense. Some of these plans and documents have only recently been made available as part of the *Fonds Potsdam*, an archive of material assembled by the German *Kriegsmarine* during the Occupation and transferred to Berlin, where it was seized by the Russians in 1945; the materials were returned to France after the fall of the Berlin Wall and have now been reclassified and distributed among the various French national archives. Unfortunately only partial documentation concerning the *torpilleurs d'escadre* of the *Le Hardi* class has survived, and much of this dates from 1936, before the final 'as-fitted' plans were drawn up by the shipyards. However, by piecing together the information available and by extrapolation from other contemporary projects, notably the *contre-torpilleurs* of the *Mogador* type and the battleships of the *Richelieu* class (which introduced the revolutionary Sural forced-circulation boiler), the authors are confident that they have produced the most complete study yet of these ships, even though some detailed aspects of the design must remain a matter for conjecture.

The colour section again features the work of marine artist Jean Bladé, formerly the Surgeon General for the French armed forces. These beautiful watercolours, which were painted during Jean's time in the Navy (1922–1965), constitute a valuable record of the destroyers and their activities, and provide a comprehensive illustration of the paint schemes and tactical markings of the ships at the various stages of their service lives.

ACKNOWLEDGEMENTS

The authors would like to express their thanks to the following organisations which have assisted them with their research:

The Service Historique de la Défense:
Centre d'archives de l'armement et du personnel civil (CAA) at Châtellerault
Département Marine at Vincennes, Paris

One of the highlights of the book is the section on the modernisations of the *contre-torpilleurs* of the *Le Fantasque* class, which corrects a number of errors in both English- and French-language secondary sources. This was possible only with the considerable help and support of A D Baker III, who was kind enough to lend his copies of the original BuShips plans and supplied many photos from his personal collection; Rick E Davis, who has conducted extensive research into the archives of the Charlestown Navy Yard, Boston, and Norman Friedman also provided many interesting photographs of the ships during their time in the USA, many of which are previously unpublished. Marc Saibène, author of the two French monographs on the *torpilleurs d'escadre* (see Sources), generously supplied photographs from his personal collection not only of the TEs of the *Bourrasque* and *L'Adroit* classes, but of the early *contre-torpilleurs.* Philippe Caresse, Robert Dumas, Leo van Ginderen, Jaroslaw Malinowski and Peter Cannon also contributed photographs, which have been duly credited. The remaining photographs are from the private collections of the authors; it has not always been possible to trace the precise origin of these, and all rights are reserved.

Sincere thanks are also due to Dr. Jean Bladé, who supplied the watercolour of *Volta* which illustrates the jacket as well as the colour artwork in the centre section of the book, and to his son, Jean-Sébastien Bladé, who was kind enough to provide high-resolution scans and photographs of his father's paintings. The authors also wish to extend their thanks to Rob Gardiner (Seaforth Publishing), who has offered support and advice throughout the project, and to Steve Dent, both for the intelligence and creativity he has displayed in designing the layouts and for the infinite patience with which he has accommodated the inevitable last-minute amendments. Without the collaboration of these people this book would not have been possible.

John Jordan & Jean Moulin
October 2014

ACRONYMS AND ABBREVIATIONS

ORGANISATIONS

CAA	Centre d'Archives de l'Armement (at Châtellerault, SW France)
CFLN	*Comité français de libération nationale* (French Committee of National Liberation)
CPE	*Commission permanente des essais* (Trials Commission)
CSM	*Conseil supérieur de la marine* (Navy Board [advisory])
DCAN	*Direction centrale des armes navales* (Ordnance Department)
DNL	*Division navale du Levant* (Levant Division)
EATM	*Ecole d'application du tir à la mer* (gunnery school ship)
EALM	*Ecole d'application du lancement à la mer* (torpedo school ship)
EMG	*Etat-major general de la marine* (Naval General Staff)
FMA	*Forces maritimes d'Afrique* (African maritime forces)
FMF	*Forces maritimes françaises* (French Admiralty September 1939 to 1944, at Maintenon & Vichy)
FNFL	*Forces navales françaises libres* (Free French Naval Forces)
MDAP	Mutual Defense Assistance Program (US)
NGS	Naval General Staff
STCN	*Service technique des constructions navales* (Constructors' Department)

TECHNICAL

ACAD	*automatique contre-avions double* (automatic AA twin mounting)
AMC	armed merchant cruiser
APV	auxiliary patrol vessel
CAD	*contre-avions double* (AA twin mounting)
CAQ	*contre-avions quadruple* (AA quad mounting)
CAS	*contre-avions simple* (AA single mounting)
CT	*contre-torpilleur*
CV	*chevaux* (horsepower: 1CV = 0.98632shp)
DA	*disponibilité armée* (care & maintenance)
DCT	depth charge thrower
DF	direction finding
D-P	dual-purpose
FPB	fast patrol boat
FTP	follow the pointer
GA	general arrangement
HA	high-angle (guns)
HE	high explosive
HF	high frequency
HP	high pressure (turbines)
IP	intermediate pressure (turbines)
LA	low angle (guns)
LP	low pressure (turbines)
MF	medium frequency
Mle	*Modèle* (model)
MG	machine gun
OEA	*obus explosif en acier* (HE shell)
OEcl	*obus éclairant* (starshell)
OI	*obus incendiaire* (incendiary tracer shell)

OPFA	*obus de perforation en fonte aciérée* (SAP shell)
OPf(K)	*obus de perforation* (armour-piercing shell)
OTC	*ondes très courtes* (VHF)
psi	pounds per square inch
p&s	port and starboard
p/w	passageway
RF	rangefinder
RPC	remote power control
rpg	rounds per gun
rpm	rounds per minute
SAP	semi-armour piercing (shell)
shp	shaft horsepower
S/L	searchlight
TE	*torpilleur d'escadre* (destroyer)
TS	Transmitting Station
TT	torpedo tube(s)
u/s	ultrasound
UTS	ultimate tensile strength
VTE	vertical triple expansion (reciprocating engine)
W/T	wireless telegraphy

RANKS

CA	*Contre amiral* (Rear-Admiral)
CC	*Capitaine de corvette* (Lieut.-Commander)
CF	*Capitaine de frégate* (Commander)
CO	commanding officer
CPO	chief petty officer
CV	*Capitaine de vaisseau* (Captain)
EV	*Enseigne de vaisseau* (Sub-Lieutenant)
LV	*Lieutenant de vaisseau* (Lieutenant)
PO	petty officer
VA	*Vice amiral* (Vice-Admiral)
VAE	*Vice amiral d'escadre* (Squadron Vice-Admiral)

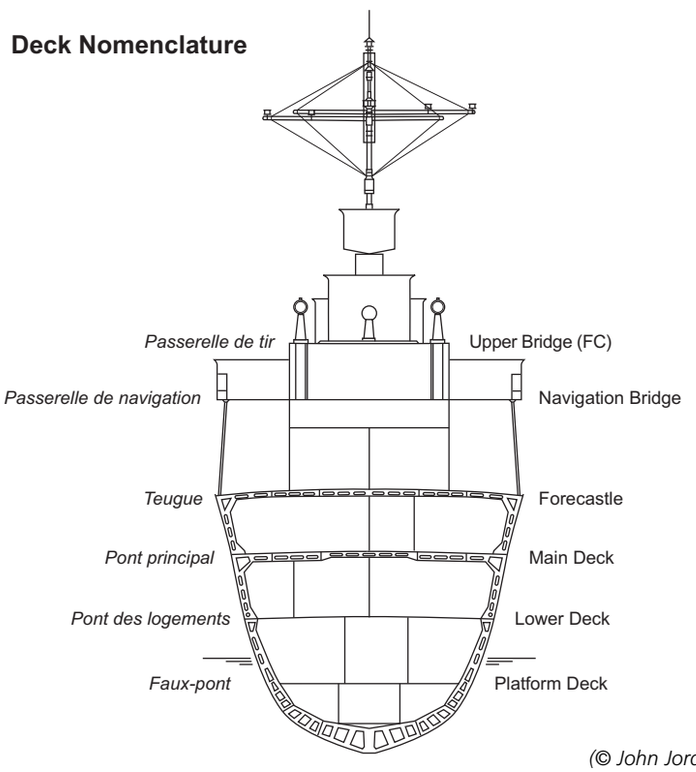
NAVAL FORMATIONS

DC	*division de croiseurs* (cruiser division)
DCL	*division de croiseurs légers* (light cruiser division)
DCT	*division de contre-torpilleurs* (scout division)
DCX	*division de croiseurs auxiliaires* (armed merchant cruiser division)
DL	*division légère* (light division)
DSM	*division de sous-marins* (submarine division)
DT	*division de torpilleurs* (torpedo boat division)
EL	*escadre légère* (light squadron)
FHM	*Forces de haute mer* (high seas forces)
FI	*Force d'intervention* (intervention force)
FNI	*Force navale d'intervention* (Naval Intervention Force)
FNTF	French Naval Task Force
GASM	*Groupe d'action anti-sous-marine* (Anti-Submarine Group)

FOOTNOTE REFERENCES

CM	*circulaire ministérielle* (ministerial circular)
CN	*constructions navales* (construction dept.)
DM	*décision ministérielle* (ministerial directive)
EMG	*état-major général* (general staff)
/1	personnel
/2	intelligence
/3	operations
/4	support
FMF	*forces maritimes françaises* (French admiralty replaced EMG during Second World War)
PM	*préfecture maritime* (maritime district)
/1	1st Region (Cherbourg)
/2	2nd Region (Brest)
/3	3rd Region (Toulon)
/4	4th Region (Bizerte)
/5	5th Region (Lorient)

Deck Nomenclature



CONVERSION TABLES

Length m	Length ft	Beam m	Beam ft
95	312	9.5	31
100	328	10.0	33
105	345	10.5	34.5
110	361	11.0	36
115	377	11.5	38
120	394	12.0	39.5
125	410	12.5	41
130	427	13.0	42.5
135	443		
140	459		

Guns mm	Guns in	Torpedoes mm	Torpedoes in
75	3	381	15
100	3.9	450	17.7
130	5.1	550	21.7
138.6	5.5		

Boiler working pressure kg/cm²	Boiler working pressure psi
18	255
20	285
27	385
35	500

Notes: Length to nearest 1ft, beam to nearest 0.5ft; guns & torpedoes to one decimal place; boiler working pressure to nearest 5psi.

INTRODUCTION

THE FIRST FRENCH TORPEDO BOAT DESTroyers were built as a response to the British boats of that type, the first of which ran trials in 1893–94. When completed at the turn of the century they were referred to as *contre-torpilleurs* (lit. 'anti-torpedo boats'), and this would continue to be the official designation for the first series of 300-tonne boats and for their larger successors until 14 March 1913, when the designation was amended to *torpilleurs d'escadre* ('fleet torpedo boats').

Subsequent French destroyers (projects and ships) would continue to be officially designated *torpilleurs d'escadre.* The term *contre-torpilleur* would be revived in 1921–22 to describe a new and completely different type of large fleet scout unique to the interwar Marine Nationale with which the name has become synonymous. And the *torpilleur* ('torpedo boat') designation, previously used for small coastal torpedo boats intended for *défense mobile*,[1] would be revived for the 600-tonne torpedo boats built following the London Treaty of 1930, which set no quantitative or qualitative limits on ships displacing less than 600 tons standard.

The present book aims to cover the classes of *torpilleur d'escadre* and *contre-torpilleur* designed and built for the Marine Nationale during the interwar period, some of which continued to serve after the Second World War.

THE EARLY DESTROYERS

The characteristics of the earliest French destroyers were suggested by Jacques-Augustin Normand, whose Le Havre shipyard (the Chantiers Normand) had been particularly prominent in the construction of the *torpilleurs défensifs*.[2] Normand proposed a ship of 300 tonnes, with a speed of 25 knots to enable it to accompany the battle fleet, armed with two torpedo tubes and four 381mm torpedoes (the reloads were to be stowed in lockers on deck), together with quick-firing (QF) guns capable of penetrating the machinery spaces of an opponent.

The first four ships (*Durandal* class) were laid down from August 1896 and were launched and completed in 1899–1900. They were considered a success; a total of 55 ships of the 300-tonne type would be built for the Marine Nationale, together with 20 for foreign navies. In the last two classes the 381mm torpedo was replaced by a new 450mm model with greater power and range. However, this exacerbated the topweight problem which had long been considered the only negative feature of the ships

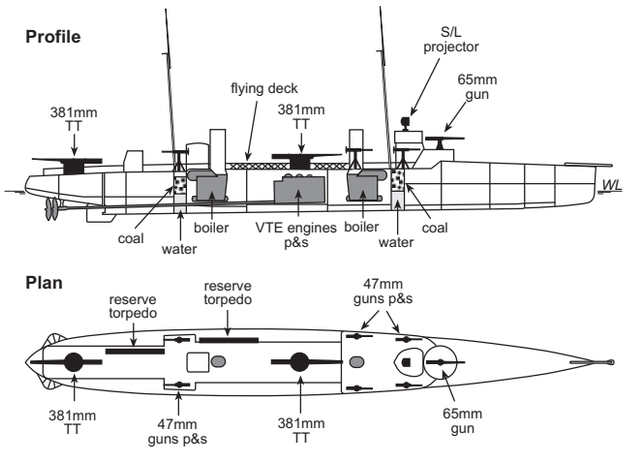
The 450-tonne type which succeeded the *300-tonnes* aimed to correct this deficiency. The mixed armament of a single 65mm and six 47mm guns of the latter was also regarded as a weakness, and the 47mm was now

[1] Essentially the protection of French ports; the concept of *défense mobile* was a key element in the defensive strategy promoted by Admiral Aube of the *Jeune Ecole* during the early 1880s.

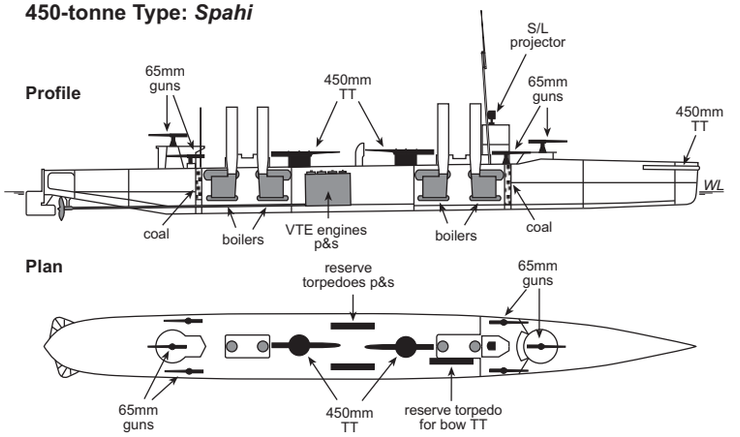
[2] Also known as *numérotés*; these small torpedo boats, none of which displaced more than 100 tonnes, carried only numbers, not names.

The Early French Destroyers

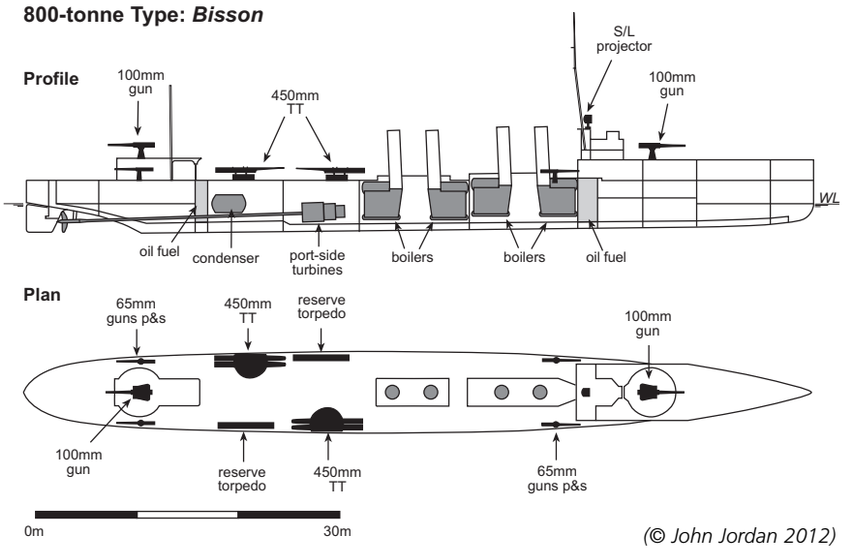
300-tonne Type: *Arquebuse*



450-tonne Type: *Spahi*



800-tonne Type: *Bisson*



Top: The 300-tonne destroyers *Branlebas* and *Fanion.* Note the single trainable torpedo tubes above the stern. *(Philippe Caresse collection)*

Above: The 300-tonne destroyer *Mousqueton* at Toulon. Abaft the second funnel are the two after 47mm guns and the tube of the reserve torpedo for the after mounting. Note the pronounced tumble-home of the ship's sides. *(Philippe Caresse collection)*

considered too lightweight to be effective. The latest British destroyers of the 'River' class displaced 550 tons and were being rearmed with four 12pdr (76mm) guns. Normand proposed a homogeneous armament of six single 65mm guns and three 450mm torpedo tubes, again with reloads. It would be the last time he exerted an influence on French destroyer characteristics; he died shortly afterwards on 11 December 1906.

The first class of seven ships (*Spahi* class) had a similar machinery arrangement to the *300-tonnes*; there were boiler rooms fore and aft of a central engine room with conventional vertical triple expansion (VTE) reciprocating engines side by side. The *Spahi* type was generally regarded as successful. However, the next two units introduced an experimental mixed propulsion system on three shafts, with a VTE engine driving the centre shaft and steam turbines on the two outer shafts. This was an arrangement common in contemporary liners; it had the theoretical advantage of economic steaming using the reciprocating engine, while the thirsty turbines provided sustained high speed.

The experiment was not a success: the reciprocating engine had forced lubrication, which resulted in regular breakdowns before the technology was mastered; and both boiler rooms were now forward of the engine rooms, which unbalanced the trim of the boats. Coal was generally stowed adjacent to the boiler rooms, and the transfer of these considerable weights forward resulted in sea-keeping problems.

The last four ships had turbines only on their three shafts, and the last three had oil firing. The experimental nature of much of their machinery and the lack of uniformity between individual ships complicated training and maintenance. However, lessons were learned: subsequent destroyers would be powered by turbines alone, auxiliary machinery by electricity rather than steam, and oil would be preferred to coal, not only for ease of refuelling but because of the reduction in the physical exertion required by the stokers at the high speeds at which these ships were intended to operate.

THE 800-TONNE TYPE

The final type of destroyer built for the Marine Nationale prior to the First World War was the 800-tonne type. The fleet wanted bigger ships with better sea-keeping, able to maintain speed in rough weather; a raised forecastle was considered essential. Improvements in the performance of torpedoes meant that engagements between destroyers would take place at longer range; the 65mm Mle 1902 was considered effective only to 1000m, whereas a 100mm gun could reliably hit at 2500m. This would put the new ships on a par with the latest British destroyers of the 'Tribal' class, which displaced 850 tons and were armed with two 4-inch guns. The 65mm was retained, however, as its high rate of fire (12/13rpm) was liked, so the ships ended up with a mixed battery of two 100mm Mle 1893 (disposed fore and aft) and four 65mm guns. Four 450mm torpedo tubes in twin trainable tubes (each with a single reload locker) completed their armament.

A class of twelve ships (*Bouclier* class) was authorised under the 1908 and 1910 estimates and completed before the outbreak of war, followed by a class of six (*Bisson* class: authorised 1910–11, four in service by August 1914), and a final class of three (*Enseigne Roux* class: authorised 1913), two of which entered service in 1916 with the third suspended.

Despite a relatively mature technological base there were major differences in configuration, equipment and performance between individual ships, which in accordance with previous practice were allocated to no fewer than nine different private shipyards in addition to the two naval dockyards at Rochefort (3 ships) and Toulon (3 ships). Two ships had three shafts, the others two; some had cruise turbines, others did not. Most had four evenly spaced funnels but one ship, *Casque*, had the two central boilers mounted back to back and had a broad central funnel flanked by two slimmer funnels. *Bouclier* had a length overall of 72.3 metres; the other ships were between 74m and 78.3m; beam varied between 7.6m and 8.1m, and power between 13,000CV and 14,000CV. Unsurprisingly, performance was uneven: the three-shaft *Bouclier* achieved 35.3 knots on trials, the two-shaft *Dehorter* only 29.3 knots; in service *Casque* made 29 knots, *Bory* only 24 knots. This, together with the vibration suffered at different speeds, made tactical grouping of

Left: The 450-tonne destroyer *Lansquenet*. The first seven ships of this type had a similar machinery arrangement to the 300-tonne destroyers, with reciprocating engines side by side in a single engine room and the boiler rooms fore and aft. They could be distinguished by their two widely-separated pairs of funnels. *(Philippe Caresse collection)*

the ships difficult. The heavy fuel consumption of the entire class drove the French inexorably towards reduction gearing. The first British geared turbines entered service aboard the destroyers *Badger* and *Beaver* in 1912–13,[3] and it was decided that the third ship of the *Enseigne Roux* class, the *Enseigne Gabolde*, would be completed as a test platform for Parsons geared turbines.

A document outlining tactics for the fleet dated 1910, and which was still in force in 1914, makes clear the influence of the Russo-Japanese war with regard to the deployment of the French *torpilleurs d'escadre*. It stated:

> The flotillas can act only in conjunction with the battle fleet … Their intervention will be most effective during the exploitation phase of the battle, once the big guns have prepared the ground by disrupting the cohesion of the enemy battle line. In particular, they should take every opportunity to separate ships which have fallen out of the line or to inflict further damage on a crippled opponent. However, their key role begins at sunset and during the pursuit which will follow the battle…[4]

Although the flotillas would accompany the fleet into battle, the document suggests that they would be kept on the disengaged side of the line until 'opportunities' arose; they would not attempt to launch an attack on the enemy line when the latter was still formed and engaged. Torpedo ranges were still in the region of 2000–3000m,[5] and torpedo-armed craft attempting to close the enemy line would be greeted by a hail of medium-calibre shell. This view would change as gun engagement and torpedo ranges increased.

The 'flotillas' of the elite force of the French Navy in August 1914, the *Armée Navale*, comprised six *escadrilles* ('flotillas') each of six *torpilleurs d'escadre*, led by the 800-tonne *Bouclier*: two comprised 800-tonne ships, two 450-tonne ships, and two the early 300-tonne type. The other major light formation, the *Division des flotilles* of the 2nd Squadron, operated in the Channel area and comprised three *escadrilles* each of six 300-tonne destroyers, and three *escadrilles* of submarines.

Below: *Voltigeur* and her sister *Tirailleur* (450-tonne type) had an experimental mixed propulsion system on three shafts inspired by that of contemporary passenger liners, with a reciprocating engine (for endurance) driving the centre shaft and steam turbines (for high speed) on the two outer shafts. The relocation of all four boilers and their associated coal bunkers forward adversely affected trim. *(Philippe Caresse collection)*

[3] *Badger* and *Beaver* were given 'part gearing' as an experiment; full single reduction gearing was first installed in the *Laforey*-class destroyers *Leonidas* and *Lucifer* in 1913.

[4] Quoted in Le Masson, *Histoire du Torpilleur en France* (Académie de la Marine, 1967), p.176; translated into English by the author.

[5] The newest French torpedo, the Modèle 1909R, the first to employ a reheater, had a range of 2000m at 33 knots and 3000m at 28 knots.

THE *STATUT NAVAL* OF 1912

The *Statut Naval* (Naval Law) of 30 March 1912, which was intended to arrest the decline of the *Marine Nationale* in relation to the other major European powers, established the fleet structure to be achieved by 1920 as: 28 battleships, 10 scout cruisers, 52 fleet torpedo boats, 94 submarines, and 10 vessels for distant stations.

The imbalance between the number of capital ships and the number of torpedo boats intended to accompany them is striking. The low priority accorded to flotilla craft in the programme would become alarmingly apparent in the following months. The year 1912 saw the authorisation of no fewer than twelve 'super-dreadnought' battleships of the *Bretagne*, *Normandie* and *Lyon* classes. In contrast, the number of fleet torpedo boats ordered in 1913 was cut to three (in previous years an average of 6–7 boats had been ordered).

In December 1913 Vice-Admiral Le Bris, Chief of the Naval General Staff (NGS), submitted a lengthy report in which he proposed the construction of 58 new destroyers for a total force of 115 in 1920 – he estimated that Rochefort and private industry could easily deliver nine hulls per year. The Navy Minister disagreed; there was limited funding available for new construction and he was of the opinion that this needed to be concentrated on the capital ship programme.

The NGS was not to be deterred. In successive reports submitted to the Navy Minister during 1914 it opposed the inclusion of the 450-tonne destroyers and the ten most modern 300-tonne boats in the figure of 52 destroyers projected for 1920.[6] It questioned whether the 300-tonne type could be classified as 'high seas destroyers' under the terms of the Naval Law, as their limited sea-keeping and endurance would inevitably place constraints on the deployment of the battle fleet. Even when the twenty 800-tonne destroyers completed or building were added to the 23 smaller ships, there remained nine new destroyers to be laid down by 1917 at the latest (for entry into service during 1920). The NGS therefore proposed the construction of nine destroyers of a new, more powerful 1500-tonne type under the 1915 estimates (to complete the force of 52 *torpilleurs d'escadre* enshrined in the Naval Law), a further ten of the same type (to replace the *300-tonnes*) in 1916, and thirteen additional ships (to replace the *450-tonnes*) under the 1917 and 1918 estimates. This would create a modern force of fleet destroyers comprising:

4 *escadrilles* each of eight *1500-tonnes*
2 *escadrilles* each of eight *800/900-tonnes*
4 x *800-tonnes* as replacements or for the Channel Fleet (2nd Squadron)

The 450-tonne and 350-tonne destroyers were to be transferred to anti-submarine defence duties.

By this time tactical thinking had moved much closer to British and German practice. The new destroyers would need to be able to protect their own battle line against attack by torpedo boats, hence the increase in size and power. (The latest British destroyers displaced close to 1000 tons and had a uniform armament of three 4-inch [102mm] guns.) Each *escadrille* would now have eight, rather than six destroyers, in imitation of the German flotillas and the British half-flotillas.

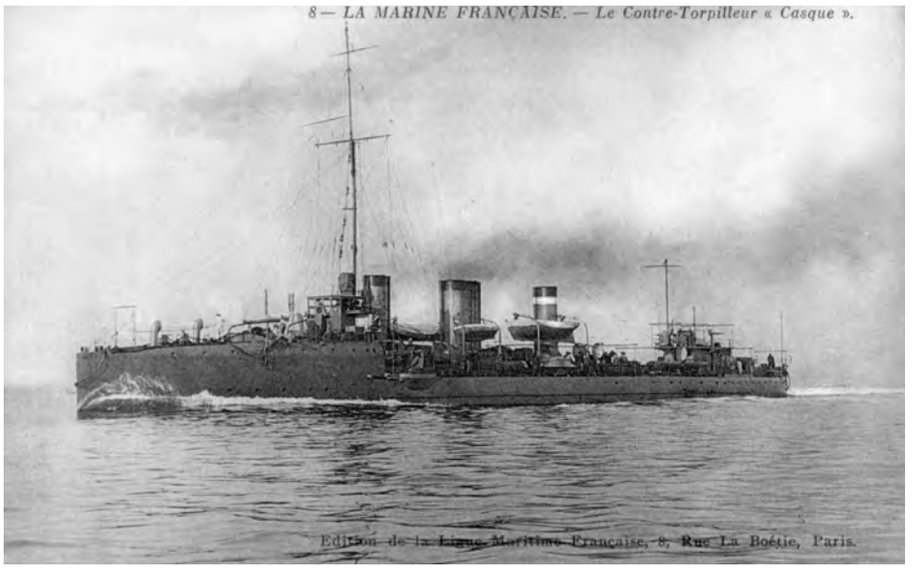
M89 AND M90

The year 1913 saw the publication of a report by the Comité Technique on the *torpilleurs d'escadre* built from 1908 onwards, which in addition to reviewing the ships in current service also pointed the way forward.

When considering armament, the report stated that the instability of the platform, together with the relatively small size and high speed of the targets – the enemy's own destroyers – meant that gunfire was effective only out to 3000m. The targets were completely unprotected, so a non-capped shell with a comparatively large bursting charge of picric acid (*Mélinite* – 15% of shell weight) was recommended; ideally this needed to penetrate the hull below the waterline in order to incapacitate the ship, so it should have a flat nose (*cône tronquée*) fitted with a light ballistic cap which detached when it hit the water; the shell would

Below: *Commandant Bory* had the classic 800-tonne configuration with four evenly-spaced funnels and the twin torpedo tubes *en echelon* abaft the fourth. Note the large 100mm guns fore and aft; the remaining four guns were 65mm. *(Philippe Caresse collection)*

Bottom: There were considerable variations in appearance and performance between the various ships of the class. This is *Casque*, which had her two middle boilers mounted back to back and the second and third funnels combined. *(Philippe Caresse collection)*



[6] The thirteen 450-tonne destroyers had entered service between 1909 and 1912, the 330-tonne ships of the *Branlebas* class between 1908 and 1910; they were therefore relatively modern units when the *Statut Naval* was promulgated in 1912.

require a very sensitive fuze to ensure detonation. Given an inherently unstable platform, a fast, manoeuvrable target and rudimentary fire control, it was thought that very few hits would be obtained, so the largest possible calibre was desirable to ensure maximum damage from a single hit. The report recommended a uniform armament of at least six 90mm guns or four 100mm guns; however, an even larger calibre of 14cm[7] was the committee's preferred option, even if this meant a reduction in the number of guns to two. The Comité Technique also wanted a doubling of the number of torpedo tubes from four to eight: two triple 450mm mountings abaft the funnels would be complemented by two single torpedo tubes abeam the bridge which would be capable of launching torpedoes within 20 degrees of the ship's axis. The boilers were to be designed to make smoke; geared turbines were preferred to provide improved fuel economy, giving a range of 2600nm at 10 knots.

Studies were produced and an *avant-projet* submitted by the STCN on 29 January 1914 and approved by the NGS on 9 June. The new destroyer would have a displacement of 1530 tonnes – almost twice that of the previous *torpilleurs d'escadre* and 50% greater than the latest British ships. It was estimated that 25,000–30,000CV would be required to drive the ships at the required speed: 33 knots on trials for 30 knots service. (This was over-optimistic; judging from contemporary British practice c.38,000CV would probably have been needed for a

SCHNEIDER 14CM/25 PROPOSAL

Breech:	SA horizontal sliding
Length in calibres:	25
Weight of mounting:	6.65t
Weight of shell:	36kg
Weight of charge:	3.9kg
Type of ammunition:	fixed
Pressure at breech:	2400kg
Elevation:	-1°/+20°
Muzzle velocity:	550m/s
Recoil force:	23.56t
Range:	6000/6500m effective (but excessive dispersion beyond 5000m)
Firing cycle:	15 rounds per minute

Note: This would have been the first gun with a sliding breech in the Marine Nationale.

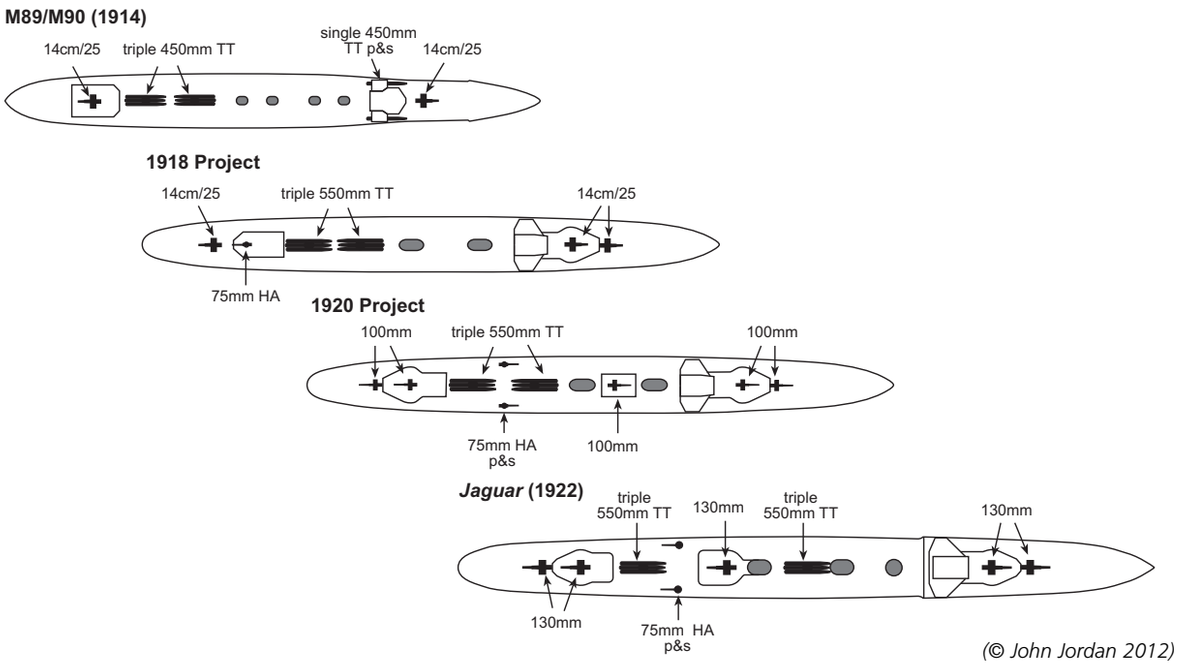
[7] The precise calibre was 138.6mm.

[8] The flotilla leaders of the *Lightfoot* class (1914-15 Estimates), which displaced 1440 tons, needed 36,000shp to achieve their designed 34.5 knots.

Below: *Enseigne Gabolde*, the last ship of the 800-tonne series, was completed as a technology demonstrator for Parsons geared turbines and the new 550mm torpedo, which was carried in two twin mountings. Unlike her half-sisters she had a uniform armament of 100mm guns: two forward of the bridge, one aft. She is seen here shortly after completion in 1921. *(Marius Bar)*

The Origins of the Contre-Torpilleur 1914-1922

	M89/M90 (1914)	1918 Project	1920 Project	*Jaguar* (1922)
Displacement:				
Normal	1530t	1650t	1780t	2400t
Full load	1700t		2063t	3000t
Dimensions	n/a	n/a	107m x 10.5m x 4.0m	127m x 11.1m x 4.1m
Machinery	four boilers two-shaft geared steam turbines 38,000CV	four boilers 2/3-shaft geared steam turbines 40,000CV	four 18kg/cm² boilers two-shaft geared steam turbines 38,000CV	five 18kg/cm² boilers two-shaft geared steam turbines 50,000CV
Speed	33kts trials	35kts trials 32kts full load	35.5kts trials 32kts full load	35.5kts trials
Endurance	n/a	3600nm at 15kts	3000nm at 17kts	3000nm at 20kts
Armament	two 14cm/25 (2xI) eight 450mm TT (2xIII, 2xI)	three 14cm/25 (3xI) six 550mm TT (2xIII) one 75mm HA	five 100mm/45 (5xI) six 550mm TT (2xII) two 75mm HA	five 130mm/40 (5xI) six 550mm TT (2xIII) two 75mm/50 HA
Complement	5 officers + 150 men	7 officers + 169 men	7 officers + 171 men	12 officers + 187 men



(© John Jordan 2012)

ship of this size.[8]) Armament would be that proposed by the Comité Technique, and the complement was fixed at 5 officers and 150 men. In the spring of 1914 a proposal was received from Schneider for a light-weight 14cm/25-calibre gun; the characteristics are in the accompanying table. A longer 45-calibre 14cm model derived from the 55-calibre secondary guns of the new dreadnoughts would arm the proposed scout cruisers (*Lamotte-Picquet* class).

Two ships, designated M89 and M90,[9] were pencilled in under the 1915 estimates; they were to be in service by 1917. In the interim the last unit of the 800-tonne series, the *Enseigne Gabolde*, would trial the geared turbines and the triple torpedo tubes intended for the new ships. However, in the spring of 1914 the Navy Minister refused to incorporate M89 and M90 into the 1915 programme, much to the surprise of the Navy, which had already ordered torpedoes for them in anticipation. Studies continued until August 1914, but the outbreak of war put an end to any hope of completing them and the project was revived only in the spring of 1917.

[9] The 300-tonne series had received the designations M0 to M54; the 450-tonne and 800-tonne destroyers M55 to M88.

THE ARGENTINE AND JAPANESE DESTROYERS

In 1910 Argentina had ordered twelve destroyers from Europe to accompany the two dreadnoughts *Rivadavia* and *Moreno* building in the United States. The Argentines wanted to sample the latest destroyer technology and therefore divided their order equally between Britain, Germany and France. The four French ships were designed and built by Ateliers et Chantiers de Bretagne, Nantes; they were launched in 1911. Construction times in the French shipyards were still notoriously slow, and the destroyers were still in the final stages of fitting out when they were requisitioned for the Marine Nationale on 9 August 1914.

Designed for operations in the South Atlantic, the Argentine destroyers were large, seaworthy ships which displaced close to 1000 tonnes on trials. They proved underpowered, and although some ships achieved their designed speed of 32 knots in early sea trials, 27 knots was a more realistic figure in service. The Argentine Navy had intended to arm them with 4-inch (102mm) guns and 18-inch (457mm) torpedoes, but in French naval service they received four 100mm guns – initially of an old and obsolete model – and four single 450mm torpedo tubes. They subsequently served with the Channel Fleet (*2e Escadre*

Légère), and *Intrépide* had the distinction of flying the flag of the British Rear-Admiral Horace Hood on one occasion.

The cessation of all new destroyer construction following mobilisation in August 1914 left the Navy seriously short of destroyers to counter the growing menace from German and Austro-Hungarian submarines, and in 1916 the French were compelled to consider having destroyers built in Japan, the other Allies being unwilling or unable to deliver sufficient hulls within the desired time-frame. Twelve 2nd Class Destroyers of the *Kaba* class were duly ordered in December 1916. Construction times were impressive by French standards, and all twelve ships were delivered to Port Said on 26 October of the following year. These comparatively small ships (displacement was 685 tonnes) were unremarkable, and their Japanese 4.7in (120mm) and 3in (76mm) guns created supply and maintenance problems for the Marine Nationale, but armed with depth charges they did the job they were required to do, serving as escorts for convoys and troop transports in the Eastern Mediterranean for the final 13 months of the war.

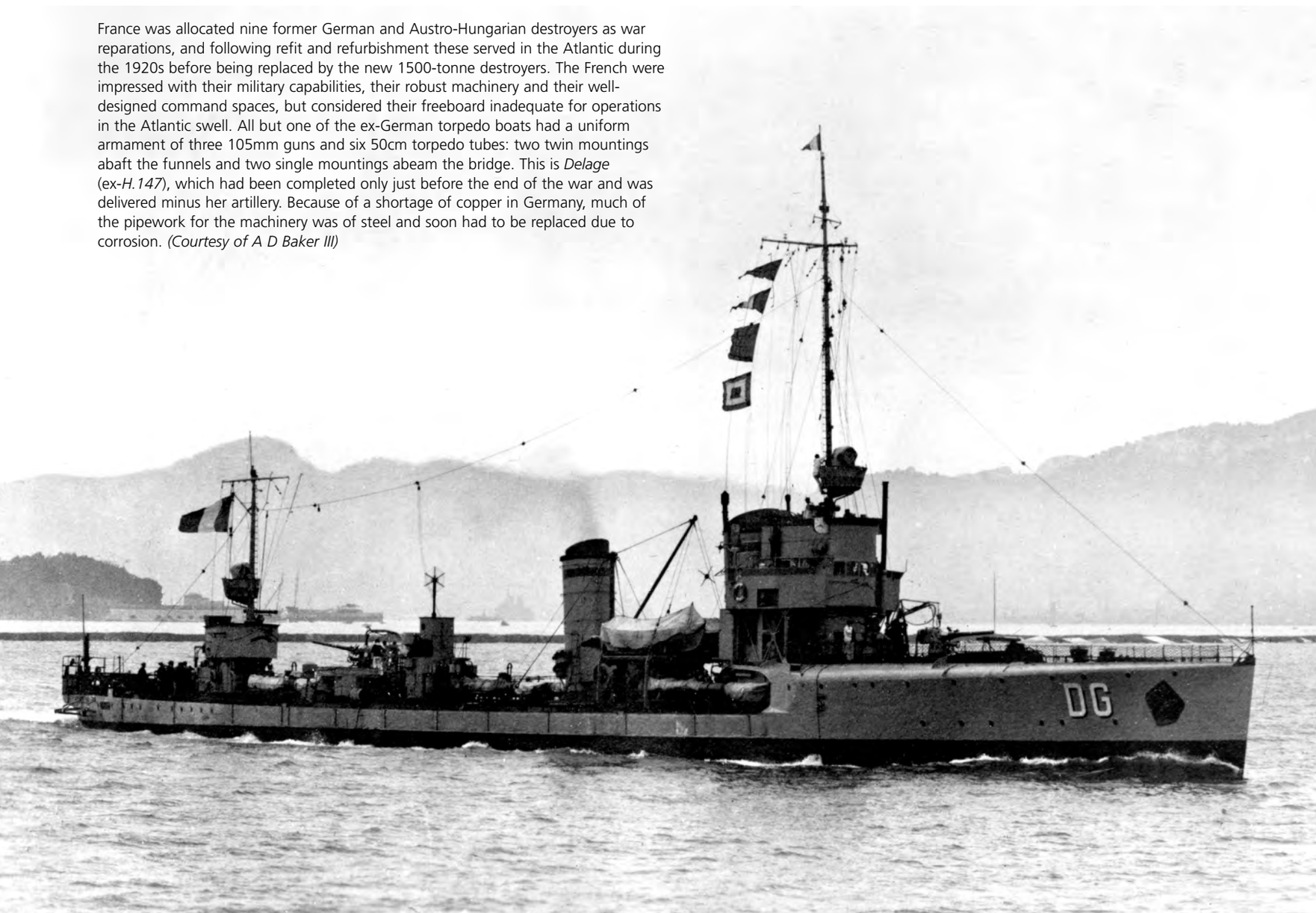
The ex-Argentine and Japanese-built destroyers had little influence on subsequent destroyer designs. However, the French were impressed by the sea-keeping qualities of the boats built for Argentina, and by the simple, robust machinery of the Japanese-built ships. The homogeneity of the latter was also seen as a significant advantage when compared with the diversity of the French 800-tonne type.

THE STUDIES RESUME

Studies of the new destroyers to be laid down once war had ended resumed in 1917. A note dated 20 April[10] reiterated the staff requirements for the 1914 design, but with a renewed emphasis on sea-keeping which reflected war experience. There were now to be three (vs. two) of the proposed Schneider lightweight 14cm guns and two 75mm HA guns. The triple – but not the single – torpedo tubes were to be retained, and these were now to launch a new heavyweight 550mm torpedo with much-increased explosive power and range. It was hoped that the adoption of single reduction geared turbines would deliver an increase in endurance from 2600nm at 10 knots to 3000nm at 16 knots. French familiarity with the Italian Navy during operations in the Adriatic suggested the 'light

[10] EMG Note 97.

France was allocated nine former German and Austro-Hungarian destroyers as war reparations, and following refit and refurbishment these served in the Atlantic during the 1920s before being replaced by the new 1500-tonne destroyers. The French were impressed with their military capabilities, their robust machinery and their well-designed command spaces, but considered their freeboard inadequate for operations in the Atlantic swell. All but one of the ex-German torpedo boats had a uniform armament of three 105mm guns and six 50cm torpedo tubes: two twin mountings abaft the funnels and two single mountings abeam the bridge. This is *Delage* (ex-*H.147*), which had been completed only just before the end of the war and was delivered minus her artillery. Because of a shortage of copper in Germany, much of the pipework for the machinery was of steel and soon had to be replaced due to corrosion. *(Courtesy of A D Baker III)*



scouts' (*esploratori leggeri*) of the *Aquila* class as a possible model.[11]

However, the Italian Navy was not the only one to influence French thinking during this period. A later note dated 24 September 1917 proposed the construction of two distinct types of destroyer following British practice: a *torpilleur d'escadre* of 1530 tonnes, and a larger *conducteur d'escadrille* ('flotilla leader'). The *torpilleur d'escadre* was to have a designed speed of 33 knots and an armament of three 14cm guns and six 550mm torpedoes in two triple mountings; the flotilla leader a speed of 35 knots and an additional 14cm gun. An EMG report dated 22 December of the same year broadly endorsed this proposal, but required the standard destroyer to make 35 knots on trials. Endurance was to be 3000nm at 14 knots for the destroyer and 3500nm for the leader. Both types were to have a tight turning circle and a reinforced bow for anti-submarine operations.

During the last months of the war the NGS was contemplating a force of 100 *torpilleurs* similar to the British 'V' class (1300 tons, 35 knots), following favourable reports by Captain Vandier, French liaison officer with the Grand Fleet. The Chief of the Naval Staff also wrote to each of the naval attachés in Rome, London and Washington asking them to supply details of the latest destroyer construction.

Work on plans for the new ships resumed in earnest after the Armistice of 11 November 1918. On the 28th of that same month the Constructors Department (STCN) wrote to the NGS asking for confirmation of staff requirements, which they understood to be: 1650 tonnes, four boilers in two boiler rooms, turbines on two/three shafts for 40,000CV, a maximum speed of 35 knots and a cruise speed of 17 knots. In its reply the NGS insisted on: three guns of about 14cm calibre with 30-degree elevation, firing a 30kg shell to a range of 15,000m; a single 75mm HA gun; a speed of 32 knots at deep load, and flexible machinery with an endurance of 3600nm at 15 knots or 2800nm at 17/18 knots. It also wanted a flared bow with sheer, and a spacious, 'comfortable' bridge. Complement was to be 7 officers, 19 POs and 150 men.

This was a bigger ship than the 1914 project, with an extra gun, fewer but more powerful torpedoes, and greater endurance. There was a renewed emphasis on seaworthiness, but arguably the greatest difference in requirements was for a gun engagement range out to 15,000m, which reflected both the longer distances from which the latest torpedoes could be launched and war experience. In being less than specific about the calibre of the main guns the NGS was recognising a problem with its previous assumptions. The light-weight 14cm/25-cal. gun proposed by Schneider had too short a barrel to deliver accurate fire beyond 5000m. In specifying a minimum 30kg shell the NGS was opening the door to a slightly smaller-calibre gun.[12]

In a note dated 25 February 1919 Admiral de Bon, Chief of the Naval General Staff, pointed out to the Minister that the Italian Navy had completed or laid down no fewer than twelve flotilla leaders and 40 torpedo boats during 1914–18, and that the corresponding figure for the Marine Nationale was three. He proposed that the new priority for construction be as follows: 'destroyers' (British terminology was adopted to denote the entire category of flotilla craft), followed by light cruisers, and finally capital ships. These suggestions were accepted by the new Navy Minister, Georges Leygues, on 4 March.

The Naval General Staff followed up this submission by a more detailed '*Note sur les destroyers*', which was approved on 12 March 1919. This was the most significant submission yet by the NGS, as it attempted to define the missions and capabilities of the larger ships now contemplated.

The double role of the *torpilleur d'escadre* had been clearly set out in a study dating from 1914: its primary mission was to attack the enemy battle line with torpedoes; its secondary role was to disrupt by torpedo and gunfire the attacks of enemy flotilla craft against the French line.

The larger vessel described in the note of March 1919, however, and which would subsequently become the *contre-torpilleur*, had a triple role, with a markedly different set of priorities. Its primary mission was scouting, followed by the protection of its own battle line against enemy flotilla craft. Torpedo attacks against the enemy line of battle were relegated to third place, and were circumscribed by constraints on approaching the enemy ships too closely.

The qualities required for the first two roles were stated to be: high speed, endurance, a large radius of action and a powerful armament. When scouting for the battle line these ships would be expected to hold a contact and to be capable of engaging not only destroyers but small cruisers. This implied a speed and armament superior to current flotilla craft, light protection, and a displacement of at least 2000 tonnes.

The Naval Staff considered that torpedo attacks on the enemy battle line with torpedoes would no longer be launched at the close ranges accepted before and during the war. Torpedo technology had progressed to the point at which attacks could be launched at 12,000–15,000 metres. While accepting that the percentage of hits obtained at such distances would be small, the solution was seen to lie in combining multiple torpedo firings with superior fire control.

The French considered torpedo reloads impractical under action conditions, even at these longer ranges. In the European theatre ships would normally return to their home port after each engagement, and it was important to maximise the number of torpedoes immediately available in the tubes; the Pacific powers, faced with longer campaigns over vast expanses of ocean, would fit their destroyers for at least two torpedo engagements.

Close combat was envisaged by the report as being

[11] As completed in February 1917 the *Aquila* displaced 1600 tonnes, had a designed speed of 34 knots, and was armed with three 150mm guns, four 76mm guns and four 450mm torpedo tubes. The armament was later amended to four 120mm guns and two 76mm HA guns.

[12] The Schneider 14cm gun fired a 36kg shell; the weight of the shell fired by the 130mm gun on which development work would soon begin, and which would eventually be adopted both for the *torpilleurs d'escadre* and for the early *contre-torpilleurs*, was 32kg. Note that the shell fired by the contemporary British 4.7in (120mm) gun would have been considered too light; it weighed less than 23kg.

most likely at night, when hostile forces might stumble into one another. In these conditions ramming might still be possible; ramming was also considered important for the effective prosecution of submarine contacts, so the bow would need to be reinforced. Both the scouting role and night combat would require propulsion machinery which was flexible and responsive.

In the context of the above considerations the following detailed recommendations were made:

A – Hull
To be designed for strength and speed; reinforced bow; a 'clean' hull, with anchors in hawsepipes; bridge to be protected from wind, sea and spray to ensure comfortable command spaces in all weathers; greater draught to ensure good sea-keeping (earlier French flotilla craft had been designed with shallow draught in order to minimise the threat from mines and torpedoes).

B - Armament
Guns: Need for compromise between weight of shell and rate of fire; largest practical calibre 138.6mm (need stressed for high level of reliability of loading mechanisms and fire control to achieve acceptable rate of fire); four semi-automatic 138.6mm proposed, disposed as superimposed single mountings fore and aft; all guns to have shields to protect their crews from splinters and spray; each gun to be provided with 150 rounds, including some ready-use rounds stowed close to the gun (an innovation attributed to British practice); anti-aircraft protection to be provided by one of the 138.6mm guns on an HA mounting plus four machine guns; fire control to be provided by a director[13] incorporating a rangefinder.

Torpedoes: Two triple mountings for 550mm long-range torpedoes on the centre-line with good arcs, especially forward; torpedo sights to be located on bridge.

Depth charges: Although not primarily anti-submarine vessels, might need to use depth charges in the event of a hostile submarine being present, or against enemy flotilla craft in the event of a failed ramming or close encounter(!); eight 100kg DC to be carried for this purpose; study proposed for laying mines in the path of the enemy battle line, ten mines being carried by each destroyer; depth-charging and minelaying also to be controlled from bridge.

Illuminating shell: Searchlight projectors to be replaced in their traditional role of illuminating enemy ships at night by starshell in order not to provide a point of aim for an opponent; one 60cm projector to be fitted for long-range signalling, plus a 30cm projector for signalling in formation (the stress laid on power and reliability of the electrical circuits suggest that these were particular failings of earlier French models).

C – Speed
To be capable of 40 knots at full load displacement for six hours in order to ensure a comfortable 35 knots in normal service; boilers and auxiliaries to be robust and reliable (rough weather speed trial proposed).

[13] The British term 'fire-director' is used in the Note.

D – Radius of Action
Must be able to accompany the battle line in all weathers.

E – Wireless Telegraphy
Main W/T office to be close to the bridge with direct communication.

F – Aeronautics
Winch for balloons.

G – Making Smoke
By direct injection of fuel oil into funnels.

H – Protection
Sides of boiler and machinery rooms to be protected by 5cm gratings with a height of three metres (one metre above, two below waterline), with transverse end bulkheads of same composition; protective deck of 4cm plated gratings over the same area; protective mattressing around the bridge, torpedo tubes and guns to absorb splinters; paravanes against mines; comprehensive damage control arrangements employing hand-operated steam pumps, and powerful ventilators to disperse gases.

I – Compartmentation
Ship to be divided into three sections for damage control purposes, of which central section to comprise boiler and machinery rooms; ship to be able to steam with either of outer compartments flooded.

J - Pumps
Each of the three sections to have two powerful independent pumps per compartment.

The above proposals are reproduced in detail because of the insight they give us into French technical and tactical thinking of the period. Some of that thinking is retrospective and analytical, reflecting on lessons based on hard wartime experience (cf the observations on hull-form, the reliability of machinery, and on damage control). However, the document also shows an acute awareness of the tactical possibilities opened up by new technology (lightweight large-calibre guns, long-range torpedoes, starshell). Of particular note is the emphasis on superior battle control from a capacious, comfortable bridge, with centralised director fire control and long-range torpedo sights.

Such was the philosophy which was to underpin not only the *contre-torpilleur*, but also the new *torpilleur d'escadre*, the design of which would also incorporate many of the above features.

TOWARDS A NEW *STATUT NAVAL*

Given the disruption to French industrial infrastructure resulting from the war there was still little chance of laying down a new ship for at least two/three years. Serious consideration was given to an offer by the British Thornycroft company to complete two of the cancelled destroyers of the 'W' type for the French government, but in June 1919 the proposal had to be rejected due to a dramatic fall of the franc against the pound sterling.

Work on the new generation of French flotilla craft continued, however. On 1 April 1920 the *Conseil*

THE SHIPS WHICH INFLUENCED THE FRENCH *CONTRE-TORPILLEUR*

	***Leone* (It)**	***Scott* (GB)**	***S.113* (Ger)**
Built:	3 ships 1921–24	1917–19	1917–18
Displacement:	2000t	1625t	2060t
Dimensions:	109.5m x 10.4m	97.5m x 9.7m	105.5m x 10.2m
Machinery:	2-shaft geared turbines; 42,000shp = 34kts	2-shaft geared turbines; 40.000shp = 36kts	2-shaft steam turbines; 45,000shp = 36kts
Armament:	8 – 120mm/45 (4 x II) 2 – 76mm/40 (2 x I) HA 6 – 450mm TT (2 x III) (70 mines)	5 – 120mm/45 (5 x I) 1 – 76mm/45 HA 6 – 533mm TT (2 x III) (40 mines)	4 – 150mm/45 (4 x I) 4 – 600mm TT (2 x II)

Notes:
Length is waterline (*S.113*) or between perpendiculars (others).
For comparability, data for *Scott* are metric equivalents.

Above: The Italian *Tigre*, one of a series of large, fast and powerful *esploratori leggeri* ordered in 1917 and completed postwar. With a displacement of 2000 tonnes (normal), a speed of 34 knots and a main armament of eight 120mm guns in twin mountings, these ships had a major influence on the design of the French postwar *contre-torpilleurs* of the *Jaguar* class. *(Leo van Ginderen collection)*

Supérieur de la Marine formally proposed a *torpilleur d'escadre* with the following characteristics:

Displacement: 1350 tonnes
Armament: 4 – 100mm (4 x I), 2 – 75mm HA (2 x I), 4/6 – 550mm TT (2/3 x II)
Speed: 33 knots
Endurance: 3000nm at 15 knots

The proposal was approved by the Minister on 28 April. On that same day he agreed to include two new destroyers of the larger type, variously referred to as a *torpilleur-éclaireur* (lit. 'torpedo scout') or *contre-torpilleur*, in the next naval estimates; they were to bear the names *Lion* and *Guépard.* The characteristics of these ships were as follows:

Displacement: 1780 tonnes
Armament: 5 – 100mm (5 x I), 2 – 75mm HA (2 x I), 6 – 550mm TT (2 x III)
Speed: 35.5 knots
Endurance: 2800–3000nm at 17 knots

The key differences between this type and the proposed *torpilleur d'escadre* were higher displacement, an additional 100mm gun (to be located between the funnels), higher speed and greater endurance.

The *Comité Technique* was unhappy because the 100mm gun failed to meet the Navy's requirements. Not only was shell weight (16kg) only half that recommended by the NGS, but the 100mm was outclassed by both the British 4.7-inch and the Italian 120mm guns now being fitted in their destroyers. In order to avoid any delay in ordering these vessels, the *Comité Technique* was prepared to accept that the first two ships, which would effectively be the prototypes, would be armed with the lightweight 100mm weapon, but envisaged that their successors would be armed with four 138.6mm guns.[14] In the event the French Parliament, equally unconvinced by the design in its current form, refused to sanction the Minister's request.

The need for a larger-calibre gun would be underlined by the resumption of building on the Italian *esploratori leggeri* of the *Leone* class,[15] which displaced 2000 tonnes and were armed with four twin 120mm guns, and by French acquisition of the ex-German 'super-destroyer' *S.113*, displacing 2060 tonnes and with an armament of four 15cm guns.[16] A further meeting of the *Comité Technique* on 3 July 1920 determined that 100mm was too light a calibre and the 138.6mm gun too heavy for a destroyer, and that the 130mm currently under development represented an effective compromise. The committee, no doubt influenced by the Italian *Leone* design, proposed that a twin mounting be developed alongside the current single mounting to give maximum flexibility in the armament of the new ships.

By September 1920 requirements for a war against Italy were calculated as nineteen ships of the *contre-torpilleur* type: six for blockade and thirteen for the fleet; all were to be at least as powerful as their Italian counterparts. A total of 146 *torpilleurs* would also be required in the event of a war against Italy and Germany.[17]

New proposals considered on 14 January 1921 by the Naval General Staff showed a major jump in displacement for the *contre-torpilleur*, from 1780 tonnes to 2310–2400 tonnes. Steam was to be provided by no fewer than five boilers, and the turbine machinery would deliver 50,000CV for a top speed of 35.5–36 knots. Endurance was to be at least 3000nm at 15 knots. Six alternative armament layouts were presented:

[14] From about 1920 the Marine Nationale used millimetres rather than centimetres; the 14cm gun of the Great War period became the 138.6mm gun.

[15] Five ships had been ordered from Ansaldo, Genoa, on 18 January 1917, but a shortage of steel and other materials meant they could not be laid down during the First World War. Three were reordered on 30 October 1920. The first class of French *contre-torpilleurs* would be christened with the same 'big cat' names.

[16] *S.113* was ceded to France on 5 May 1921, and entered service with the Marine Nationale as the *Amiral Sénès* in May 1922. Her main guns had a horizontal sliding breech which made a considerable impression because of its speed and simplicity of operation; it was subsequently adopted for the models of 138.6mm gun which armed the later French *contre-torpilleurs.*

[17] It was envisaged that the *contre-torpilleurs* would operate only in the Mediterranean, where they would be opposed by the Italian *esploratori leggeri.*

A: four 138.6mm guns in single mountings.
B: eight 130mm in twin mountings.
C: five 130mm in five single mountings (two forward, two aft, one amidships).
D: six 130mm in single mountings (three forward, three aft).
E: six 138.6mm in two twin and two single mountings (two forward, two aft, with the twin mountings superimposed).
F: six 138.6mm in four single and one twin mountings (superimposed singles fore and aft with the twin mounting amidships).

Design 'A' was rejected because of the height of the 138.6mm mountings, and 'D' because of the triangular arrangement of the guns fore and aft – a feature of the prewar French destroyers. The Naval General Staff was inclined towards 'F', despite the mix of twin and single mountings, with design 'C' – which could be realised immediately – as the 'safe' option. Provided the twin 130mm mounting was successful, 'B' could then form the basis of the design for ships laid down after 1921.

A Note of 20 January 1921 (137 EMG 1) proposed a powerful anti-submarine outfit for these ships, comprising:

– stern rails for launching 200kg depth charges or mines
– depth charge throwers mounted on either side of the ship
– ultrasonic submarine detection apparatus
– an SC listening tube[18]
– provision for Walser listening apparatus and an associated cabin

The definitive project was outlined in Note 1062 EMG 1 of 25 May 1921. The new *contre-torpilleur* would displace 2360 tonnes and would be armed with six 130mm guns: a single mounting with a twin superimposed forward, a single amidships, and two superimposed singles aft. The new *torpilleur d'escadre* would have a normal displacement of 1455 tonnes, and would have only four single 130mm guns, superimposed fore and aft.

[18] The SC listening tube was conceived by US, British and French scientists in 1917. The tube contained two air-filled rubber balls, each connected to the listener's ears via a stethoscope. The listener turned the SC tube until the sound was the same in both ears, which gave the direction of the contact – although it was impossible to tell whether it was to port or starboard, ahead or astern. Range could be estimated by the intensity of the sound. The original device was considered primitive, and was usable only at short ranges and at low speeds. For the Walser listening apparatus see Chapter 1.

Below: Another important influence on the French *contre-torpilleur* was the German 'super-destroyer' *S.113*, which served with the Marine Nationale from 1922 until 1936 as the *Amiral Sénès*; she was employed for much of that time as the leader of the Atlantic flotillas. Displacing 2060 tonnes (normal), she was designed for a speed of 36 knots, which she achieved on trials. The French were particularly impressed with the lightweight (8.5-tonne), fast-firing 15cm gun, of which she mounted four. The German 15cm L/45 C/16 gun featured a sliding breech, and would influence the design of the later models of 138.6mm fitted in the French *contre-torpilleurs*. The Germans destroyed all examples of their new 60cm torpedo before the ship was handed over, and the tubes were modified to fire the standard German 50cm type. *(Courtesy of Marc Saibène)*

CHAPTER 1

THE *JAGUAR* CLASS

INTRODUCTION

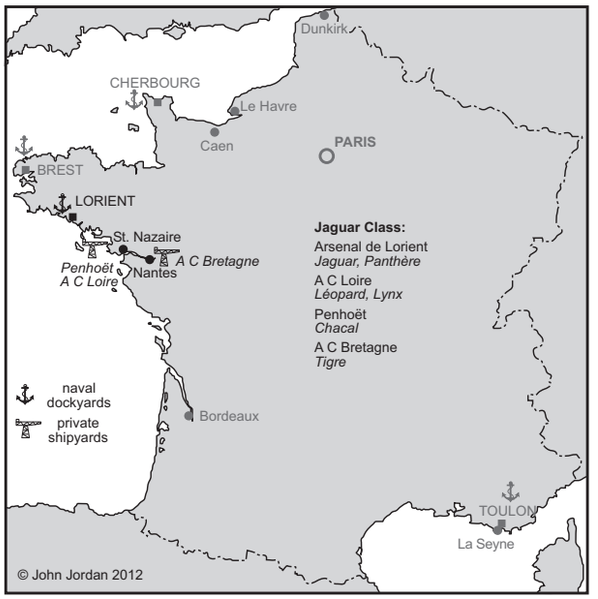
The tortuous route to the *contre-torpilleur* of the 1922 Programme has been outlined in the previous chapter. In April 1921 an *avant-projet* was adopted by the Technical Committee (*Comité Technique*). Characteristics agreed on 12 May were as follows:

Displacement: 2360 tonnes (normal)
Horsepower: 50,000CV for 35.5 knots (normal displacement)
Endurance: 700nm at 35 knots (main turbines); 3000/3500nm at 15 knots (cruise turbines)

Note that the horsepower required for 35.5 knots was calculated to be 31% greater than in the 1920 design (38,000CV), and displacement had risen accordingly by 33%.

The draft plans were drawn up by the STCN under the supervision of *Ingénieur principal* Garetta. Six units were to be ordered and, in a break from previous practice, these were to be identical. In particular, commonality of machinery and shaft layout would ensure that they could operate together in a six-ship *escadrille* without allowances having to be made for optimum cruise and flank speeds, as had been the case with the destroyers of the 800-tonne type.

The Washington Naval Arms Limitation Conference intervened in November of that year, effectively putting plans on hold. Faced with Anglo-Saxon insistence that France should be limited to 175,000 tons of capital ships – a third of the total tonnage allocated to Britain and the United States – a meeting of the National Defence Council (*Conseil de la Défense Nationale*) on 28 December proposed that France should opt for a purely defensive fleet, and it was suggested that for the not-unreasonable sum of 500m francs per year, 330,000 tons of light surface ships and 90,000 tons of submarines could be built over a period of ten years. The Washington Treaty was duly signed on 6 February 1922, and little more than a month later (28 March) a new naval programme was adopted, authorising the construction of three cruisers (*Duguay-Trouin* class), six *contre-torpilleurs* (*Jaguar* class), twelve *torpilleurs d'escadre* (*Bourrasque* class – see Chapter 2) and nine sea-going submarines (*Requin* class)[1] over two financial years.



A sum of 156 million French francs was allocated to build the six *contre-torpilleurs*. The Navy Minister decreed that two would be constructed in the French Naval Dockyards; the remaining four hulls would, in conformity with the wishes expressed by the lower house of parliament, the *Chambre des Députés*, be ordered from private shipyards. This arrangement would ensure quality control on the one hand – by effectively making the *arsenaux* the lead yards responsible for coordinating the project – and on the other a broadening of the industrial base, thereby

[1] In addition, twelve small 600-tonne submarines would be authorised under the Coast Defence budget.

BUILDING DATA

Name	*Jaguar*	*Panthère*	*Léopard*	*Lynx*	*Chacal*	*Tigre*
Programme	1922	1922	1922	1922	1922	1922
Prog. no.	4	5	6	7	8	9
Project no.	–	–	–	–	–	–
Builder	Lorient	Lorient	ACL St-Naz.	ACL St-Naz.	Penhoët St-Naz.	ACB Nantes
Ordered	18 Apr 1922	18 Apr 1922	26 Feb 1923	26 Feb 1923	26 Feb 1923	26 Feb 1923
Laid down	24 Aug 1922	23 Dec 1923	14 Aug 1923	14 Jan 1924	18 Sep 1923	18 Sep 1923
Launched	17 Nov 1923	27 Oct 1924	29 Sep 1924	25 Feb 1925	27 Sep 1924	2 Aug 1924
Manned for trials	1 Jun 1925	12 Apr 1926	20 Sep 1925	4 Aug 1926	10 Nov 1925	10 Jun 1925
Acceptance trials	14 Sep 1925	9 Sep 1926	14 Dec 1926	7 Feb 1927	26 Feb 1926	15 Sep 1925
Commissioned	25 Jun 1926	1 Nov 1926	15 June 1927	1 Jun 1927	1 May 1926	5 Dec 1925
Completed	7 Oct 1926	4 Jan 1927	13 Oct 1927	18 Oct 1927	28 Jul 1926	1 Feb 1926
Entered service	19 Nov 1926	4 Feb 1927	15 Nov 1927	15 Nov 1927	23 Dec 1926	7 Feb 1926

DESTROYER BUILDING DURING THE INTERWAR PERIOD

BETWEEN THE WARS FRANCE HAD NUMEROUS NAVAL CONSTRUCTION facilities. There were state-run naval dockyards at Cherbourg, Brest and Lorient on the Atlantic coast, and Toulon in the Mediterranean; the naval dockyard at Rochefort, which had built destroyers before and during the Great War, was closed in 1928. There were also numerous privately-owned shipyards capable of building naval vessels. These were subject to several reorganisations involving buy-outs, mergers and closures during the period in question; the reorganisations were often due to social changes and had a major impact on the local community.

The list of yards involved in the construction of *contre-torpilleurs* and *torpilleurs* between 1922 and 1940 follows. The abbreviation in square brackets is the one used in the Building Data tables:

- Arsenal de Lorient [Lorient]
- Anciens Chantiers Dubigeon, Nantes [Dubigeon Nantes]
- Ateliers & Chantiers de la Seine-Maritime Worms & Cie, Le Trait (between Le Havre and Rouen) [Worms Le Trait]
- Ateliers et Chantiers de Bretagne, Nantes [ACB Nantes]
- Ateliers et Chantiers de France, Dunkirk [ACF Dunkerque]
- Ateliers et Chantiers de la Loire, Nantes [ACL Nantes]
- Ateliers et Chantiers de la Loire, Saint-Nazaire [ACL St-Nazaire]
- Ateliers et Chantiers de Saint-Nazaire Penhoët, Grand Quevilly (near Rouen) [Penhoët, G Qu.]
- Ateliers et Chantiers de Saint-Nazaire Penhoët, Saint-Nazaire (Penhoët is a district of Saint-Nazaire) [Penhoet, St-Naz]
- Chantiers Navals Français, Blainville (near Caen) [CNF Caen]
- Dyle et Baccalan, Bordeaux (renamed *Ateliers et Chantiers Maritimes du Sud-Ouest et de Bacalan Réunis* in 1928) [D&B Bordeaux]
- Forges et Chantiers de la Gironde, Bordeaux [FC Gir Bordeaux]
- Forges et Chantiers de la Gironde, Harfleur [FC Gir Harfleur]
- Forges et Chantiers de la Méditerranée, Graville (a district of Le Havre from 1919) [FCM Graville]
- Forges et Chantiers de la Méditerranée, La Seyne [FCM La Seyne].

Key Dates in the Construction Process

The different stages in the construction of warships were defined by decrees published in the *Bulletin Officiel* (BO). The baseline publication was that of 17 June 1925, subsequently modified 19 Aug 1929, 10 July 1933 and 13 March 1937. An explanation follows:

- *Mise en chantier* [Ordered]: for the dockyards the date of the official instruction to lay the keel; for private yards the official notification of the order.
- *Mise sur cale* [Laid down]: first steel laid on the slipway (or in the construction dock).
- *Lancement* [Launched]: date of launch (or floating out); followed by fitting out (*achèvement à flot*).
- *Armement pour essais* [Manned for trials]: command of the ship at this point passes from the builder to the Navy and its nominated CO; the ship is partially manned for her initial trials.
- *Présentation en recette* [Acceptance trials]: the official acceptance trials; the turbines and gearing, together with other items of auxiliary machinery are partially dismantled towards the end of this stage and all components inspected (*les démontages*).
- *Armement définitif* [Commissioned]: from this date the vessel is fully provisioned and receives her full complement; this is effected during the period of inspection of the machinery and before reassembly prior to the final machinery trials (*les essais de bon fonctionnement*), conducted to ensure that all machinery is in fully working order. [After 13 March 1937 this would become the completion date – *date d'achèvement* – in order to conform to the provisions of the London Treaty of 25 March 1936.]
- *Clôture de l'armement* [Completed]: follows successful completion of the *essais de bon fonctionnement*; it is generally marked by an inspection visit from the Trials Commission, the *Commission supérieure d'armement.* [Before 10 July 1933 this was also the official completion date – see above.] The *Clôture de l'armement* was followed by an endurance cruise, which had to be for a minimum of four days for large surface warships and 24 hours for smaller vessels, called the *traversée de longue durée* (TLD).
- *Admission au service actif* [Entered service]: the subject of an official pronouncement by the Navy Minister, this date often coincides with the attachment of the ship to a specific squadron/division/flotilla. [Before 10 July 1933 the date of 'entry into service' was that of the *Clôture de l'armement*; between 10 July 1933 and 13 March 1937 it was the date of *Armement définitif*; from 13 March 1937 it became a date in its own right.]

laying the foundations for the major programme of construction anticipated.

In July the ships were given the names of predators: *Jaguar*, *Panthère*, *Léopard*, *Lynx*, *Chacal* and *Tigre*.[2] The names previously proposed for the two 1920 ships, *Lion* and *Guépard*, would be revived for the second series of *contre-torpilleurs* (see Chapter 4). At the same time the first two units, allocated the programme numbers 4 and 5[3] were ordered from Lorient Naval Dockyard. The other four ships were put out to tender, and following a lengthy tendering procedure contracts were awarded on 7 March 1923 to three experienced private shipbuilders. Ateliers et Chantiers de la Loire of Saint-Nazaire received the orders for *Léopard* (6) and *Lynx* (7), Ateliers et Chantiers de Bretagne of Nantes for *Tigre* (8), and Penhoët-Saint Nazaire for *Chacal* (9). All three of the private shipyards were geographically close to Lorient, on the west coast of Brittany (see map), and the four privately-built ships were to be delivered on completion to the naval dockyard, which was to be the *port d'armement* for all six units of the class.[4]

The name-ship, *Jaguar*, was laid down on the Lorient no.7 slipway (see map) on 22 August 1922, a full year before the second ship of the class. *Léopard* (A C Loire) was laid down on 14 August 1923, closely followed by *Chacal* (Penhoët) and *Tigre* (A C Bretagne) on 18 September. *Panthère*, the second ship assigned to Lorient, would be laid down on 23 December 1923 on the slipway vacated by *Jaguar* at her launch, and *Lynx* (A C Loire) would be laid down on 1 January 1924 on a different slipway to her sister *Léopard*, which would be launched only on 29 September of the same year. From laying down to launch took an average of 12–13 months per ship; however, fitting out and completion took a further 2–3 years, due largely to the novelty of the design, the late delivery of equipment from sub-contractors and, in particular, teething troubles with the new propulsion machinery, which considerably delayed the entry into service of the lead ship, *Jaguar*.

Despite the desire for conformity, there would be numerous detail design differences between the ships

[2] The influence of the Italian *Leone* class is readily apparent in the choice of names; the four sisters of *Leone* were to have been named *Tigre, Pantera, Leopardo* and *Lince* (the last two were cancelled).

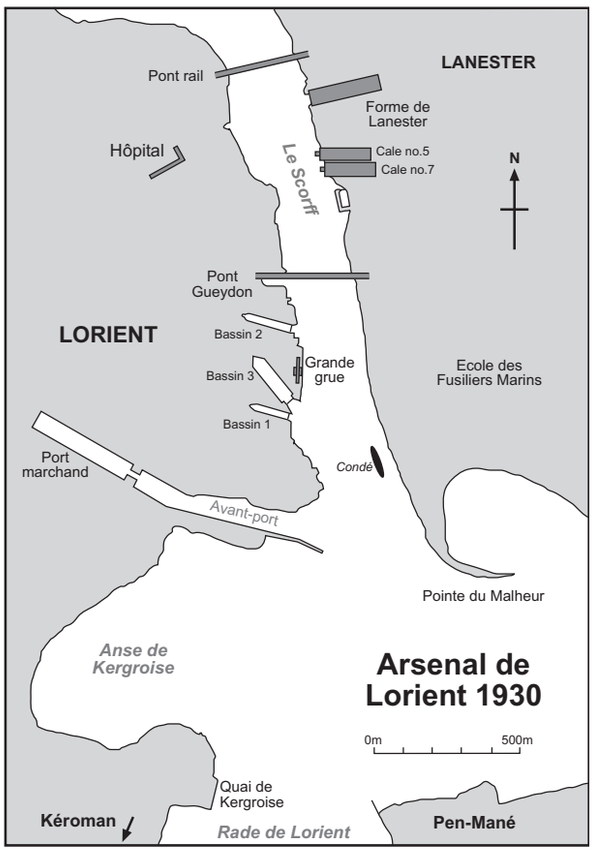
[3] The cruisers *Duguay-Trouin*, *Lamotte-Picquet* and *Primauguet* were nos.1, 2 and 3 respectively.

[4] The *port d'armement* was responsible for all except the initial machinery trials, and provided the ships with their full statutory complement.

GENERAL CHARACTERISTICS

Displacement:	2126 tons standard; 2380 tonnes normal; 2980–3075 tonnes full load
Dimensions:	Length 119.7m pp, 126.8m oa; beam 11.1m; draught 4.1m
Machinery:	Five Du Temple small-tube boilers, 18kg/cm^2 (216°) Two-shaft geared steam turbines 50,000CV for 35.5kts (designed)
Oil fuel:	530 tonnes; radius 3000nm at 15kts, 700nm at 35kts
Armament:	Five 130mm/40 Mle 1919 in single mountings (132rpg) Two 75mm/50 Mle 1924 HA in single mountings (150rpg + 120 starshell) Two 8mm Hotchkiss MG Mle 1914 in two single mountings Six 550mm torpedoes Mle 1919D in two triple mountings Two DC chutes each for six 200kg depth charges (+ 4 reloads) Four Thornycroft depth charge throwers Mle 1918
Complement:	10 officers + 187 men peacetime 12 officers + 209 men wartime

built in the various yards. The Marine Nationale divided the six ships into three pairs for reference purposes: *Jaguar* and *Panthère* (Lorient NDyd) were referred to as *Arsenaux*, *Chacal* and *Tigre* as *Industrie A*, and *Léopard* and *Lynx* (A C Loire) as *Industrie B*. These differences are readily apparent in the official plans. Variations in the layout of the accommodation spaces are evidenced by the number and spacing of scuttles fore and aft, and the configuration of the bridge structure, the centre deckhouse and the gun deck for no.3 mounting was quite different in the *Industrie* ships. These detail differences extended to much of the equipment and fittings, which were generally sub-contracted by the shipyard.

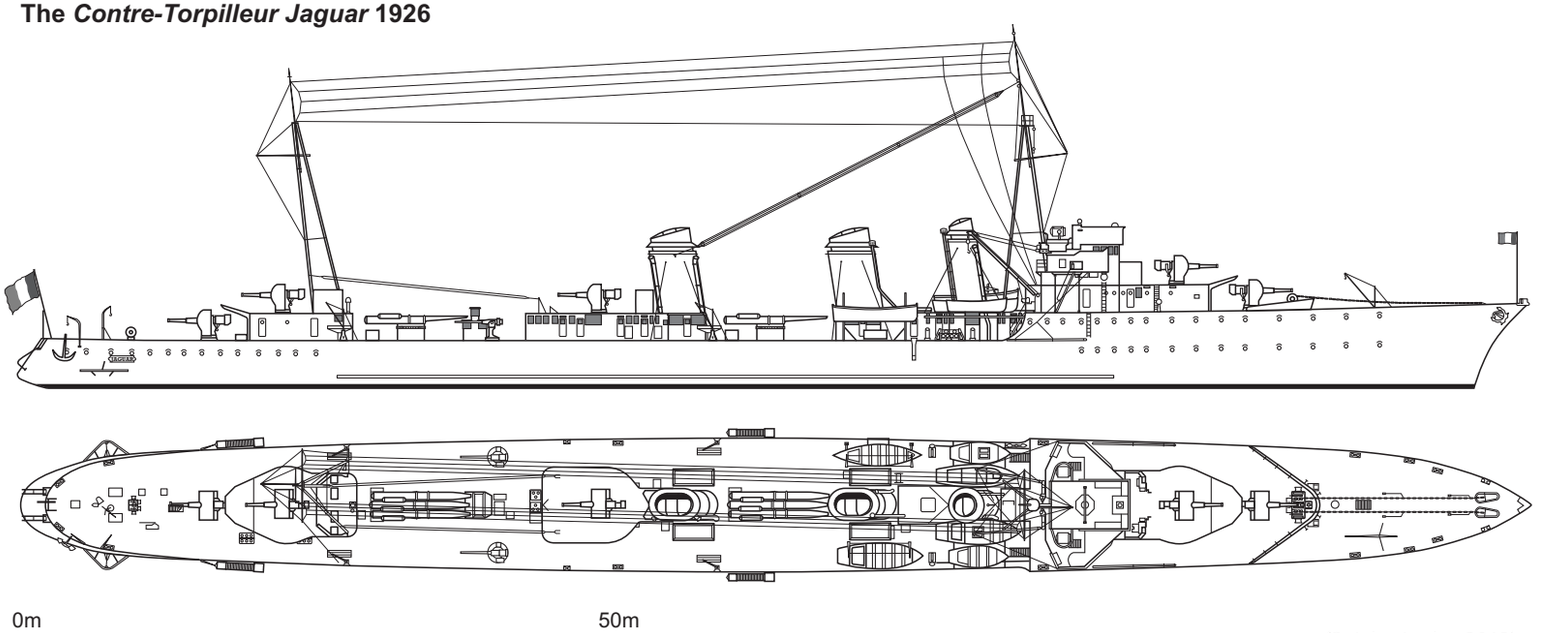


(© John Jordan 2011)

HULL AND GENERAL CONFIGURATION

Longitudinal framing was adopted for all the new flotilla craft – it had previously been employed only for larger vessels. The transverse frames, 58 in number, had a spacing of 2.1 metres, reducing to 1.4 metres at the ends of the ship, and were numbered from the aft to the forward perpendicular. Eleven main transverse bulkheads (*cloisons principales*) extended from the ship's bottom to the upper deck and divided the hull into twelve watertight compartments designated A–L (see drawing), penetrated only by cables and pipework.

The *Contre-Torpilleur Jaguar* 1926



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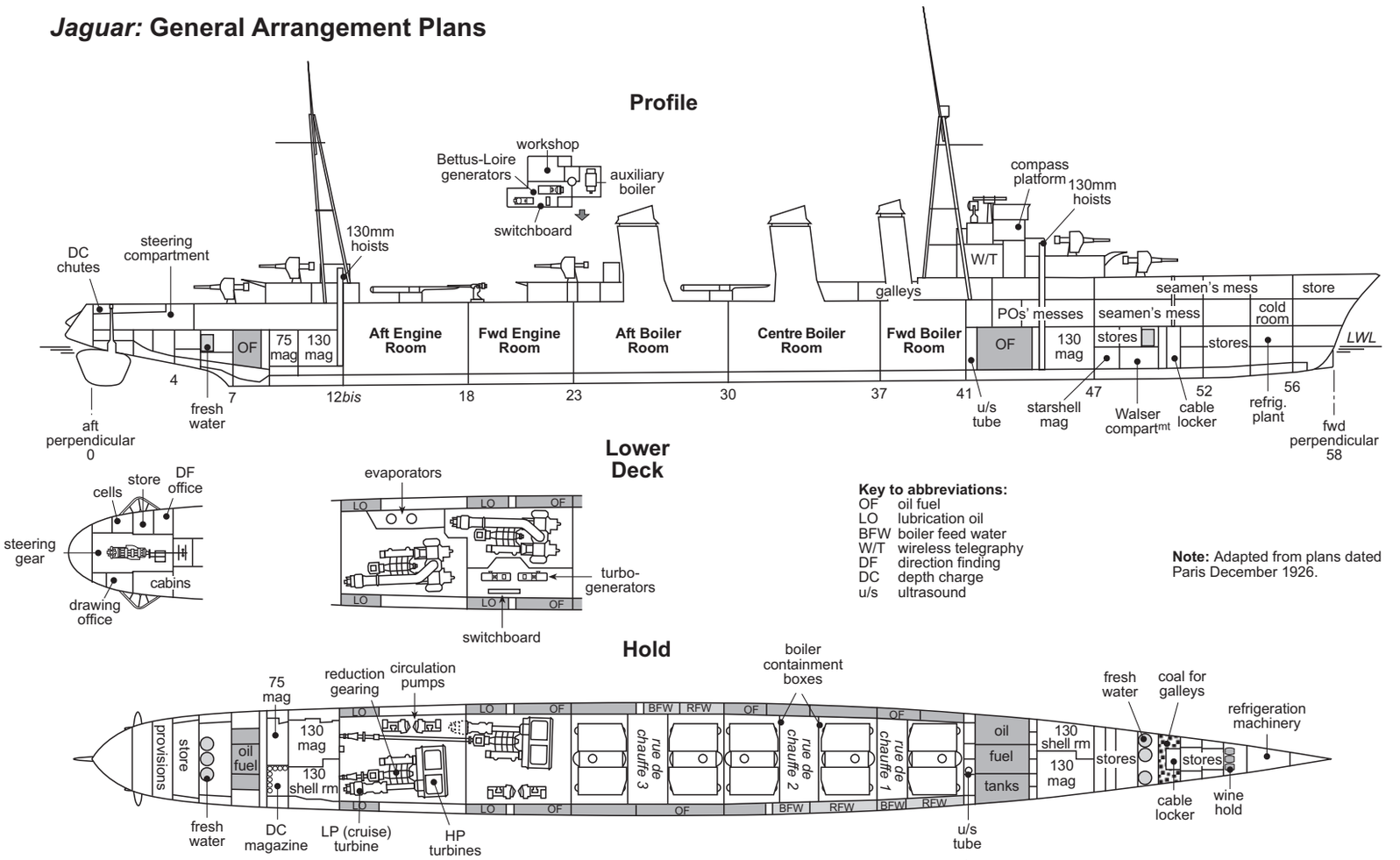
The profile and plan drawings are based on 'as fitted' plans for *Jaguar* and *Panthère* drawn up by the STCN and dated Paris December 1926. They show the ships broadly as completed, with a 3-metre base rangefinder atop the bridge. In the plan view, note the configuration of the centre deckhouse abaft the funnel which distinguished these ships from their 'industry' counterparts.

Jaguar: General Arrangement Plans



(© John Jordan 2013)

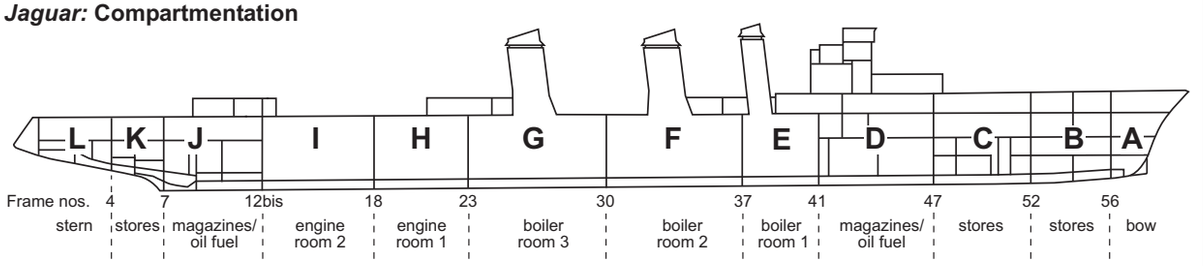
Fourteen pumps rated at 100 tonnes of water per hour were provided – two in each of the larger spaces – plus two portable 30t/h pumps for the two *arsenaux*.

The double bottom extended for most of the ship's length. Abeam the machinery spaces a continuous longitudinal bulkhead rose from the double bottom to the Main Deck to enclose the main oil fuel and boiler feed water tanks and to provide some protection against flooding for these large compartments. There were additional transverse fuel tanks forward and aft of the machinery spaces.

The slim hull, which had a length/beam ratio of 10.8:1, was designed for high speed. For the first time in a French destroyer there was a prominent raised forecastle (*Teugue*) with pronounced sheer and flare, combined with a 'clipper' bow. The Main Deck (*Pont Principal*) was the only continuous deck apart from the Hold (*Cale*) and was the strength deck; abaft the forecastle it was the weather deck. The Lower Deck (*Pont des Logements*, lit. 'Accommodation Deck') was interrupted by the five large machinery compartments, which extended to the Main Deck. At its forward end were the messes for seamen and petty officers while the officers' cabins were, according to tradition, located in the after part of the ship, forward of the steering compartment (see Inboard Profile). A second seamen's mess, the *Poste supérieur de l'équipage*, was located in the forecastle, together with the sickbay.

There was a large, capacious bridge structure of broadly square configuration to house the compass platform, chart house, main W/T office and signal distribution centre. Abaft the break in the forecastle

Jaguar: Compartmentation



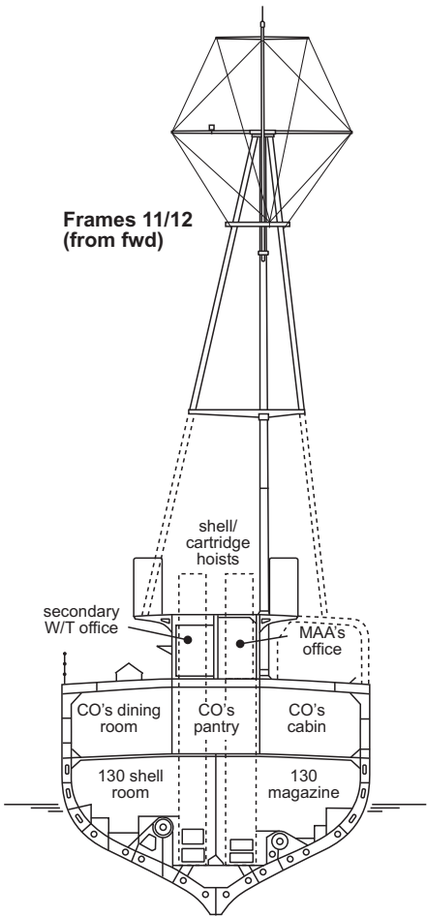
(© John Jordan 2013)

there were three deckhouses: the forward deckhouse (*roof avant*) housed the uptakes and ventilation trunking for the first two boiler rooms, as well as the bakery and the main galleys; the centre deckhouse (*roof milieu*) the uptakes and ventilation trunking for the after boiler room, the machinery workshop, the auxiliary boiler and emergency generators, as well as the CO's galley; the after deckhouse (*roof arrière*) the secondary W/T office and the after ammunition hoists. The ship's boats were grouped around the forward deckhouse, while the centre and after deckhouses each supported a gun mounting; the third of the upper guns was mounted atop a deckhouse which extended from the lower level of the bridge (*roof supérieur avant*).

Jaguar: Sections

Note: Adapted from plans dated Paris December 1926.

Frames 11/12 (from fwd)



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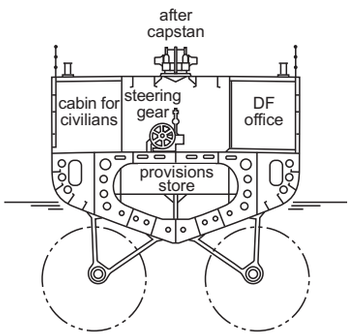
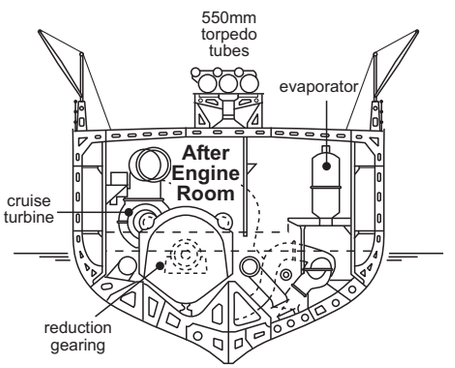
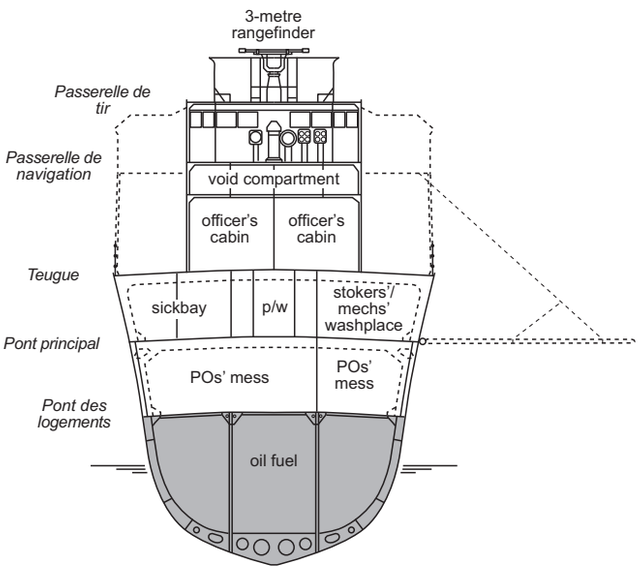
Frames 3/4 (from fwd)



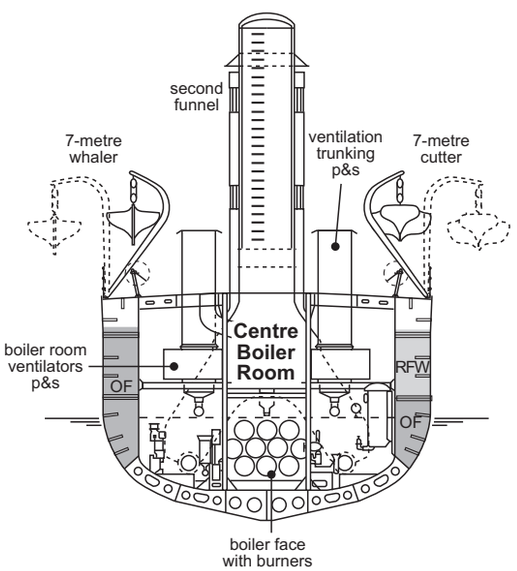
Frames 15/16 (from fwd)



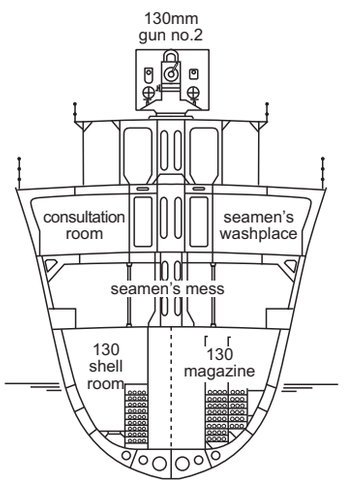
Frames 42/43 (from aft)



Frames 33/34 (from aft)



Frame 46 (from aft)



There were two light tripod masts. The mainmast was offset to port of the ship's axis. Between the masts were suspended the main W/T aerials.

The six *Jaguar*s were of riveted steel throughout; electric welding was introduced in the French shipyards and dockyards only from 1930. The steels used for construction and protection were classified according to their Ultimate Tensile Strength (UTS), the maximum stress a material can withstand while being stretched or pulled before 'necking' (when the cross-section begins to contract significantly). The unit of measurement used by the French was kilogrammes per square millimetre (kg/mm^2, often shortened to 'kg'). The mild steel used for the construction of these and other contemporary French flotilla craft was rated at 50kg (= 32 tons/psi).[5] Total hull weight for the *Jaguar*s was approximately 813 tonnes, representing 37.5% of standard displacement.

GROUND TACKLE AND NAVIGATION

There were two bower anchors in hawsepipes. These were of the 2360kg Hall stockless type, and were attached to seven shackles of 42mm chain cable. They were handled by a 30CV windlass located on the forecastle.

Two further anchors were provided on either side of the stern. To starboard there was a 910kg anchor, lowered by gravity. To port was a 570kg anchor – that of *Tigre* was to starboard, forward of the stern anchor – which was moored using a launch. Both anchors were raised by a 7.2CV stern capstan. A second 910kg anchor was stowed on board.

The single suspended, balanced rudder had a surface area of 14.44m^2 (14.13m^2 in the two *Industrie A* ships). It proved too small, and the servo-motor too feeble, for a ship of this size and speed. At 30 knots it took 25–30 seconds for the rudder to move through its maximum 35-degree angle. As a consequence the turning circle was excessive: 525m at 20 knots, 570m at 25 knots were the figures obtained on the trials of *Tigre* in 1925.

MACHINERY

Much of the internal hull of the ships was occupied by their powerful propulsion machinery; the machinery compartments occupied 50% of the ships' length (between perpendiculars) and the propulsion machinery alone accounted for 35% of standard displacement.

Steam for the turbine machinery was supplied by five small-tube boilers of the Du Temple type: those for the four *Industrie* ships were provided by the builders; those for *Jaguar* and *Panthère* were subcontracted to the A C Gironde shipyard at Bordeaux, the order being placed on 31 January 1923. Robustness and reliability were prioritised over performance, and the boilers were rated at a conservative 18kg/cm^2 (260psi), giving a saturated steam temperature of 216°C. Each boiler, together with its auxiliaries, weighed 74 tonnes.

The five boilers were disposed 'in line' on the ship's axis in three boiler rooms. Boiler Room 1 (Section E) housed a single boiler, with the exhaust uptake being led into the smallest of the three funnels. Boiler Rooms 2 and 3 (Sections F and G) each housed two boilers face to face, with a single *rue de chauffe*[6] between them, the uptakes being combined into two broader funnels (see General Arrangement plan). Each boiler was housed within a gas-tight containment box so that the *rue de chauffe* remained at atmospheric pressure and the stokers could work in a well-ventilated space with moderate temperatures.

The turbine machinery was in two separate, albeit adjacent engine rooms. Each set of turbines was completely independent of the other, with its own pumps and other auxiliary machinery, and comprised two high-pressure (HP) turbines working in parallel (main turbines), and a separate low-pressure (LP) cruise turbine with an integral reverse turbine. Single-reduction gearing was located between the paired HP turbines and the cruise turbine. Each set of turbines, including gearing and auxiliaries, weighed 193.2 tonnes. The forward set of turbines (Section H) drove

[5] High-tensile steels used for protective plating in French cruisers were 60kg, and later 80kg.

[6] The working path which ran across the boiler faces and was the domain of the stokers.

Left: *Tigre* running trials on 14 October 1925. She was the fastest of the class, achieving an impressive 36.7 knots with 57,200CV, which was widely reported and had a considerable impact abroad. *(US Navy NH 88960, courtesy of A D Baker III)*

Below: A fine stern view of *Tigre* as completed in 1926; she still has the original half-shields on her main guns, which would be replaced in early 1928. Note the distinctive stern, with the doors for the depth charge chutes and the rails fitted to ensure that the charges did not strike her hull when dropped. Note also the height of the tripod mainmast, which is offset to port. *(US Navy NH 88960, courtesy of A D Baker III)*

the port shaft; the after turbines (Section I) the starboard shaft. Each shaft was fitted with a bronze outward-turning three-bladed propeller with a diameter of 3.6 metres.

Considering that this was the first installation (with the *Bourrasque*s) of reduction gearing in a production destroyer design,[7] it proved remarkably problem-free and delivered substantial benefits in endurance. This was less true of other components of the propulsion machinery. Four of the ships received Rateau-Bretagne impulse turbines, which were generally successful after the initial 'teething' troubles were resolved. However, the two *Industrie B* ships built by A C Loire, *Léopard* and *Lynx*, were fitted with reaction turbines from Breguet-Laval which gave enormous problems (sheared blades, ingress of seawater into the condensers). Considerable additional work was necessary before they were passed fit for service, and *Léopard* was delivered to Lorient two years late. Following this experience Breguet-Laval turbines would never again be fitted in French destroyers.

All six ships sustained speeds of around 34.5 knots with 52,200–56,000CV at normal displacement over their 8-hour trials, and a mean average of 35.3–35.6 knots with forced draught over the ninth hour (see table). *Tigre* was the fastest, with an impressive 36.7 knots on 57,200CV, which was widely reported and had a considerable impact abroad. In service the ships comfortably sustained 30 knots on main turbines with all five boilers on line, even in their later years.

There were four main fuel tanks with a capacity of 530 tonnes of heavy oil. Thirty-five tonnes of lubrication oil were carried, plus 100 tonnes of reserve feed water for the boilers, in side and bottom tanks. There was also 12 tonnes of fresh water for sanitation and 4 tonnes of potable water for the crew in separate tanks fore and aft (see plan).[8] Following trials, endurance was calculated at 3300nm at 13 knots on cruise turbines with just two boilers lit. These figures were within the original parameters specified. However, the high fuel consumption of the boilers at maximum power meant that when the main turbines were engaged, range was only 600nm (vs 700nm) at 35 knots, and 1000nm at 28 knots.

The engine rooms were on two levels, with platforms at the upper level to starboard and to port of the turbines respectively. The upper platform of the forward engine room was occupied by two 60kW (80kW max.) Fives-Lille turbo-generators, which used the steam from the turbines to produce on-board electricity to power the searchlight projectors (circuit no.1), the ammunition hoists (2), the torpedo tubes (3), the ventilation for the machinery (4), the electrical motors for various items of equipment (5), and the port and starboard lighting circuits (6&7). Electricity was distributed through the ship via the seven 115V circuits, the main switchboard being adjacent to the turbo-generators (see GA plans). The platform in the after engine room was occupied by the evaporators which provided distilled water for the boilers and fresh water for the crew.

The fore and after capstans and the steering motors were powered using steam from the auxiliary boiler, which also provided services for the crew. The auxiliary boiler was located in the centre deckhouse abaft the third funnel. Also located in this deckhouse were two Bettus-Loire oil-fuelled generators, which in theory could provide sufficient electrical power when the ship was alongside without having to light one of the main boilers. The larger of the two generators, rated at 30/36kW, comprised a four-cylinder, four-stroke diesel and a six-pole 110V, 254A (305A max.) dynamo. A second, smaller generator rated at 15/18kW was added as emergency back-up following a ministerial instruction dated 11 September 1926.[9] The modest

[7] Parsons reduction gearing had first been trialled in the 800-tonne *Enseigne Gabolde* from 1923 (see Introduction).

[8] Under the Washington Treaty, neither the fuel oil nor the reserve feed water were counted in 'standard' displacement, but although Washington standard displacements were calculated (retrospectively) for these ships, these considerations had no impact on French destroyer design during the period 1922-1930.

[9] DM 15417 CN/4.

MAXIMUM NORMAL POWER AND FULL POWER TRIALS

The Maximum Normal Power (*puissance maximum normale*, or PMN) trials were over eight hours. The Full Power (*feux poussés*, or FP) trial normally followed on from the 8-hour PMN trial and was run for one hour. All the trials were run on the Iles de Glenans/Ile de Groix range; three successive runs were made, and the results of the best recorded. The trials for the *Jaguar* class were to be run at a mean displacement of 2,404.73 tonnes; adjustments (parentheses in the table) were made for ships which displaced in excess of this figure at the start of the trial.

	Jaguar	***Panthère***	***Léopard***	***Lynx***	***Chacal***	***Tigre***
Date of trial:	18 May 1926	16 Sep 1926	12 May 1927	20 Apr 1927	18 May 1926	3 Oct 1925
Displacement:	2574t	2576t	2642t	2630t	2628t	2564t
Average over 8 hours						
Shaft revolutions:	353/341rpm	357/352rpm	345/343rpm	343/342rpm	349/349rpm	358/354rpm
Horsepower:	53,050CV	56,000CV	n/a	55,470CV	52,192CV	55,200CV
Speed:	34.75kts	35.22kts	34.86kts	34.50kts	34.60kts	35.80kts
(corrected)	(–)	(35.30kts)	(–)	(–)	(34.70kts)	(35.93kts)
Fuel consumption:	28.01t/h	28.39t/h	29.10t/h	29.78t/h	28.93t/h	27.09t/h
Average 9th hour						
Shaft Revolutions:	364/349rpm	365/356rpm	357/351rpm	353/348rpm	356/355rpm	371/360rpm
Horsepower:	54,850CV	56,900CV	n/a	57,810CV	54,911CV	57,200CV
Speed:	35.27kts	35.60kts	35.59kts	35.54kts	34.20kts	36.53kts
(corrected)	(–)	(35.70kts)	(–)	(–)	(35.30kts)	(36.70kts)
Fuel consumption:	29.91t/h	29.13t/h	30.35t/h	30.96t/h	31.60t/h	27.83t/h

Notes:
1. Fuel consumption is expressed in tonnes of oil burned per hour (t/h).
2. The shaft revolution figures show the mean for the forward and after turbines respectively.
3. The figures representing the best performance for the class are underlined.
4. The torsiometers which measured the horsepower transmitted through the shafts aboard *Léopard* were not functioning on 12 May 1927.

Source: Jean Lassaque, *op. cit.*

power generated by these units was sufficient only to supply lighting and other basic functions (circuits nos.4, 6 and 7, and possibly 5).

MAIN ARMAMENT

The *avant-projet* for the 2400-tonne *contre-torpilleurs* envisaged a main armament of six or seven 130mm guns Mle 1919 in a mix of twin and single mountings. The two *Arsenaux* and the *Industrie A* ships were to have one twin (no.2 gun forward) and four single mountings, the two *Industrie B* ships two twins and three singles. In the event, trials with the twin mounting Mle 1921 aboard the sloop *Amiens* were disappointing; the layout was cramped and the loading numbers tended to get in one another's way, so the rate of fire for the twin mounting was significantly less than for two singles. It was therefore decided on 14 August 1923 that all five mountings would be of the standard Mle 1919 single type. As the weight of the twin mounting was almost twice that of the single, this would prove to be a wise decision (see Evaluation below).

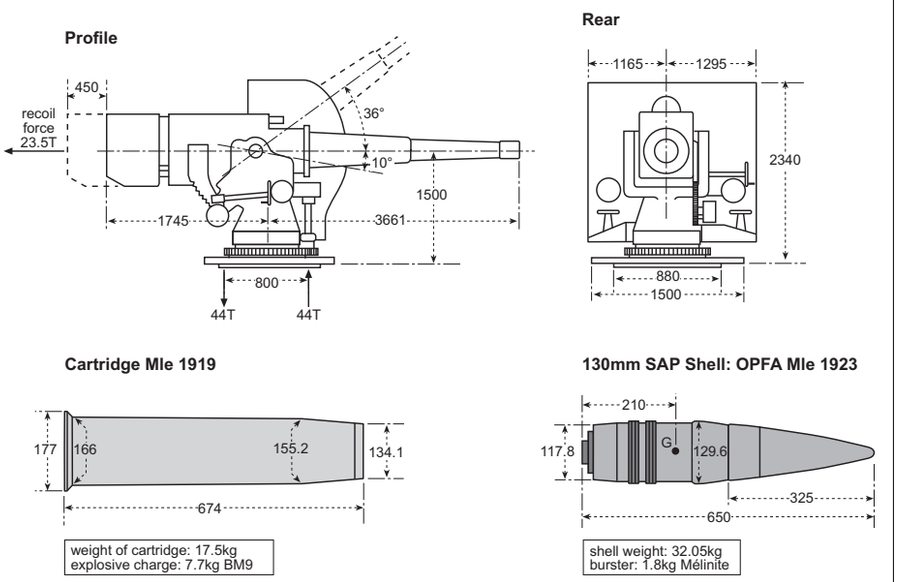
Development of the 130mm Mle 1919 gun had begun shortly after the Armistice. It was a simple, robust weapon employing prewar technology, including a Welin interrupted screw breech (see table for data). It fired a heavyweight semi-armour piercing (SAP) shell weighing 32.05kg able to penetrate 8cm of cemented armour at 10,000m and 4.5cm at 18,000m; the bursting charge was 1.8kg of picric acid (*Mélinite*). There was also a high-explosive (HE) shell weighing 34.85kg, with a bursting charge of 3.6kg. However, the comparatively short barrel – adopted because it made the gun handier and lighter – meant that long-range performance was mediocre. The gun used separate ammunition, and the cased charge, comprising 7.7kg of BM9 propellant, provided a modest muzzle velocity of 734m/s. In order to maximise range the trunnions were raised to a height of 1.5 metres, permitting an elevation of 36°; however, this made loading difficult at lower angles of elevation. Loading was also slowed by the screw breech mechanism and the retention of separate ammunition, and the loading cycle was never more than six rounds per minute, even with a well-trained crew.

The 130mm Mle 1919 was already officially deemed obsolescent by September 1923, but the development of a new generation of guns was not feasible within the available time-frame, and on 10 March 1925 it was decided that the *Jaguar*s would be initially armed with the 130mm Mle 1919 in order not to delay their entry into service, but that they would be retro-fitted at a later stage with a new model.[10]

The guns on the *Jaguar* and *Bourrasque* classes were on simple pivot mountings and had a lightweight shield to protect the gun crew against blast, wind and spray. The latter proved inadequate, and in 1926 Lorient dockyard developed a new 'wrap-around' model. It was trialled aboard *Panthère* in 1927 and retro-fitted to *Jaguar* and the two *Industrie A* ships; *Léopard* and *Lynx* were fitted with the shields on completion. The new shields provided much better protection for the gun crew, albeit at the cost of an additional 2.5 tonnes in topweight.

The regulation peacetime ammunition provision was 132 rounds per gun, for a total of 660 shells and 745 cased charges, of which 85 were flashless charges for night firing. The magazines fore and aft of the

[10] DM 527 EMG/1.



Note: Measurements are in millimetres.

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130MM/40 MLE 1919

Gun Data	
Construction	not autofretted
Weight of gun	4.05 tonnes
Breech mechanism	Welin interrupted screw
Ammunition type	separate
Projectiles	OPFA Mle 1923 (32.05kg) OEA Mle 1923 (34.85kg)
Propellant	7.7kg BM9 in cartridge Mle 1919
Muzzle velocity	735m/s
Range at 36°	18,500m

Mounting	
Designation	Mle 1919
Protection	3/5mm
Weight of mounting	12.5 tonnes
Elevation	-10° / +36°
Loading angle	not above 15°
Firing cycle	5–6rpm

Notes:

Mle	*Modèle*	Model
OPFA	*Obus de Perforation en Fonte Aciérée*	Semi-Armour Piercing (SAP)
OEA	*Obus Explosif en Acier*	High Explosive (HE)

machinery spaces had ample capacity, having been designed to accommodate the ammunition for six guns. The forward magazine, which served guns nos.1 and 2 forward of the bridge, could accommodate 398 shells and 468 charges; the after magazine, serving guns nos.3, 4 and 5, 404 shells and 418 charges. The reception posts for the electrically-powered hoists, which used a continuous chain mechanism to raise the shells and cartridges in the horizontal position (see p.46), were located behind no.2 gun and forward of no.4 gun. Shells and charges were transferred by hand either to the ready-use stowage racks or directly to the breech of the guns. There were intermediate reception positions behind no.1 gun and forward of no.5 gun. The latter were located in an enclosed ammunition lobby (see Bridge Decks drawing), whereas the upper reception trays were in the open atop their respective deckhouses, with blast shields to the sides.[11]

The French had been impressed by the British practice of providing ready-use stowage close to the guns of their destroyers. Stowage racks for 24 rounds per gun were located close to the guns for mountings nos.1, 2, 4 and 5 on the *Jaguar*s. There was no midships magazine for no.3 gun, located abaft the third funnel. This gun was therefore given increased ready-use stowage of 30 rounds; the racks could be replenished from the after magazine using an overhead cable with a block and tackle, but this was not usually possible at sea and was prohibited in combat.

The ambitious original design for these ships featured a 'destroyer director' capable of providing remote training and pointing of the guns, with automatic correction for parallax and centralised firing. In the transmitting station (*PC Artillerie*) an electro-mechanical computer Mle 1923B would calculate the fire control data necessary for training and elevation and transmit them instantaneously to the guns. Unfortunately, development of this system by the DCAN[12] was protracted, and once the ships entered service it became clear that they already carried far too much topweight.

In the event all six ships were provided with a simple 3-metre coincidence rangefinder (Mle B.1926) developed by the French SOM[13] company on a lightweight pedestal of the Barr & Stroud type. They were also fitted with a mechanical fire control computer *type aviso* Mle 1919 as a temporary measure. Fire control data had to be communicated to the guns by voice-pipe or telephone and the guns were trained and laid using handwheels in the time-honoured fashion. The order to fire was transmitted by the Control Officer on the bridge and executed at the guns using an electro-mechanical device. For independent fire Homécourt sights were provided on the guns.

Although starshell was increasingly favoured as a means of target illumination during a night action because it was less likely to reveal the position of the ship, two 75cm searchlight projectors were installed atop the forward superstructure, immediately abaft the compass platform. The projectors were supplied by either BBT (Barbier, Bénard & Turenne – *Arsenaux/Industrie A*) or OVP (Ouvrard, Villars & Perez – *Industrie B*) and were remotely controlled from positions in the bridge wings. The bridge position had the advantage of excellent arcs to port and to starboard, and the projectors could also be used at reduced power for signalling. However, in service the arrangement proved less than satisfactory, as when the searchlights were switched on at night and at full power the personnel on the bridge was effectively blinded; later *contre-torpilleurs* would have a revised searchlight arrangement, and would have separate 30cm signal projectors in the bridge wings.

[11] In the following class of *contre-torpilleurs*, the *Guépard* class, the forward hoists were fully enclosed in a deckhouse with a curved front face.

[12] *Direction Central des Armes Navales* (Ordnance Department).

[13] *Société d'Optique et de Mécanique de haute precision.*

75/50 MLE 1924/1922

Gun Data

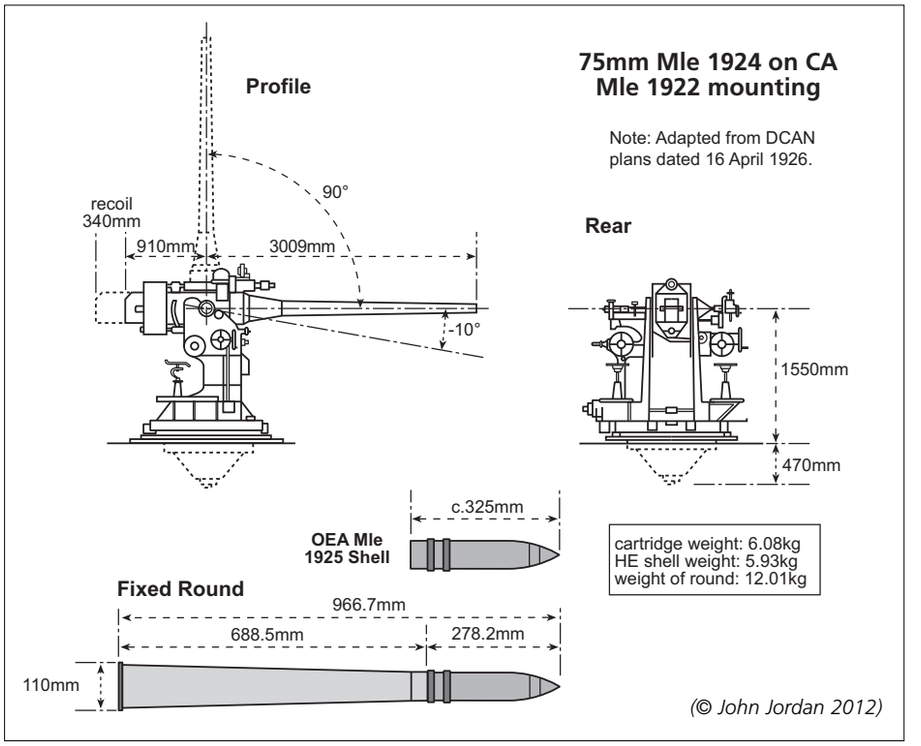
Construction	autofretted barrel
Weight of gun	1.07 tonnes
Breech mechanism	Schneider concentric ring
Ammunition type	fixed
Projectiles	OEA Mle 1925 (5.93kg)
	OEcl Mle 1923
Propellant	BM5/BM7 (2.18kg)
Complete round	
weight	12.01kg
dimensions	967mm x 110mm
Muzzle velocity	850m/s
Max. range	15,000m (45°)
Ceiling	7500m (90°)

Mounting

Designation	CA Mle 1922
Weight of mounting	?? tonnes
Loading angle	–10° / +75°
Elevation	–10° / +90°
Firing cycle	15rpm theoretical
	8rpm practical

Notes:

Mle	*Modèle*	Model
OEA	*Obus Explosif en Acier*	High Explosive (HE)
OEcl	*Obus Eclairant*	Starshell



ANTI-AIRCRAFT WEAPONS

The aerial menace to ships during the 1920s remained negligible. Torpedo bombers were only just beginning to make their presence felt, and they were generally slow, low-performance aircraft requiring good weather conditions to make an effective attack. The ability to hit a moving ship with bombs dropped from altitude was still questioned in most naval quarters, and it would be a further ten years before dive-bombers began to enter service in numbers.

The anti-aircraft armament fitted in the six *Jaguar*s and the contemporary *torpilleurs d'escadre* reflected the thinking predominant at the end of the First World War. Medium-calibre guns such as the 75mm/76mm/3-inch and 102mm/4-inch on high-angle mountings and using time-fuzed ammunition were intended to deter – and in the event of a lucky hit shoot down – reconnaissance aircraft, and were to contribute to a long-range barrage through which torpedo-bombers would have to fly when the ships were part of a fleet or squadron formation. Light machine guns provided a modest self-defence capability against fighter aircraft

Left: *Chacal* as she appeared following her first major refit at Toulon 1927-8. The original gunshields have been replaced by the new model, and the foremast yard has been lowered. *(Leo van Ginderen collection)*