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TECHNICAL MAINTENANCE OF AIRCRAFT AT FIELD AIRDROMES

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Aircraft maintenance in the open is considerably more difficult than it is in hangars. It is necessary not only to make arrangements for protection from the elements for convenience in servicing, but also, in the case of operational airfields, to satisfy a number of tactical requirements.

Selection of Sites for Construction of Aircraft Parking Areas

If an airfield is near a wooded area, the parking areas are usually located on the edge, or 100-200 meters inside it. In hilly and mountainous localities, the parking areas are usually at the foot of the hills or mountains; in the steppes, they are near gullies and also on the boundary of populated points.

Jet fighters are placed as near the field as possible. This facilitates take-off, and towing of aircraft to and from the runway. Lengthy taxiing of jet engines is undesirable due to the large amount of fuel expended. Moreover, jet aircraft are less maneuverable on the ground than are aircraft with reciprocating engines, because they can turn only by braking.

Aircraft parking areas should be situated on fairly solid ground, but at the same time it should be permeable to moisture. It should not have ground water near the surface.

It is essential to see that the surface vegetation is dense, even, and free from bald patches and hillocks. Parking areas for jet aircraft are cleared of high grass and shrubs with special care because of the danger of fire.

The surface of the soil in the neighborhood of parking areas should be even, so that aircraft can taxi freely to and from the starting point.

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In winter, ice airfields are sometimes constructed on the frozen surfaces of lakes and rivers. The parking areas are located in places not subject to the formation of heaps of broken ice and snow hummocks. When selecting a parking area on an ice airfield it is important to note that on seas, rivers, and lakes where there are currents, the strength of ice at the bank is considerably reduced. The thickness of ice, as a rule, is checked over the whole area of the proposed airfield.

When operating ice airfields, the accumulation of a large amount of machines and mechanized equipment in one spot is not permissible. Planks are placed under the wheels to reduce the specific load on the ice.

No portion of the surface of sea ice should be bared of snow. There should be no thin secondary ice layer over the surface of river or lake ice, because it breaks easily under the pressure of wheels or skids.

Construction and Equipment of Aircraft Parking Areas in the Open

The nature and amount of work entailed in equipping aircraft parking areas depends to a considerable extent on the air situation, the distance of the parking areas from the front line, the period for which the site will be used as a base, and the possibility of obtaining additional labor from the local inhabitants.

Under any conditions, as a rule, action is taken to protect materiel from attacks and observation by enemy aircraft, and also from the action of wind and weather.

Methods of protection against aerial attack include the construction of revetments for aircraft and dugouts and slit trenches for personnel.

A revetment is an enclosed plot of ground with a recess for the aircraft, if there is no danger of flooding by ground water, or without a recess, when the ground-water table is high. In the first case the earth removed is utilized for the enclosure. The most usual form of revetment is the horseshoe. The walls of the revetments are made from various readily available materials: stone, stone and earth, earth alone, earth and sandbags, earth and straw, earth with a cut wood or frame wall, wood, and, finally, a wooden "naslon" with an earthen embankment.

In the case of jet aircraft, the revetment is made only from noninflammable materials (earth, stone). An aperture for blowing through is made in the rear wall so as to avoid backwash in the revetment when testing the engine.

The revetments are usually left open on top, but for better camouflage they can be covered with logs strewn with earth.

In a hilly or mountainous area, the revetments are dug out of the hillside or constructed like a cave in cliffs. In winter, they are made with a wall of snow and ice blocks, or with a wooden "naslon" and a snow embankment. In cases where base conditions are such as to preclude the construction of artificial revetments, the aircraft are isolated from each other by strips of woodland or natural features.

Dugouts for personnel, chiefly mechanics, are built near aircraft parking places, sometimes even at the foot of the rampart of the aircraft revetment. The dugouts have enough room for the mechanic to set up a vise and arrange working space.

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Slit trenches for sheltering the crew during enemy air attacks are usually constructed adjacent to the aircraft revetment. War experience has shown that the most suitable slit trenches are those of the "goose foot" type. This shape facilitates passage to a safe position when the airfield is dive-bombed.

Protecting aircraft from enemy observation can be accomplished by several types of camouflage depending upon the nature of the terrain and the time of year.

Natural camouflage can be used when the aircraft are placed on the outskirts of a wood, in scrub, ditches, gullies, and populated places. In open country, camouflage nets or rugs are stretched horizontally over posts.

When artificial camouflage equipment is not available, efforts are made to blend the brightness of the aircraft with the general background. Jackets are hung on all bright parts (propellers, lights, etc.).

If aircraft are kept in revetments, turf is laid on the breastwork and a camouflage net or rug is hung above on posts.

Materiel is protected from the action of moisture in the following way. Surface moisture is carried away from parking places through a drainage system. Drainage ditches are made in the revetment, and these connect with a drainage trench which is dug one meter from the rear end of the revetment. High grass near the aircraft is mowed and small bushes are cut down. Boards soaked in creosote, or plaited mats of conifer branches, are placed under the wheels of the aircraft.

In winter, when aircraft are sometimes used on skid landing gear, the latter are set on the so-called snow combs, i.e., conifer needles, straw, linen, plywood, soaked in paraffin or moistened with antifreeze. This prevents the skids from freezing to the ground.

Jackets are put on propellers, engines, cockpits, and, in some cases, wing center section and tail, to protect them from precipitation. Shock cords are usually sewn on to the edges of these jackets in order to provide for closer attachment to the aircraft.

In order to prevent icing up of surfaces, the wings and tail assembly of aircraft are covered with jackets made of canvas, sacking, or burlap. Plywood sheets, boards, mats plaited from conifer branches, and also canvas, straw, or rope mats are placed under tires. By this means it is possible to prevent them from freezing to the snow and hence avoid the damage which would be incurred in pulling them away.

In order to prevent the cockpit windows from freezing over, the canopy is left partly open whenever there is no precipitation.

Special jackets are put on the tires to protect them from accidental damage due to spilling of fuel, oil, or coolant.

Special jackets are used in areas where intensive dust formation is possible. Pads are used to prevent dust falling into radiator honeycombs, air intakes of reciprocating engines, and turbojet engines. All holes in the fuselage are blocked with shaped wooden plugs.

An important way of reducing dust formation in revetments is to line the insides of the ramparts with stone, brick, boards, or turf.

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Before testing reciprocating engines, the surface of the ground under the propellers should be carefully swept and watered to avoid the injurious effect of small pebbles, rubble, and grit on the propeller.

In order to reduce wear of and prevent damage to turbojet engines, it is sometimes necessary, when testing such engines in a dusty place, to construct asphalt or concrete areas in front of the parking areas, or to roll the ground It should be borne in mind that if stones, earth, pieces of concrete, etc., fall into the intake cone of a turbojet engine, the compressor is put out of action, and, consequently, the whole engine.

In order to protect aircraft from the destructive effects of wind, it is the practice to put special clips or clamps on elevators, rudders, and also on the ailerons. Moreover, the aircraft are moored to points on the ground. The control surfaces are clamped whether the aircraft are in revetments or in the open.

Aircraft in the open are usually moored. However, in places with strong squalls it may be necessary to moor aircraft in revetments also.

When there are no revetments available, single aircraft are placed tail to wind so that the wind presses the tail assembly and wings toward the ground. To prevent lifting, forward or backward movements, and swaying sideways, the aircraft are lashed down with hawsers or halliards to rings embedded in concrete or to stoppers twisted into the ground, or, in extreme cases, to supports buried in the ground. In the last case, wooden beams, crossties or rails at least 1.5 meters long are buried beneath the mooring points on the aircraft wings. Around them are passed cables 8-10 millimeters in diameter or iron rods 15 millimeters in diameter. To increase the holding power of the buried supports, the beams are laid in the pits in such a manner that they rest against the intact ground. The ends of the cables are brought to the surface in the form of a loop and to them are attached the guy ropes from the mooring points on the aircraft. The aircraft can be further secured by attaching each side of the landing gear or members of the wing center section to stoppers. The rear of the fuselage is attached by cables or by halliards to four stoppers. Wooden chocks are placed under the wheels.

When there is no time to spend on installing special mooring points, the aircraft may be secured to heavy weights placed on the ground underneath, e.g., sandbags or stones.

At a permanent airfield in winter the same mooring procedure is carried out as in summer. If there are no prepared mooring points, the aircraft are secured to stoppers twisted into the ground, to rope loops frozen into the snow, to bags of snow frozen to the snow on the ground, and, in the case of parking areas on an ice surface, to a pole lowered under the ice through a hole.

When aircraft are based in the conditions of the Polar regions, they are moored to an ice crosspiece, to a rounded stone placed in a pit and covered with a mixture of earth or gravel and snow, to a coil or rope or metal four-way piece placed in a pit and covered with water, or to boxes or bags filled with earth, sand or gravel. The mooring device is attached to special mooring rings on the aircraft or to a landing-gear strut and the tail wheel.

Following are the main requirements in servicing the aircraft. Dust, mud, and grease spots are removed from surfaces of parts with a clean dry rag. Dirty metal skin is first soaped with high-grade solid soap. Very dirty plywood and linen casing is wiped with a rag moistened with warm soapy water (350-400 grams high-grade solid soap to 10 liters of water heated to not more than 30 degrees centigrade)

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Substances which have a deleterious effect on protective coatings, such as gasoline, kerosene, acids, alkalis, and solvents, cannot be used to clean metal, wooden, or fabric skin. It is equally inadmissible to scrape off mud or to remove grease spots with metal brushes. Wooden aircraft are sometimes cleaned by washing the surface with water from a bucket or fire engine. This practice is absolutely inadmissible, especially when the surfaces are not wiped dry after washing but are left to dry in the sun, for this will probably result in warping and cracks.

Hot water is sometimes used in winter to remove grease spots or ice crust. The temperature of the water should not exceed 40-50 degrees as failure of riveted seams can be caused by temperature stresses.

Special attention must be paid to prevent dirt and moisture from accumulating inside the aircraft, since their harmful effect is aggravated by stagnant air. Dust, dirt, and moisture are removed from internal cavities by blowing with compressed air and ventilating (by opening all louvers), etc.

A careful check is kept on drainage holes. Dirty grease is removed from parts with kerosene, after which clean grease is put on. Under damp climatic conditions even perfectly clean grease has to be changed frequently, as it soon takes on moisture and corrosion occurs under the grease layer. In the case of aircraft which are grounded only for a short time, only those parts or mechanisms which are directly subject to the action of the atmosphere are weatherproofed, the weatherproofing being carried out after each flight. The correct execution of all weatherproofing work plays an extremely impo tant part in the system of preservation measures. An interruption in conservation routine, the use of materials not meeting technical specifications or otherwise unsuitable, is absolutely forbidden.

The observance of preventative measures does not dispense with the necessity for systematic checking of the condition of the aircraft and the timely discovery of defects. Working parts are checked daily during the post-flight inspection, and adjustments are made periodically at definite time intervals.

The technical personnel carrying out inspection must properly assess the condition of parts and diagnose from the external signs the beginning of the process of deterioration. No less important is it to evaluate the degree of serviceability of a defective part and to find a method of immediately putting a stop to the destructive process.

We shall examine the methods of determining the most characteristic defects of materiel which can arise due to field conditions and will give an appraisal of the technical state of the defective part.

A white deposit on painted metallic or wooden aircraft skin is a product of paint deterioration. The appearance of such a deposit is called "omeleniye" (chalking). A deposit due to chalking can easily be rubbed off with cloth and the paint assumes its former appearance.

One must be able to distinguish chalking phenomena from corrosion of a metallic surface. The paint puffs up during corrosion, forming little bubbles beneath which the corrosion products are located. The corrosion products have the appearance of grayish flakes. If the flakes are removed with a dry rag it is possible to discern the paint damage and traces of the corrosion of the metal in the form of dark spots.

Corrosion of steel parts is marked by the appearance of a continuous reddish-brown scale (rust). If rust is detected on painted steel parts the paint is removed with a mixture of turpentine and denatured alcohol or gasoline. The spot is cleaned with 00 or 000 emery until the rust is completely removed, washed with dehydrated kerosene, and then repainted. In winter, after traces of corrosion have been removed, the damaged place is not painted but temporarily protected.

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If the corrosion has progressed far and deep cracks, whose removal would involve weakening the parts, are observed on the part surfaces, replacements should be fitted.

A symptom of the corrosion of light alloy parts is the appearance of pockmarks consisting of a grayish white deposit on the surface of the metal.

If signs of corrosion are detected the part is carefully examined to establish the causes of the corrosion and discover the areas affected. The paint is then removed from an area considerably larger than that where the corrosion was originally detected. The affected area is cleaned with 00 or 000 emery and polished with pumice. It is then washed with gasoline and carefully dried. A careful examination is then carried out with the aid of a glass of at least 10 X magnification. If no cracks or pinpoint formations are discovered, indicating the corrosion extending within the material, the outer surface is painted and the inner lacquered. (If it is impossible to paint the surface, it is temporarily protected.)

If, after careful cleaning, examination discloses dark spots with a rough surface (symptoms of intercrystalline corrosion) the part must be replaced.

Special attention during inspections should be paid to the conditions of the rivets, as they are very susceptible to corrosion. If a coarse light deposit is found on the head of a rivet, it is cleaned; if a crack is discovered, the rivet is replaced.

The appearance of a dark blue tinge on wood (continuous or in the form of radial bands) becoming black in places denotes the presence of fungus. In such cases the outside of the part is usually covered with a white fur. A part with a continuous deep blue tinge and covered with white fur is replaced. The situation is different when the wooden part is covered with green mould. This growth does not lower the strength of the material and does not result in the growth of fungus. The mould is removed with a clean rag moistened with a 10-percent alcohol solution of formalin. The places where the mould was are then cleaned with emery paper and given one coat of oil lacquer.

The appearance on wood of a yellow tinge, merging into brown, indicates the development of a fungus which destroys casein cells. In this case the lacquer film over an area twice as large as the spot is removed with 00 emery paper, the timber cleaned to a depth of 0.1-0.2 millimeter, and wiped with a rag moistened in a 10-percent alcohol solution of formalin. The part is then dried and given one coat of oil lacquer. If, after all this, the wood still has a reddish brown color and signs of rot are present the part is replaced.

It is necessary to distinguish between: (1) the change in color of a wooden part caused by the development of fungus; and (2) the change in color due to repeated washing of the aircraft. Repeated washing may result in the paint becoming tarnished, in which case it is repainted after the wood is thoroughly dry.

Areas of wood which are damaged or have damaged paint are washed with antiseptic (5-percent solution of formalin in alcohol), dried, and given two coats of oil lacquer.

Cracks may appear in plywood paneling for various reasons. Small hairline cracks, whose size varies according to the humidity, are permissible in service. They are dealt with by puttying and painting. Large continuous cracks, and loose nails in the skin, and also warping and swelling of the skin are signs of serious defects. In such cases the aircraft is overhauled. Loosening of plywood skin is checked by tapping with a hammer. In places where the gluing of

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the skin is damaged the sound of the blow is duller. Skin which has become loosened from the frame is stripped off and repaired.

Correct operation and careful care of material prevents accidents and increases the life of the aircraft.

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