

## CHAPTER II. FIRST PRODUCTION OF THE PLASTIC LINERS

Chicago Depot Takes over Liner Procurement---The Chicago Quartermaster Depot took over the procurement of the helmet liner in February 1942. For a short period the Philadelphia Quartermaster Depot was designated by the Office of The Quartermaster General as the procuring depot, and had let the initial Quartermaster contract of December 15, 1941, for the Hawley fiber liners to the McCord Radiator Company.<sup>1</sup> This contract appears on the Chicago Depot records, however, as one carried through to completion by the Chicago Depot.<sup>2</sup> With the letting of the second contract March 2, 1942, for 1,000,000 liners, procurement and production were really under way. No unusual problems stood in the way of production of the fiber liner, since it was a comparatively close adaptation of the tropical helmet.<sup>3</sup> Securing additional equipment and priorities on critical materials<sup>4</sup> were main difficulties.

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<sup>1</sup>Contract No. W669 qm-14488, 250,000 liners at \$1.545 each.

<sup>2</sup>The reason for transferring the helmet liner procurement charge from Philadelphia to Chicago could not be precisely ascertained either from records in the Chicago Depot or in the Historical Section of the Office of The Quartermaster General. One theory was expressed that the assignment of the item to Philadelphia in the first place was made because the liner was considered primarily a textile item, with the light webbing suspension a main feature. Since Ordnance was purchasing the steel helmets through the Detroit Ordnance office, however, and since the liner was more or less in a fluid design state and needed extensive coordination with the steel helmet, it was decided to transfer the item to the Chicago Depot, closer to Detroit. (Telephone conversation: W. S. Gaylord, Plastics Section, Res. & Dev. Br., OQMG---T. M. Pitkin, Hist. Sect., OQMG, Feb. 8, 1944.)

<sup>3</sup>Special adaptation was necessary on the liners procured for parachute troops. Briefly, these were an extra chinstrap attachment for fastening the liner to the steel helmet, so that if the wearer happened to assume an upside down position, he would not lose his steel hat; and a chamois-covered chincup on the liner strap itself. For a more extended discussion, see p. 93.

<sup>4</sup>See pp. 28-30.

Work toward getting the plastic liner into production, however, had barely begun. The Chicago Quartermaster Depot faced the unusual and challenging experience of helping industry roll off the assembly line a totally new product. Not only were specifications for the new type of liner little beyond the "tentative" stage, but properties and conditions of one of the basic materials used in manufacture---the phenolic resin---were not very widely understood. Technical difficulties in manufacture therefore could be expected. In addition, the usual hindrances incident to securing individual production on a new item. The fact that procurement of the liner had the capability to be pushed rapidly provided an additional excitement of Colonel Grice, the chief of the Standardization Branch, O.Q.M.G. The Quartermaster General, had suggested back in November 1941 when using a plastic liner was adopted, substantial production could be operational within three months and heavy production well within capabilities, although the action appears to have been slightly over-optimistic. Although first production of the plastic liner was reported by the Chicago Quartermaster Depot late in May 1942, the emergence of many unforeseen problems delayed getting into full production until the late fall of 1942. Some of the problems were in connection with the tooling up of the industry; some were due to the slowness of certain firms to realize the technical skill involved in making the liner; other difficulties resulted from the fact that lines of authority of the Office of The Quartermaster General and the procuring depot were not always clearly defined, or where they were,

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<sup>5</sup>Memorandum of Colonel Grice to Chief, Supply Division, O.Q.M.G., Nov. 12, 1941: Plastic Liner for New Steel Helmet M-1.

it was not easy to adhere to them because of other factors in the situation.

Principal requirements to manufacture of the new liner were six: steel molds; impregnated cloth; hydraulic presses for plasticizing or molding the liners; paint; suspensions, which involved certain items of hardware; and assembly of the finished liners.

The Standardization Branch of the Office of The Quartermaster General had warned that it would take time to secure the steel molds, 60 to 80 of which would be needed for first production. To insure quality and absolute uniformity in the molds, it was considered essential by this branch that all molds be procured through one prime contractor.<sup>6</sup> No unusual problem was anticipated in the production of the plastic resin-impregnated cloth. The Standardization Branch advised that this cloth be procured from one firm to insure maximum quality and uniformity in quality; and that the material then be supplied to the various molding contractors---advice which also was not followed.<sup>7</sup> The hydraulic presses to be used in forming and shaping liners were considered to be available in sufficient number, since such presses, used for stamping out refrigerator parts, washing machine and automobile parts in peacetime, now were standing idle. No particular difficulties were anticipated in connection with the paint covering or the suspensions.<sup>8</sup> Nor were any unusual problems foreseen

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<sup>6</sup>As it turned out, each helmet liner contracting firm was permitted to have its own molds made, principally to expedite mold manufacture. Since no type of mold was specified by the QMC, and one firm preferred to have solid steel casting, while another wanted porous or iron castings, this made it possible for each to satisfy its desire. Interview with Major Pratt.

<sup>7</sup>One manufacturer could not turn out the needed yardage fast enough. In addition, some manufacturers found that 8 ounce duck would work better in their molds, while others used 12 to 10 ounce duck; still another had a special duck made up to fit special molds he had made.

<sup>8</sup>This view also was over-optimistic, as may be seen in Chapter IV.

in the assembly and packaging of the liners.<sup>9</sup>

Specifications in Transition---Specifications for the plastic helmet liner were in so transitional a state when the Chicago Quartermaster Depot took on the helmet liner procurement assignment that it was nearly six months from the time the change-over from the fiber liner had been approved before anything but temporary specifications were made available.<sup>10</sup> Such a situation did not make the first days of procuring the item any easier. The first specifications issued by the Office of The Quartermaster General in February 1942,<sup>11</sup> particularized the material for the plastic liner body---laminated phenolic resin-impregnated fabric--- and described to a certain extent the standards for materials and workmanship of the component parts, although contracts carried the statement that variance in some respects was permitted if it would facilitate delivery.<sup>12</sup> Another variance in specifications, one made necessary by material shortages was the substitution of cadmium or zinc-coated steel for aluminum and brass used in the hardware for the liner.<sup>13</sup>

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<sup>9</sup>Colonel Grice to Chief, Supply Division, OQMG, Nov. 12, 1941: Plastic Liner for New Steel Helmet M-1.

<sup>10</sup>On the fiber liner the specifications written by the Ordnance Department (Spec. AXS-664, "Helmet, Lining Assembly for Helmet, M1") apparently served the Quartermaster Corps without revision through the six procurements effected by the Chicago Depot before manufacture was discontinued, despite the fact that Ordnance had turned over the specifications and explanatory tracings with the thought that they should serve merely as a basis for the Quartermaster Corps in preparing its own. Chief of Ordnance to OQMG, QM 421 S-CE, 1st Memo Ind., Nov. 6, 1941.

<sup>11</sup>OQMG No. 42, issued Feb. 13, 1942.

<sup>12</sup>The statement indicated that if any manufacturer was in a position to complete and deliver liners before July 15, 1942, permission would be granted upon request to vary the weight of the webbing and the location of the suspension until new specifications were completed.

<sup>13</sup>This notice was carried as Addendum No. 1 on all requests to bidders. Parts of the liner affected were the loop for the chin strap, rivet, socket, stud, and reinforcing washer in the backstrap.

Meantime, while contracts for the liner following "OQMG N. 42" were negotiated in early 1942, design details already were undergoing change as a result of suggestions made at the frequent conferences between manufacturers and the Standardization Branch of the Office of The Quartermaster General. Alterations in specifications made as design changes occurred became the responsibility of the Chicago Quartermaster Depot,<sup>14</sup> which in the course of the first year and a half of handling procurement of the item---February 1942 to August 1943---issued a total of eight specifications on the liner proper and its component parts.

Two disadvantages for the procuring depot attended this "flux-stage" of specifications. One was that although the specification revisions were to be taken care of at the Chicago Depot, final adoption of design changes rested with the Standardization Branch, which apparently more than once<sup>15</sup> was discouragingly slow in informing Chicago about its decision. Thus, on several occasions, when design changes on small but important details like the garter-stud for the chin strap fastener were ready but the specification had not yet been approved, the Chicago Depot, knowing fresh purchase by the sub-contractors on chin straps was imminent, was at a loss to give correct advice. The other disadvantage was that the Office of The Quartermaster General, as soon as a change in design had been approved by the Standardization Branch, was justifiably anxious to see it in production immediately; with the consequence that the Chicago Quartermaster Depot had to ascertain what part of the production

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<sup>14</sup>Telephone conversation, Major Florsheim, CQMD, Major Allesee, OQMG, May 28, 1942.

<sup>15</sup>Telephone conversations, Major Florsheim, CQMD, Major Allesee, OQMG, May 12, June 2, 1942.

on contracts already made could be shifted to the new design without upsetting the contractors' arrangements for component parts.<sup>16</sup>

First Contracts on the Plastic Liners—The four contractors with whom initial negotiations were made by the Chicago Quartermaster Depot for a total of 3,387,124 plastic liners were: the Inland Manufacturing Division of the General Motors Corporation, Dayton, Ohio; the Micarta Division of the Westinghouse Electric and Manufacturing Company, Trafford, Pennsylvania; the St. Clair Rubber Company, Marysville, Michigan; and the Mine Safety Appliances Company, Pittsburgh. The prices per unit, excluding headbands and neckbands, ranged from \$1.62 to \$2.35. In early April, the Depot threw open the bidding on 3,300,000 more liners, and received offers from 20 firms with net prices ranging from \$1.26 on 240,000 units, to \$2.27 on 200,000.<sup>17</sup> From this group of bidders, six more manufacturers were chosen to receive contracts.<sup>18</sup> They were selected mainly for their ability, so far as the Chicago Depot could

<sup>16</sup> When the old-style hammock and headband used in the fiber liner were changed to the new type (See Chapter V.), the Chicago Depot determined that of a total quantity of 4,334,000 liners purchased only 672,000 could be furnished with the new-type suspension because of definite commitments contractors had made to their suppliers. Colonel Elliott, CQMD, to Major Allesee, OQMG, 1st Ind., June 20, 1942.

<sup>17</sup> Colonel Elliott to Col. Wm. R. Buckley, OQMG, April 8, 1942. Although nearly 50 firms had been named as prospective bidders by the OQMG in a letter of March 1942, Colonel Elliott was of the opinion that the number of manufacturers chosen should be limited, in view of the fact that contracts for fewer than 600,000 to 1,000,000 liners would not enable the manufacturer to purchase the type of equipment necessary to do the job properly. As soon as ten or a dozen contractors were set up, moreover, said Colonel Elliott, they would be in a position to produce between one-half and three-quarters of a million liners a month. Twenty-two firms submitted bids for contracts on Procurement Directive No. 199-42-NEG-225-C&E.

<sup>18</sup> The method of procurement was by informal bid, negotiated contract, under authority of Para. 4 b, Circ. Let. No. 336, OQMG, 1941.

determine it, to go into production rapidly and to handle the item, rather than for the attractiveness of their bids. This course of action was followed on the suggestion of Colonel Elliott, who in forwarding the bid quotations to Washington, pointed out that since there were so many complications in the helmet liner picture, including the uncertainty and inconsistencies of specifications, it would be only practical to call in for conference those manufacturers believed to be most able, to explain the situation to them, and then set a ceiling price at which the various awards could be made.<sup>19</sup> Colonel Elliott also recommended in the same letter that manufacturers utilizing the high-pressure method of molding the helmet be contracted with, although the low-pressure molding required less expensive equipment. His reason was that the low-pressure method did not produce "as satisfactory an appearing article."<sup>20</sup> The awards, as made to this final group of six new contractors, went to four firms ready to do high-pressure molding, and to two, the Hood Rubber Company and the Seaman Paper Company, for low-pressure liners.<sup>21</sup> The new contractors chosen,

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<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> The Hood Company had devised a method of manufacturing the liner that was different from any others to date. (See Chapter III.) The Seaman Paper Company discarded the low-pressure method before beginning production.

their bids and unit prices paid, were as follows:<sup>22</sup>

<u>Contractor</u>	<u>Number</u>	<u>Price</u>	<u>Bid</u>
Capac Manufacturing Company, Capac, Michigan	600,000	\$1.53	\$1.65
Firestone Tire & Rubber Company, Akron, Ohio	750,000	1.35	1.35
Hickok Manufacturing Company, Inc., Watertown, Massachusetts	240,000	1.2602	1.2602
Hood Rubber Company, Inc., Watertown, Massachusetts	200,000	1.40	1.70
International Molded Plastics, Inc., Cleveland, Ohio	160,000	1.66	1.63
Seaman Paper Company, Chicago, Illinois (Molded Plastic Products)	400,000	1.50	1.82

Interestingly enough, the Hickok Company, which later asked to have its contract cancelled because costs of sub-contractors were running too high,<sup>23</sup> was the lowest bidder, with the Firestone company second to the lowest. Original bids of the other successful firms were from 4 to 32 cents higher than the unit prices at which their contracts finally were awarded. The maximum unit price "offered" by the Army in this second group of contracts was appreciably lower than the prices paid manufacturers in the first four contracts when experience at figuring costs on the new item was meager.<sup>24</sup>

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<sup>22</sup>For a list of all contracts to date of this writing, see Appendix I.

<sup>23</sup>The Hickok Company planned only to assemble the liner and supply the chin strap and suspension. See p. 38.

<sup>24</sup>The Inland Mfg. Co. at the close of 1941 had offered a unit price of \$2.349 on an order of 750,000 liners complete with headband and neckband, which took in the amortization cost of their molds; or \$2.106 if the Government paid for the molds. By February, this



Of the total 10 manufacturers with whom the Chicago Quartermaster Depot made the contracts for plastic helmet liner production, 5 had worked extensively with plastics during peacetime. They were the Capac Manufacturing Company, International Molded Plastics, the Micarta Department of the Westinghouse Electric & Manufacturing Company, the Seaman Paper Company and the Mine Safety Appliances Company.<sup>25</sup> The other firms had carried on manufacture of a variety of products ranging from automobile parts to rubber footwear.<sup>26</sup> It may be assumed that they all were definitely interested in securing the Quartermaster orders, whatever their past experience or the lack of it; for the aid several of these firms lent in the first troublesome days of liner development, and the earnest endeavor they displayed in getting their wheels rolling were noteworthy contributions to the

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company had reduced the offered price to \$1.744, with Government molds, on a 1,000,000 order; and by June 30, 1942, further to \$1.60. Inland to CQMD: Dec. 27, 1941; Jan. 16, Feb. 9, 1942.

<sup>25</sup> Mine Safety Appliances Co., manufacturers of industrial safety helmets, had for ten years or more been making a laminated fabric, phenol formaldehyde impregnated shell which they called the MSA Skullgard. Properties of the Skullgard---impact strength, light weight, semi-rigidity with some flexibility, imperviousness to water and weathering conditions, and permanent physical and chemical stability---were practically identical with those required in the Army helmet liner. After experimental moldings using the "Skullgard" formula had been improved by the Quartermaster General's office, the Company released all its helmet molding patents, royalty free, for the manufacture of Army helmet liners and went into production through supervised subcontracts. W. J. Sharbaugh, Military Products Department, Mine Safety Appliances Company, to Capt. Joseph H. Burkhart, Historical Officer, CQMD, Feb. 10, 1944.

<sup>26</sup> The St. Clair Rubber Co. produced rubberized fabrics, rubber adhesives and cements, mechanical rubber goods, automobile floor mats and coated fabrics. The Firestone Rubber and Latex Products Company, a subsidiary of the Firestone Tire and Rubber Company, manufactured rubber latex products and some plastic objects. The Hood Rubber Company in pre-war days produced rubber and canvas footwear, asphalt storage battery boxes and other rubber goods.

war effort.<sup>27</sup>

Getting manufacturers of the new plastic liner into production was to require strictest attention from the procuring depot, collaborating with the Office of The Quartermaster General. As indicated previously, molds for the "high pressure" process which the majority of the contractors were using, had to be supplied either by the Army or by the manufacturer himself. To make the molds required considerable time. In the first place, it was difficult to locate the keller-machines<sup>28</sup> necessary in their construction. Contact was made

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<sup>27</sup>The Hood Rubber Company, in working out its own manufacturing process on the liner, paid special attention to economies in raw material and equipment, and utilized women for most of the operations, thus aiding the labor market. The Westinghouse Electric and Manufacturing Company, among other ideas, developed a resin formulation providing a three-to five-minute cure of the helmet without cooling, which permitted molds to be operated continuously hot; previous to the development of the helmet liner, press cure cycles for phenolic laminated helmets were approximately one-half hour long. The Mine Safety Appliances Company devised a molding cure which cut the time from an original 12 to 2 minutes, and the baking of the enamel finish from 30 minutes to 1 1/2 minutes by use of the infra-red oven. The Capac company was instrumental in developing a mold which automatically cut off flashings in the pressing operation, reducing two operations to one; this company also was the first to mold eight liners at one "shot," while other companies produced one or two liners per shot. Of the subcontractors, the Paul K. Weil Co. made a notable contribution. Manufacturers of the suspension and backstrap, this company made individual studies of the dimensions of the liners produced by each of its six customer-companies to ascertain the exact point where the punch-press would make holes for fastening these components, and thus was able, by developing an adjustable die on its web cutter, to cut suspensions that would fit each manufacturer's liner exactly, preventing distortion. The Weil company also helped work out, with the Wright-Guhman Company, St. Louis, a substitute for rubber cement made of non-critical materials which was used as a dip for the ends of webbing in the liner suspension, to prevent ravel. (For the contribution of other contractors toward improving design, see Chapter V, Developments in Design.)

<sup>28</sup>A keller-machine is a machine for automatically reproducing a wood pattern or metal die by sculpturing a press die, forge die or other part out of a block of metal. The cutting tool is guided by a complicated, electro-magnetic control actuated by a tracing tool which scans the surface of the pattern, each movement of the tracer across the surface of the pattern resulting in a similar movement of the cutting tool along the corresponding plane of the metal block.

throughout the country with shoe factories, plants that made egg crates, and small and large machine shops to secure loan of their keller apparatus so that an adequate number of molds could be made available as soon as possible. Kellering of each mold required approximately 10 days. Before the 200 or more molds which represented the total number eventually turning out helmet liners were manufactured, four or five months had elapsed, and it was at least one month after the first contract of March 28 had been let before even one mold was available.<sup>29</sup>

The helmet liner molds, which measured 23 5/8" x 2 1/4" x 12", cost approximately \$2,000 each. Each of the contracting firms directed the making of its own molds.<sup>30</sup> The fact that the Office of The Quartermaster General did not arrange for an A-1-a priority rating on steel for the helmet liner molds badly delayed mold production. The Chicago Quartermaster Depot, searching out available keller-machines, found itself competing with the Air Corps, which could demand the service of such machines by showing the top priority.<sup>31</sup> In early April 1942,

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<sup>29</sup>Meanwhile, of course, the St. Clair Rubber Co. was turning out the low-pressure liners and the Hawley Products Co. continued to make the fiber liners.

<sup>30</sup>The Westinghouse company made molds for the Seaman Paper Company, however.

<sup>31</sup>Preference or priority ratings on critical materials for war use were established in the summer of 1940 by the Office of Production Management (later the War Production Board) and the Army and Navy Munitions Board. For Army and Navy procurements, A-1-a was the top priority rating at first, the series going downward to A-1-j; ratings A-2 to A-10 were for goods for essential civilian needs. In addition, there were class AA priorities, which took precedence over all others, and were reserved for emergencies of an exceptional nature, only on the specific authority of the Priorities Committee, Army and Navy Munitions Board. Critical materials used in Quartermaster items for some time were classed as A-1-i, however, which made it extremely difficult for Quartermaster contractors to secure these materials for manufacturing. (cont'd.)

by which time the Ordnance Department already had had 300,000 steel shells for the new helmet assembly completed by the McJord Radiator Company, Brig. Gen. C. L. Corbin, supply chief of the Office of The Quartermaster General, wrote the Army and Navy Munitions Board to request an A-1-a priority for all companies chosen for helmet liner production. Pointing out that Ordnance was procuring the steel helmets under preference ratings ranging from A-1-a to A-1-h, he said:

The Quartermaster Corps, because of the fact that there is no direct allocation of materials, has been forced to procure all the necessary plastic molds and other equipment necessary for the conversion of existing plastic facilities under an A-1-i priority. One company, the Mine Safety Appliance Company, has been granted an A-1-a priority in a letter from the Army and Navy Munitions Board, dated March 27. Other companies, such as the Inland Division of General Motors Corporation, the Hawley Products Company, the St. Clair Rubber Company, and the Panolyte Corporation, are still applying an A-1-i priority. Consequently, these companies, which need identical equipment in most cases, have identical suppliers and are experiencing difficulty in equipping their plants to go into production on a quantity basis within the specified delivery dates <sup>32</sup>

There was also apparently some difficulty at first about deciding who---the Chicago Quartermaster Depot or the Office of The Quartermaster General---was to issue preference ratings for molds and auxiliary equipment. As late as mid-May 1942, Col. C. H. Elliott,

In the summer of 1942, a new preference rating scheme was introduced which set up preference ratings AA-1, AA-2, AA-3 and AA-4, with an emergency category of AAA to break bottlenecks in the production of specific items. These new grades were superimposed upon the existing ratings and were authorized for issuance on approved listing of items. By 1944, all components of the helmet liner except textiles could command an AA-1 priority, superseded only by AAA Emergency ratings. This advantage came about through an Army-Navy Munitions Board Priorities Directive of April 1943, which placed 40 percent of all Army purchases in AA-1 and 60 percent in AA-2X (after AA-2). Interview with Lt. Henry W. Thiele, Priorities Branch, CQMD.

<sup>32</sup>Corbin to Priorities Division, Army and Navy Munitions Board, April 7, 1942: Request for Higher than Routine Rating.

procurement officer of the Chicago Quartermaster Depot, wrote the Priorities Branch of the Office of The Quartermaster General, pointing out that the Chicago Depot the day before had finally been given authority to issue certificates of priority to manufacturers on the steel for molds.<sup>53</sup> This action seems to have destroyed the first bottleneck to production of the plastic liner.

Financing of Manufacturers---The tooling up for plastic liner manufacture represented a comparatively large outlay of money. Considering that each mold, costing from \$2,000 to \$2,500, would produce about 190 helmets on a 24-hour shift, the expenditure for molds alone, to produce each 1,000 helmets amounted to nearly \$15,000. Other equipment also was needed,<sup>54</sup> and because of the accelerated delivery of large orders, the effect was to place a big load at the beginning of performance for tools, material and labor. In some instances, too, the plants had been faced with cessation of normal business because of the war and had no funds for capital investment. The smaller manufacturers interested in making the liner, especially, were confronted with monetary needs which in some cases were beyond possibility of loan through normal borrowing channels.

To aid in financing the early manufacture of the helmet liners, the Quartermaster Corps held out two possibilities. These were: purchase of the high pressure molds used in plasticizing the impregnated

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<sup>53</sup> Copy of letter from Elliott to OQMG Priorities Branch, May 19, 1942: Preference Rating for Liners, Helmet, referring to letter from OQMG, May 18, 1942: Preference Rating.

<sup>54</sup> The St. Clair Rubber Company reported \$86,500 developmental expense on the low-pressure liner. The Capac Manufacturing Company spent more than \$79,000 for special tools, dies, molds and other preparation. Reports to QM Price Adjustment Adjustment District Office, Chicago.

cloth, and advance payments on contracts by means of special accounts.<sup>35</sup> For other types of financing, the contractors could utilize the Defense Plant Corporation, Government-guaranteed loans, direct loans from their local banks with an assignment of claims, and other means offered as wartime expedients.<sup>36</sup>

Of the 200-odd molds required by the various contractors utilizing the high-pressure molding process, 150 or more were paid for by the Government, and became Government property in the contractor's shop. Only the Capac Manufacturing Company and the Seaman Paper Company purchased and possessed their own molds. In the cases of the other five firms, the procedure usually followed was for the Quartermaster Corps to permit a higher unit price on the liner in the first contracts, in payment of the manufacturing cost of the molds which in turn became Government property as soon as the amortization had been accomplished.<sup>37</sup> As indicated previously,<sup>38</sup> because of the amortization allowance prices of the liners on the first contracts were higher than they otherwise would have been. The Capac company, for example, completed its first contract at \$1.53 per liner, amortizing all costs of its molds on this contract; with the second and

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<sup>35</sup> Authority for the latter procedure was given in Sec. 201, Title II of Public Act No. 354, 77th Congress, approved Dec. 18, 1941, and Executive Order 9001, issued Dec. 27, 1941.

<sup>36</sup> The CQMD files held no records of applications for financing of helmet liner manufacture other than by methods discussed in this section, however.

<sup>37</sup> When the Inland Manufacturing company discontinued making the liner, the 39 molds which the Government had purchased were stored at the Columbus ASF Depot and loaned on occasion of need to firms still manufacturing the item.

<sup>38</sup> See p. 17.

subsequent contracts, the price dropped to \$1.35.<sup>39</sup>

Advance payments on contracts for the helmet liners were made by the War Department through the Chicago Quartermaster Depot to two firms, the St. Clair Rubber Company, makers of the low-pressure liner, and the Capac Manufacturing Company.<sup>40</sup> Under the procedure, funds were deposited to a special account in banks designated by the contracting firms, and were drawn upon by company check, for the payment of raw materials, labor and miscellaneous general supplies.<sup>41</sup> Careful accounting was made to the Depot on every withdrawal, showing the check number, the person to whom check was made payable, and the purpose of the expenditure. The St. Clair company was under an advance payment bond, but the Capac company was not required to

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<sup>39</sup> According to financial statements of the Capac company of Dec. 31, 1943, "This savings passed on to the Government was in excess of the reduction in costs resulting from amortization of special tooling and preparation costs over the first contract." (Chicago QM Price Adjustment District Office files.)

<sup>40</sup> Advance payments by the War Department were authorized under Executive Order No. 9001, Dec. 27, 1942, and Section 201, Title II of Public Act No. 354, 77th Cong., approved Dec. 18, 1941. Advances were to be made only to contractors with sufficient ability and reliability to complete their contracts, and the contractors had to submit full information on their financial conditions. Advances were limited to 30 percent of the contract price except in special circumstances. The contracting officer in the procuring depot could approve advances not in excess of \$250,000, or 30 percent of the contract price, the QMG could approve advances not exceeding 50 percent of the contract price on contracts under \$5,000,000, and approval of the Under Secretary of War was required on advances in excess of 50 percent of the contract price or contracts of more than \$5,000,000. Beginning in April 1942, interest at the rate of 2½ percent per year was charged on the unliquidated balance of advance payments outstanding, with certain exceptions. OQMG Cir. Letter No. 256, June 22, 1942.

<sup>41</sup> Capital expenditures were not permitted from the advances.

have one.<sup>42</sup>

The St. Clair company's advance amounted to \$246,361, on a contract for 500,000 liners whose total price to the Government was \$1,070,000. It was applied for specifically to cover cash requirements for materials and payrolls. The advance was repaid within a few months, by withholding 25 percent of the billings on the delivered liners--- the proportion the advance bore to the amount of the contract. The total outlay for installation expenses of this firm for the helmet liner was written off within six months,<sup>43</sup> and an actual refund of excess profits was made the War Department by the company under re-negotiation proceedings.<sup>44</sup> The advance to the Capac company amounted to \$150,000, against a contract for \$918,000 worth of liners. This firm had made a Reconstruction Finance Corporation loan amounting to \$100,000 to provide working capital, which was secured by a mortgage on property, plant and equipment, an assignment of money to become due on the helmet liner contract, and a guaranty bond signed by company officers. The RFC loan was liquidated at the rate of 12.45 percent of the gross proceeds from the helmet liner contract, and the \$150,000 advance from the War Department through the contracting Depot also was liquidated from helmet liner proceeds, at the rate of 17 percent of the gross receipts, the liquidation being effected within 10 months.<sup>45</sup>

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<sup>42</sup>Contract files, St. Clair W199 gn-23809; Capac W199 gn-25187.

<sup>43</sup>History of Renegotiation, St. Clair Rubber Company, Chicago  
 (M) Price Adjustment District Office.

<sup>44</sup>See p. 110.

<sup>45</sup>History of Renegotiation, Capac Manufacturing Company, Chicago  
 (M) Price Adjustment District Office.



Four of the helmet liner manufacturers assigned claims against payments by the Government in order to secure loans from their banks,<sup>46</sup> and at least one of these secured financing through a guaranteed Government loan.<sup>47</sup> The firms taking advantage of the Assignment of Claims Act for financing included the St. Clair Rubber Company,<sup>48</sup> the McCord Radiator and Manufacturing Company, the Seaman

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<sup>46</sup> Assignment of claims under public contracts was permitted under the Assignment of Claims Act of 1940, approved by Congress Oct. 9, 1940. Contractors assigning claims sign over the moneys of an entire contract to a bank, which received payment from the Army Finance Officer as deliveries of the contract items were made.

<sup>47</sup> Executive Order No. 9112, March 25, 1942, granted the War Department authority to make or to participate in direct loans to contractors and subcontractors whose work was necessary to the prosecution of the war, or to guarantee against loss to the extent necessary any financing institution which might make loans to such contractors. The powers were administered by the Advance Payment and Loan Section, Fiscal Division, Services of Supply, through liaison officers detailed for duty in every city where there was a Federal Reserve Bank. Applications for the loans were made by the contractors through their local banks, which in turn transmitted them to the Federal Reserve Bank in the district or to a liaison officer. After the application was made, it became the duty of the liaison officers to obtain information from procurement officers of the technical service concerned, and from other sources, to determine the necessity of the contract and the ability of the contractor to perform. A Statement of Necessity was issued in approved cases, and arrangements were made for War Department loans or guarantees not in excess of an aggregate of \$100,000---from all services---to be completed by the Federal Reserve Bank acting as Fiscal Agent of the United States, or by a liaison officer, without submitting the matter to the Advance Payment and Loan Section which, however, had to approve any loans in larger amount and all guarantees over 90 percent of the loan. The War Department followed the policy of guaranteeing loans rather than employing direct loans or participating in loans; no guarantee was to be in excess of 90 percent save in the most exceptional and pressing cases where no other method of financing was available; in the ordinary case the lending bank was counted on to assume a risk of at least 10 percent. Regulation V of the Federal Reserve System, effective in April 1942, further decentralized the loan procedure by authorizing the Federal Reserve banks, without reference to Washington, to arrange loans and guarantees where it was believed they would contribute to the obtaining of maximum war production.

<sup>48</sup> On Contract W199-qm 24379.

Paper Company and the International Molded Plastics Company. The last-named company apparently was the only one of the helmet liner firms which also sought a Government-guaranteed loan, the amount of which was \$100,000.<sup>49</sup>

An indirect financial advantage utilized by several of the helmet liner manufacturers was the securing of Necessity Certificates, which permitted a deduction in the computation of taxes, over a period of 60 months, for the amortization of the cost of facilities constructed specifically for war use.<sup>50</sup> The certificates were applied for through the Chicago Depot by the Capac Manufacturing Company, International Molded Plastics, St. Clair, Inland, and Mine Safety Appliances, as well as by some of the sub-contractors.

Obstacles to Early Production---Early production was the main objective of the Quartermaster Corps as soon as preparations seemed reasonably well taken care of, and every effort was bent toward fulfilling this aim. The liner manufacturers, who were to supply the item complete with head- and neckband suspension, and chinstrap installed, as well as the snap fasteners for attaching the headband and neckband, were given lists of suppliers of these accessories; the Chicago

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<sup>49</sup>On Contract W199-qm 8641.

<sup>50</sup>This was made possible by Section 124 of the Internal Revenue Code. Prior to Dec. 17, 1943, the Secretary of War and the Secretary of the Navy were authorized to act upon applications for Certificates of Necessity; but under Executive Order No. 9406, of that date, and amended by Executive Order No. 9429, of March 2, 1944, the authority was transferred to the War Production Board. The "war emergency facility" covered by the certificate referred to any facility, land, building, machinery or equipment installed after June 10, 1940, certified as necessary in the interest of national defense during the emergency period.

Quartermaster Depot meanwhile went about securing contracts with firms for the head- and neckbands.<sup>51</sup>

Officers from the procurement division of the Chicago Quartermaster Depot went out on field trips to plants of the liner manufacturers, in order to discover particular difficulties that arose in getting production under way, and to determine how soon finished liners would be forthcoming. A telephone report by Capt. Merritt C. Pratt to the Office of The Quartermaster General on April 21<sup>52</sup> showed that three of the five original contractors had a total of approximately 50,000 liners on hand, but that two of them---the Inland Manufacturing Company and Mine Safety Appliances---were not yet manufacturing, though they promised 1,000 a week beginning about May 1st. Their main reason for delay was inability to secure priority rating on some of the materials needed especially in the mold manufacture. One month later a written report by Captain Pratt showed that they were "moving along" but still not entirely under way. Moreover, the firms which had been given contracts in the second group let were proceeding but slowly, also claiming they were delayed by the mold makers. Excerpts from the report picture this situation:

Mine Safety Appliances Co., Pittsburgh, Pa. This manufacturer has three machine shops doing their kellering of the molds. I found that in two of the three machine shops the keller machines were standing idle. The reason being that Mine Safety had not checked their steel supplier regarding their steel forgings [sic]....

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<sup>51</sup>For a complete description of the method of helmet liner procurement, see Chapter IV.

<sup>52</sup>Capt. M. C. Pratt - Lieutenant Brady, COMG, Wash. Tel. Con. April 21, 1942.

Capac Manufacturing Co., Capac, Mich. City Pattern Works of Detroit, Mich., are kelling the mold for the Capac Co. If the mold maker is not held up by the non-delivery of the castings, the Capac Mfg. Co. will get into production on time. The first completed mold is to be delivered to the Capac Co. on the 1st of July and the contract for the kelling is supposed to be completed by the 1st of August. City Pattern Works is having a little trouble getting skilled labor to finish the molds after kelling....

Firestone Rubber Company will have 20 molds in operation by the 15th of July. Some trouble has been experienced in getting the required steel to make the molds....They have lowered the quantity for the first month to 75,000 liners, but it is believed that they will turn out more than the amount they have set up....Every effort is being made by the Firestone Company to get into production ahead of time; they are trying some castings made their own way, and if successful they will be in production ahead of time.<sup>53</sup>

The Seaman Paper Company in Chicago, which had bid on the low-pressure type of liner, found upon investigation that they could not make liners successfully by this method. They instead contracted with the Westinghouse Electric Manufacturing Company to make their molds and cloth for the high-pressure liner which they could mold in their plant; time needed to set up their presses, however, made impossible the promised delivery on the quantity set for them the first month. The Inland Manufacturing Company had stopped kelling of all molds because they were found to be "a little off in construction." Although the firm was given permission to use up to 12 of the defective molds in order to get under way, Captain Pratt reported that they had not been put in use, and that as late as June 5 only 3 molds were in operation. A total cancellation of production was in the offing in the instance of the Hickok Manufacturing Company, which had taken a contract for production at \$1.26

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<sup>53</sup> Report of Capt. M. C. Pratt, CQMD, May 27, 1942.

a unit, with the plan of subletting all operations except installing suspensions and chinstraps and painting. The firm which had given the Hickok company a price on forming the liner shells had erred in quoting the price, and to secure shells from another manufacturer just to do the installation did not figure to an advantage; so request was made to the contracting officer at the Chicago Quartermaster Depot to be released. This was accomplished with approval of the Office of The Quartermaster General.<sup>54</sup>

The St. Clair Rubber Company and the Westinghouse Electric Company, however, presented a more optimistic picture. First shipment of the new plastic liners made by the low-pressure method at St. Clair and assembled with the steel helmet shells at the McCord company had been made about April 22, 1942. There were 25,000 liners in the lot, which with 28,750 headbands and 27,500 neckbands had been shipped to the Philippine Department.<sup>55</sup> At the time of Captain Pratt's visit to the plant in late May, the steel shells required to complete the St. Clair contract all had been cast, and as fast as new help could be trained, the 220 molds were to go into operation to produce an estimated 12,000 liners a day. On June 1, the Westinghouse plant, making the high-pressure liner, had 14 molds in operation, with 17 in process of completion. When their installation would have been completed, by mid-July, Westinghouse hoped to turn out 10,000 liners a day. "This firm," Captain Pratt reported, "is doing very fine

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<sup>54</sup>The Hickok Company, in the leather goods business, later worked on the helmet liner by supplying chinstraps and headbands. The 240,000 liners on the Hickok contract were awarded later to the Westinghouse company at a unit price of \$1.53.

<sup>55</sup>Telephone Conversation: Lieutenant Brady, OQMG - Captain Pratt, CQMD, April 16, 1942.

work in lending a helping hand to the liner contractors."<sup>56</sup>

From the beginning, the Office of The Quartermaster General was extremely anxious to have production of the liners expedited, and with that objective in mind requested the Chicago Quartermaster Depot in an "Immediate Action" letter on May 25 to assign competent production representatives to the contracting plants. It was asked that these representatives render a daily report to the Depot on production progress and a weekly report to Washington.<sup>57</sup> The Depot's principal inspector assumed the role of production representative and was kept on constant tour of the plants, which sent their daily output figures in to the Depot, where they were consolidated into a weekly report to the Office of The Quartermaster General. Most of the helmet liner plants worked their molds 24 hours a day, with three shifts, but assembling of the liner was on a 48-hour week basis mainly, though some contractors ran a double-shift on assembly operations, employing the workers, who were largely women, on two seven- or eight-hour shifts for six days a week.

Helmet Liner Section Set up at Chicago Depot--At this point the helmet liner procurement, with its attendant duties of buying head and neckbands was beginning to result in increasing "paper work" at the Depot, and in June 1942, a helmet liner section was officially organized in the Clothing and Equipage Branch of the Procurement Division.<sup>58</sup> Purchase of the liners had already been consolidated with

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<sup>56</sup> Report of Captain Pratt, May 27, 1942.

<sup>57</sup> Brig. Gen. C. L. Corbin to CQMG, May 25, 1942.

<sup>58</sup> First officer in charge of the helmet liner section was Maj. Marvin E. Allesee, who headed the C & E Branch. Leaving the Depot for duty in the CQMG, Major Allesee was followed in turn by Maj. Harold B. Florsheim and Capt. (later Major) M. C. Pratt, who had been an assisting officer under both predecessors.

purchase of other items of clothing and equipment, and so it continued. Since liner purchasing was accomplished without formal advertising for competitive bids, contract writing comprised the chief duty of the purchasing section on this item, and was a full-time job for no more than one person. A production and distribution section was set up separately for the helmet liners, however, chiefly to maintain the constant checks sought on liner production, and to follow through on the distribution, which was scheduled by the Chicago Depot on instructions from Washington.<sup>59</sup> Expediting duties were performed almost entirely by Major Pratt, who during the first months of liner production spent a large part of his time in the field and in contact with Washington on matters related to the clearing of critical materials that demanded priority ratings. At no time was a Depot organization of large size necessary to carry on the business of helmet liner procurement, and in this respect the item was much less troublesome than some of the other clothing and equipage items procured at the Chicago Depot, such as gloves, cots and trunk lockers. The fact that the liner manufacture, being rather specialized in requiring special molds, could not be taken on overnight by a new firm; and the fact that the contracts were made with only a handful of prime contractors, resulted in a more easily controlled situation, and obviated many of the minor difficulties characterizing the procurement of such articles as bedsteads and cots.

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<sup>59</sup> See p. 87.