

When the Simplest Thing is Difficult: Manufacturing Depth Charges in Canada, 1933-1945

William Rawling

Au début de la Deuxième Guerre mondiale, le Canada avait une économie plutôt basée sur l'agriculture que sur l'industrie lourde. Par conséquent, le conflit a servi ni plus ni moins comme période d'apprentissage, surtout dans le domaine de la manufacture des armes. Un excellent exemple est la charge de profondeur pour la guerre contre les sous-marins qui, même si elle représentait la plus simple des armes déployées contre les U-boot, comprenait des technologies de telles complexités que l'industrie canadienne a mis quelques années à maîtriser leur production. Cet article étudie l'histoire de la fabrication de ces armes anti-sous-marines et de leurs composantes afin de nous éclairer davantage - au moins en partie - sur l'évolution de l'industrie militaire et navale au Canada de 1939 à 1945.

That Canadians are an unmilitary people is an oft-repeated phrase, and one could add that they are not very naval-minded either. In spite of being surrounded on three sides by salt water, this country has never developed the kind of armed maritime tradition found in the United Kingdom, or even the United States and Russia. It thus comes as no surprise that the country did not build up the kind of naval-industrial complex to be found in the UK and US, and had to rely on external sources of supply for ships, armaments, and equipment. In general terms, this situation has been well-studied in Michael Hennessy's PhD dissertation, "The Rise and Fall of a Canadian Maritime Policy, 1939-1965: A Study of Industry, Navalism and the State,"¹ while one particular aspect, electronic detection devices, has been examined in detail in David Zimmerman's *The Great Naval Battle of Ottawa*, with its provocative subtitle *How admirals, scientists, and politicians impeded the development of high technology in Canada's wartime navy*.² For scholarly studies of how depth charges and other antisubmarine weapons such as hedgehog and squid were used tactically, one could not do better than to look

¹ University of New Brunswick, Fredericton, 1994.

² Toronto: University of Toronto Press, 1989.

at the work of Marc Milner, Roger Sarty, and Michael Hadley.³ But if historians have focussed on large artifacts such as ships and sophisticated equipment such as radar, there is still work to be done on such things as gun mounts and anti-submarine weaponry. These are basic tools of naval warfare which determine whether a navy will be able to fulfil its most basic role. The lowly depth charge is an excellent example; an explosive-filled canister projected over a ship's side or dropped from its stern, it was the least complicated (barring the ram) of the panoply of devices deployed against the U-boat in the Second World War. It nevertheless proved a major challenge to Canadian industry and the Royal Canadian Navy (RCN) in spite of its apparent simplicity and the supposed ease with which it could be manufactured.

The nature of the antisubmarine war from 1939 to 1945 added to the challenge. For the first years of the conflict the depth charge was the only weapon capable of reaching an underwater enemy; guns and using a ship's bow as a ram could only be effective against a submarine on the surface. Tactical evolution in which ever-larger patterns of the weapon were used to improve the possibility of a kill increased demand. Ahead-thrown weapons such as hedgehog and squid became available later, but installing such devices and training sailors in their use and maintenance was a time-consuming process, and in fact the RCN did not adopt squid during the war for those very reasons.⁴ The depth charge thus remained an important weapon for the entire duration of the Battle of the Atlantic, with a concomitant demand for supply.

The very organization dealing with such developments was growing and evolving throughout the period under study. As G. N. Tucker noted in the official history of the RCN, the evolution of Naval Service Headquarters (NSHQ) deserves a volume in itself, but only a paragraph can be devoted to it here. In 1939 it occupied two floors of an office building. Coordination was effected by staff officers visiting each other in their offices. As the pressures of war increased, the personal touch was lost as ever-growing numbers of staff officers dealt with such issues as weapons procurement. In January 1940, regular weekly staff meetings were inaugurated, and in August a Naval Council was created, made up of the minister, the deputy minister, and high-ranking naval officers within headquarters. Later, it ceased to exist, and was replaced by a Naval Board, made up of the deputy minister and staff officers, and a Naval Staff made up exclusively of naval officers; the latter, as a body, directed such branches as Equipment and Supply. At a lower level, in early 1943 the Directorate of Warfare and Training was created to take on responsibility for such topics as tactics as well as

³ See especially, though not exclusively, Marc Milner, *North Atlantic Run*, (Toronto, 1985) and *The U-boat Hunters*, (Toronto, 1994); Roger Sarty, *The Maritime Defence of Canada*, (Toronto, 1996) and *Canada and the Battle of the Atlantic*, (Montreal, 1998); and Michael Hadley, *U-boats against Canada*, (Kingston and Montreal, 1985).

⁴ William Rawling, "The Challenge of Modernization: The Royal Canadian Navy and Antisubmarine Weapons, 1944-45," *The Journal of Military History* (April, 1999).

research and development; the Naval Stores Division fell under its authority.⁵ The Department of Munitions and Supply, a separate wartime government department, was responsible for the actual manufacture of weapons as requested by the fighting services. There were thus many players involved in providing depth charges to the R C N , that fact itself a commentary on the challenges involved.

From a purely manufacturing perspective, the depth charge is of two-fold interest. First, it was one of the few weapons of modern combat to have been considered for Canadian manufacture before the outbreak of war. Second, every component necessary for its operational use was eventually made in this country. Each part posed its own problems, but coordinating the production of the whole was perhaps the greatest challenge of them all. At first glance it was a simple device made up of a canister, explosives, a primer to set off the explosives, and a pistol to measure water pressure and determine when the primer should detonate. In reality each component was a major technological endeavour, the cylinder having to sustain huge pressures, the explosives needing to be chemically consistent to a degree not required in the civilian world, as well as a pistol and primer each made up of numerous tiny parts which had to be manufactured to extremely fine tolerances akin to those of the most expensive watches. It was therefore an excellent example of how nothing is easy in war, whether it be organizing a campaign or attempting to assemble weapons. To recall Clausewitz's perhaps overly-quoted aphorism, "Everything in war is very simple, but the simplest thing is difficult," especially when simplicity is merely a figment.

In 1933, with these challenges waiting to be discovered in the future, the Deputy Minister for National Defence wrote the High Commissioner in London: "Certain Defence Problems have lately been under examination, and the Department is considering the feasibility of manufacturing Depth Charges, depth charge pistols and all necessary stores connected with them in Canada and the filling of the charges with TNT. It is therefore requested that information may be obtained as to whether a complete set of manufacturers' drawings and specifications of all pertinent parts is available for issue if required, and the approximate cost of same."⁶ After working its way through the British hierarchy, the necessary drawings were made available (at a cost of three pounds).

National Defence also contacted the Dominion Arsenal to determine if it could manufacture the weapon and its associated fuses, asking: "What facilities exist or could be improvised by the Arsenal at Quebec to permit of hot pouring of TNT in containers to provide depth charges?"⁷ The additional plant required to carry out such work would cost \$100,000, but Commodore Percy Nelles, the Chief of the Naval Staff (CNS), noted that "It would be a

⁵ G.N. Tucker, *The Naval Service of Canada: Its Official History, Volume II* (Ottawa, 1952), 418, 421-23, 427.

⁶ DM to High Commissioner in London, 18 May 1933, National Archives of Canada (NAC), RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

⁷ Col G.P. Loggie, DEOS, to Superintendent Dominion Arsenal, 1 March 1934, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

step in the direction of making Canada self sufficient if the plant required by the Arsenal could be obtained." However, "It is regretted that there are no Naval funds available in the forthcoming financial year so far as can be foreseen at present."⁸ It was left to the Major-General of Ordnance (MGO), Clyde Caldwell, to suggest alternative approaches; though the superintendent of the Dominion Arsenal foresaw no difficulties manufacturing the weapon in Canada. "If Peace-time purchases of worthwhile magnitude are likely to be made, it will be necessary to undertake more detailed investigation of the Trade with a view to determining whether suitable machinery exists in trade plants or if it will be necessary to provide special machines for undertaking the work. In the latter event, it would be for consideration whether the Department would purchase the machinery and install it in a selected plant or would arrange for the manufacture of the Depth charges, the contractor to supply his own machinery."⁹ One way of reducing costs was to combine a bomb-filling plant for the Royal Canadian Air Force (RCAF) with the manufacture of depth charges for the RCN,¹⁰ but in the event the latter were not manufactured in Canada in peacetime.

The RCN, despite early support for the idea, determined in September 1937 that an annual expenditure of twenty depth charges in training did not create sufficient demand for home production. "Although we must work towards making ourselves self-sufficient in war our small annual peace requirements would not warrant heavy expenditure on special plant."¹¹ The CNS also recommended that an "investigation be [made] for emergency war time production," although, of course, he was unaware that Nazi Germany would invade Poland exactly two years later. In October, 1939, a month after Canada's declaration of war, a Central Investigation Committee reported on the possibility of manufacturing depth charges in this country, suggesting that "There should be no difficulty in regard to the containers, but there might be in the manufacture of the pistol mechanisms." In regards to the latter, however, "There is an expert mechanic with the Woodstock Machinery Company, Woodstock (formerly operating for himself under name of Cockram Company) who has had previous experience in Great Britain in the making of these pistols."¹² An inspector paid the firm a visit and concluded that it had the necessary space to manufacture the device, though it would need additional equipment; the "expert mechanic" mentioned above would supervise the work.¹³ For filling casings with explosives, in October 1939 the Superintendent of the Dominion Arsenal reiterated his view of five years before that a new filling plant would be required to carry out

⁸ Cmdre Percy Nelles, CNS, to DM, 18 March 1937, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

⁹ Maj-Gen Clyde Caldwell, MGO, to DM, 26 August 37, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹⁰ Col E. J. Renaud, DEOS, to Director of Naval Stores, 9 September 1937, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹¹ CNS to DM, 2 September 1937, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹² H. W. B. Swabey, Central Investigation Committee, to Director of Naval Stores, 2 October 1939, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹³ G. Ogilvie, Central Investigation Committee, to Director of Naval Stores, 9 October 1939, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

such work, and had the necessary plans drawn up.¹⁴ German U-boats having initiated operations in the first days of the war, there was, however, an immediate need for seven hundred and twenty depth charges, which the RCN suggested be ordered in England, "as it is felt that the Admiralty will undoubtedly be able to spare this number within a reasonably short time."¹⁵ Such optimism, bordering on the naive, was understandable in the early months of the war, but would not last long.

With many elements falling into place (or so it seemed) the MGO, in the early days of 1940, summarized the manufacturing situation. The weapon, as mentioned above, could be broken down into four components: the casing that held the explosive, the explosive itself, the primer that set off the explosive, and the pistol that detonated the primer at a given water pressure. For the empty casing, "While the cylindrical case could be rolled and welded, the ends and components would require special tooling to produce... Hydraulic testing apparatus is required, as are gauges." Then there was the matter of filling. "Each depth charge requires 300 lbs TNT grade I. It is assumed this could be provided by obtaining a part of the output of Messrs Defence Industries Limited which is now being sold to the British Supply Board. 1,000 depth charges would require 150 tons TNT, one month's output at the present rate of production... It is certain there is not enough melting and pouring equipment in the country to complete this job in a reasonable time."¹⁶ As for the primer, "This is rather elaborate, requiring machined components," as well as Grade 1 explosives, including a portion in pellet form at a time when the commercial product was in short supply. Additionally, "pressing technique and tools must be developed." Finally, there was the pistol: "This mechanism consists of 34 components, some forged and machined, some metal and some rubber. Tools and gauges of special types would be necessary, as well as rather elaborate leakage testing and other apparatus."¹⁷

The MGO's conclusions were similar to those of the CNS a few years before, perhaps reflecting the business-as-usual atmosphere that pervaded most Canadian wartime endeavours before the Fall of France in June 1940. He suggested that "In view of the above, I am of the opinion that production of depth charges in Canada would not be economical in quantities of less than twenty to thirty thousand, due to tooling and gauge charges, as well as the filling equipment required. It is therefore recommended that they be obtained from England, and not produced in Canada unless the quantity required would justify local supply, or they are unobtainable overseas... It may be possible that the British Supply Board is contemplating production in Canada, if so, Canadian requirements could be pooled with British production with advantage."¹⁸ Optimism was not a monopoly of the higher echelons of the naval service.

" Superintendent I Jomimon Arsenal to DCE & ME DND, 29 October 1939, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹⁵ CNS to Acting DM, 2 November 1939, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹⁶ MGO to CNS, 6 January 1940, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

¹⁷ *Ibid.*

¹⁸ *Ibid.*

One reason for such high hopes was British tardiness in replying to signals of September and October 1939 asking if they could meet Canadian requirements for depth charges. A reply finally came, by way of the High Commissioner to Canada, in March 1940, and it was not favourable. The British "suggest that you be invited to consider meeting these and any other Dominion requirements by manufacture in Canada. Admiralty recommend this course of action in view of large numbers required to meet Canadian service and large demand for this type of work in the United Kingdom to meet Imperial requirements. Drawings and specifications have been supplied to Engineer Rear Admiral Sheridan" of the British Supply Board.¹⁹ Ironically, though previous investigations by the MGO and others had found that, technically, "No great difficulty is expected in getting the various items manufactured in Canada," explosives and primers might prove a problem as "the whole production of TNT for the next year has been earmarked for the British Government."²⁰

In the months that followed the British found that their production of depth charges was such that they could accept Canadian orders; then came the fall of France in June, 1940, and the move of U-boats to ports on the French coast, with direct access to the North Atlantic, that dramatically increased their effectiveness. The new war situation changed the strategic picture in no uncertain terms and with it requirements for various weapons. Depth charges were among them, and the British Admiralty Technical Mission (BATM), sent here to locate materiel for the Royal Navy, approached Canada's Department of Munitions and Supply with a request for a thousand such devices. (In 1941 the BATM, the RCN, and the Department of Munitions and Supply came to an arrangement by which the two navies would determine, jointly, their requirements for the western hemisphere, then would submit these to the Department, which would place the necessary orders and contracts, with inspection of the final product carried out by the BATM). The RCN in March 1940 had determined that it needed one thousand depth charges for its own use, and according to a CNS report of September the deficit had still not been made good six months later.

The situation at present in respect to RCN stocks of Depth Charges is that with a shipment now being received at Halifax, the total number available is approximately 1,960. Requirements for commissioning vessels in the current year are 989 leaving 971 as a reserve to meet expenditure. This quantity is short of the standard of two in reserve to one on board by approximately 1,000.

It is therefore recommended that arrangements be made to include 1,000 in the order being placed for manufacture to meet these current requirements.

An overseas requisition [from the UK] placed on 10th August for 4523

¹⁹ High Commissioner to Naval Secretary, 8 March 1940, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

²⁰ CNS to Controller-General British Supply Board, attn R/Adm H.A. Sheridan, 16 March 1940, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

charges will require to be reduced by 1,000 to release funds to meet the cost of manufacturing the Canadian order. Having in mind that considerable time will elapse before deliveries commence, it is not considered advisable to further curtail the quantity on overseas requisition, until more definite information can be obtained in respect to delivery dates, and rate of output.²¹

Attitudes towards ledgers had obviously changed in a year. Staff officers and bureaucrats were now willing to risk financial waste to guarantee that the necessities of war would be delivered in timely fashion.

It was only a month later that the CNS could report that "the estimated delivery date on Depth Charges, to be manufactured in Canada, has now improved making it feasible to increase the Canadian order to 4,000."²² With five hundred and twenty-three yet to be delivered by the British and a large quantity already in stock, the navy felt it had a sufficient supply to last until Canadian manufactured weapons became available in the spring of 1941. That presumed, however, that deadlines would be met, perhaps another symptom of early-war optimism; in August 1941 the CNS warned that "first deliveries are some months behind schedule." In a letter to Vice-Admiral A.E. Evans of the B A T M he pointed out that

It was at your Mission's request that an order in Great Britain for 4,000 Depth Charge Equipments was cancelled, and similar quantity off Admiralty order for 10,000 taken over by the Royal Canadian Navy on the understanding that deliveries would be forthcoming not later than April, 1941. This would have been quite satisfactory even if Canadian production had been only a month or two behind schedule, which was allowed for in our decision...

The decision regarding Depth Charge Pistols has now become most serious as the Admiralty has not provided this item in equivalent numbers to Depth Charges which they have supplied to date.²³

The four different manufacturing streams required to make depth charges had obviously been imperfectly coordinated, and "Our Corvettes on Convoy Escort Duty and various Auxiliary Vessels carry reduced outfits of Depth Charges, due to shortage of Pistols, which amounts to approximately 400 at the present date. This, however, does not represent the actual picture as this type of ship is being delivered and commissioned at a rapid rate, and the shortages grow from day to day..."²⁴ By the time depth charge pistols could be delivered in any quantity, "our immediate requirements for ships in operation, mainly on Convoy Duty, will have risen

²¹ CNS to DM, 20 September 1940, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

²² CNS to A / DM Naval Service, 21 October 1940, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

²³ CNS to V/Adm A.E. Evans, B A T M, 1 August 1941, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

²⁴ *Ibid.*

to approximately 600, Primers approximately 250, and Depth Charges 150 without any reserve whatever in Imperial or Canadian Stock in Halifax." He thus suggested that "It is, therefore, most important that the above minimum quantities should be allocated from first deliveries from Canadian production, and that subsequent deliveries be allocated on a 50-50 basis" between the Canadians and British.²⁵

Demand for depth charges would, in fact, continue to increase for some time to come, the Naval Staff deciding on no less than a half-dozen different occasions from September 1941 to April 1943 to add them to one type of vessel or another. First it approved a further dozen per corvette, then additional stowage in minesweepers, sixty per auxiliary cruiser, small numbers to rescue vessels, an increase from one hundred to one hundred and twenty-six per frigate, and increased numbers to Bangor-class minesweepers.²⁶ Clearly, any vessel able to contribute to the antisubmarine war was expected to do so, and the Naval Staff ordered that the necessary ordnance be made available for that purpose.

Balancing supply with demand was thus a continuing challenge, and though by March 1943 Captain R. W. Wood, Director of Naval Ordnance, Torpedoes and Mines, noted a need for 20,500 depth charges for the first six months of 1943 and a further 23,000 for the second half-year, "We are at the present time running short of orders to keep the firms engaged in the manufacture of these depth charges in continuous production."²⁷ And this at a time when the demand curve still sloped upwards. Except for a decision to reduce the depth charge pattern in escorts from fourteen to ten (meaning ten charges would be fired or dropped against a suspected U-boat at one time), Naval Staff continued to increase their numbers in R C N ships. In August 1943 it ordered that frigates carry two dozen more, for a total of one hundred and fifty; in September the Naval Staff ordered that River-class destroyers were to have their torpedo tubes modified to use the mark X depth charge; and in October it was the RCAF's turn, its Marine Craft Number M208 being authorized to carry four.²⁸ Other developments compounded the problem. Wood pointed out in December that "As an instance, the ordinary depth charge is now required to be made about one half inch shorter than formerly," possibly to prevent jamming in the rails due to ice or incorrect filling. "The Department has some 10,000 charges filled and about 15,000 empties in course of filling and these cannot, of course, be altered economically, yet there requires to be an immediate supply of some 5,000 of the shorter type."²⁹

²⁶ Naval Staff Minutes, 58-8, 9 October 1941; 84-15, 23 April 1942; 100-2, 25 June 1942; 109-7, 3 August 1942; 146-12, 14 January 1943; and 159-2, 8 March 1943, Directorate of History and Heritage, Department of National Defence, Ottawa (DHH), 81/520/1000-100/3.

²⁷ Wm Cunningham, Assistant to Director-General Naval Armament and Equipment, to Capt R. W. Wood, Director Naval Ordnance, Torpedoes, and Mines, 8 March 1943, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

²⁸ Naval Staff Minutes, 173-3, 26 April 1943, 196-9, 19 August 1943, 203-2, 27 September 1943 and 205-6, 11 October 1943, DHH, 81/520/1000-100/3.

²⁹ Capt R. W. Wood, DNOTM, to CNES and CNS, 2 December 1943, DHH, 80/218, Folder 2.

He had already proposed to Commander E.P. Tisdall, the Superintendent of the Naval Armaments Depot, that orders be placed with more lead time but months later the problem's complexity remained unresolved as G.K. Shiels, the Deputy Minister of Munitions and Supply, reported to his navy counterpart.

I am informed that Depth Charges for use on the Atlantic Seaboard are procured from Canada, and I believe some concern has recently been expressed over the possibility of these Depth Charges not being available in sufficient numbers when required. Our Ammunition Production Branch has for some time been discussing an order for 15,000 units of these stores but, although an order for the Pistols has been received, we have had no request for either Bodies or Primers.

I would like to point out that orders presently in the hands of contractors for the production of Depth Charge Bodies will be completed early in April, and at this late date it is questionable if material can be secured in time to ensure continuity of production. We must also consider the question of filling facilities as the filling plants cannot be expected to maintain production if deliveries of empty bodies are spasmodic.

I felt it advisable to point out to you the essentiality of sufficient notice being given this Department if we are to produce these extremely important stores in time for any emergency which might arise and it seems, if an order can be anticipated as a result of the request for Pistols, that we should be informed immediately and provided with the requisite Contract Demand and Financial Encumbrances to avoid the possibility of urgent deliveries being delayed at some time in the future.³⁰

The paper trail, however, seemed to prove Shiels in error. Captain Wood pointed out that an order for fifteen thousand depth charges, including bodies (filled casings) had been forwarded on 10 February, approved by the minister a week later, and received by the Department of Munitions and Supply on 24 February.³¹

Thus over four years after the war's outbreak lines of communication still suffered from kinks that needed smoothing out. It was therefore fortunate that the demand curve seemed to be flattening out, due to the Allies gaining the upper hand in the Battle of the Atlantic. The development of ahead-throwing weapons, hedgehog and later squid, also reduced the demand for depth charges. A problem of the older technology was a time lag between detection when sonar discovered a target, and the launch of depth charges, which had to wait until after the vessel had moved over the submarine that by then might well have begun

³⁰ Shiels, DM Mun and Sup, to DM Naval Service, 3 March 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

³¹ R. W. Wood, Dir Naval Ord, to CNS, 10 March 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

evasive manoeuvres. By firing forward soon after the enemy was detected, ahead-thrown weapons were an order of magnitude more accurate than depth charges. No doubt it was for these reasons that in March 1944 the Naval Staff refused to approve increasing the depth charge pattern in Tribal-class destroyers from five to ten, and from June to October changed its mind in regards to aiming 105-foot minesweepers with additional ordnance.³²

Meanwhile, the delivery of completed depth charges from the manufacturer to the user was showing signs of friction. As an anonymous staff officer related, that month he discovered that a Quebec shipyard required 500 depth charges for new construction vessels, and a quick telephone call revealed that 1000 of the weapons were in fact ready at the plant. Consigning instructions were issued on the spot, "with emphasis on the priority of the 500 for Quebec." The shipyard was telephoned to determine a delivery date - the reply, "URGENT." In order to meet such demands, the staff officer started playing the role of railway traffic control, ordering one car, filled with two hundred and fifty depth charges, to be hooked up and to leave without waiting for the next to complete loading. It could follow later. "Quebec reported receipt of one car load of 250 D/Cs & asked when could they have the remainder which I promised were following... Enquiry revealed that 2nd car had not left!" An enquiry on the 27th (the day of the staff officer's report) discovered that the car had just pulled out. "This is a rough summary of just one case concerning D/Cs. There really was quite a lot of telephoning done in an effort to satisfy Quebec's requirements."³³

There was also potential for conflict at the inter-departmental level, especially as the war in Europe approached its end, with Allied forces poised to enter Germany in early December 1944. Responding to a request to estimate requirements for the fiscal year beginning 1 April 1945, Captain Wood could only reply that current capacity should be maintained, though "no commitments for the acceptance of deliveries at this rate can be made, nor can orders be placed to cover." In way of explanation, he provided a lesson in the technical complexities of modern war. "It must be realized that an estimate anywhere approaching accuracy is practically impossible to give, due to the uncertainty of the future. It is reminded, however, that Canada continues to be responsible for the supply of Depth Charges ... and all related stores to meet all RN and RCN requirements in the Western Hemisphere; this is a grave responsibility which is not felt has been regarded seriously enough by those responsible for their production in the past." This was a comment aimed at the Department of Munitions and Supply. "While it is quite possible that only a fraction of the above mentioned amounts may actually be called for - indeed it may well be unnecessary to place any new order - it is felt that we must consider ourselves morally bound not to dismantle or disturb, in any way, the facilities for producing the above quantities on very short notice,

³² Naval Staff Minutes, 231-7, 27 March 44, 241-10, 5 June 1944, 247-11, 17 July 1944, 262-12, and 30 October 1944, DHH, 81/520/1000-100/3.

³³ A SO (T) to DNO, 27 October 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

should they be required."³⁴ The Department of Munitions and Supply graciously agreed.³⁵

It had good reason to do so, since the Royal Navy and RCN expected to use the depth charge in the Pacific campaign; for though the RCN had adopted hedgehog, it had good reasons for maintaining the older technology. First, ahead-thrown weapons had not yet been installed in all of the RCN's ships, and in fact they never were. Since the beginning of the conflict NSHQ had given priority to keeping vessels on operations; refits and even training had waited their turn. Second, the depth charge was still tactically useful, ready for almost immediate launch for a quick counter-attack to force a submarine to take evasive action and perhaps lose contact with the convoy. Therefore, for the Pacific campaign it was the "Admiralty's" intention to supply Depth Charge pistols in hermetically sealed tins to prevent deleterious effects in tropical temperatures." Furthermore, the Mark X depth charge, which could be deployed from a destroyer escort's torpedo tubes, was considered sufficiently useful for the Admiralty to withdraw torpedoes from such ships to increase the number of the Mark Xs they could carry.³⁶ Depth charge technology would not be completely superceded until after the war was over.

Having had a look, in very general terms, at the challenges of depth charge manufacture and delivery, to understand the complexities involved in such endeavours it may be useful to examine the manufacture of the major components. Some do not seem to have caused serious difficulties; for example, the mechanism that threw the depth charge over the side of a ship was, appropriately, called the thrower, and the depth charge itself was attached to the thrower by means of a just-as-appropriately named "carrier." By October 1940 production of this latter item had settled into a routine, five hundred being built by Gauthier and Julien of Portneuf Station, Quebec, and sent to Halifax at a rate of one hundred per month. "Admiralty specification has been amended to cheapen manufacture and save time," but there is no evidence that this proved a problem.³⁷ In February 1942 the firm, having completed its contract, approached the navy to ask if there would be any further orders, but none were expected for the time being.³⁸ Thus some demands could be filled without any hair pulling on the part of the Department of Munitions and Supply, the navy, or the company involved.

That was not, of course, always the case, and the carriers built by Gauthier and Julien may have been a very rare exception to the general rule that something always went wrong

³⁴ Capt R. W. Wood, Dir Naval Ord, to Secy DMS, 2 December 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

³⁵ As Secy to DG Naval Arm and Eqt to Capt R. W. Wood, 19 December 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

³⁶ Naval Staff Minutes, 273-12, 15 January 1945, 279-4, 26 February 1945, DHH, 81/520/1000-100/3.

³⁷ Cdr R. W. Wood, Dir Naval Ordnance, to Inspector of Naval Ordnance H M C Dockyard, 10 October 1940, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-28.

³⁸ Assistant to Director General Naval Armament and Eqt to Capt R. W. Wood, Dir of Naval Ord, Torpedoes, and Mines, 8 February 1943; Wood to Wm Cunningham, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-28.

when a firm began exploring new manufacturing territory. For example, Lieutenant L.S. Rolland, the Inspector of Naval Ordnance, related in February 1942 that some depth charge throwers built by the Canadian Locomotive Company were failing, not during inspection, which might not be so serious, but while in use. On HMC Ships *Georgian* and *Lunenburg*, "Up to the present time five in number have broken under normal service conditions. On visual examination of these bolts the brass was found to be crystalized with irregularities."³⁹ Investigation found that the problem was not with materials, but with how they had been assembled during manufacture or reassembled during maintenance. Thus "the cause of fracture was the use of excessive force during original assembly, or at some subsequent time, when screwing up the nuts of these bolts."⁴⁰ The simple solution was to "ease off."

On other occasions the navy dealt with solutions in search of problems rather than the other way around, such as helping in the disposal of cartridge cases. The Bridgeport Brass Company had ten thousand such items in storage which had, for a variety of reasons, been rejected for use in making artillery shells. The majority of them, however, might serve as the "Depth Charge Thrower [Impulse] Cartridge Cases" that held the explosives that fired the weapon away from the ship. As a BATM staff officer related, "It is thought this information may be of interest to you in case any further orders of Cartridges for Depth Charge Throwers are contemplated. In the case of the orders now in hand, the Department of Munitions and Supply was able to purchase these empty Cases at **\$95.00** per thousand."⁴¹ Captain Wood arranged for the purchase of five thousand of them.⁴²

Peripheral devices such as carriers and cartridge cases were thus proving to be reasonably straight forward, but with regard to the thrower itself, the RCN and the Department of Munitions and Supply were on two learning curves simultaneously. Not only was the demand for the device increasing year by year, but the technology itself was undergoing continuous development. In October 1942, for example, the Naval Staff learned of the Mark IV thrower that retained the carrier when the depth charge was fired, as distinct from previous versions which expended it. The staff approved acquiring the new device for RCN ships.⁴³ The next in line of development was the Mark V, which can serve as an example of how Canada's procurement system dealt with that part of the weapon, it being developed after procedures were firmly in place. In January 1944 a minute by the Secretary of the Naval Board (which included the Deputy Minister among its membership) advised that "A new light type Thrower is now under construction in the United Kingdom ... which weighs approximately **50%** less than the present Mark rV Thrower. It is Admiralty's intention to fit

³⁹ Lt L. S. Rolland, Inspector of Naval Ord, to Dir Naval Ord, 14 February 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-70.

⁴⁰ R. W. Wood, DNO, to Secy Naval Board, 5 March 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-70.

⁴¹ BATM to Dir of Naval Ord, Torps and Mines, 13 April 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-32.

⁴² R. W. Wood, DNOTM, to Secy BATM, 1 May 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-32.

⁴³ Naval Staff Minutes, 123-11, 1 October 1942, DHH, 81/520/1000-100/3.

all ships except those used for Harbour Defence with the new Thrower when it becomes available."⁴⁴

At its 219th meeting, the Naval Staff recommended to the Naval Board that the Mark V be installed in all RCN anti-submarine escorts with conditions to be described below.⁴⁵ There was thus a continuing impetus to improve the thrower. The Naval Board, on one of the rare occasions when it considered purely technical matters, broached the subject in January 1944. Mistakenly referring to the Mark V as the Mark VI, it recommended that the RCN continue to fit the Mark IV until its successor became available. The Naval Staff related that corvettes were still armed with the Mark II! "It was noted that Naval Staff has given direction that the situation regarding the supply, fitting and positioning of all types of throwers be kept under constant review and brought to the attention of Naval Staff, as conditions warrant." The Naval Board concurred.⁴⁶

Months later, in June, the situation was still one of watch-and-wait rather than decisiveness, and Captain Wood had to warn that "The preliminaries to ordering are well advanced and any further action will have to be taken very slowly to avoid committing the Naval Service to something which Board may change or throw out."⁴⁷ It was only three days later that the necessary approval was given, so that "Drawings are main concern now," while "Sea trials up to that date [25 May] showed up many snags, therefore assume there will be some delay yet."⁴⁸ Events, however, succeeded one another quickly and the weapon was cleared for use before the end of June, with mass production for the Royal Navy to begin in November. According to the Canadian Naval Mission Overseas, based in London, British "Production can also begin for RCN if the 400 you wanted are ordered immediately. Cost is slightly less than Mk IV."⁴⁹ NSHQ had different plans, however, replying that "Attempt being made to arrange Canadian manufacture to commence before November, final decision dependent on receipt of complete manufacturing drawings. When these are received first deliveries and rate of production can be determined at which time further advice will be forwarded."⁵⁰

The agent responsible for investigating the possibility of manufacturing the new depth charge thrower in Canada was William Cunningham of the Department of Munitions and Supply. He approached Manitoba Bridge and Iron Works, in Winnipeg, and reported that

This firm appears to be very well suited to manufacture this type of Thrower in all details. As far as can be determined, no major sub-contracting

⁴⁴ Secy Naval Board Minute, 11 January 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁴⁵ *Ibid.*

⁴⁶ Naval Board Minutes, 144-11, 11 January 1944, DHH, 81/520/1000-100/2.

⁴⁷ R. W. Wood to Sec NB, 13 June 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁴⁸ A/LCdr G. Shilston, D Torpedoes and Mining, to DNO, 21 June 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁴⁹ CNMO to NSHQ, nd, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁵⁰ NSHQ to CNMO, nd, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

will be necessary...

Receipt of drawings and specifications being indefinite the only tentative estimate that can now be given is the commencement of production in from 3 to 4 months after they are received...

It must be admitted that the drawings and specifications when finally received, may well be such as to alter the above. Manitoba Bridge now have considerable stocks of steel, and if their stocks will meet specifications, some improvement may be expected on the 3-4 month period.⁵¹

The firm's expected production was one hundred per month, but the exact demand for the Mark V was still being determined. In September 1944 the Director of Warfare and Training recommended "That approval to replace Mark IV Throwers with Mark V Throwers in all RCN ships be withdrawn, but that consideration be given to providing sufficient Mark V Throwers to fit RCN ships and training establishments which will be retained in the Post-War Navy."⁵² With armies advancing across Europe, it might not be worthwhile removing ships from operations to install new equipment, and the Naval Staff decided to do so only in vessels destined for the war in the Pacific.

Other events also intervened. Not only did drawings become something of a bottleneck but as the war seemed to be nearing its end the naval service had to decide what it needed for the current effort and what it hoped to acquire and retain for the post-war fleet. When in October 1944 a staff officer in the Directorate of Torpedoes and Mines reported that "We are now commencing production of the last Mk IVs and a further order for Mk IVs will have to be placed if the Mk V is not proceeded with," and that "This order will have to be given as soon as possible to enable the manufacturer to obtain the necessary raw materials,"⁵³ the reply was very much in keeping with the state of the war effort: "the matter has again been referred to Staff with the recommendation that Mark Vs be not exchanged [sic] for Mark IVs in ships of the Post War Navy."⁵⁴ The main issue seemed to be one of availability, Mark Vs not yet having been produced for trials, though the development of ahead-thrown weapons like hedgehog and squid may have reduced the priority of depth charge throwers for new-construction vessels.

Depth charges were manufactured through the entire course of the war. The surviving documentary records suggest the depth charge casings (or bodies) were more straightforward to make than throwers, though the contracting process was the same as for other war purchases. For example, Western Steel Products of Winnipeg received notice in November

⁵¹ A/Cdr G. M. Luther, D Armament Supply, to DNO, 27 June 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁵² Naval Staff Minutes, 257-17, 25 September 1944, DHH, 81/520/1000-100/3.

⁵³ ASO(T) to DTM, 10 October 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

⁵⁴ A/LCdr G. Shilston, D Torps and Mining, to DAS for ASO(T), 13 October 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-73.

1942 that the Canadian government "shall require a supply of 2,500 Depth Charges, Mk VII, bodies, empty, and this letter is to advise you that it is our intention to place an order with you for these supplies... You are authorized to cover immediately for the raw material required for the manufacture of the supplies covered herein." Such notification was to allow the manufacturer to begin work while the details of the contract were still being determined, and when it came time to actually sign a document, it would stipulate certain conditions, such as "Manufacture - to be strictly in accordance with the drawings and specifications which are already in your possession covering similar stores you are now producing... Inspection - to be arranged by and to be to the satisfaction of the Inspector of Naval Ordnance, British Admiralty Technical Mission, Ottawa, to whom any enquiries in this connection should be addressed."⁵⁵

Arrangements to fill the casings with explosive were somewhat more elaborate, and the first order of business was to determine what type of material to use, each requiring its own particular procedures and equipment for safety and efficient handling. Possibilities included TNT, RDX, and Torpex; in late 1942 both the RCAF and BATM preferred the latter for some of their weapons. Lieutenant-Colonel G. Ogilvie, the Director of Ammunition Filling, wanted to know what the RCN preferred. "My reason for asking this is in order that timely steps may be taken to create facilities at the filling plant. We could aim at January production if action can be taken now."⁵⁶ Captain Wood estimated the amount of Torpex required for depth charges to the end of March 1943 to be one hundred and eighty tons.⁵⁷

When in early 1943 the Admiralty adopted the depth charge Mark VII, which was filled with the even more powerful Minol, Canada's naval service had to determine if substitutes were acceptable, "As Minol filling is not undertaken in Canada." If Torpex could be used instead, "Arrangements can be made to fill a small quantity at an early date with increased numbers later as production line is augmented. If satisfactory confirm and supply by bomber mail drawings and specifications governing the filling of Mark VII DCs with Torpex."⁵⁸ The Admiralty's reply provides an example of just how different one explosive could be from another when it came to integrating it within a manufacturing process. "Admiralty policy is that all destroyers and frigates be equipped with Minol Depth-Charges," and though no Mark VIIIs were being filled with Torpex in the UK, trials towards that end were being carried out. "No drawing and specifications available at present. Minol can be mixed in any Amatol plant," but it was uncertain whether one of the latter could be used to fill depth charges with Torpex.⁵⁹

⁵⁵ DM to Western Steel Products, Winnipeg, November 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

⁵⁶ LCol Ogilvie, D Ammo Filling, to Wm Cunningham, 12 September 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

⁵⁷ Capt R. W. Wood, DNOTM, to Cunningham, 28 September 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

⁵⁸ NSHQ to Adty, 15 March 1943, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

⁵⁹ Adty to NSHQ, 12 April 1943, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

Obviously, such research took longer than the RCN had anticipated, and NSHQ warned the BATM in June that since "filling plant having ceased manufacture of Amatol" and since current capacity was being used "for filling with TNT and Torpex therefore the delay in filling Depth Charges Mark VII with Minol will be at least six months." It therefore asked if "trials [had] been completed on Depth Charge Mark VII filled Torpex. If so can depth settings and speed restrictions for dropping be given as filling with Torpex in Canada could be immediately undertaken. BATM can make up filling drawings. Urgently request an early reply."⁶⁰ It was up to the Senior Canadian Naval Officer in London to respond, though not until October, that the British Chief Superintendent of Armament Research had "confirmed that plant for melt amatol filling is suitable for use with minol," but since "torpex contains about 40 per cent of RDX, which is more sensitive than TNT, special consideration must be given to the design of plant operating with it." He sent along the necessary drawings.⁶¹

Like so much else, demand for explosives expanded continually for most of the war. But that did not necessarily mean that government and industry were willing to invest in new facilities in order to maintain supply, especially when it became clear the conflict was near its end. In October 1944 the Department of Munitions and Supply's William Cunningham explained to Captain R. W. Wood that though depth charge production for the following three months had been determined by the demands of both the RCN and RN, other weapons also required explosives, so it looked as if the availability for depth charges would only allow two thousand five hundred a month. But "According to figures received from you, you will require 4,000 ... during the months of February and March, 1945. In order to provide these quantities it will be necessary to install further equipment which it is estimated would cost \$75,000. The department's policy is that such expansion should not take place at this time."⁶² That last phrase would become a refrain heard often in the last six months of the European war.

The primer set off the explosives in a depth charge. It was an explosive device in its own right, and like so many other wartime items its production exemplified the imperfections that can creep into a system being developed for the first time. A rather dramatic example was offered in October 1943 when the Captain (Destroyers) at Halifax signalled the Commander-in-Chief Canadian North-West Atlantic to advise that depth charge primers were mning short and "as these are urgently required request supply may be expedited." A week before the Commodore Superintendent of Halifax Dockyard had requested the supply of primers be hastened, and NSHQ had replied that seven hundred were being shipped from Cherrier, Québec. "This is a most unsatisfactory situation especially in view of the fact that the Naval Armament Depot, during the period prior to exhaustion of this item, was called upon only to supply primers for normal expenditures and new construction. It would have been disastrous had large scale submarine activity developed within this command when stocks of primers

⁶⁰ NSHQ to Adty R BATM, 25 June 1943, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

⁶¹ SCNO(L) to Secy NB, 2 November 1943, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-180.

⁶² Wm Cunningham, As to DG Naval Arm and Eq, to Capt R. W. Wood, Dir Naval Ord, 5 October 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

were at such a low ebb in Royal Canadian Naval Armament Depot... I consider it most essential that sufficient stocks should be maintained at the Armament Depot at all times to not only supply normal commitments but also in order to meet extraordinarily large demands which may arise unexpectedly."⁶³

Perhaps the most disturbing defect to come to light, from the point of view of the user, was that some of the primers were being delivered empty of explosives. Commander H.F. Pullen, Superintendent of the Naval Armaments Depot at Halifax, explained how the discovery "occurred during a 100% examination of all Canadian made DC Primers, ordered to be carried out as the result of certain other defects discovered in these Primers." Other problems coming to light included loose parts - or parts missing entirely, so that "To date, a total of 3,340 Primers, DC Mk VII have been examined, and the process continues. Owing to the above mentioned state of affairs, it appears probable that a continuous examination will be necessary... It should be possible for ships to check their Primers by weighing, in order to discover any unfilled ones," there being a difference of one and a half pounds between them. "It is considered that this state of affairs may well be responsible for the failure of many Depth Charges and it would be of interest to know the source of manufacture of the Primers used. In any event a situation such as this should not be possible, especially in war time. The failure to fill primers, or to allow them to pass as serviceable, denotes criminal negligence on the part of the persons concerned. I consider this to be a most grave and serious situation, as it can well destroy confidence in Canadian made weapons of war. It is requested this matter be referred to the authorities concerned."⁶⁴ It was.

Investigations unearthed similar problems at Esquimalt; they also revealed, according to the Inspector of Naval Ordnance (INO) that

These Primers concerned were filled at the Defence Industries Plant at Bouchard PQ. From the Company's records they were filled at a time when it was necessary to employ staff who were not experienced in this particular work. Unfortunately the INO's examiner was also inexperienced but this does not excuse his lapse.

The necessary steps have been taken by the Filling Contractor to reorganize the staff employed on this work with a view to prevent a recurrence of this unsatisfactory work.

The INO has taken necessary disciplinary action with his staff.

It may be remarked that the Directing Staff of Defence Industries Limited have been most co-operative in this investigation and it is considered that the steps that have been taken should prevent a repetition of this gross

⁶³ C-in-CCNA to Secy NB, 30 October 1943, DHH, 80/218, Folder 2.

⁶⁴ Cdr H.F. Pullen, Super Naval Arm Depot Halifax, to DNO, 8 August 1942, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

carelessness.⁶⁵

The whole process had taken less than a month.

It had, however, to be repeated two years later, when the Flag Officer Newfoundland Force revealed that five primers, Mark VII's once again, were found to have no filling nor markings. "Lot number cannot be established as these had been fitted to depth charges and it is not known from which box they were removed."⁶⁶ There were no inspector's marks on the boxes mentioned,⁶⁷ so NSHQ was forced to recommend the time-consuming expedient of having ships check all their primers by weighing them.⁶⁸ Some two months later, the INO reported that the Inspecting Officer for Montreal had investigated the filling plant and found that "the inclusion of empty primers was purely accidental due to inadequacy of space allocation for the work of filling and the possibility that after some interruption of the work empty primers inadvertently were passed on as filled... The layout has now been changed and assurance is given that filling has been resumed and the improved arrangements are working satisfactorily."⁶⁹

In the case of depth charge primers it is difficult to avoid the conclusion that Canadian manufacturers lacked the tools or the knowledge, or both, to carry out the kind of precise work necessary to the task. As late as April 1945, with war's end in Europe only a few weeks away, another defect was discovered and reported by the Superintendent of the Naval Armaments Depot at Dartmouth, Commander N.J. Magnusson. In accordance with instructions arising out of previous incidents, all Mark VII primers were passed through a laboratory for examination, including gauging to ensure they and their components had been manufactured to specified tolerances. "The boxes and individual primers as received direct from Cherrier Filling Plant all bear the stencil "Gauged" and the date. On gauging diameter it was found that approximately 95% of all primers failed... It is suggested that the gauging operation as carried out at new manufacture is being done prior to the assembling of the components... As the result of failure to gauge, the primer has to be broken down [and protruding lugs] ground down to enable it to pass the gauge correctly. This introduces a great deal of lost time and slows down an otherwise rapid operation."⁷⁰ Once again, one of the basic precepts of mass production, that the user should not have to make any adjustments before final fitting, could not be met.

⁶⁵ Insp of Naval Ord BATM to DNOTM, 4 September 1942, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

⁶⁶ FONF to NSHQ, 6 September 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

⁶⁷ A/Cdr L.W. Rolland, Chief Insp Naval Ord, to Insp Naval Ord BATM, 12 September 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

⁶⁸ NSHQ to Distribution, 22 September 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

⁶⁹ Insp Naval Ord BATM to Chief Insp Naval Ord Ottawa, 13 November 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

⁷⁰ Cdr N.J. Magnusson, Super Naval Arm Depot Dartmouth, to DNO, 23 April 1945, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-140.

Though resolved quickly, such incidents could not have filled the naval service with confidence, and if the client was a RN officer he might approach the B A T M to help expedite matters. Such seems to have been the situation when A. J. Atkins of the British Admiralty Delegation in Washington contacted Rear-Admiral (Engineer) E.J. O'B. Croker of the B A T M "regarding delay in supplies of Depth Charge Stores from Canada." Moving quickly, "immediate contact was made with the RCN Officers concerned and the seriousness of the present position was heavily stressed." The RCN stated that seven hundred primers were available at the filling plant at Cherrier and were "arranging for the earliest possible despatch of these." Croker had, however, to point out "that the responsibility for issue of Depth Charge Stores to meet Western Hemisphere requirements is the responsibility of Canada and that BATM can not exercise control over such issues. Nevertheless we shall be pleased to assist in any way we can and in this connection it would be very helpful if a statement of any outstanding requirements and further demands could be sent to BATM."⁷¹

Supply deficiencies continued for some months nonetheless. In a meeting held in February 1944 it was suggested that "the stock of Primers is not at all that might be desired and there was some discussion regarding the production of Primers." A Mr Anderson, representing one of the departments concerned,

stated that it would not help to reduce Pistol output as this would not release any machines which could help in the Primer production. He stated that his main trouble was lack of orders and the consequent trouble with material supply, and at the end of January his outstanding orders for Primers Mk VII amounted to 4,450 only though the monthly requirement was 5,000 or a little more...

This led to considerable discussion in the course of which Mr Anderson made it plain that the only way he could keep going was to anticipate orders on the strength of verbal statements or else to rely on advance instructions issued by DMS in anticipation of Contract Demand. Mr Manson [of DMS] agreed that this was the case and said that Contract Demands must be lodged considerably further ahead of requirements if a hold-up was to be avoided as he is not permitted to issue any instructions to the Contractor until the Contract Demand is actually received. In fact Mr Anderson explained that though he was informed of further orders coming he had no Contract against which to place his sub-orders and the only way he could meet the present demand for Naval Services was to rob material from an Air Force Order for Mark VIII Primers for which the delivery requirement was not so urgent. By doing this he hoped to deliver 6,500 Primers Mark VII in February which would materially help the stock position and would enable the backlog of

⁷¹ R/Adm (E) E.J. O'B Croker, BATM, to A.J. Atkins, DASW BAD, 25 January 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

supply to B A D [British Admiralty Delegation in Washington] to be cleared up in the near future...

It was obvious, however, that the position could not be regarded as satisfactory and that the risk of a hold-up would remain unless further orders were forthcoming at an early date.⁷²

Thus the problem lay not with manufacturers' inability to meet demand, they having been up and running for some time, but with the Department of Munitions and Supply's inability, first, to predict demand and, second, turn that prediction into written contracts.

Then there were problems with delivery parallel to those of depth charges more generally. In late October 1944 an unnamed staff officer reported that he had received an urgent demand from Dartmouth, Nova Scotia, for Mark VII primers. Enquiries revealed that, according to the paperwork at Munitions and Supply, all outstanding orders had been filled. On his own books, however, the anonymous staff officer had a deficiency of no less than seven thousand primers, so he sent his clerk over to the Department of Munitions and Supply "to personally make a comparison of the records."

It was agreed that we still required approximately 7,000 Primers delivered to complete. Numerous telephone enquiries have resulted in my being told that over 4,000 were at Cherrier unfilled, then that there were none, then that they were located again and once more that that was an error and that the 4,000 mentioned were Mark VII No II.

On Wednesday I was informed ... that investigation showed 5,210 Primers Mark VII No 2 ready for shipment and 2,000 ready in a few days. On Thursday he informed me that 1,500 would be shipped to Dartmouth as soon as filled...

I phoned again today for the latest information and I am informed that over 4,000 Mark VII's unfilled are at Cherrier and that 1,500 are being filled and shipped. Remainder following about 4th November...

This state of affairs has been going on for some weeks and it has not been reported to a higher authority mainly because the difficulties were always on the point of being cleared up.

When Dartmouth or Quebec called or signalled regarding non delivery, I would get in touch with M and S [Munitions and Supply] and every thing would be straightened out and I would be assured that the matter was in hand and delivery would be made. Then I would inform our depots of this and instruct them to report receipt. No report of receipt being forthcoming, but instead, a request for hastening action, I would again contact M and S and

⁷² Meeting Held in Mr Anderson's Office, Dept of Tpt, 22 February 1944, N A C , RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

would be told all the reasons why delivery had not been made but that now aft was in order and delivery would be made. Again I would inform Dartmouth and Quebec, and again the foregoing would be repeated.⁷³

At the time of writing his report, fifteen hundred primers were being shipped to Dartmouth with another two thousand five hundred to follow a week later.

As with the primer, so for the pistol, which also had to be manufactured to very fine tolerances. In March 1943, Rear-Admiral (Engineer) E.J. O'B Croker complained to the Admiralty that a Canadian sub-contractor had misinterpreted a drawing and machined a groove in the wrong place. The error allowed movement such that the striker, a spring-loaded device that started the whole process of detonation going, would hit the edge of a disc instead of passing through a hole in it, making the pistol a "dud." The defect could be corrected by inserting a brass strip in the groove, and those that had been modified in this manner had the letter " C " prefixed to their serial numbers.⁷⁴

Quantity, at least for a while, was also a difficulty because of the inability to predict demand accurately. At a 22 December 1943 meeting a Mister Anderson reported that total expected pistol output for that month was six thousand split evenly between the RN and RCN. He predicted production of six thousand five hundred to seven thousand in January, six thousand five hundred in February, and seven thousand in March. Therein lay a problem. Commander (Engineer) A.G. Clarke of the BATM pointed out that such numbers meant UK requirements would not be met. Two RCN representatives, a Lieutenant Scriver and a Mister Ashbee,

stated that the Western Hemisphere requirements had developed considerably in excess of estimates with the result they they now have to supply approximately 1,000 Pistols per month more than originally allowed for. This is principally due to increased demands received from B A D [British Admiralty Delegation in Washington] and outlying bases (e.g. Bermuda). The above commitments together with the present state of stock makes it quite impossible for them to accept any reduction in the quantity allocated to them...

Information at present available is not sufficiently reliable to attempt any forecast beyond March 1944 and in fact the Western Hemisphere requirements for that month are to some extent guess work.⁷⁵

⁷³ ASO (T) to DNO, 27 October 1944, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-50.

⁷⁴ R/Adm (E) E.J. O'B. Croker, BATM, to Dir Arm Supply Adm, 5 March 1943, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-130.

⁷⁵ Meeting Held in Mr Anderson's Office, Dept of Transport, 22 December 1943, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-1.

Attacks against escorts began in September 1943 and intercepted messages from U-boat headquarters indicated a possible escalation in the war against convoys, but divisions of responsibility were clear, and though the Admiralty had cabled a need for further supplies of pistol Mark LXs, the meeting recommended they be advised "That the increase in Western Hemisphere requirements was such that the number of Pistols available for export to UK would have to be reduced."⁷⁶

Trying to predict needs that were determined in large part by the activities of an enemy who worked to dissimulate his intentions was difficult, to say the least, and little more than a year later the situation reversed itself. Commander Clarke reported:

As a result of decreased demands for New Construction and various other factors there has recently been a considerable improvement in the RCN stock of Pistols Depth Charge. The present position is such that future manufacture will have to be reduced considerably [and maintained just enough] to keep the capacity alive, and instructions are, therefore being issued to the contractor to cease delivery on RCN orders until the existing UK orders are completed in May after which delivery to the Canadian Pool is to be at a rate of 1500 per month only...

In consequence of the forgoing [sic] the Canadian Authorities are anxious to know if further orders are likely to be required for delivery to UK and it would, therefore, be greatly appreciated if an indication of future UK policy could be stated now. DMS and RCN would both be grateful for any orders which it may be practicable to place for Depth Charge Pistols either Mark VII** or FX*** [the addition of stars denoted different versions within a same mark] which would help to keep the existing capacity alive. It is of course appreciated by the Canadian Authorities concerned that any such policy is liable to change at fairly short notice if the changing war situation should so demand.⁷⁷

That is to say, should the war in Europe come to a quick end.

On the other hand, it might go on for some time, and with German U-boats adopting new technologies and developing new tactics until the very last days of the conflict the Allies had to keep apace. New submarines with a much deeper diving capability forced development of new pistols designed to sink deeper and still set off depth charges with reasonable accuracy. They were assigned the Marks XXII and XXIII. As a preliminary to manufacturing them in Canada, "these pistols were stripped down at the plant and from information gained by a critical examination of the components, numerous queries which had been raised with respect

⁷⁶ *Ibid.*

⁷⁷ Cdr (E) A. G. Clarke, B A T M, to D Arm Sup, England, 7 February 1945, N A C, RG 24, Acc 83-84/167, Box 2082, NSS 5320-130.

to manufacture were cleared up... Sub contractors are experiencing difficulty with the manufacture of certain springs... Up to the present date, springs produced have not been satisfactory. However, with samples which are now available as a guide ... it is expected that suitable springs will be made."⁷⁸ So wrote Lieutenant T. K. L. Rowe in early April 1945. He also noted that six shop models would be ready in about a week, with the first coming off production lines in early May, "ready for acceptance by Inspector of Naval Ordnance B A T M" before being sent to NSHQ for examination. The delay in placing a contract for gauges held up production of large numbers of the new pistols, but Germany surrendered before the problem became a serious issue.⁷⁹

In fact, there was nothing "simple" about the depth charge, though with regard to antisubmarine weapons it was the one with which the R C N would be most familiar throughout the war. Dealing with the many intricacies involved in manufacturing even the simplest naval weapon was an ongoing process when the European conflict came to an end. With a minimal demand for armaments in peacetime, Canada had, in effect, to create an industry from scratch in the midst of war, and there lay the main challenge. When manufacturing consumer goods, such as automobiles, problems can be worked out over a period of months or years, but such was not the case with weapons required immediately for battle. With U-boats sinking merchant vessels faster than the Allies could build them, weapons such as depth charges were needed quickly, in large numbers, and capable of performing their allotted task. If in war even the simplest thing is difficult, perhaps it is because of this multiple challenge of quantity, quality, and timely delivery.

⁷⁸ Lt(t)(g) T. K. L. Rowe, Inspector Torpedoes and Mines, to DNO, 6 April 1945, NAC, RG 24, Acc 83-84/167, Box 2082, NSS 5320-130.

⁷⁹ *Ibid.*