
THE FIRST FLIGHTS

USING THE Grumman parts, the knowledge that could be gained from the PK ships on how these parts went together, and whatever tools they could improvise either from copying Grumman fixtures, or through their own ingenuity, the five Eastern Aircraft plants settled down to the production of their first parts and planes.

As early as March 23, two months and two days after Eastern's formation, the Linden plant had fabricated its first Navy-okayed assembly, and production was gaining momentum slowly as more workers learned the aircraft skills.

The Tarrytown plant completed its first Navy-okayed part on May 5; Baltimore fabricated its first part — a right nose rib — and passed it through Navy inspection on June 20. Bloomfield shipped its first set of fighter assemblies to Linden on July 4 — little more than 30 days after its official entrance into Eastern Aircraft — and its first set of bomber cables and other assemblies on August 4. By the middle of the year the Trenton plant was humming on the production floor to the tune of hammers, files, mallets, and emery cloth — doing almost everything by hand.

All plants were still expanding their personnel — productive and nonproductive — as fast

as possible. In some cases it even looked as if the plants were overmanned in comparison to the amount of work available. However, peak production would require a tremendous force of trained employes which, if not early hired and trained, would not be available when the time arrived for them to do actual peak production work.

Physical expansion was still progressing full blast at the middle of the year, and revisions were constantly being made on the facilities that would be required by peak production. Since there was no assurance that either of the production schedules would remain the same, the five Eastern plants had to accustom themselves to a sense of more or less constant conversion and expansion.

By the middle of the year, Linden needed more space, so negotiations were made with the owners of the adjacent Gordon Gin plant, which, a war mortality itself, had ample floor space in its warehousing section to accommodate Linden's purchasing and accounting departments. A large portion of the plant was taken over on September 1, 1942.

Work was still progressing at a feverish pace on the two airports. Bulldozers were chugging through the scrub growth across the street from the Linden plant, construction men were

working on the huge 80-plane hangar, and roadworkers were laying down the macadam runways. Trenton had arranged with the Civil Aeronautics Board for construction of its airport across the street from the plant, and beside the Reading Railroad tracks. The CAA needed an airport for the Trenton locality and its needs fitted so nicely into Eastern Aircraft's that an arrangement was made for CAA sponsorship of the project.

The layouts of the five plants were now fairly well arranged for progressive flow of assemblies, and, although each of the plants had been cautioned against the danger of applying the familiar automotive techniques without first learning the how and why of the aircraft manufacturer's method, it nevertheless encouraged production innovations that could be proved sound.

In the paint and anodizing departments, for example, automotive practice had for years been completely mechanized, and there was no good reason why mechanization could not work under aircraft manufacture. As a result, elaborate conveyor and monorail systems were early installed in nearly all of the plants. Both Linden and Trenton installed electric pre-heating and drying systems, using infra-red lamps which accelerated the process considerably. Another paint department innovation made early at Trenton was the use of air-agitated dipping tanks resulting in evenness of paint on subassemblies.

At Linden the production department worked out a method of gas tank skin installation, a process which formerly took 20 man-hours of pulling and pushing by several persons, that could be done just as completely by two persons in two hours, merely by use of air inflation of the skin.

Innumerable fixture innovations were made throughout the plant which cut manhours and

in nearly every case resulted in a surer job. The fin assembly on the fighter, formerly made by hand on a bench, was tooled with a fixture that cut the assembly time down from nearly two hours to 20 minutes. The fuselage and part of final assembly which was formerly done on one jig was broken down into several subassembly, assembly and master jigs with the resultant shrinkage of manhours from 150 to 75.

All plants introduced faster and mechanized burring techniques with the use of Hammond lathes and other spinning equipment. Master drill plates were widely introduced to speed drilling and insure accuracy of holes. Former automotive elliptical and straight line bending machines used in bending automobile mouldings were relocated in the Trenton plant, and others were acquired for Linden and Baltimore for bending aircraft stringers. Done by hand in nearly all other aircraft plants, the use of these machines at Eastern cut down to a few minutes what formerly took from one to fifty manhours of hand hammering. On the bomber more than 225 separate parts were found to lend themselves to this mechanical forming.

All plants were conveyORIZED on final assembly with the exception of Bloomfield where more than 1000 different assemblies differed too greatly from each other to allow the uniformity of conveyORIZED assembly. At Trenton the conveyor line carried final "floating assembly jigs," which offered a spectacular advance over the general aircraft procedure wherein final assembly jigs were almost universally lined up in stationary rows.

While these activities were continuing at all plants, two planes began to take impressive shape at Trenton and Linden — number one bomber and number one fighter. Time was drawing near for the first flight of both planes. The parts were slowly but surely assembled

into the new General Motors products. They were “knocked down” by inspectors, reassembled, refitted, “knocked down” again and slowly reassembled again. Then, late in August, 1942, seven months after Eastern Aircraft’s formation, the first Wildcat was hooked up to a tractor and hauled tail-first out of the rear of the Linden plant, across the highway and over to the partially completed airport, where it was put through the usual preliminary ground tests and tune-up. On the thirty-first day of August it was taken to the far end of one of the runways by Linden’s chief test pilot, given the gun, and brought down the runway into the air, proving to employes that they could build — and had built — a plane that could fly.

The next day the entire plant personnel witnessed the first official flight of a General Motors-built Wildcat. As thousands cheered the maneuvers of the plane under the expert handling of an ex-Flying Tiger, Eastern Aircraft test pilot, the head of Linden’s flight department explained over a loud-speaker system the various turns and twists the plane was being taken through.

The plane passed all tests.

Linden’s first flight was a tremendous stimulus to every Eastern Aircraft employe. Accomplished a month ahead of schedule, it set up a goal for the Trenton plant and for Baltimore and Tarrytown and Bloomfield, which were supporting Trenton. Meanwhile, in the huge final assembly bay Trenton’s number one went through the same merciless inspection — the same pulling apart and putting together again that the first fighter underwent, until, one day, it was hauled out through the big door, across the street and the Reading Railroad tracks, and over to the hangar. For several days that seemed unending, the new giant was checked and made ready for flight.

On November 11 the sun shone forth, and

the big bomber was slipped out of the hangar and into the air on its first but unofficial flight, with Trenton’s chief test pilot at the controls. Returning sometime later with the plane, the pilot switched to a reserve tank of fuel. No gas flowed. He jiggled the switch and still no gas flowed. Many miles from the airport, he was forced to start a glide, but without any mishap he landed cross-wind. An anxious crowd ran to inquire what had happened. Mechanics investigated the gas system and soon discovered the fault. A fuel selector valve had been installed exactly 180° wrong; when turned to “on” position no gas would pass the valve; turned to “off,” gas would have flowed.

The next day, amid fanfare, and with great ease, the TBM-1 bomber passed its initial flying test.

That experience with the valve, although no damage resulted from it, nevertheless gave Eastern Aircraft a clearer insight into some of the problems that lay ahead. The mistake was so easy, so human to make. In the old automotive days it would have been discovered during Inspection Repair, or at best and with hardly any inconvenience, a short while after the car was on the road. With Navy planes there is no chance to undo the wrong installation while the plane is in the air. Everything *has* to be right in aircraft manufacture — especially in the manufacture of military aircraft, where the life of a pilot depends on perfection.

Eastern’s entire training program had been pointed toward educating the old automobile employes and the new people to this very important fact. Someone had made a mistake that nearly cost a pilot’s life, nearly wrecked a plane, and came within an ace of demolishing Eastern Aircraft’s morale and General Motors’ reputation. Fortunately, a smart pilot was at the controls and no actual damage was done.

INTO THE NEW YEAR

THE AVENGER torpedo bomber contract called for delivery of one ship in November — the first ship was delivered shortly after the first flight on November 11, 1942 — and for two ships in December. One of the December ships reached the hangar on the sixteenth, the other on the thirty-first. The two planes were accepted by the Navy on the last day of the month and the schedule for 1942 was met. The Wildcat fighter program meanwhile had maintained its deliveries well above schedule, and by December 31 it had turned over to the Navy a total of 23 planes — 14 above its scheduled requirements.

All plants were producing in good quantities, especially Tarrytown, which had moved out well ahead of its schedule.

Bloomfield, despite innumerable difficulties in getting engineering information on both the FM-1 and the TBM-1, was producing, ahead of schedule, sets of control cables, electrical assemblies and tubing for both planes, and could boast that it had never once held up the production of a single plane.

By the end of 1942 employment throughout the Eastern Aircraft Division had gone up to 22,848 — which was twice the total peak peacetime employment of the five plants.

Obviously, the new Division was beginning

to roll. But there were many tough problems to be faced with the New Year. As of December 1, the bomber schedule had been boosted 50% by the Navy, and there were to be other increases in both planes.

The original engineering problems were still far from any solution, and in fact, had become temporarily even more complicated by the gradual releasing of lofted engineering data. This had the effect of adding a fifth reference to the list of references from which tooling was developed, and until all tooling was finally brought into harmony with the loft or else the loft was brought into harmony with existing tooling, a discrepancy would still stand between product and process engineering on both of the ships.

Furthermore, all plants were still begging for more engineering information of any kind. There was still no sure Bill of Materials, nor a positive Parts List on either plane. Production was building planes with improvised tools, and selective assembly had to be resorted to in order to maintain schedules.

The uppermost problem of the immediate future was the transformation of Eastern's production from the struggling, pushing, halting manufacture of single planes to a smooth flow of parts and assemblies into final planes com-

ing with clocklike precision out of final paint and over to the hangar at a constantly increasing rate.

This first year of war served to influence and make demands on the Division in 1943. Early in the new year an impatience permeated the five plants — a “let’s get going” type of impatience in every employe, the U. S. Navy, and the man in the street who was crying for more and more action.

Time Magazine in December, 1942, came close to covering the situation in one paragraph of an article captioned, “How Goes the Battle?”

“In North Africa the United States advance was stalled for lack of air supremacy. From the Solomons came little news of fighting. Sole bright spot on the fighting front was Buna which fell into United States hands.”

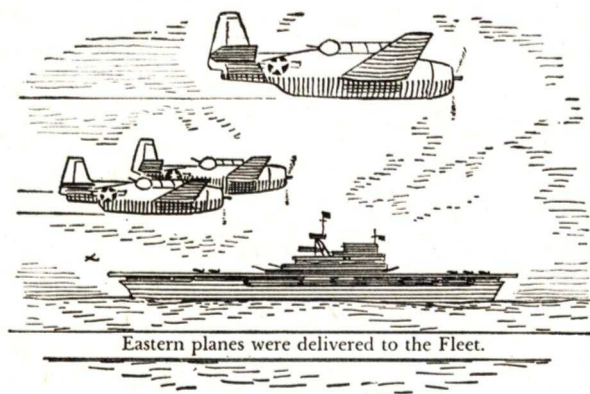
President Roosevelt reported in January, 1943, that the Arsenal of Democracy had made good with the production of 48,000 planes during 1942 — the Japanese Navy in a public report to their nation admitted the loss of three aircraft carriers, one battleship, 40 warships,

and 65 merchantmen, to which they added two aircraft carriers, one battleship, and 22 warships as being damaged in the year following Pearl Harbor. This was somewhat in contrast with U. S. claims of sinking six carriers, two battleships, 129 warships, and 108 merchantmen, but heartening.

Time Magazine injected a further disconcerting note when it reported on February 11, 1943, that the Japanese army had scarcely been touched. In all the South Pacific theatres, only three or four divisions were in direct contact with the Allies.

Whether the following news report of January 11, 1943, can be interpreted as an implication of Navy’s air strength is a matter of opinion, but it is worthy of note: “A group of Army four-motored bombers dropped 76 one-thousand-pound bombs on Japanese installations at Wake Island. These planes flew at the request of the Navy to implement Navy strategy.”

One thing was certain, the Navy needed planes, and they were justified in building up schedules which seemed almost impossible to attain.



Eastern planes were delivered to the Fleet.

A WILDER WILDCAT (FM-2)

TWO GREAT AIRPORTS with modern hangars, control towers, and long, wide flight and taxi lanes, were receiving planes from the Trenton and Linden plants of Eastern Aircraft early in the new year. Test pilots of the new Division were putting these ships through the required U. S. Navy maneuvers with more frequency. Everywhere there was evidence of activity and real achievement. The Navy's need for these planes was great, and once a plane had been accepted following its tests, it was immediately flown away to a delivery point.

In addition to the need for established models, there were other demands. U. S. Navy Fleet movements and operations which necessitated better protection — and preparations for new offensives—dictated design changes in the Wildcat and the Avenger too numerous to mention, but the big change to affect the Linden plant was the change in the model itself.

In July, 1942, one month before even the first GM-produced Wildcat was flown, the Bureau of Aeronautics of the U. S. Navy called for the production of an improved Navy fighter, later styled as a "wilder" Wildcat and designated the FM-2.

This new version of the Wildcat, while bearing many of the original ship's characteristics,

was developed because the Navy had a specific job for it. Already on the ways of some of the nation's leading shipyards were many merchantmen being converted to small aircraft carriers to combat the submarine menace to Allied convoys. Later these carriers made the headlines as "Baby Flat-Tops." The Wildcat (FM-2) was the plane being developed for these carriers. Performance-wise, it was a much better plane than the FM-1, which Grumman and Eastern had been building. Test pilots and U. S. Navy men who flew it lauded its performance.

A report was received from one of the first squadrons overseas to be equipped with FM-2's, telling how a well-known Navy captain took the controls to see what the new Wildcat was really like: "He slowly rolled it on a take-off at about 75 feet, did a chandelle back over the field, rolled over on his back, practically dragging his head along the runway, nosed up and climbed inverted to about 3,000, then put it in a three-turn spin, recovering a few inches above the ground, after which he pulled a few vertical snaps, going up and down and looping, then brought it back and drawled in his own typical Southern accent, 'The Japs are going to get quite a thump when they first run into our squadron now equipped with FM-2's.' "

U. S. Navy officers, Grumman and Eastern Aircraft engineers continued to work and confer on the many problems and changes involved till January, 1943, when the loose ends of the designing — and the entire production responsibility for the new plane — became Eastern's alone. Grumman was already burdened with engineering and production problems on a great new fighter known as the "Hellcat."

Planning for the production of the FM-2 was an experience. Without so much as a breather from the first cold-water plunge on the first Wildcat, the new ship was scheduled for production in the midst of a rapidly ascending, demanding schedule. No cut-off point or work stoppage on the FM-1 could be established to make way for the FM-2 production. Instead the schedule was set to absorb the FM-2 Wildcat on an accelerating scale as the production of the FM-1 tapered off. However, the over-all and combined schedules, including both ships, continued to climb.

Little ever reached the public about the new plane. Newspapers in commenting on successful air engagements — involving Eastern planes — merely mentioned that Wildcats had played a big role in battle, with no further reference to the designation. Several magazines in the new year, unaware that a "wilder" Wildcat was in production, wrote stories antiquating the ship in direct comparison with Grumman's new fighter, the Hellcat.

Admittedly, Grumman had designed and started production on a truly great plane, but the new Wildcat and Hellcat could not be honestly compared for they were both developed for two different types of operations.

Until late in 1943, the U. S. Navy prohibited the release of schedule figures on the production of Wildcats and Avengers, although the employes were most anxious to know what Eastern Aircraft had to produce.

They also wanted to know more of the FM-2 story, for aforementioned magazine comparison stories on the Wildcat vs. the Hellcat had been inaccurate and misleading. For security reasons nothing of this nature could be released.

Actual production schedules and figures for public consumption cannot possibly be released till some day in the future, when the world is at peace again, but it can be said that from a few planes in January, 1943, the schedule for the FM-1 and FM-2 jumped by leaps and bounds until December, 1943, when 1400% more planes were produced — and this was not the peak. Trenton's schedules on the Avenger took an almost comparable skyride. The job was getting tougher — the climb steeper. Success could only be measured through actual production in the months to come. So far the job had been done — and done well. As the early months of 1943 passed, Eastern was ahead of schedule. Could it maintain the pace?

THE BUILD-UP

EXPANSION – ADJUSTMENT – what did it mean to those who went into the new year with the Division? On the lighter side it meant picking up tools, papers, books, and moving often. Frequent were the questions –

“Where is Product Engineering Department now? It was here last week.”

“Where can I find Mr. Smith? Isn’t this his old office?”

“The rationing office used to be here. What happened to it?”

Many were the workers who listened to training session lectures in makeshift rooms only to have the walls torn down around them before the class was over. The instructor would usually end his talk with, “Next week we’ll meet – you’ll be notified where before the time comes.”

But there was something bigger and more serious than this behind the scenes. There were new Letters of Intent from the Navy for more and more planes per month. The burden increased – new moves were necessary – more hours of planning – trial and error – failure and success.

Trenton struggled with the task of building a unique new final assembly line. This line, which was tentatively scheduled for completion on January 5, 1943, was designed to snake

in an “S” fashion through the large final bays of the former automobile hardware plant, then to straighten out into a final bay in one long sweep, and finally to empty through a huge doorway in front of the building facing the new airport.

Above and paralleling the line an overhead wooden walkway was designed and utilized for working down into the ship as it passed by cradled in a large dolly.* This walkway practically eliminated the necessity of excessive climbing. All in all, the line was compact and modern to the point of causing considerable comment from production men, some of whom were obviously dubious about its practicability. But getting this line into operation was a must if ships were to roll out of the plant in the quantity demanded by the Navy.

And in the meantime, planes had to be produced, and men and women still continued to work on them by hand, pushing them over the unfinished assembly line route until work on the giant machines could be finished.

Often the question was raised, “Why the ‘S’ line? It’s unique, but why?” Actually Trenton was cramped for space. If the original 105

*A moving platform similar to a huge jig or fixture with many unique features designed to make all installation points accessible to the worker.

stations had stretched out in one long line, they would possibly have reached the Reading Railroad tracks some distance in back of the building. In order to properly utilize the space available, it was necessary to run the line through the high bays and use the low bays in between for small assembly work. But even with this careful planning and layout the line was known to have a limit. As time went on there was not enough room to carry the burden of production. Subsequently, a new addition was added to the rear of the main plant to accommodate 24 stations into the final assembly line. This new addition provided room for the installation of wings, and thus equipped the plant for peak monthly production. Across the street from the main plant another large building progressed slowly. Designed to house the engineering, accounting, and personnel sections, it alleviated a crowded condition in the plant early in the fall of 1943. Connected with the new building was an experimental hangar, which took shape and was ready for occupancy shortly afterwards.

These two buildings and the new section at the rear of the main plant had not progressed as scheduled — at times the work stood still, awaiting the government's decision on the type of construction material to be used in each phase of the job. Critical materials during these days seemed to change with the wind. Steel would be critical for a short period of time, only to take a back seat to wood, and so on week after week. Meanwhile, the constant flow of new employes into the plant created an almost impossible situation.

While the final assembly flow at Linden had been established prior to the first of the year, there was a question as to whether the actual layout was adequate. On paper it seemed so. Three lines flowed through the final assembly with a triplication of operations taking place.

But a change of layout could bring about improvements. It was felt that a single line would allow for better utilization of manpower. By hooking the ends of these lines together to form an "S," it was no longer necessary to train three men for the same type of job; thus, the new line proved more adequate.

Plant facilities at Tarrytown and Baltimore were not prepared to handle the burden once the bomber contract had been increased. In the latter part of the summer of 1942, plans had been made at both points either to build or to acquire the necessary floor space to expand in line with the accelerated schedule.

At the time it seemed almost ironical that there were large Chevrolet plants adjacent to both the Tarrytown and Baltimore Eastern Aircraft plants. However, each of these plants was actively engaged in manufacturing trucks for the U. S. Army, and could not be considered.

It was estimated that Eastern Aircraft would need an additional 240,000 square feet for future operations at Tarrytown. After much discussion, it was agreed that plans should be submitted for a new building in the Kingsland Park area to connect with the main plant.

Plans were rushed through to completion and sent off for approval on August 31. On October 15, 1942, the building, while approved by Navy authorities, was rejected because other U. S. Agencies were not able to concur. Time was slipping by, and it was again necessary that Tarrytown revise their plans, and quickly.

Army requirements slackened, the truck production in the Chevrolet plant next door was curtailed to some extent. A total of 90,000 square feet of floor space was then offered to Eastern. A few days later an announcement was made that the Chevrolet Tarrytown Division would discontinue Army truck production altogether, and it was then realized that

all of the necessary floor space would be available for the new program.

Employees of Chevrolet began dismantling the plant on December 23, 1942, to make it ready for Eastern Aircraft occupancy. However, it was not possible to begin work on the entire area until January 1, 1943, because of the presence of Army trucks that were still trickling off the Chevrolet lines.

It was necessary to reinforce the floor, to rewire the entire production area for better lighting, and to provide greater rest room facilities for the expected new employees. During the week of March 28, 1943, whole departments moved from the main building into the new plant, designated No. 3, and during that week over 83 tons of equipment were moved.

On April 8, the first single conveyor line in the new plant was put into operation. It was longer than any that Fisher Body or Chevrolet had ever operated in the Tarrytown section.

A similar story could be related about Baltimore. They did not need floor space comparable to that at Tarrytown, but the problem was acute, for 75,000 feet of floor space was difficult to find anywhere near the main plant in the city.

Several buildings were inspected near the plant, and one which met the requirements was found in the early fall of 1942. Tentative arrangements were made to acquire it. However, during the first week of October, it was learned that Army truck production would also be curtailed at Baltimore Chevrolet plant. Fortunately, 74,000 feet of floor space was now available, for not only was the Chevrolet plant adjacent to the Baltimore Eastern Aircraft plant — it was only separated by a brick wall. Arrangements were then made to acquire the new facilities, and during the first week of

November, 1942, definite plans were agreed upon and then submitted for approval. The removal of machinery and equipment was started on February 5, 1943, and simultaneously equipment was moved from the main plant to the Chevrolet section. Work was completed on April 1, 1943.

Bloomfield, too, had need for additional manufacturing space. The smallest plant of the five-plant Division had been struggling under an increased production load each month, for the plant's electrical and hydraulic assemblies had to be made all in advance of the assembly of both the bomber and the fighter.

An addition to the main plant, almost doubling its size, was completed in the midsummer of 1943, but this did not relieve the pressure entirely. More space was needed and needed badly. Subsequently a building was acquired approximately one mile from the main building, and was converted and practically ready for production by the end of 1943.

Many additional moves were made throughout the year, but the cessation of Wildcat and Avenger production at the Grumman plant during 1943 threw an additional burden on Eastern Aircraft's facilities. Carloads of tools and unused parts and assemblies were shipped to Linden and Trenton for use and disposal. They had to be stored, but where? Warehouses had been built for the storage of automotive equipment, but they were no longer adequate. The surrounding countryside was scoured for available space, and with the approval of the U. S. Navy many odd buildings were soon acquisitioned and utilized.

Expansion and conversion continued to keep but one step ahead of production every day during the year 1943, and men's thinking and planning had to precede it all.

HELP FROM WITHIN

THE MEN AND WOMEN who were trained for aircraft work in the five plants during 1942 first took their places on the production lines when a fuselage, center section, wing, or nearly complete plane was a rarity. During the early part of January, 1943, the gaps in these lines began to fill, and as the ships passed their stations with more and more regularity, individual skill increased. Many thousands of sincere, hard-working Americans were doing an ever-better job in the five plants. Their hands were operating the presses, the bending machines, handling the rivet guns and bucking bars — they were forming small parts, de-burring, welding — they were assembling two great Navy planes in an ever-increasing quantity. There had been mistakes, but these were decreasing day by day — things were looking up. The same people continued to extend a helping hand to the new folks who were pouring from the training schools into production work. Human effort multiplied rapidly.

As the demands of the Selective Service System on the male personnel became heavier, it was gratifying the way women took over various types of work. Aided by special training they grasped the work quickly and worked efficiently with the lighter, specially designed tools.

The General Motors Suggestion Plan went into operation in the five plants during the midsummer of 1942. Its popularity increased in the early part of 1943. Eager and enthusiastic employes, while relatively new to many of the jobs, soon found new and better ways of doing their work — of accelerating production — of creating safer working conditions in the plants. Suggestions of merit coming through during these months were more than welcome to management, and the plan developed quickly.

Meritorious suggestions are worthy of coverage. A \$1,000 Bond was awarded to an employe in December, 1942, for introducing the Arco case method of heat treating in the tool and die department in one of the plants. This took the place of a former method known throughout the industry as pack-hardening, and resulted in a distinct improvement in quality, and a saving of time and materials.

Another employe in 1943 submitted a suggestion which described a method of annealing steels rapidly. Prior to the development of this, breaking, failure, and rework were quite commonplace in the operations of forming, bending, and blanking, when the ordinary annealed stock was used. The new suggestion, known as the "Iso thermal annealing of steel,"

came as an excellent solution to the problem and virtually eliminated the aforementioned difficulties. The suggester was also awarded a \$1,000 War Bond.

Another employe designed a burner using butane gas to re-melt old kirksite dies, thus making it possible to salvage many hundreds of pounds of kirksite and lead. He too was awarded a \$1,000 War Bond.

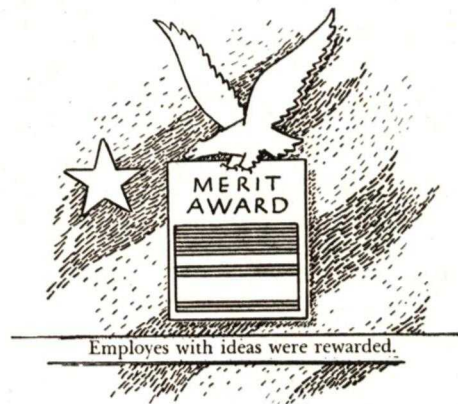
An equalizing clamp which would adapt itself to the position of a part to be milled, brought a \$500 War Bond to another alert employe, for it eliminated scrap; a template used in final assembly of the leading and trailing edge meant \$157.68 in War Bonds and Stamps for the suggestion; a multiple dimpling and forming die which eliminated 12 dimpling operations meant a \$100 War Bond to the suggester.

Another Eastern employe developed a unique fixture, a combination of a mitre gauge on a delta-circular saw. This enabled an oper-

ator to cut pieces of metal of predetermined angles without the use of templates or scribing jigs. This one was worth \$379.30 in War Bonds and Stamps to the employe. A roller bearing guide or hold-down device for a router was worthy of a \$250 award.

These are but a few — by the end of 1943, approximately \$30,000 had been paid to thinking employes in the plants who were willing to give something extra to help the Navy get its planes faster.

Along with these major contributions to production, thousands of relatively new employes continued to put millions of dollars into the war effort through the continuous purchase of War Bonds. They collectively authorized vast sums of money to be deducted weekly, semi-monthly, and monthly from their pay checks, and yet when each new War Loan Drive was announced by the U. S. Treasury Department, their participation managed to be ever greater.



SECOND WIND

IN THE FIRST few months of 1943 Eastern Aircraft had caught a certain stride. Not much of a one perhaps — something like a young child's first faltering steps — but nevertheless a stride. Out of the plants each month came the Navy's rising schedule — of Avengers and Wildcats — and more.

But the schedules were still comparatively light, and it was possible to produce the planes by sheer determination. Eastern Aircraft knew that, successful as early methods might be at low production, they were definitely inadequate for the staggering schedules which stared it in the face for the latter half of 1943 and the peak output due in early 1944. The even flow of materials and parts from thousands of subcontractors and fabricating departments to assembly departments was an absolute necessity.

Every effort was being made to bring about this even flow. Purchasing, material control, production control, scheduling and other departments — all were working under a full head of steam to accomplish a job which was not easy. It was a race against time. Each month, as spring wore on, found new techniques being introduced into this or that department which increased its capacity to produce its share of the final products — the

Wildcats and Avengers the Navy was begging for.

Each month found outside subcontractors fighting to keep the pace, and, on the whole, doing a little better than the month before. But it was spotty — two steps forward and one backward. Enough of this part but not enough of that. Efficient, even flow required more than this. Unless all departments and all subcontractors fulfilled their obligations completely the peak schedules required by the Navy would remain a mirage.

And so, each month the rapidly rising schedules became more difficult to reach.

Superimposed on these difficulties was another — changes in the plane.

During the summer and fall of 1943 Linden was to change its production from the FM-1 to the FM-2 — a change fully as great as changing from one year's model to the next in automotive manufacture — except that in this case the plant could not shut down to retool. Instead the relentless Navy schedule went up and up.

The Avenger, too, was going through a face-lifting process. Reports from the combat areas indicated that this deadly torpedo bomber would be much more lethal with the addition of guns in its wings — and much safer for its

fliers if they ran into a Zero far away from fighter cover.

For the Tarrytown plant this, too, meant just as great a job as changing automobile models. So, late in the summer, while Trenton, Baltimore and Bloomfield sped ahead in their production, Tarrytown tooled — seven days a week and with long overtime every day, to turn out the newly designed wing.

Each day the bank of Tarrytown's wings in the Trenton plant dwindled while Tarrytown moved at a feverish pace to get the new wings in production. Again it was a race against time. If the last wings in Trenton were used up, that plant as well as Baltimore and Bloomfield would be forced to close down — just at a time when the Navy needed — yes — demanded every possible plane. Only three sets of wings were left in Trenton's bank when new wings began arriving.

However, problems superimposed on more problems finally took their toll — Linden and Trenton missed their schedules in October. Linden had missed before, but this time East-

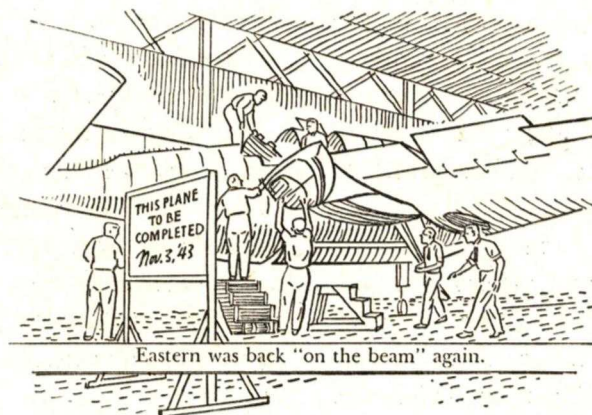
ern was short on both Wildcats and Avengers.

It was discouraging, yes — but it was the kind of discouragement which led everybody to redouble his efforts to get in stride again. And this they did.

The man in final assembly, the woman with the riveting gun, the assembler, the welder, the hundreds of people who were almost swamped with office detail — all tightened up their belts a little and made up their minds that the Navy fliers were going to get the planes they needed.

Efforts in various directions which had been in process for months came to fruition. New techniques, a balance of the flow of materials and parts, and probably most of all, an organization of men and women who had learned how to do the difficult job, who were now more confident — all these contributed to the upswing.

December, 1943, saw Eastern Aircraft deliver to the Navy, not only all the Avengers and Wildcats it asked for, but more than the demanding schedule called for. Eastern was back "on the beam" again.



SOMETHING OLD — SOMETHING NEW

THERE WAS little slackening of pace around the engineering departments through the year. Product engineers were still wrestling with many old and new problems. It was now a case of fitting loft dimensions and information where these were needed — a case of refining all engineering information on design changes.

These changes were coming through in increasing numbers, and as the schedule stepped up, it became more difficult to establish break, or change, points in the production line to incorporate them. The process men had to have sufficient lead time and accurate information to obtain and develop the proper tooling. The purchasing department needed lead time to go into the open market, and secure the right material — and production needed time to familiarize everyone with the new installations. In fact, everyone had a problem — not once, but on every single change. In time, management developed new systems to handle this delicate situation, and in Trenton alone over 500 changes affecting thousands of parts on the Avenger were cleared up to the end of 1943.

New tooling was being developed in all plants with an eye on the ascending schedule. In the new year, a thorough study had been made of all tooling on the floor at Linden,

and it was evident that there were many points in the fuselage assembly of the Wildcat that could be improved by the development of better jigs and fixtures. Sections of the fuselage had previously been assembled without the aid of tooling. After much study, many of the bulkhead assemblies formerly fastened and riveted without time-saving equipment found their way into newly developed jigs which quickly increased production.

Linden continued to improve on its tooling throughout the year. Costs and time were reduced through the use of commercial plastics for short-run dies. New types of small tools entered the picture, and a noticeable increase in production became evident.

Tool engineers in Trenton found a way to handle a difficult problem. Parts of jigs formerly built of fabricated steel were replaced by aged cast-iron pipe. Where an ill-fitting part or assembly could be forced into the steel jigs, thus resulting in the rejection of the entire assembly, the cast-iron pipe could not be forced without breaking. Parts of Trenton's jigs and checking fixtures were constructed from old pieces of pipe found lying in a nearby field, because the structure of the metal itself was stabilized — which would not be true of new iron or steel.

The Trenton tooling program became more involved with each increase of the Avenger TBM contract. This was met each time by a continuing process of breaking an assembly into more subassemblies, which in turn took the load off the main jigs. A good example of this could be found in the department where the center section of the Avenger was fabricated. A maximum of 28 master jigs had been designated to carry the load under a smaller contract. Naturally, these were not adequate when the contract was increased. Once more it was necessary to break the job down into more subassemblies which would allow more people who could be trained quickly to work on this critical assembly.

Interesting are the strides made by the Baltimore plant during the year. They had played follow the leader in the early stages of tooling, and in turn had found that tooling copied from that of other plants would not carry the load. Then ingenuity came to the fore. The entire aft section of the ship, as built in Baltimore, over a period of time, was broken down into no less than 385 subassembly operations for which approximately 222 types of new and improved jigs were put in use.

Giant jigs and fixtures developed in the plant to relieve the burden on the main assembly fixtures bore strange names such as "War Pony" and "War Horse," but did much to reduce manhours per ship.

A competitive spirit took root in the final assembly section of the Baltimore plant during 1943, when groups of employes working on the same type of operation challenged each other to a race. Story coverage of the event followed in an edition of the *Eastern Aircraftsman*, with the result that the employes worked even harder and many more manhours were saved per ship.

While this general over-all development was

proceeding through 1943, the aircraft industry in general was making great strides. Companies all over the country were exchanging new and better techniques, and Eastern Aircraft contributed and benefited with the rest of them.

The Aircraft War Production Council, East Coast, Inc., was formed on October 2, 1942, by Aviation Corporation, Bell Aircraft, Brewster Aeronautical, Curtiss-Wright, Eastern Aircraft, Fairchild Airplane & Engine, Glenn L. Martin, and Republic Aviation "to pool their resources of engineering, research, manufacturing techniques, facilities, and materials in an all-out endeavor to obtain maximum production of war planes for the United Nations." This meant much to the new Eastern Aircraft Division, for these companies were always willing to lend a helping hand wherever necessary, and to open their doors to Eastern's personnel on any occasion; and many were the times when Eastern needed this cooperation, and appreciated it.

Constant movement kept pace with improvement in the Division. Crowded conditions in Trenton plus difficulties in obtaining people in the area made it necessary to make certain changes before production in the plant was affected adversely.

Beginning in February, 1943, and continuing till July 29, the first of a series of many assemblies with the necessary tooling was transferred from Trenton to the Baltimore plant as a permanent assignment.

On July 29, 1943, and continuing for the balance of the year, the responsibility for the manufacture of even greater numbers of parts and assemblies was transferred to Tarrytown. Because this represented some of the major assemblies of the TBM-1, such as the gill and firewall, nose ring, and part of the center section, production of thousands of tools and man-

hours was involved in this mass exodus of work. The amazing thing about these moves was that they were accomplished without upsetting production schedules.

Behind this mass movement of work was the constant struggle to rebalance responsibilities throughout the Division, in an effort to obtain quantity and quality production consistent with the availability of men, materials, and machines at each plant point. Only through constant and accurate planning and forecasting could Eastern Aircraft's production unit, with its plants scattered miles apart, keep in

complete coordination and harmony to the end of meeting swiftly rising Navy schedules. And so, as Trenton's lines bulged with new fuselages and planes, and every bit of space in the production areas groaned under the additional materials and machines, original plans gave way to movement. Could Tarrytown handle this one? Maybe Baltimore could take on something else. Bloomfield might try another assembly. The rebalancing movement was on, and was destined to continue till the war's end. Eastern Aircraft's production at all points had to be perfectly synchronized.



ANOTHER YEAR

LATE IN 1943, production in all five plants was smoothing out. Here and there an occasional "bug" appeared, only to be quickly corrected. Employees on all levels were now well acquainted with the task at hand and better able to cope with any situation.

The Tarrytown plant was still in the process of absorbing major assembly work transferred from Trenton. Shortages of parts and assemblies were being reduced under a skillful and concentrated drive which had been inaugurated in all planning and purchasing departments. Much in evidence was the better flow between plants, a better synchronization of the entire operation. As a result of all this, planes proceeded out of the Linden and Trenton plants in greater quantities.

By the end of the year travelers along the New York highway through Linden, New Jersey, would often gaze in amazement at the long lines of FM-2's lined up on the airfield ready for delivery to the U. S. Navy and the British Royal Navy.

Passengers on the well-traveled B & O Railroad line which passed between the Trenton plant and the airport observed an equally heartening sight, for every day along the hangar apron a new and larger group of torpedo bombers was lined up for delivery. In

the sky over both plants the roar of new planes being tested blended into a constant drone.

The 1,000th bomber left the final assembly line at Trenton in December, 1943, just 13 months after the first plane had been tested. Here was a plane that typified the ultimate in cooperation and hard work of all plants in the bomber group: Trenton, Tarrytown, Baltimore and Bloomfield. In a brief but impressive ceremony held on the lawn of the Trenton plant, thousands of employees watched with pride as a rear admiral of the U. S. Navy, the plant manager, many Navy personages, two famous movie actresses, and civilian personages gave the plane a colorful send-off. Even before this ship took to the air, many more planes were rolling off the line, and everyone was proud of the fact that the next thousand would be produced in one-third of the time. Newspapers along the Eastern Seaboard gave excellent coverage to this celebration, for it represented a milestone in airplane production history.

To the bomber plants it meant a great deal more, for, as of January, 1944, the Grumman plant ceased production on the famed Avenger, and the U. S. Navy turned over the entire responsibility of engineering and production to the Trenton, Tarrytown, Baltimore, and

Bloomfield plants, comprising the bomber group.

With the combined production of both Linden and Trenton well into the thousands, and the three plants at Tarrytown, Bloomfield, and Baltimore supporting the program with great quantities of subassemblies, the year 1944 promised to be an excellent one.

Employes, management, and the U. S. Navy now had great faith and pride in this, the newest of General Motors Divisions.

An interesting but almost disastrous thing happened in the second month of the new year, which well bore out the old adage that "a chain is as strong as its weakest link."

With the production tempo increasing every day, and the Linden plant well on the way toward peak monthly production, a slow-down in a small midwestern plant without warning almost caused a complete work stoppage on the FM-2. The small plant of one hundred twenty people had run into labor difficulties which seriously impeded the flow of a small but highly important part for the Linden ship. Day by day the stockpile at Eastern Aircraft lowered, and frantic pleas went out over cross-country wires for more production, but to no avail. Finally in desperation a representative of Eastern Aircraft journeyed to the sore spot and with the aid of the U. S. Navy and cooperation of other government agencies, was able to right the situation, renew the flow of the necessary part to Eastern Aircraft and continue production in the Linden plant.

Something new came into the picture in the first two months of the new year. For some time government agencies had been most active in conducting investigations which delved deeply into a plant's ability to utilize the essentials of production advantageously. It was only natural that Eastern Aircraft should come in for a share of scrutiny.

An investigating committee, consisting of selected officers of the U. S. Navy's Bureau of Aeronautics and civilian specialists of the War Manpower Commission, started their survey in January. Covering all five plants of the Division their inquiry was especially concerned with improvements which contributed to a better utilization of manpower and the contributing elements to production trends.

Their final report which was released by the Bureau of Aeronautics on the first of March, 1944, was one of the finest tributes paid the Division since its formation. Tooling and control systems were reported among the finest in the entire industry. Highly complimentary comments were made regarding production trends and special emphasis was placed on the difficulties which the five plants had surmounted during a most trying period.

In reviewing Eastern's record the report stated:

"The company had no previous experience in aircraft manufacture, none of the assigned plants and only a small proportion of their equipment were completely suited to the work, production drawings (particularly in the case of the Wildcat) were not immediately available. The company was required (by agreement) not to look to Grumman subcontractors for aid, nor to enlist personnel from other aircraft companies, and it soon encountered numerous critical shortages in the available supply of skilled labor, raw materials, purchased parts, and Government Furnished Equipment.

"The Navy's plans depended heavily on successful performance of its contracts by General Motors. Production of the Wildcat at Grumman's plant had been discontinued in order to make way for the newer and larger Hellcat, yet a continued supply of the smaller model was essential if the rapidly growing fleet of small (converted merchant ship) carriers

was to be outfitted. Improvements in the model were urgently needed to meet the numerous conditions of small-carrier operation. The supply of Avengers from the Grumman plant was not enough to meet all demands. A second source was both an immediate and a strategic necessity.

"A review of Eastern Aircraft operations shows to date a successful accomplishment of a difficult assignment. The Navy asked General Motors Corporation to produce, on short notice, large quantities of two important combat aircraft, in plants not intended for or well suited to the work, using inexperienced personnel. When it appeared that these requirements might be met, the task was made more difficult by increasing the production schedules sharply and transferring to GM responsibility for the engineering development of both models.

"The quality of Eastern Aircraft's output, under constant supervision by the Bureau of Aeronautics Representative, has from the beginning been acceptable to the Navy. It is generally agreed among those who have followed the operations that quality has steadily improved and is now the equal of the best in the industry."

The report added that Eastern Aircraft's "rate of improvement had not been surpassed elsewhere in the aircraft industry."

While the production flow through the summer of 1944 was not unhindered, hundreds of planes poured from the two plants at Trenton and Linden on schedule to complement U. S. Navy aircraft carriers all over the world. Service representatives of Eastern Aircraft were traveling to far-flung battle fronts to aid the U. S. Navy and the Royal Navy with any problem that might come up in the field. Service manuals, and pilots' handbooks were finding their way around the globe, and the name of

Eastern Aircraft was becoming well known to pilots and Navy personnel in far-away places.

Representatives of the Navy Department in Washington indicated that Eastern-built planes were on practically every Navy carrier, and the Division as a whole was still maintaining its No. 1 place as the largest producer of Naval aircraft in the country. This indeed was a tribute to the thousands of loyal workers who had put the newest of GM Divisions on the map.

Late in August, 1944, the war was going well for the Allies the world over. American, British and French forces were fanning out across France with amazing speed. In the Pacific they were closing in for the expected invasion of the Philippines. Success was riding with each new move against the enemy. Because of this success the newspapers in the first few days of September carried this story from Rear Admiral DeWitt C. Ramsey, Chief of the Navy's Bureau of Aeronautics:

"Due to changed combat conditions the Navy Department has notified the Eastern Aircraft Division of General Motors of an increase in the schedule of the TBM Avenger torpedo bombers and a decrease in the number of FM-2 Wildcat fighters. The gradual increase in the Avenger torpedo bomber schedule takes effect immediately, reaching a new peak in January, 1945.

"The cutback in Wildcat production is in line with the Navy's plans announced several months ago, of cutting back all types of Navy fighter planes, which was made possible by an unexpectedly low combat attrition rate."

Actually the Division had been requested to produce 40 more Avengers each month. The Navy was still depending on Eastern Aircraft to produce planes in great quantities, but in a bomber-fighter ratio consistent with its aggressive combat plans.