

cannot substitute for fine quality in milk powder—that it is simply an added protection.

In connection with this improvement in milk powder, officials of the Food and Drug Administration have pointed out

that they know of no barrier to the addition of so slight an amount of pure food materials to milk powder, since no standard for dried whole milk has been set up under the 1938 law.

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#### ENGINEERING

## Design Changes Needed

**Warplanes should be planned so that they can be broken down into units that could be carried on standard vehicles. Better servicing would increase air power.**

➤ WARPLANES now spend scarcely more than 3% of their time in the air, indicating a need for designs that will permit quicker, easier servicing, Clyde R. Paton and William C. Gould of General Motors' Allison Division told the Society of Automotive Engineers meeting in Los Angeles, during a discussion of servicing aircraft overseas.

Aircraft should be designed, the engineer stated, "so that they can be readily broken down into units, each complete in itself, and of such size as to be readily handled on standard transport vehicles." Grounded planes could thus take to the air again in a short time, as the defective part is removed and a new or overhauled unit dropped into place.

Such units must be packaged to withstand plenty of rough handling during overseas shipment. Trying to protect replacement parts with a "This side up" label means nothing under conditions of military operations.

After the parts have been installed, "tinkeritus" has been found to be a common cause of further trouble. This largely affects inexperienced ground crews who constantly work on engines even when they are in good condition, as well as give careless or faulty service when there is a real need for maintenance work.

From experience overseas, the engineers reported that "everything possible must be done in the design and engineering of aircraft to insure ease of service and maximum durability under the most primitive field conditions."

One of the greatest problems of flyers in advanced theaters of operation is the general lack of spares. Even when replacements have been sent they may never reach their destination, due to the exigencies of war, it was pointed out.

"Personnel can argue for travel pri-

ority," the engineers were told, "materiel cannot and frequently fails to move until followed up by special expeditors assigned to that problem. Separate flight schedules for personnel and materiel would, with rigid restrictions governing encroachment of one service upon the other, do much to correct this difficulty.

"Another difficulty is that during periods when materiel in transit is off loaded, it frequently is pirated by local supply personnel who find themselves in immediate need of the materiel in their hands."

Shipments may also be diverted at times from their original destination to another point under the pressure of military necessity, the engineers reported. Improvements are now being made to help overcome these problems.

Because of the remoteness of the Southwest Pacific war theater, servicing must depend to a greater extent on salvage operations in lieu of new spares. To help solve this problem, it was proposed at the meeting that manufacturers "undertake a program directed toward developing salvage procedures which require only simple, readily portable hand tools which can be utilized under first echelon conditions."

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### Movies An Engineering Tool

➤ MOVIES that would never be run at a theater are of dramatic interest to wartime engineers, for they measure and analyze motion and vibration in machinery.

H. D. Jackes of Wright Aeronautical Corporation suggested three problems of the aircraft industry which might be solved by further use of high-speed motion pictures:

1. Flutter of wing and control surfaces on planes.

2. Action of wheel struts and landing mechanisms upon impact with the ground.

3. Failures and vibration of exhaust collector rings. The camera could be located in the engine compartment during flight, for example, to reveal defects in the exhaust system.

Describing uses to which high-speed motion pictures are already being put for recording valve action, oil movements, and motion studies of parts, Mr. Jackes said that film records are particularly useful because they can be easily analyzed by anyone with general engineering experience. In many research problems the movies have been found superior to strain gages, seismic vibration indicators and stroboscopes for motion analysis.

The camera is the same type used to make a "photo finish" at the races. Its value has already been recognized by several industries for studies such as the action analysis of the escapement mechanism of precision clocks and of the shutters on military aerial cameras. Movies are also used in the study of various manufacturing processes, such as blowing spun glass or the action of a high-speed weaving machine.

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### Gadget-Laden Trainer

➤ THE gadget-laden training plane developed in this country is now being used by 24 United Nations and more than 10,000 have been American-built since the first model of the series appeared a decade ago, Ralph Ruud of North American Aviation, Inc., announced to the Society of Automotive Engineers.

Its development has paralleled design improvements of combat types to give the best possible training facilities in almost all tactics, from ground strafing to aerial dogfighting to bombardment.

Equipment on the versatile ship includes bomb racks, blind flying instruments, fixed and flexible guns, gun and standard cameras and the other gadgets that military pilots must learn to operate.

Aside from some Air Corps specifications, the development of the trainer has been a "designer's paradise," Mr. Ruud pointed out. As a result a trainer has been produced which is purposely hard to fly yet safe, and resembles combat planes in performance and handling. It is easy to maintain and repair. It comes

as close to indestructibility as any airplane can come. These design features have been developed, the engineers were told, within a plan for low-cost, rapid production.

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## Manly Medal Awarded

► RESEARCH on oil systems of aircraft has won the Manly Memorial Medal for John Dolza and Harry C. Karcher of General Motors' Allison Division in Indianapolis.

Although the two engineers are the first medalists to be so honored since 1939, the award is available annually for the best paper on theory or practice in the construction of, or research in, aeronautical power plants, parts or accessories. It was established in 1928 to honor Charles M. Manly, designer of the forerunner of modern radial airplane engines. The subject of this year's prize-winning paper was, "Correlation of Ground and Altitude Performance of Oil Systems."

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### ENGINEERING

# Gas Tanks of Magnesium

Other uses in warplanes, such as turret cases, tail surfacing and parts, has resulted in the tripling of magnesium production.

► PRODUCTION of magnesium will soon be more than tripled as better gasoline tanks, turret cases, tail surfacing, and other aircraft parts are developed by use of the feather-weight metal, J. C. Mathes of the Dow Chemical Company, Midland, Mich., reported to the Society of Automotive Engineers meeting in Los Angeles.

Present abundance of magnesium, which is expected to continue under present conditions, will supply the plants now coming into production. By early next year production of magnesium sheet should triple, the engineers were told, and extruded parts should be available in five to ten times the former quantity.

The problem of building fabrication facilities has been complicated since many of the parts have never been made of magnesium before, and their requirements must be determined by further engineering study.

Used to supplement aluminum, the hard, silvery metal helps increase a plane's range, load, speed and maneuverability. Sheet magnesium was reported to be satisfactory for such uses as instrument panels, turret parts, and oil and gasoline tanks.

Twelve gallons more capacity and nine pounds less weight resulted from using magnesium gasoline tanks on the British Spitfire. The tanks are also more resistant to gunfire because the magnesium does not "tulip" and form ragged holes which prevent the coat of bullet-proofing rubber from sealing punctures effectively.

From 11% to 26% weight reduction is achieved by using magnesium sheet for surfacing ailerons, flaps, elevators and tail assemblies, Mr. Mathes reported.

Many researchers have been at work on the problem of part failures due to stress corrosion. Stresses resulting from arc-welding were named by Mr. Mathes as the most serious offenders, but it is now believed that this can be overcome by a stress-relieving process conducted

at 400 degrees Fahrenheit for an hour.

Captured Nazi planes have shown a much higher base metal corrosion compared to American magnesium alloys due to impurities. Despite this, no corrosion failures were observed.

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### AGRICULTURE

## Victory Gardens Produced 8,000,000 Tons of Food

► AMERICA'S Victory Garden program for 1943 has proved that Americans can meet emergencies. Approximately 20,000,000 gardens were cultivated. About 4,000,000 acres of land were used for them. Some 8,000,000 tons of food were produced. These are figures of the U. S. Department of Agriculture.

This means that approximately one out of every two families in the country had victory gardens. In the two severe drought areas, the Middle Atlantic states centered about the District of Columbia and the Oklahoma-Texas region, many of the gardens were a failure. Throughout the nation as a whole they produced abundantly. In tonnage the production is as great as that of the food for the entire Army. A soldier uses a ton of food a year. The Victory Garden production amounts to about 125 pounds for every man, woman and child in the civilian population.

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**FOR STRATOSPHERE**—These are supercharger impellers, "fan" blades for the bombers that will fly in the upper air over enemy territory. They are being built in General Electric's Fort Wayne, Ind., plant.