SECTION 1
INTRODUCTION

In addition to those airfield facilities and features discussed in the preceding sections, the following are frequently present:

1. Compass-aligning bases
2. Aircraft-gun testing ranges
3. Drainage patterns
4. Aircraft crates
5. Jet blast marks
6. Security fences
7. Firebreaks
8. Airfield construction
9. Transformer stations
10. Water storage tanks

These features should be relatively easy to identify on aerial photography of suitable scale. Their importance lies in frequent association with certain airfield activities, types of aircraft or countries. For example, the Soviets commonly plow firebreaks around airfield storage areas.

COMPASS-ALIGNING BASES

Bases for aligning aircraft compasses are found on some airfields. They are circular, often hard-surfaced stands with compass points marked on the circumference. When an aircraft is in aligning position on this stand, its compass may be brought into adjustment with the points on the base.

FIG. 10.01 Two compass-aligning bases on airfield in former East Prussia. Aircraft on base to left is in aligning position.
Scale 1:12,000

FIG. 10.02 Two compass-aligning bases on airfield in Sovzone, Germany.

FIG. 10.03 Compass bases shown in Fig. 10.02. Scale 1:7,200

AIRCRAFT-GUN TESTING RANGES

Ranges for testing and adjusting aircraft machine guns and other weapons are most commonly found on airfields having major repair facilities or on those associated with aircraft factories. On aerial photography they appear as long trough-like installations with an opening at one end, where aircraft are positioned for target fire. This open end may or may not have a hardstand. Walls are of extremely heavy construction, generally earth banked. As a rule, the range is uncovered, though some are entirely roofed and others may have a shelter only over the aircraft position.

Ranges are often in groups of two or more and may differ in length to permit varying adjustments of guns. Occasionally, small arms and aircraft-gun testing ranges appear side by side. When occurring together they are similar in construction. The small arms ranges are generally the narrower of the two and lack stands for positioning of aircraft.

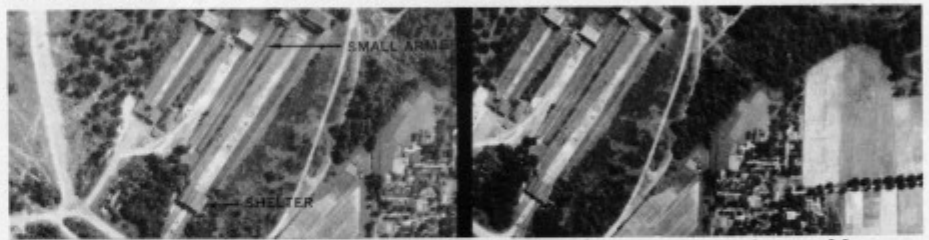


FIG. 10.04 Group of three aircraft-gun testing ranges and a small arms range in Sovzone, Germany. Shelters appear over aircraft positions. See Fig. 10.18 for similar ranges appearing at reduced scale. Scale 1:6,300

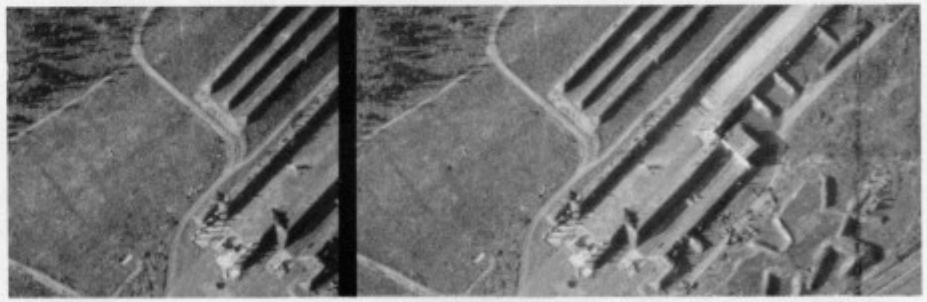


FIG. 10.05 Ranges for aircraft-gun testing and for small arms firing. Note aircraft in firing position. Sovzone, Germany. Scale 1:3,300

FIG. 10.06 Covered aircraft-gun testing range in Sovzone, Germany.
Scale 1:10,000

SECTION 2
LANDING AREA SURFACES

LANDING AREA SURFACES

Identification of Type

Positive identification of the type of landing surface is important in assessing the full capabilities of an air installation. The kind of surfacing is one of the major factors determining not only the types of aircraft that can operate from a field, but also the field's capability for supporting sustained operations.

The type of surface material on an airfield landing and take-off area often is difficult to determine from aerial photographs. However, photography of proper exposure, taken at scales of approximately 1:15,000 or larger, usually will reveal enough of the recognition features outlined in the table below to permit adequate photo interpretation of the landing surfaces.

Identification of types of landing surfaces just on the basis of tone is difficult. Many times, the various surfacing materials give the same general appearance on photographs with scales as large as 1:2,000. Graded earth, gravel, coral, sand, clay, closely cropped grass, and concrete usually reflect much more light than the features surrounding them. Most operational photography is exposed for the overall airfield and not the landing surfaces. As a result, these surfaces are overexposed and appear very light in tone. Also, the overexposure results in loss of pattern and texture details. Photography using panchromatic film with the exposure calculated to reveal the details of the surface of the landing area, should give the following average relative tone values for the various surfacing materials:

Type Surface Material	Average Relative Munsell Value (Tone)
Graded earth, gravel, coral, clay(dry)	6 - 7
Concrete	5 - 6
Pierced steel plank	5 - 7
Sod	4 - 5
Asphalt	2 - 4

The Munsell (1947) gray-scale number or value describes the degree of lightness or darkness of tone. This scale extends from black at 0 to white at 10. A shade of gray having a tone halfway between black and white has a notation of 5. Light grays range from 5 to 10, while dark grays range from 5 down to 0.

Relative tone values are helpful in identifying surface materials, but it is most important to remember that there are many factors which affect tone on a photograph, e.g., moisture content of surface material, texture of surface, angle of light incidence, printing and developing processes, etc. Therefore, the recognition features listed in the table below must be given primary consideration when identifying landing surfaces.

RECOGNITION FEATURES OF LANDING SURFACES

TYPE OF SURFACE	PATTERN			TONE	WIDTH OF LANDING AREA OR RUNWAY	TYPE OF AIRFIELD	AIRCRAFT SERVICING FACILITIES	TAXIWAYS	OTHER
	EDGES	CORNERS	SURFACE						
Sod (Page 2.03)	Irregular line	Jagged or irregularly curved	Irregular	Dark gray to white-mottled	Variable	Usually auxiliary, small civil or emergency	Usually limited	None	Tire tracks
Graded earth; Gravel; Coral; Sand; Clay (Pages 2.04 - 2.05)	Irregular line	Jagged or irregularly curved	May have grader marks	Medium gray to white-often mottled	Variable	Usually auxiliary, small civil or emergency	Usually limited	May be present	May be pit nearby where surface material obtained
Pierced Steel Plank (page 2.06)	Irregular ends of plank may be visible	Stepped	Parallel planks with holes	Dark gray to white-often mottled	Variable	Military-usually new construction	None to complete	Usually present	Often piles of steel plank in area
Asphalt; Brick (Page 2.07)	Straight line	Right angle or smoothly curved	None visible	Very dark to light gray-usually uniform	Uniform	Usually major military or civil	Usually complete	Usually present	Surface may be patched or painted
*Concrete (Pages 2.08 - 2.09)	Straight line	Right angle or smoothly curved	Block	Medium gray to white-uniform	Uniform	Major military or civil	Usually complete	Usually present	Surface may be patched or painted

*Surface of rolled earth and crushed rock gives the appearance of concrete but shows no block pattern; tone often mottled. This type of surface common in the Far East. (Fig. 11.07).

FIG. 2.01 Sod landing area having no defined runways (Sovzone, Austria). Presence of wheel tracks, together with tone characteristics, indicate sod surface. Outlined area is shown in Fig. 2.02. Scale 1:15,000

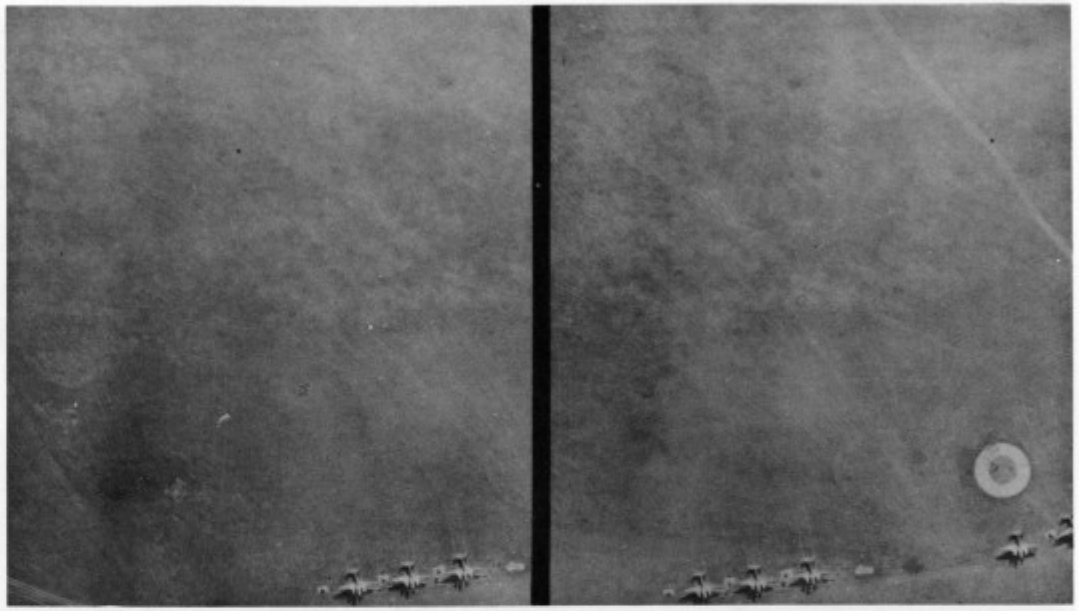


FIG. 2.02 Part of sod landing area shown in Fig. 2.01. Note mottled tone and wheel tracks. Scale 1:2,500

FIG. 2.03 Sod landing strip. Areas with light tone are bare earth or very thin sod. Dark areas are heavy sod. Cut in bank on right, which shows light, is gravel. See Fig. 2.04 for ground view. Scale 1:16,000

FIG. 2.04 View of airfield from top of gravel bank toward hangar. (See camera station in Fig. 2.03). Note coarse gravel in foreground which has a very light tone on the vertical photo. Ground stereopair

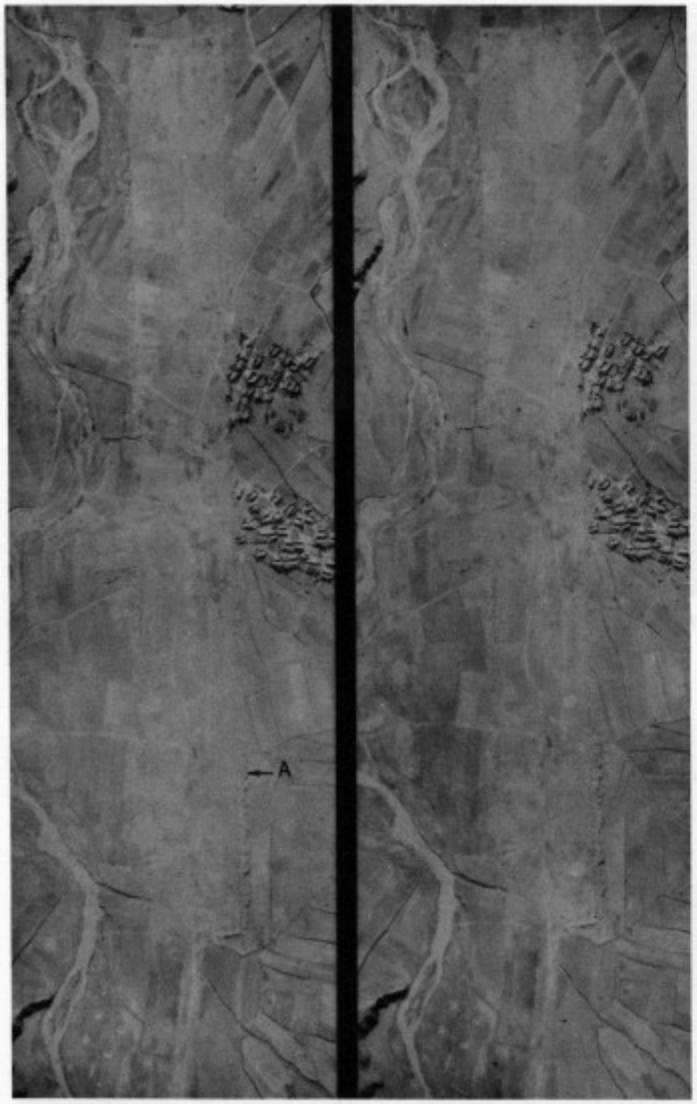


FIG. 2.05 Recently constructed, graded earth landing strip in Korea. Note that agricultural patterns and old roads are still visible. Such fields are for limited or emergency use. They are unserviceable in wet weather. Observe similarity of tone between earth fill (A) and runway surface, indicating that both are of the same material. Scale 1:10,000

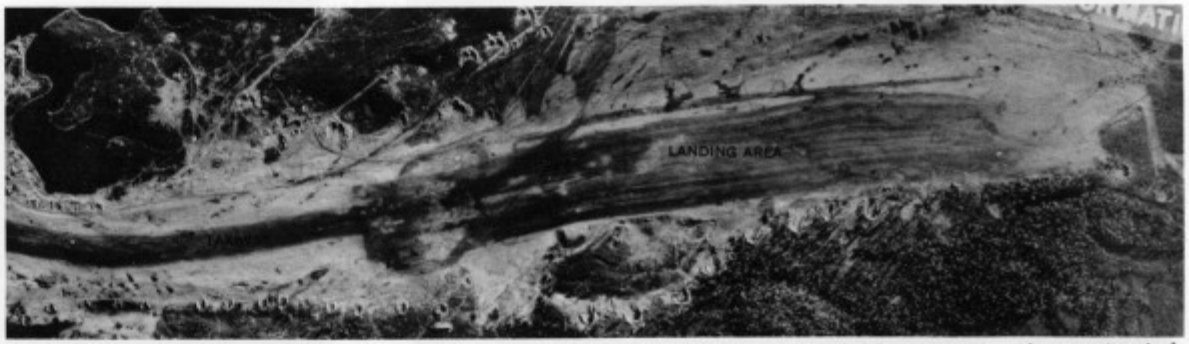


FIG. 2.06 Graded earth landing strip in European U.S.S.R. Crude oil or some other material has been sprinkled on the surface to keep down dust. Scale 1:12,000

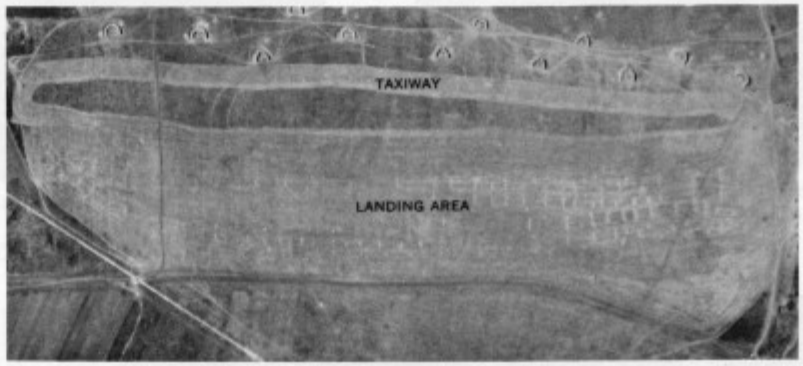


FIG. 2.07 Graded earth landing strip in European U.S.S.R. Note grader marks running lengthwise of strip. Scale 1:12,000

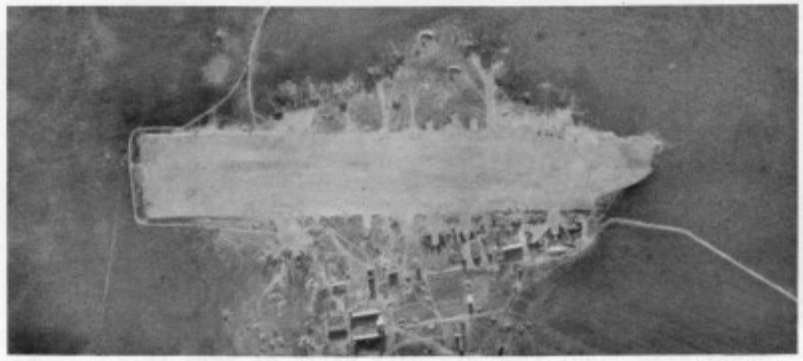


FIG. 2.08 Graded earth landing strip in European U.S.S.R. Note tone variation from medium gray to white and irregular boundary of strip. Scale 1:14,500

FIG. 2.09 Graded earth strip in U.S.S.R. Note grader marks running length of strip. Scale 1:7,000

FIG. 2.10 Graded earth runways on a small airfield in U.S.A. Note pit in lower left hand corner from which surfacing material was obtained.

FIG. 2.11 Gravel and sod landing area on small airfield in U.S.A. Note that gravel area appears very light in tone.

FIG. 2.12 Graded earth landing area in permafrost zone (area of permanently frozen ground) in U.S.S.R. Grader marks form pattern running lengthwise of strip. Polygonal pattern on surface around landing area indicates permafrost. Scale 1:8,000

FIG. 2.13 Graded earth landing area in Korea. White spots on the runway are filled-in bomb craters. Scale 1:48,000

FIG. 2.14 Large-scale photograph of landing area shown in Fig. 2.13. Scale 1:9,000

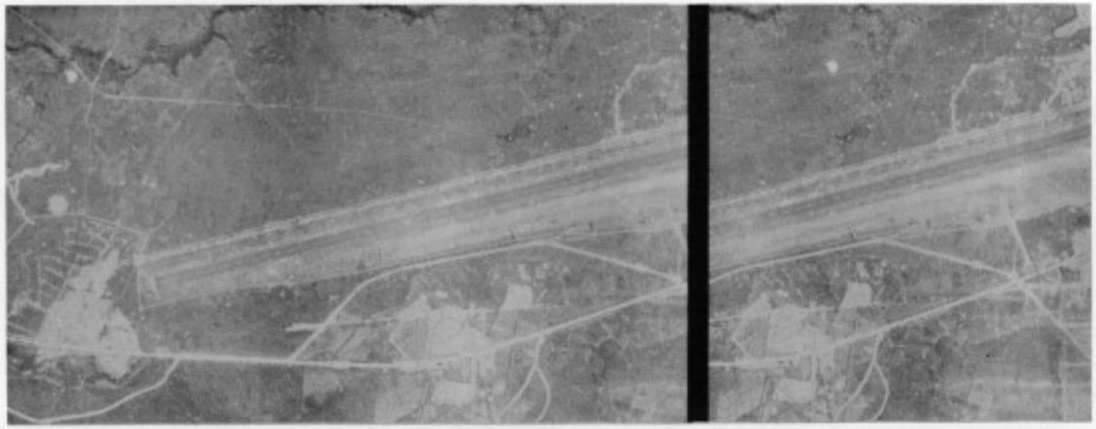


FIG. 2.15 Pierced steel plank runway. At regular intervals sections of steel planking extend beyond the edges of the runway. French Indochina. Scale 1:8,000

FIG. 2.18 Grass and seeds growing through holes in pierced steel plank runway. On small-scale photography such surfaces are easily confused with sod. U.S.A.

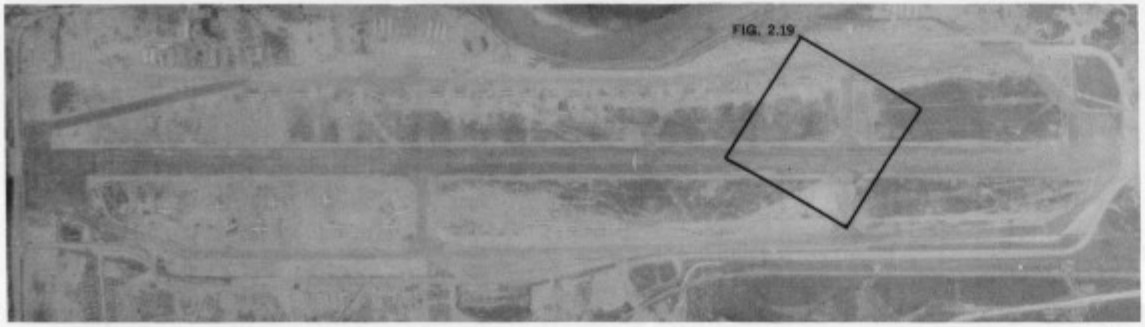


FIG. 2.16 Pierced steel plank runway, taxiway and parking area. USAF, Korea. See Fig. 2.19 for large scale of blocked-out area. Scale 1:10,000

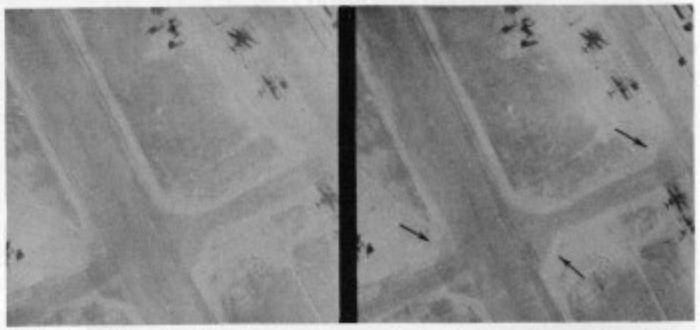


FIG. 2.19 Part of runway and taxiway shown in Fig. 2.16. Note step pattern of corners and irregular edges. Scale 1:4,300

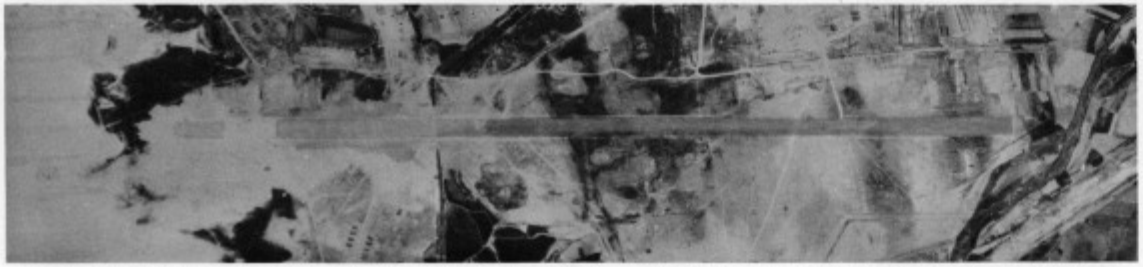


FIG. 2.17 Pierced steel plank runway in Korea. Left side of photograph shows new construction on a runway extension. Old part of runway resembles an asphalt surface except for irregular edges. USAF. Scale 1:10,000

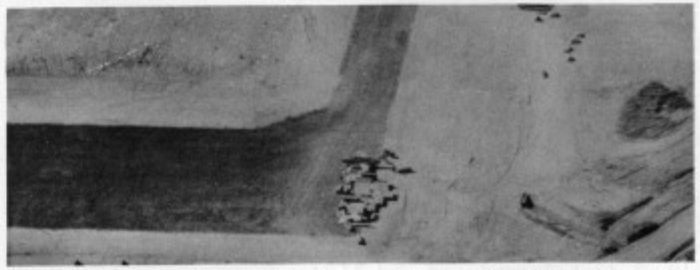


FIG. 2.20 Part of pierced steel plank runway. Note irregular edge of runway and step pattern in corner.

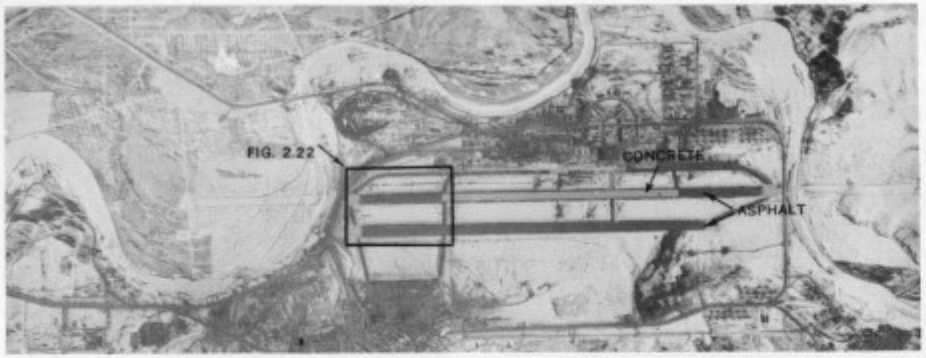


FIG. 2.21 Asphalt and concrete runways. Asphalt surface very dark, uniform tone; concrete at ends of runways and center section of upper runway light in tone with parts of block pattern barely visible. This exposure under snow conditions makes the asphalt surfaces appear almost black. See Fig. 2.22 for summer exposure. Alaska. Scale 1:38,000

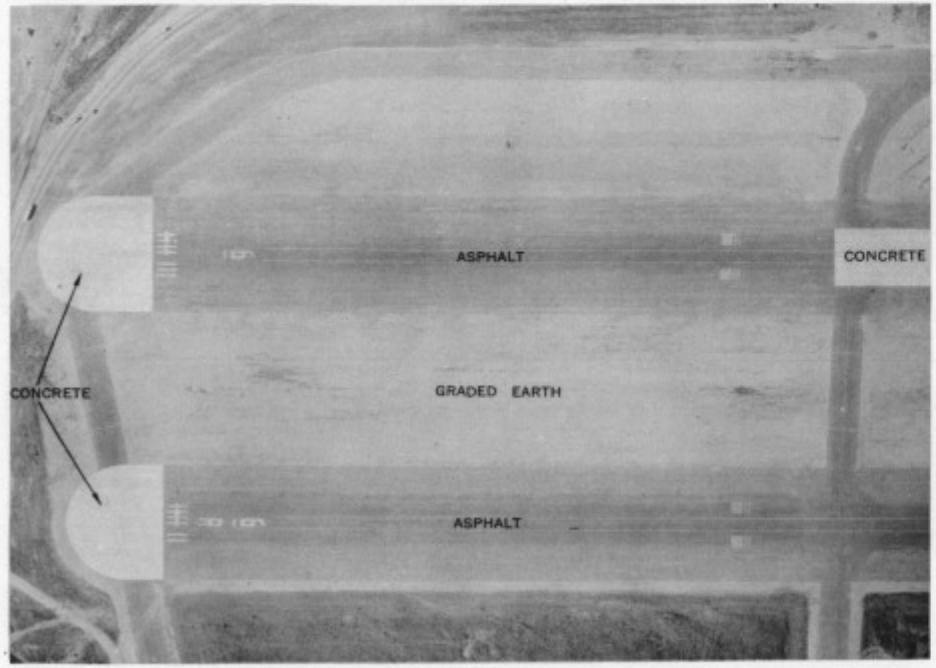


FIG. 2.22 Part of asphalt and concrete runways shown in Fig. 2.21. Asphalt surfaces are darker in tone than the concrete or graded earth, but considerably lighter than in Fig. 2.21. Note that edges are straight and corners make sharp angles or smooth curves. Painting on runways indicates hard surface. Scale 1:4,700

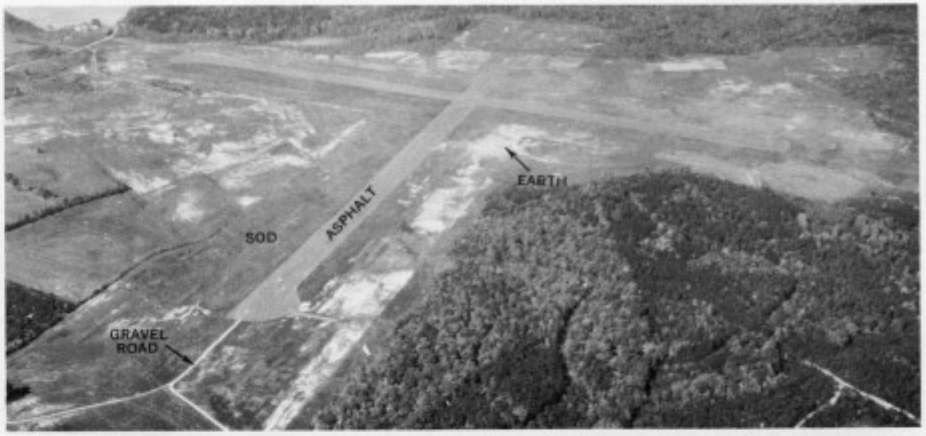


FIG. 2.23 Asphalt runways. Note that asphalt surface is lighter in tone than the sod and much darker than the gravel road or bare earth. U.S.A.

FIG. 2.24 Asphalt runways. In contrast, graded earth on edges of runway is very light. U.S.A. Scale 1:25,000

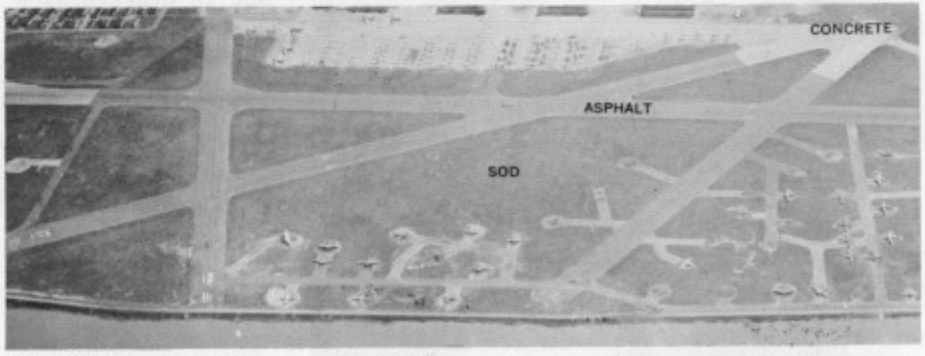


FIG. 2.25 Asphalt runways with concrete extensions and parking apron. Runway edges form a straight line and corners are smoothly curved. Asphalt surface has lighter tone than sod surface and darker than the concrete. Painting on runways indicates hard surface. U.S.A.

293820 O—54——2

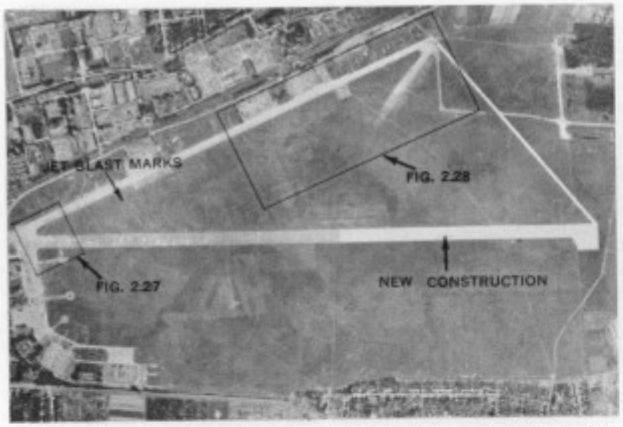


FIG. 2.26 Concrete runway on airfield in Sovzone, Germany. Note that new construction on right appears very light. Corners of runway and taxiways are sharply defined angles or smooth curves (See Figs. 2.27 and 2.28). Scale 1:25,000

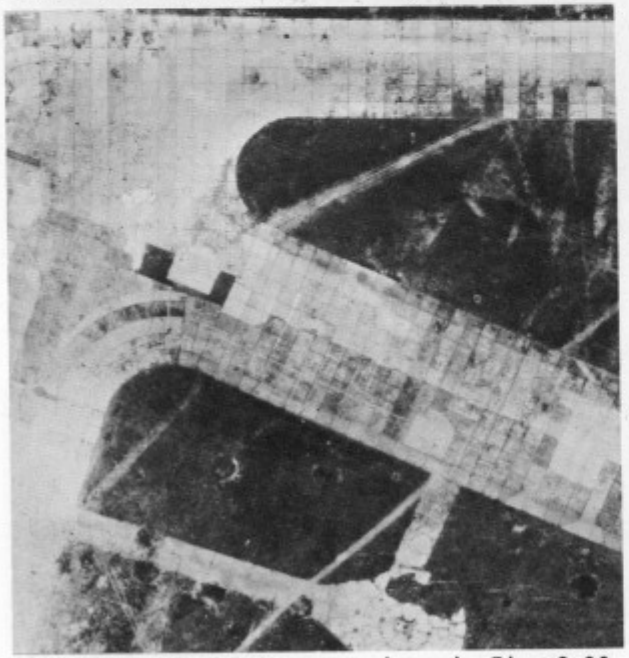


FIG. 2.27 Part of runway shown in Fig. 2.26. Expansion joints in concrete form a block pattern. Note repair patches in old runway. Scale 1:2,000

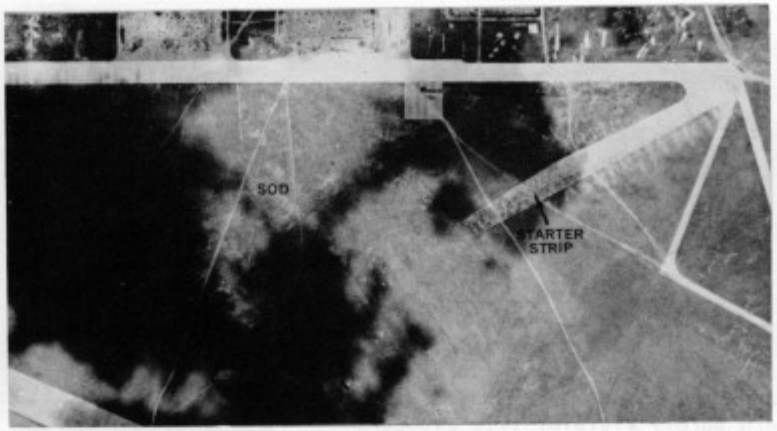


FIG. 2.28 Part of taxiway and starter strip shown in Fig. 2.26. Block pattern of concrete is clearly visible in the cloud shadow but lost elsewhere due to overexposure. Scale 1:8,300

FIG. 2.29 Very light tone, sharply defined corner angles and straight-lined edges indicate that runway is concrete. Due to overexposure the block pattern is not discernible. Sovzone, Germany. Scale 1:22,000

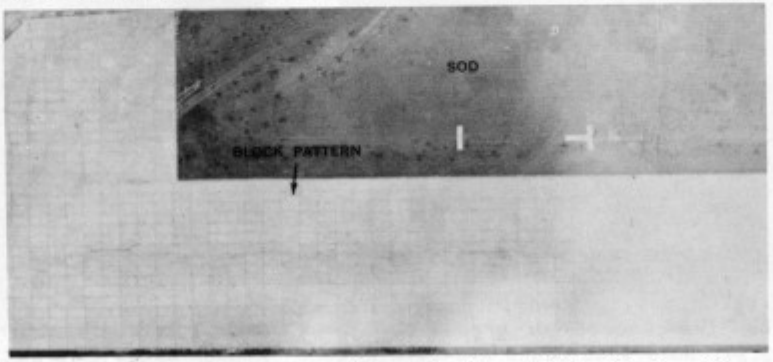


FIG. 2.30 Part of runway shown in Fig. 2.29. Block pattern of concrete visible in cloud shadow. Scale 1:2,100

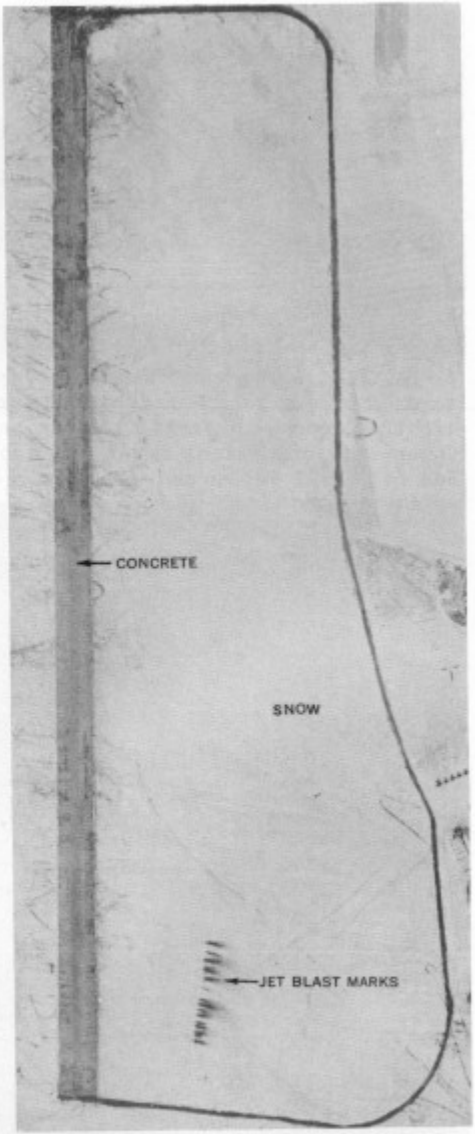


FIG. 2.31 Runway shown in Fig. 2.29. The runway, which was very light in tone on summer photography, is dark in contrast to snow. Note that block pattern is visible. Scale 1:10,000

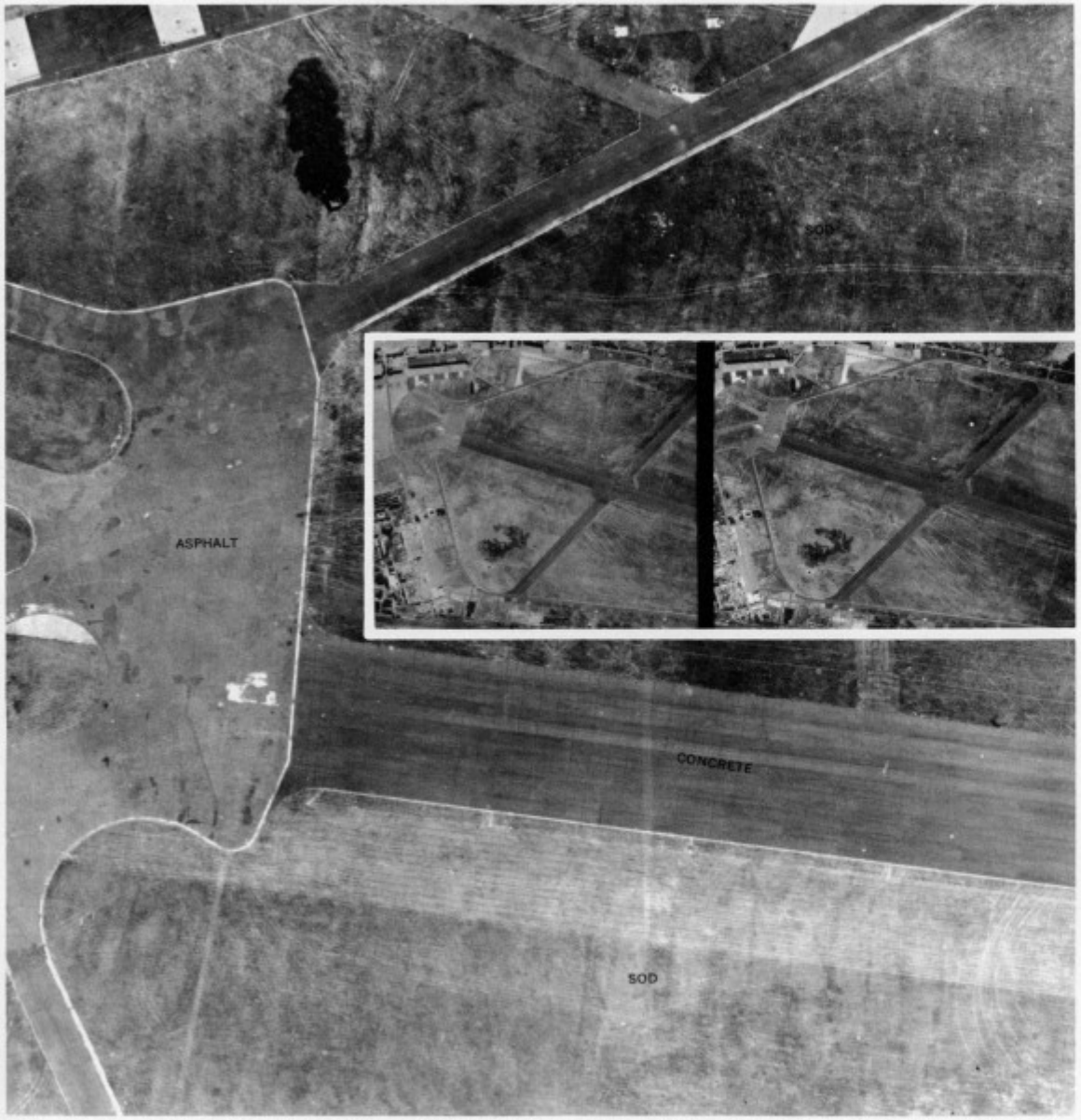


FIG. 2.32 Part of toned down concrete runway and taxiway and an asphalt assembly apron on airfield in Sovzone, Germany. Surface toned down to blend in with surrounding area. Inset is a stereopair of the airfield at a scale of 1:20,000. Scale 1:2,000

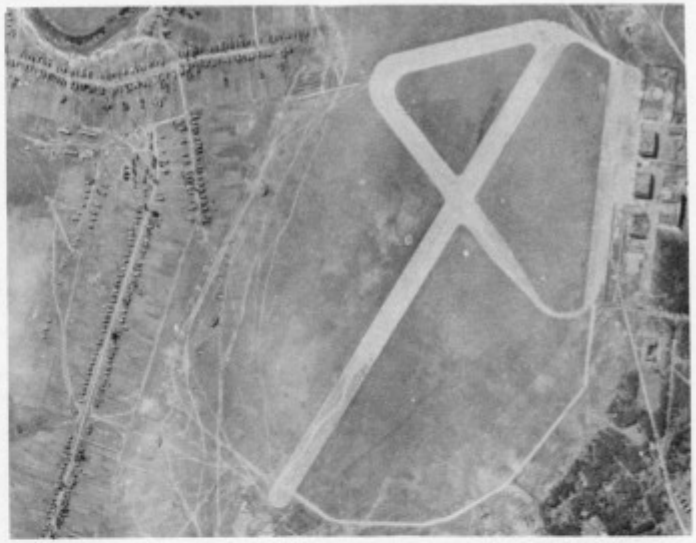


FIG. 2.33 Concrete runway and parking apron on airfield in European U.S.S.R. Note straight edges and smooth curved corners of runway. Scale 1:20,000

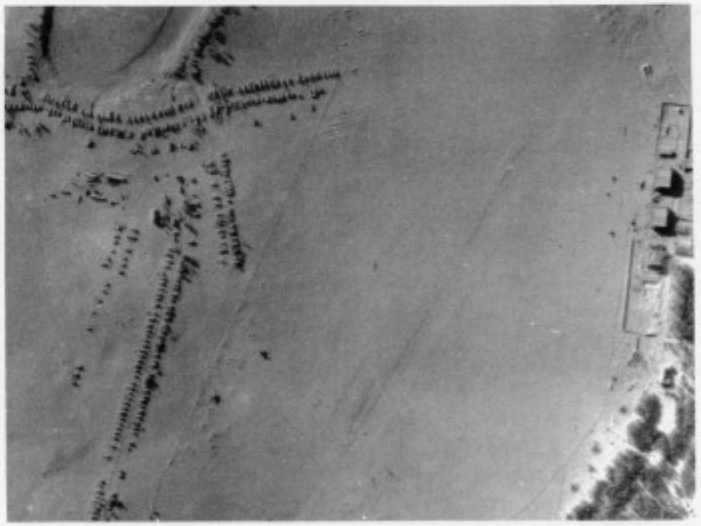


FIG. 2.34 Airfield shown in Fig. 2.33 with runway covered with snow. Summer photography is needed to determine the exact location and composition of surface here obscured by snow. Scale 1:23,000

SECTION 3

PARKING FACILITIES

PARKING FACILITIES
General - Identification

Special facilities, other than hangars, are usually provided for parking of aircraft on airfields. The facilities may be widely varied in types and in degree of improvement, depending upon the functions, capabilities and vulnerability of the fields on which they are located. A recognizable parking facility may be a hard surface with or without blast walls to accommodate one or several planes. It also may be nothing more than a mark on a natural surface to indicate a parking position. Individual facilities are identified and described on pages 3.02 through 3.08.

The location of special parking facilities in relation to significant parts of the airfield is important in PI reporting. These locations are described on pages 3.09 through 3.13.

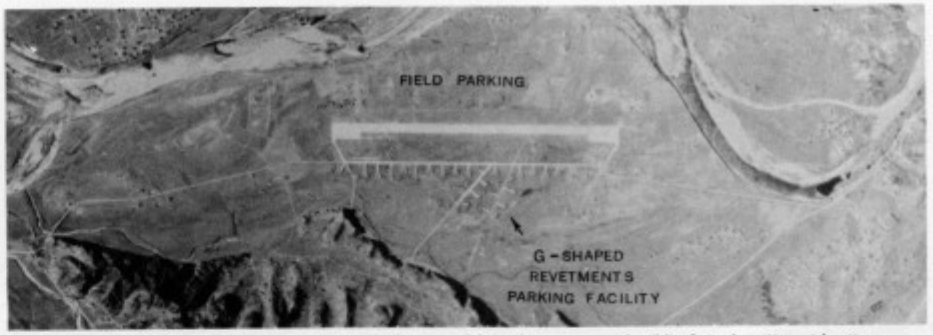


FIG. 3.01 Parking areas with facilities at airfield in North Korea. Scale 1:45,000

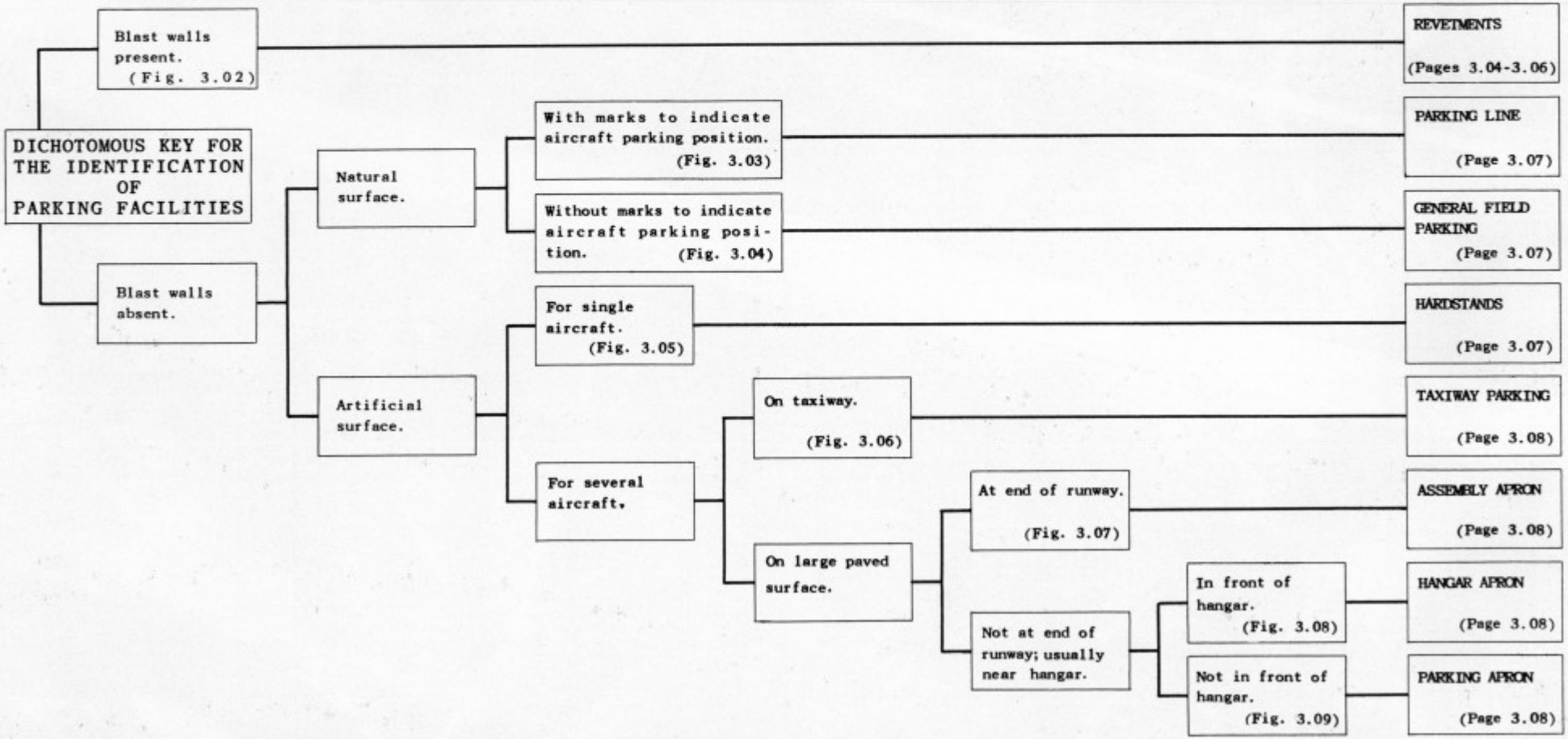


FIG. 3.02 Aircraft revetments. North Korea. Scale 1:10,000

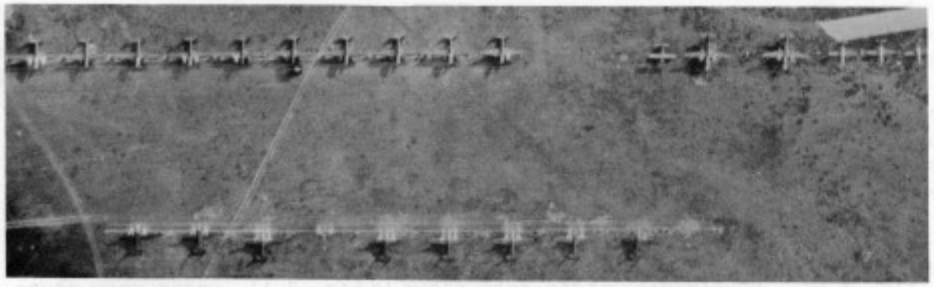


FIG. 3.03 Parking line. Sovzone, Austria. Scale 1:2,500

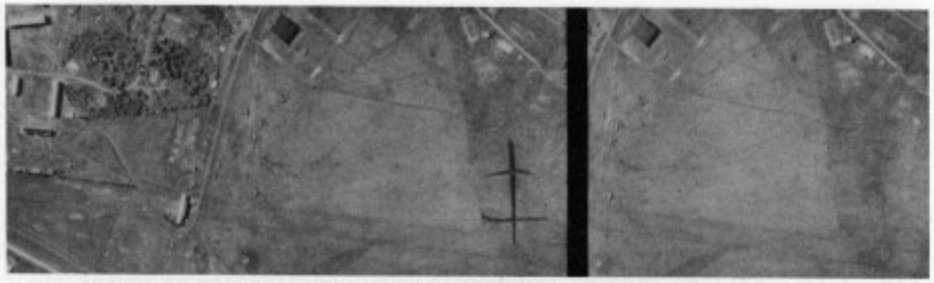


FIG. 3.04 General airfield parking. U.S.S.R. Scale 1:9,500

FIG. 3.05 Hardstands. Sovzone, Germany. Scale 1:9,000

FIG. 3.06 Taxiway parking. Sovzone, Germany. Scale 1:2,000

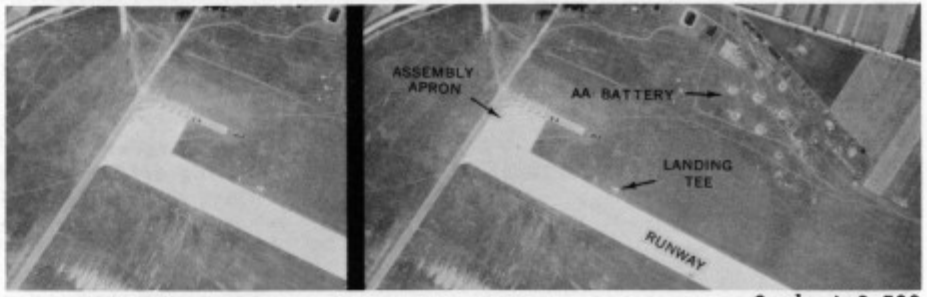


FIG. 3.07 Assembly apron. Sovzone, Germany. Scale 1:9,500

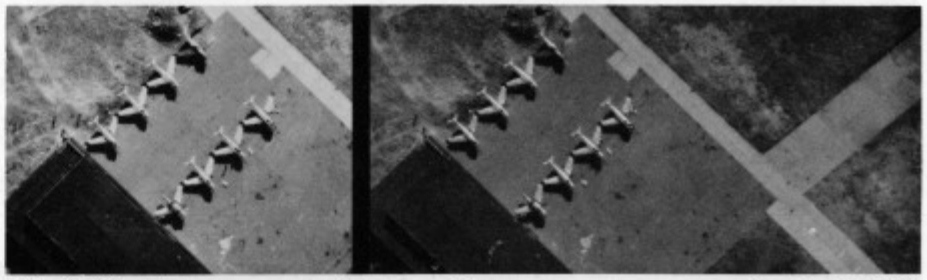


FIG. 3.08 Hangar apron. Sovzone, Germany. Scale 1:1,600

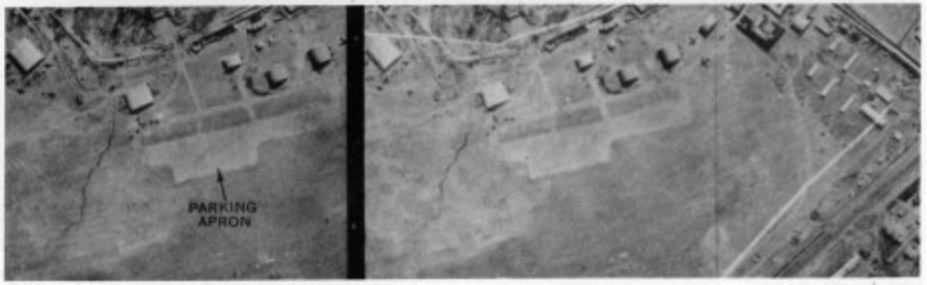


FIG. 3.09 Parking apron. U.S.S.R. Scale 1:13,000

AIRCRAFT REVETMENTS

An aircraft revetment is a blast shelter built to protect aircraft against concussion and flying bomb or shell fragments. The blast or retaining walls are most commonly constructed of earth. Other construction materials include sand bags, wood, or prefabricated concrete slabs with earth filler.

Revetments may be roofed with wood, sheet metal or concrete for added protection against blast and weather. Roofs also serve to conceal the aircraft parked within, but, if protection against observation is the sole consideration, camouflage netting is apt to be the only covering.

Many of the recently constructed Soviet revetments for jet aircraft have a vent in the rear. This provides an outlet for hot exhaust gases as well as a personnel exit.

Width of the mouth of the revetment determines the largest type of aircraft that can be accommodated. For example, an opening of forty feet will admit no aircraft larger than fighters. Generally, revetments are built to shelter single aircraft of a particular type, but in some instances they are built for more than one aircraft.

The Soviets constructed a wide variety of revetments on their airfields during World War II. It is quite likely that many of these have been rebuilt to accommodate modern aircraft.

Illustrations in this section cover recent trends in revetment construction in the Soviet Zone of Germany and in Communist-controlled North Korea. World War II revetments in U.S.S.R. are also included.

REVETMENTS CONSTRUCTED IN THE SOVIET ZONE OF GERMANY.

FIG. 3.10 Earthen revetments with blastwall protecting vents. Openings 60 feet. Sovzone, Germany. Scale 1:10,000

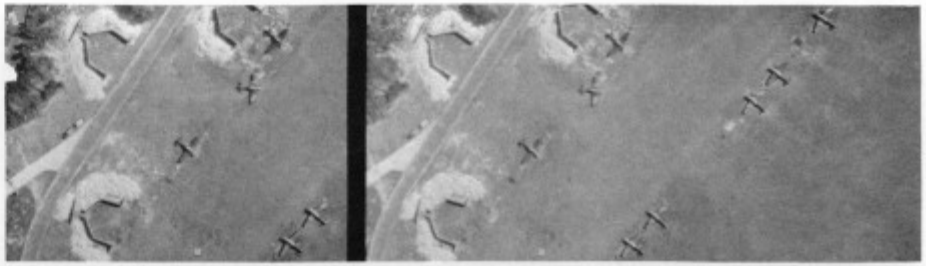


FIG. 3.11 Revetments under construction. Wooden walls are being reinforced with earth. Openings 60 feet. Sovzone, Germany. Scale 1:2,800

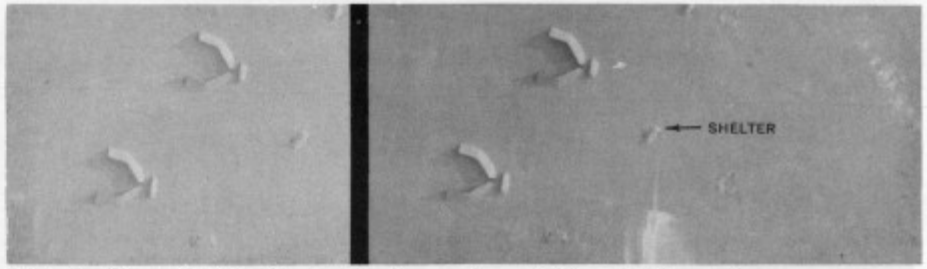


FIG. 3.12 Revetments, of the type shown in Fig. 3.11, under snow cover. Note personnel shelters in rear. Scale 1:3,000

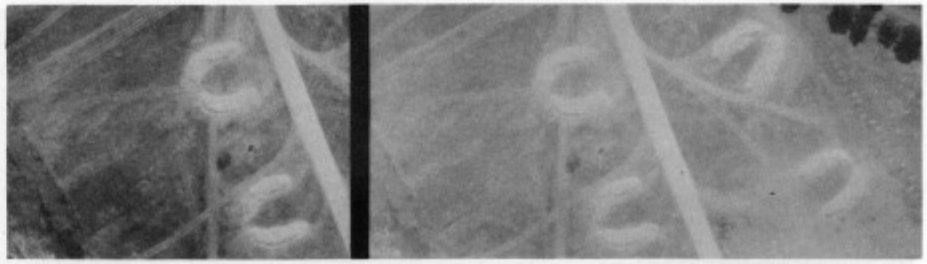


FIG. 3.13 Earthen fighter revetments under construction at Soviet field in Germany. Openings 40 feet. Scale 1:2,000

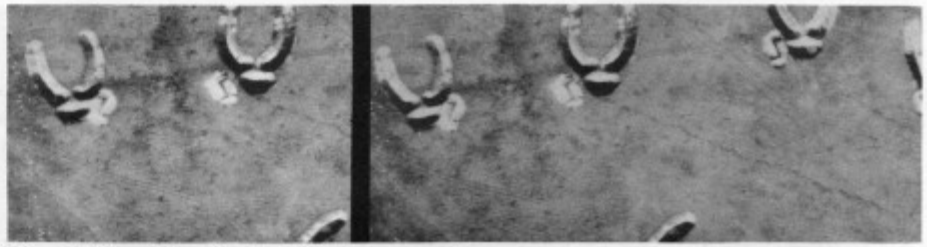


FIG. 3.14 Completed fighter revetments of type shown in Fig. 3.13. Personnel slit trench near vent. Scale 1:2,000

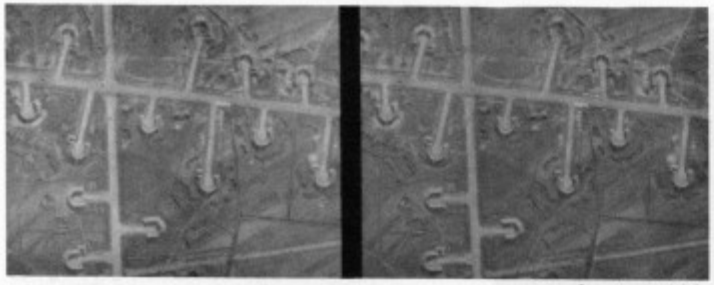


FIG. 3.15 Scale 1:8,000

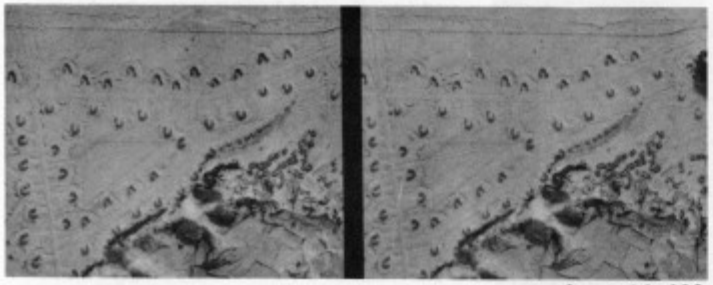


FIG. 3.16 Scale 1:20,000

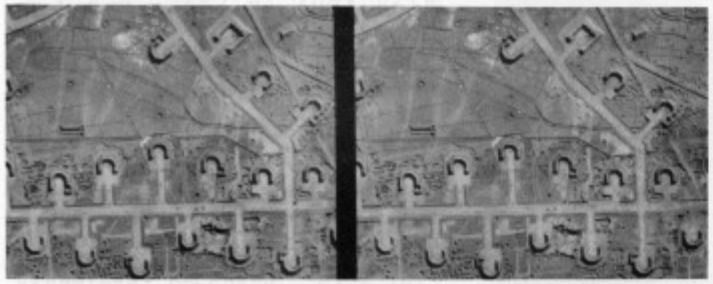


FIG. 3.17 Scale 1:8,000

FIG. 3.18 Scale 1:10,000

REVETMENTS - KOREA

FIG. 3.15 U-shaped fighter revetments. Vents in rear, some with small vehicle revetments at entrance. Excavations around revetments indicate source of building material. North Korea.

FIG. 3.16 Revetments shown in Fig. 3.15 at a smaller scale and under snow conditions. Note bomb craters in upper part of photo.

FIG. 3.17 U-shaped fighter revetments. Observe rectangular revetment at upper right. No vents or personnel shelters. Area peppered with real and dummy bomb craters. North Korea.

FIG. 3.18 U-shaped revetments with vent leading into small shelter. North Korea.

FIG. 3.19 G-shaped fighter revetments with camouflage netting. North Korea.

FIG. 3.20 G-shaped fighter revetments. Note roofed revetment near center of photo. North Korea.

FIG. 3.21 Covered and open revetments constructed by the Japanese during World War II. North Korea.

FIG. 3.22 Sand bag revetments at USAF base in Korea.

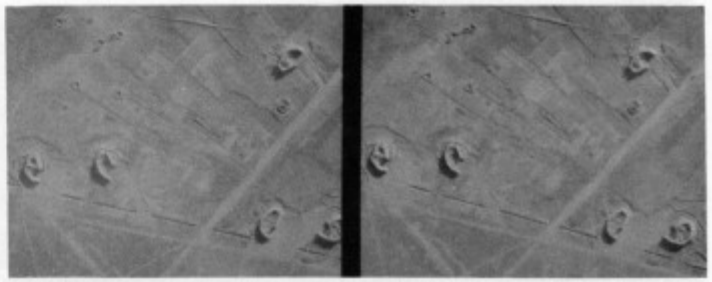


FIG. 3.19 Scale 1:8,300

FIG. 3.20 Scale 1:8,300

FIG. 3.21 Scale 1:9,000

FIG. 3.22 Scale 1:5,000

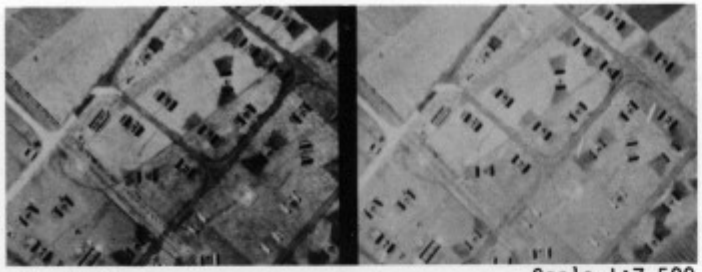


FIG. 3.23 Scale 1:7,500

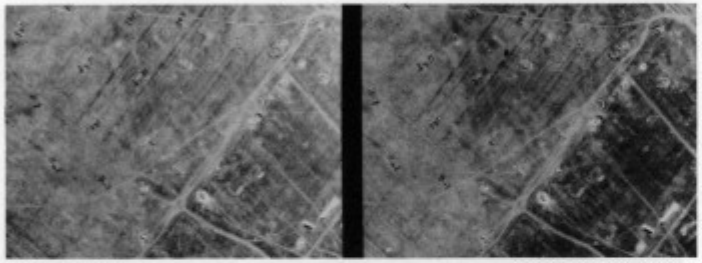


FIG. 3.24 Scale 1:10,000

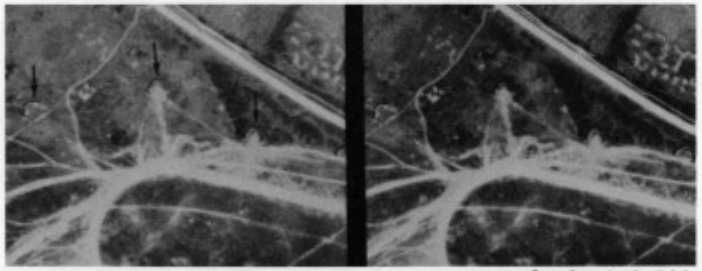


FIG. 3.25 Scale 1:9,500

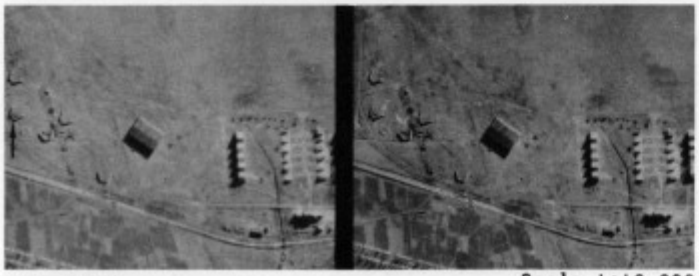


FIG. 3.26 Scale 1:10,000

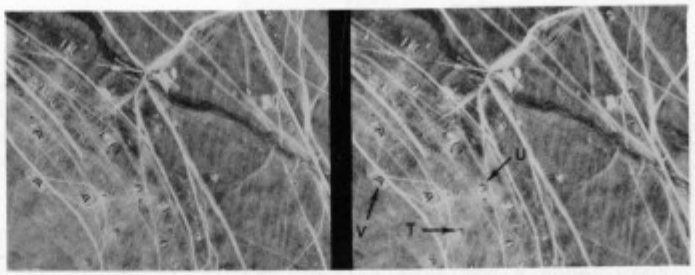


FIG. 3.27 Scale 1:13,000

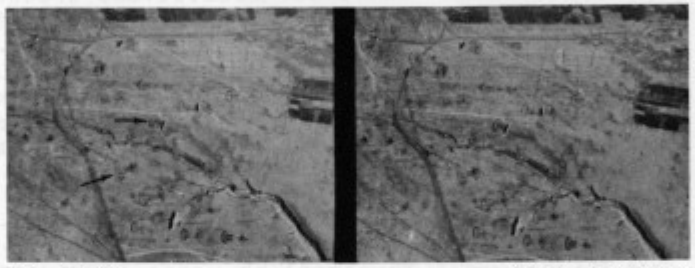


FIG. 3.28 Scale 1:12,000

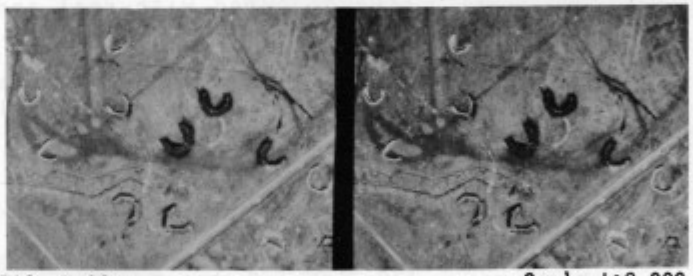


FIG. 3.29 Scale 1:8,000

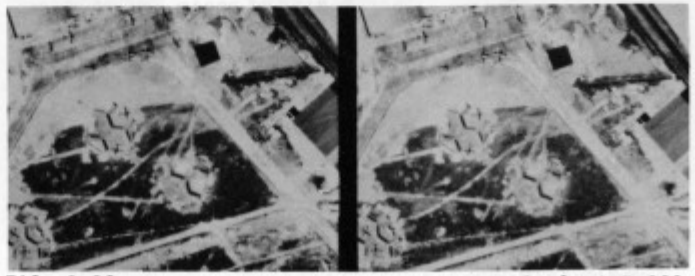


FIG. 3.30 Scale 1:5,000

REVETMENTS-U.S.S.R.-WORLD WAR II

FIG. 3.23 Aircraft revetments consisting of two parallel walls which offer only partial protection from blast. Note excavation of building material from around revetments. U.S.S.R.

FIG. 3.24 Revetments consisting of two parallel earthen blastwalls. U.S.S.R.

FIG. 3.25 U-shaped bomber revetments. U.S.S.R.

FIG. 3.26 U-shaped revetments with vent in rear. U.S.S.R.

FIG. 3.27 U-, V- and T-shaped earthen revetments. U.S.S.R.

FIG. 3.28 Simple revetments with blastwall for protecting only the forward part of the aircraft. U.S.S.R.

FIG. 3.29 U-shaped revetments with vent in rear. Observe that three revetments have been reinforced with earth. U.S.S.R.

FIG. 3.30 Multiple-bay earthen revetments. Three revetments use the same center blastwalls. U.S.S.R.

PARKING LINES

A parking line is a marker on the natural surface of an airfield used to indicate line-up and individual positions of planes. Some parking lines have a storage box for each plane and small paved areas which mark each engine position.

When a single line is used, aircraft usually are parked facing the landing area. When placed on a double line, aircraft generally face each other.

GENERAL FIELD PARKING

A general field parking facility is nothing more than a natural surface on an airfield where planes are parked. The surface is usually sod, and there are no improvements to indicate aircraft positions. This type of facility can be recognized only when aircraft are present. (See Fig. 3.04)

HARDSTANDS

A hardstand is a hard-surfaced area built to accommodate a single parked plane. A number of such stands may be placed at regular intervals along a hard-surfaced taxiway leading to the airstrip. Occasionally, a revetment is built on or immediately behind a hardstand.

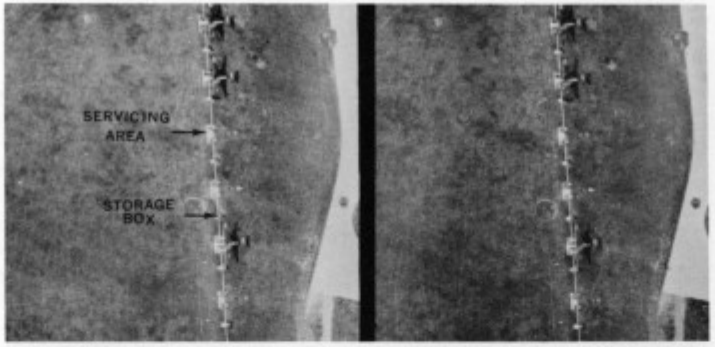


FIG. 3.31 Parking line for twin-engined aircratt. Observe small, paved servicing area under engine positions and storage box at each position.
Sovzone, Germany Scale 1:2,700

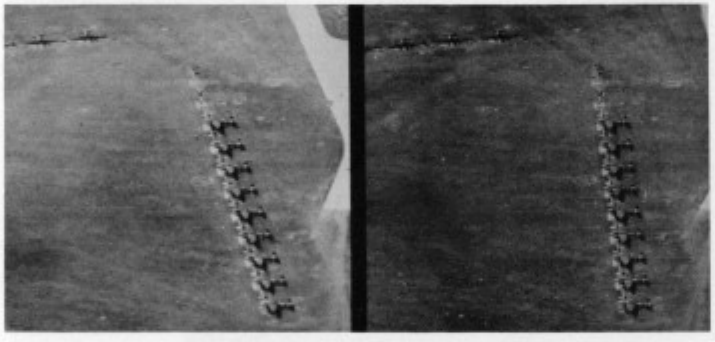


FIG. 3.32 Parking line shown in Fig. 3.31.
Oblique stereopair

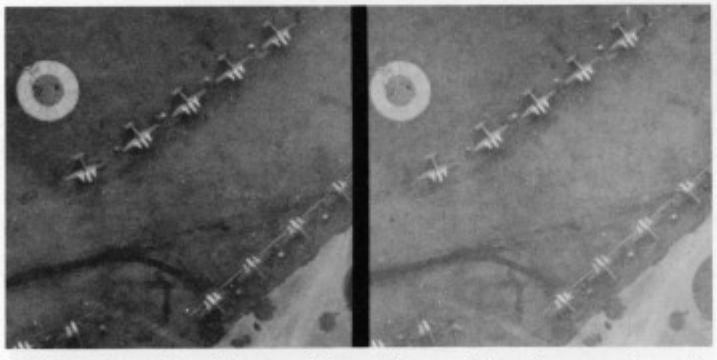


FIG. 3.33 Double parking line with storage box at each position. Note that aircraft face each other.
Sovzone, Austria Scale 1:2,300

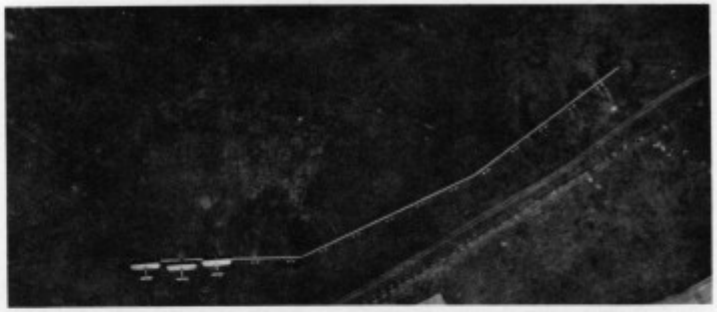


FIG. 3.34 Parking line with wheel position indicators.
Sovzone, Germany Scale 1:2,300

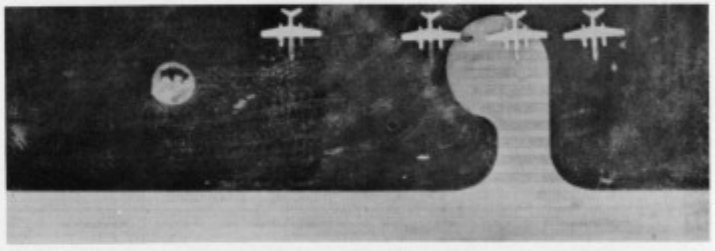


FIG. 3.35 Concrete hardstand branching from taxiway.
Sovzone, Germany Scale 1:1,900

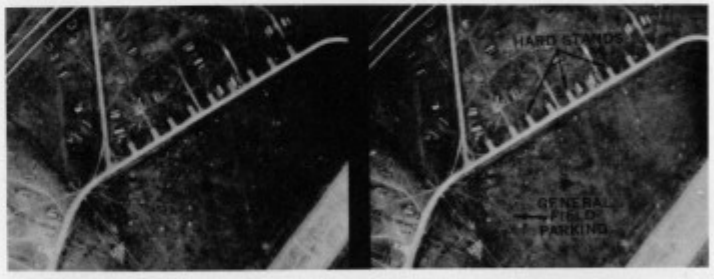


FIG. 3.36 Hardstands along taxiway. General field parking in area between taxiway and runway. U.S.S.R.
Scale 1:12,500

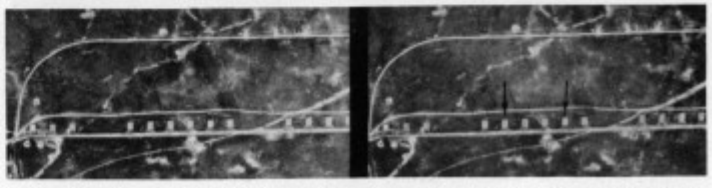


FIG. 3.37 Hardstand positions on airfield in U.S.S.R. Connections to taxiway are unpaved. Scale 1:15,000

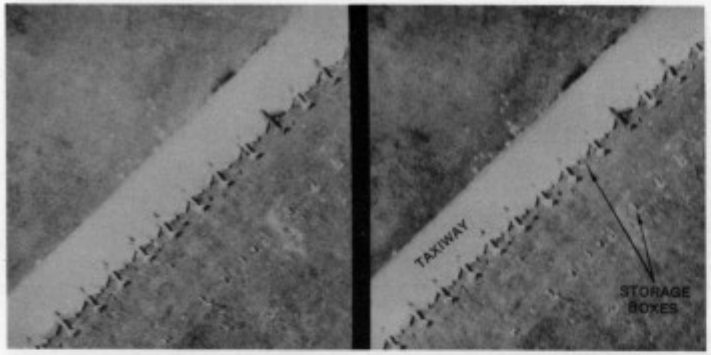


FIG. 3.38 Taxiway parking. Note storage boxes alongside and behind parked aircraft. Sovzone, Germany. Scale 1:2,000

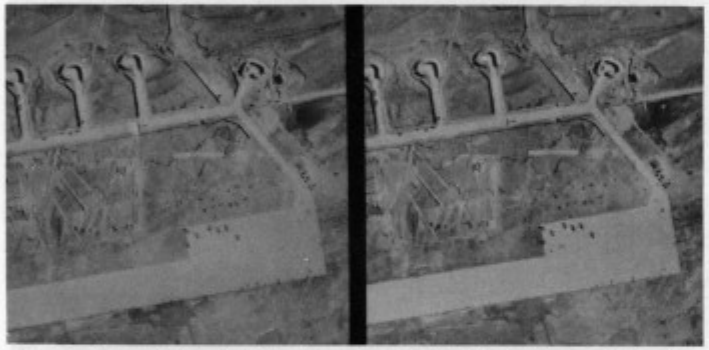


FIG. 3.39 Assembly apron at end of runway with aircraft preparing for take-off. North Korea. Scale 1:11,000

FIG. 3.40 Hangar apron with lines to indicate parking positions and taxi lane. Parking aprons lie in front of and adjacent to the airfield administration building. U.S.A.

FIG. 3.41 Hangar apron and large parking apron. Parking aprons are not usually located so near runways. Japan. Scale 1:15,500

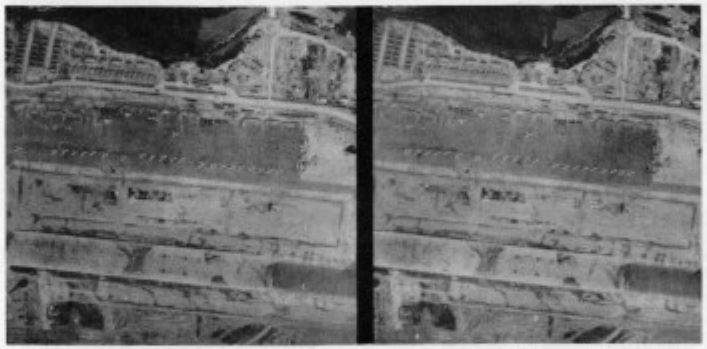


FIG. 3.42 Parking apron at USAF field in Korea. Scale 1:10,500

FIG. 3.43 Parking apron in hangar area. U.S.A. Scale 1:5,000

TAXIWAY PARKING

Aircraft are occasionally parked along the edges of hard-surfaced taxiways. Frequently, marks are painted on these edges to indicate the position of each plane. Such parking has the advantage of keeping aircraft in a convenient location for servicing.

ASSEMBLY APRON

Many military airfields have a large paved assembly apron at one or both ends of a runway, which is used only by aircraft preparing for take-off.

HANGAR APRON

The hangar apron is a hard surface situated immediately in front of the hangar. It is used for aircraft servicing, minor repair and parking. Occasionally, lines are painted on the surface to indicate parking positions.

PARKING APRON

A parking apron is a large hard surface which may or may not be located in the hangar area. It is used for aircraft servicing, minor repair, and parking and for loading and unloading of passengers and cargo. Lines may be painted on the surface to indicate parking positions and taxi lanes.

LOCATIONS

The location of a parking area is readily identified on aerial photography, since parking facilities, parked planes, taxiway systems, and track activity between parking and landing areas are all distinctly conspicuous.

On civil airfields the parking area is in some convenient location such as the hangar area. Generally the aircraft are lined up in an orderly fashion to admit a maximum number of planes into the available space and to insure efficient handling.

At military airfields parking areas normally are located on outlying parts of or adjoining the airfield. Aircraft parked in such areas often are dispersed in an irregular manner or are sheltered by blastwalls for protection against attack. In such cases, parking areas often are referred to as dispersal areas.

On-field Parking Areas

An on-field parking area may be in any convenient location on the field, other than the landing and take-off lanes. The following classification, based on location, is applied to the various on-field parking areas:

1. General airfield area.
2. Hangar area.
3. Airfield perimeter.
4. Taxiway.

Off-field Parking Areas

An off-field parking area may be any suitable location closely accessible to the field. Such an area is usually located to take advantage of natural or cultural features that offer protection or concealment to parked aircraft. The following classification, based on location is applied to off-field parking areas:

1. Wooded area.
2. Field area.
3. Base of hills.
4. Urban area.

FIG. 3.44 Airfield in North Korea built by the Japanese. Scale 1:11,000

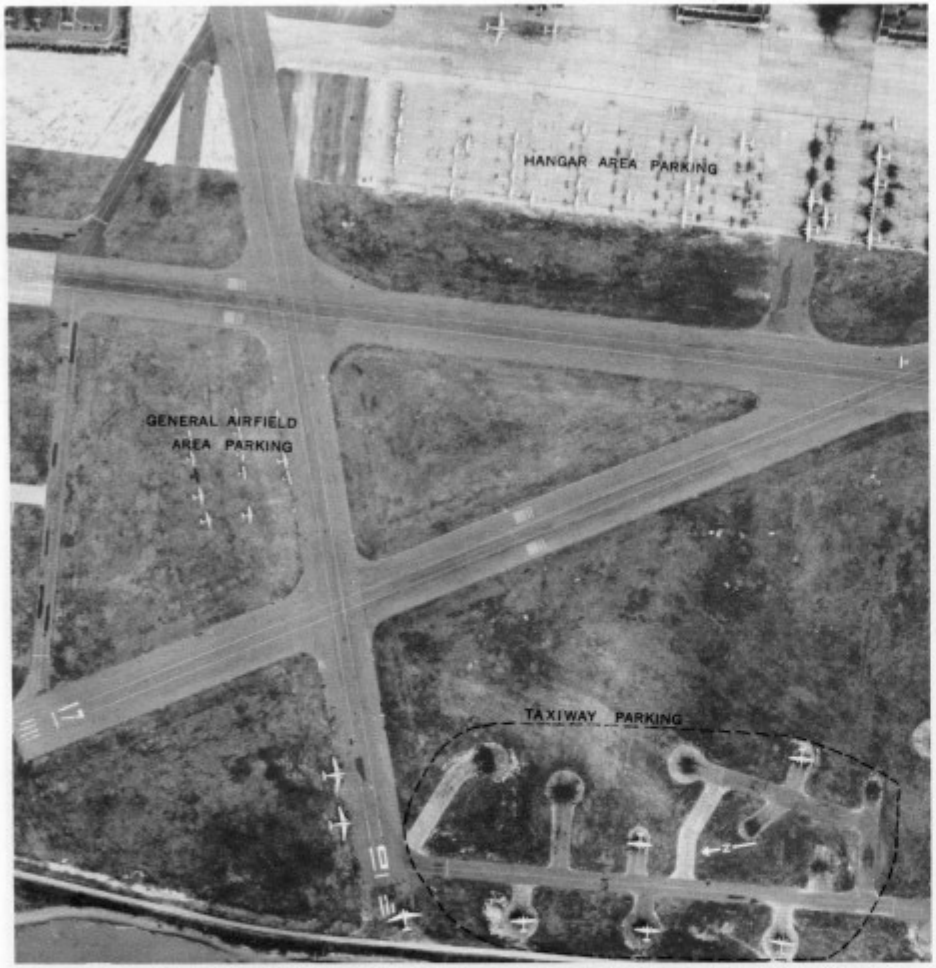


FIG. 3.45 On-field dispersal in hangar area, general airfield area and off taxiway. U.S.A. Scale 1:5,000

FIG. 3.46 On-field parking in hangar area. U.S.A. Scale 1:12,500

FIG. 3.47 On-field dispersal in general airfield area and on airfield perimeter. U.S.S.R. Scale 1:12,500

FIG. 3.48 Aircraft dispersed in general field area and on airfield perimeter. U.S.S.R. Scale 1:8,500

FIG. 3.49 Dispersal area on airfield perimeter. U.S.S.R. Scale 1:15,000

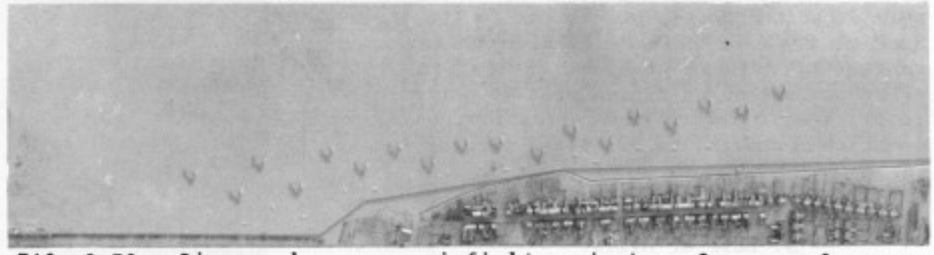


FIG. 3.50 Dispersal area on airfield perimeter. Sovzone, Germany. Scale 1:11,000

FIG. 3.51 Taxiway dispersal area with G-type revetments. North Korea. Scale 1:34,000

FIG. 3.52 Perimeter dispersal area and loop taxiway with hardstands. U.S.S.R. Scale 1:17,000

FIG. 3.53 Extensive taxiway dispersal area. U.S.S.R. Scale 1:13,000

FIG. 3.54 Taxiway dispersal with hardstands. Sovzone, Germany.

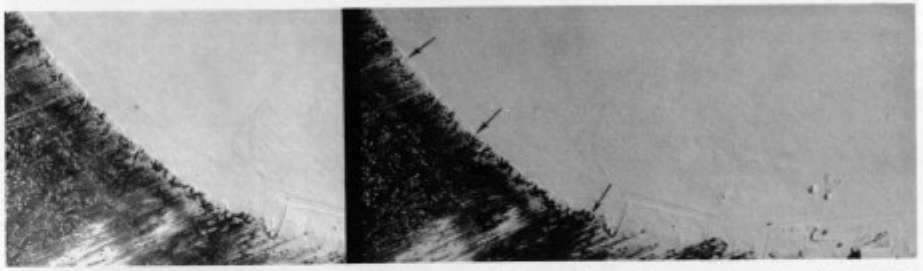


FIG. 3.55 Perimeter dispersal area with scattered revetments. U.S.S.R. Scale 1:15,000

FIG. 3.56 Perimeter dispersal area with scattered revetments. U.S.S.R. Scale 1:17,500

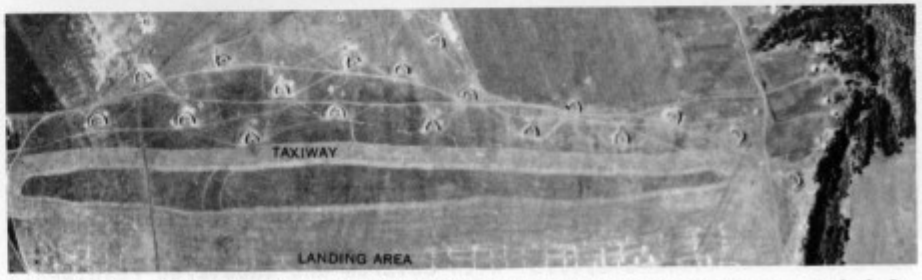


FIG. 3.57 Perimeter dispersal area with scattered revetments. U.S.S.R. Scale 1:12,000

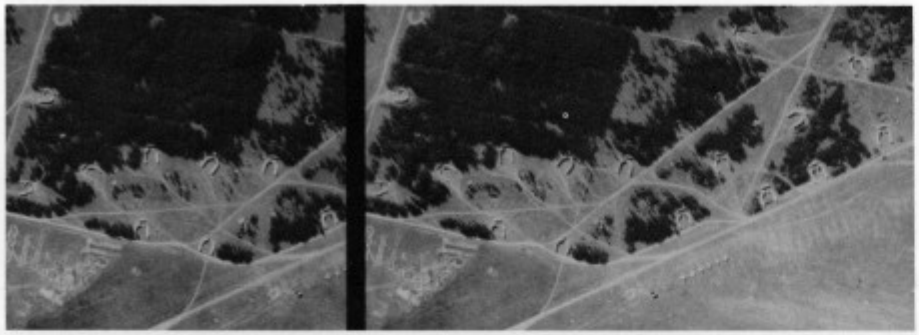


FIG. 3.58 Off-field dispersal area with revetments in wooded area adjoining airfield. Sovzone, Austria. Scale 1:10,000

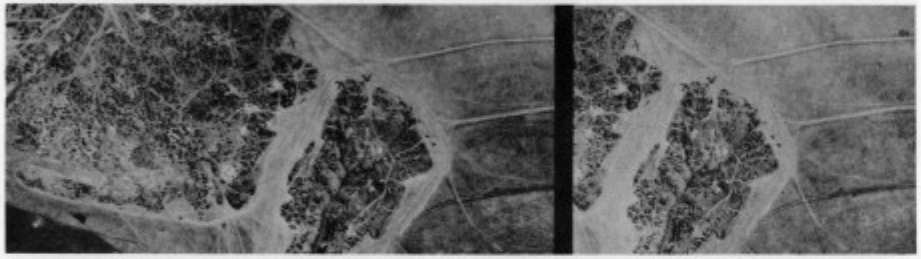


FIG. 3.59 Dispersal area in wooded area on the edge of an airfield. Note track activity. U.S.S.R. Scale 1:12,500

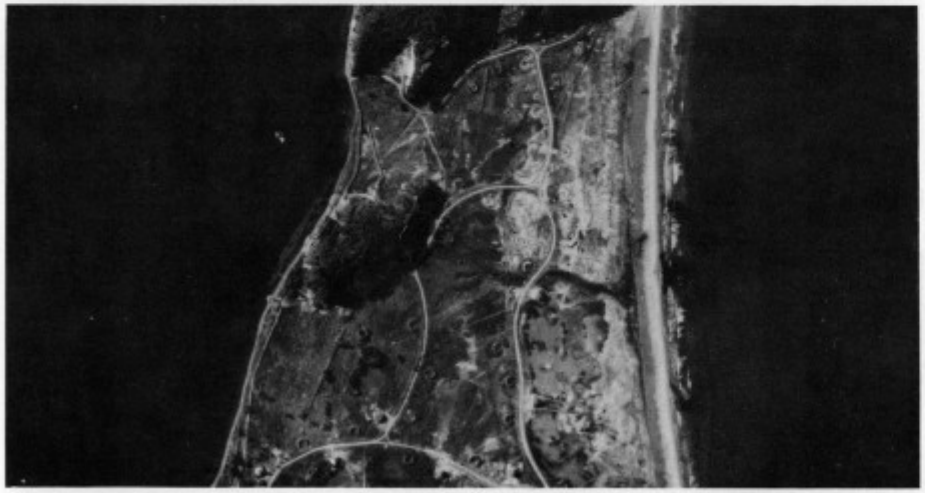


FIG. 3.60 Off-field dispersal with covered and uncovered revetments in wooded and field areas adjacent to Japanese airfield. North Korea. Scale 1:9,500

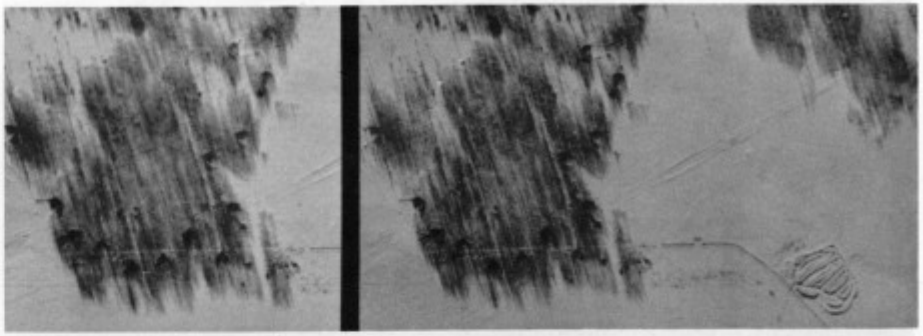


FIG. 3.61 Dispersal area with revetments in wooded area adjoining airfield. U.S.S.R. Scale 1:7,000

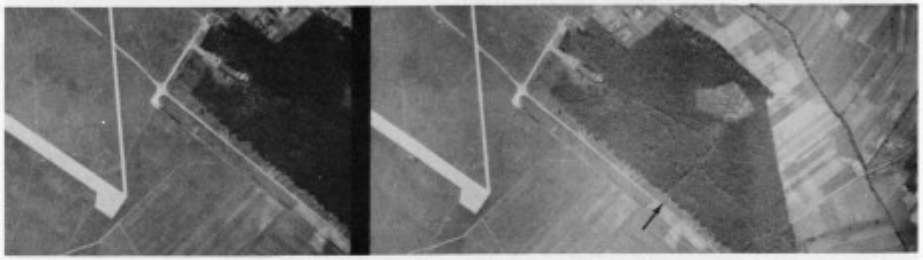


FIG. 3.62 Dispersal area along edge of wooded area contiguous to airfield. Sovzone, Germany. Scale 1:27,000

FIG. 3.63 Dispersal in wooded area bordering German airfield (World War II). Note camouflage netting covering revetments. Scale 1:15,000

SECTION 4

FUEL, AMMUNITION AND BOMB STORAGE

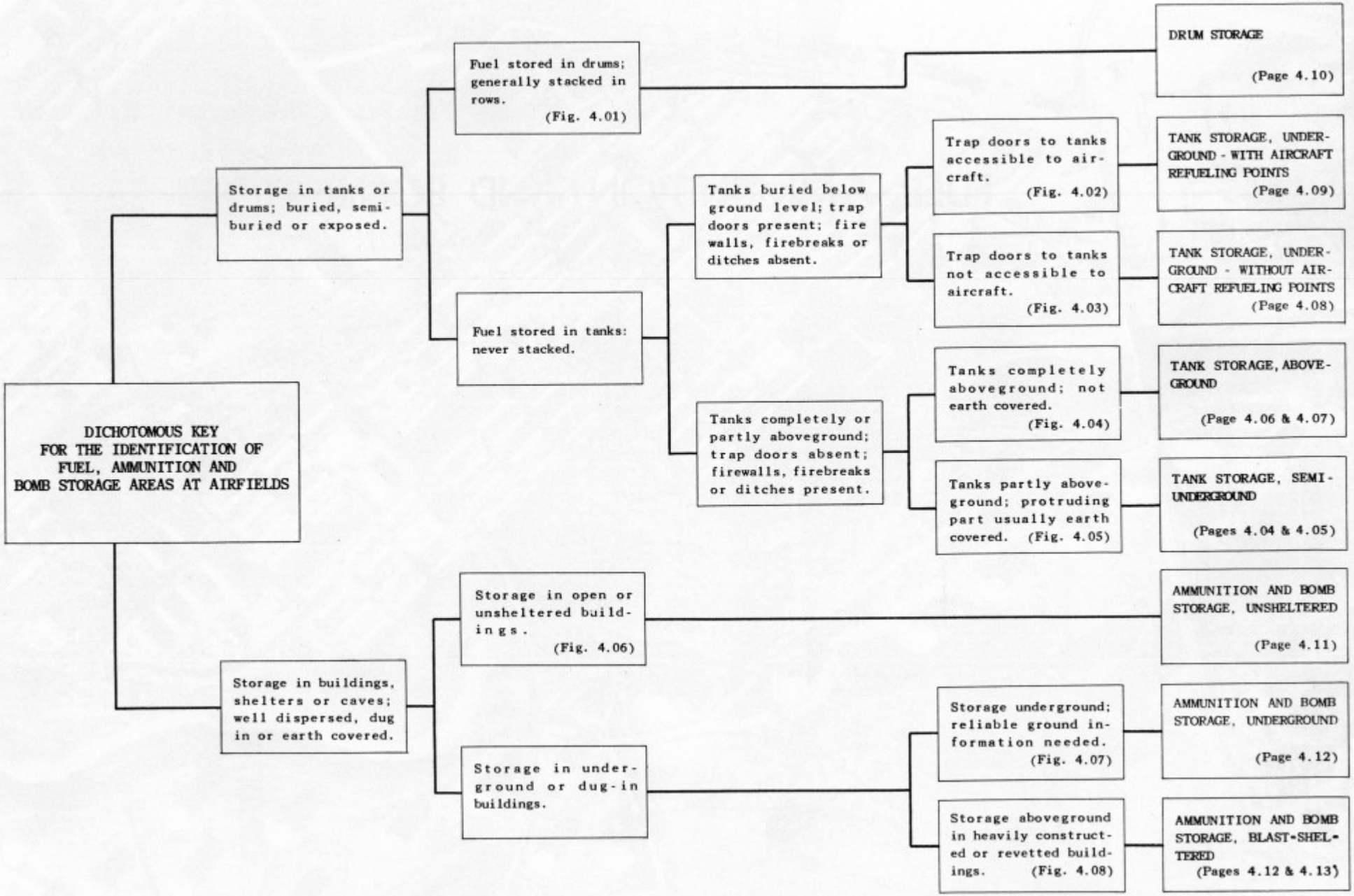

DICHOTOMOUS KEY FOR THE IDENTIFICATION OF FUEL, AMMUNITION AND BOMB STORAGE AREAS AT AIRFIELDS
Storage in tanks or drums; buried, semi-buried or exposed.
Fuel stored in drums; generally stacked in rows. (Fig. 4.01)
DRUM STORAGE (Page 4.10)
Fuel stored in tanks: never stacked.
Tanks buried below ground level; trap doors present; fire walls, firebreaks or ditches absent.
Trap doors to tanks accessible to aircraft. (Fig. 4.02)
TANK STORAGE, UNDERGROUND - WITH AIRCRAFT REFUELING POINTS (Page 4.09)
Trap doors to tanks not accessible to aircraft. (Fig. 4.03)
TANK STORAGE, UNDERGROUND - WITHOUT AIRCRAFT REFUELING POINTS (Page 4.08)
Tanks completely or partly aboveground; trap doors absent; firewalls, firebreaks or ditches present.
Tanks completely aboveground; not earth covered. (Fig. 4.04)
TANK STORAGE, ABOVEGROUND (Page 4.06 & 4.07)
Tanks partly aboveground; protruding part usually earth covered. (Fig. 4.05)
TANK STORAGE, SEMI-UNDERGROUND (Pages 4.04 & 4.05)
Storage in buildings, shelters or caves; well dispersed, dug in or earth covered.
Storage in open or unsheltered buildings. (Fig. 4.06)
AMMUNITION AND BOMB STORAGE, UNSHELTERED (Page 4.11)
Storage in underground or dug-in buildings.
Storage underground; reliable ground information needed. (Fig. 4.07)
AMMUNITION AND BOMB STORAGE, UNDERGROUND (Page 4.12)
Storage aboveground in heavily constructed or revetted buildings. (Fig. 4.08)
AMMUNITION AND BOMB STORAGE, BLAST-SHELTERED (Pages 4.12 & 4.13)

FIG. 4.01 Drum storage. Scale 1:1,750

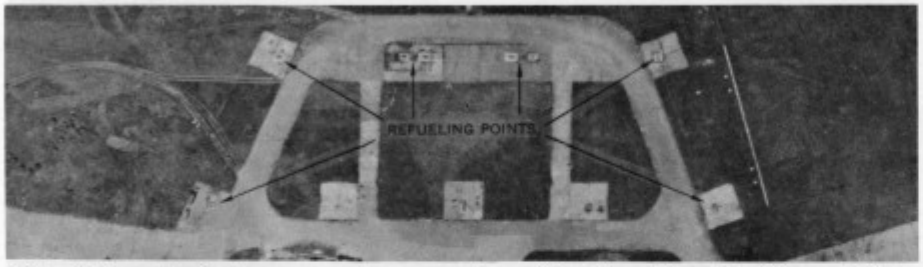


FIG. 4.02 Tank storage, underground — with aircraft refueling points. Scale 1:2,300

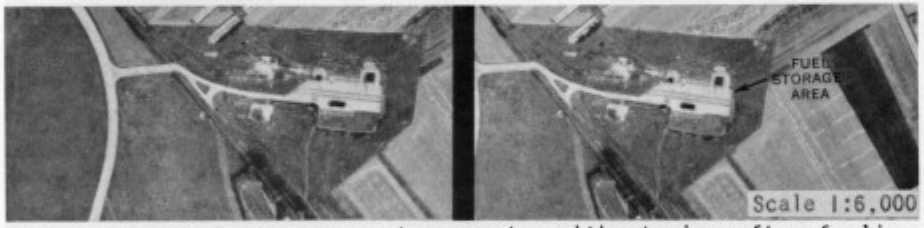


FIG. 4.03 Tank storage, underground — without aircraft refueling.

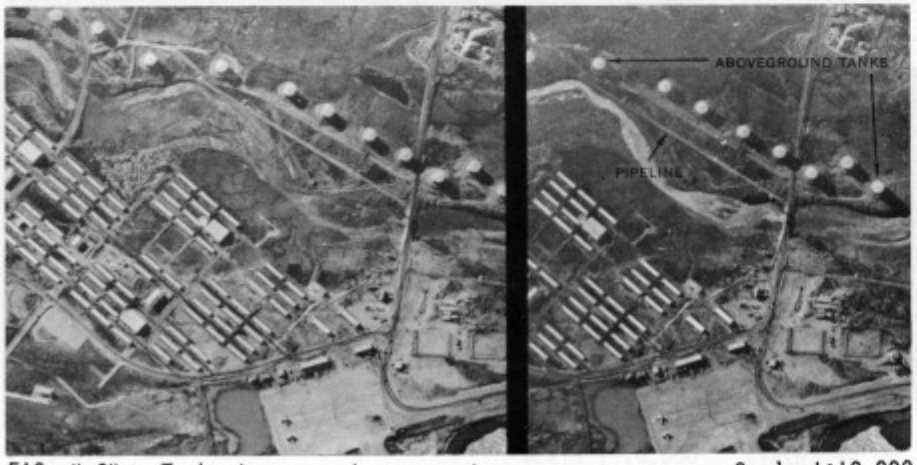


FIG. 4.04 Tank storage, aboveground. Scale 1:10,000

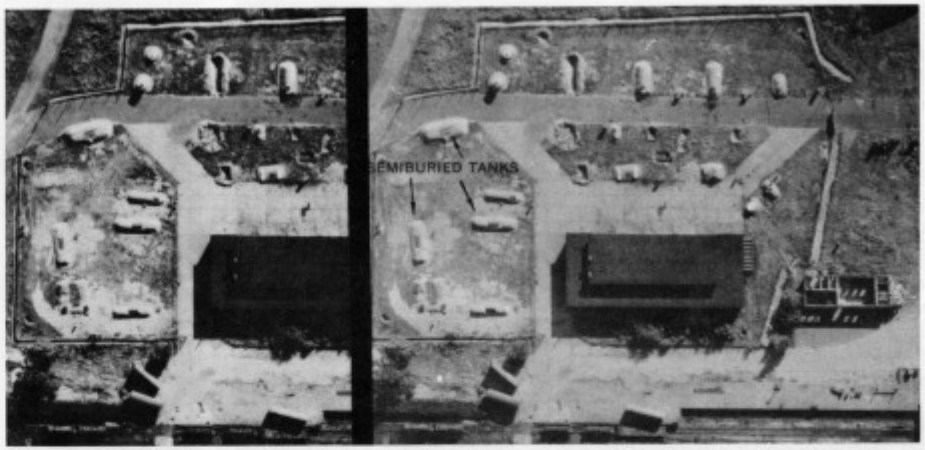


FIG. 4.05 Tank storage, semiunderground. Scale 1:1,600

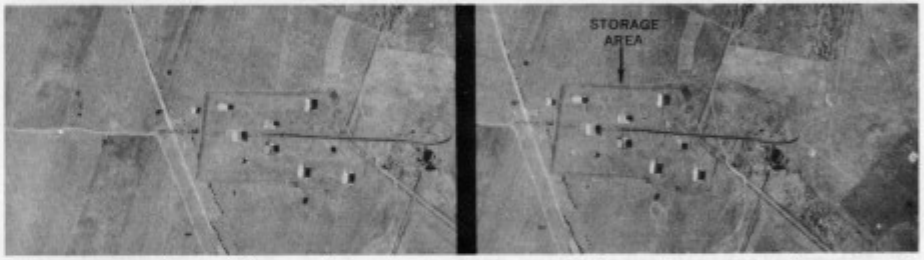


FIG. 4.06 Ammunition and bomb storage, unsheltered. Scale 1:8,200

FIG. 4.07 Ammunition and bomb storage, underground. Scale 1:7,100

FIG. 4.08 Ammunition and bomb storage, blast-sheltered. Scale 1:12,000

FUEL, AMMUNITION AND BOMB STORAGE

Tank Storage, Semiunderground

In 1952 fuel dumps of semiburied tanks were in general use at the important Soviet airfields in Europe. This fuel storage was a reserve supply to be used in case of delay in normal delivery by railroad tank car. The tanks were a part of the organizational equipment belonging to a particular flight unit. Should a flight unit move from one airfield to another, fuel storage tanks from the old dump would be moved to the new location. This fact made it possible to detect the moves of flight units into and out of airfields. Also, the number and size of tanks gave a clue to the size of the unit. It appeared that each fighter or light bomber "regiment" (approximately 30 planes) required storage for roughly 150,000 gallons of fuel.

RECOGNITION FEATURES

Always present:

1. Located on perimeter or adjacent to airfield.
2. Tanks partially buried.
3. Tanks in horizontal position.
4. Service road to storage area.
5. Service openings on top of tanks.

Usually present.

6. Earth covering on tanks.
7. Ditch surrounding area.
8. Fence surrounding area.
9. Plowed firebreak surrounding area.
10. Railroad siding nearby.
11. Overhead pipe lines.
12. Storage-type building in area.
13. Fuel trucks and fuel drums in area.

FIG. 4.09 Soviet semiunderground tank storage area. (See Figs. 4.10 - 4.12) Germany. Scale 1:1,600

FIG. 4.10 Fuel storage area shown in Fig. 4.09. Ditch and earth-covered tanks are distinctive at this scale. Scale 1:19,500

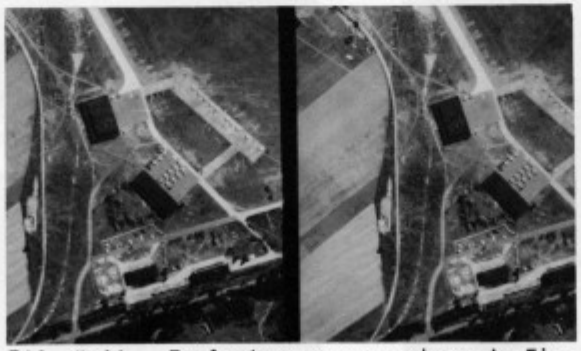


FIG. 4.11 Fuel storage area shown in Fig. 4.09. Scale 1:9,700

FIG. 4.12 Fuel storage area shown in Fig. 4.09. Scale 1:3,200

FIG. 4.13 Scale 1:9,000

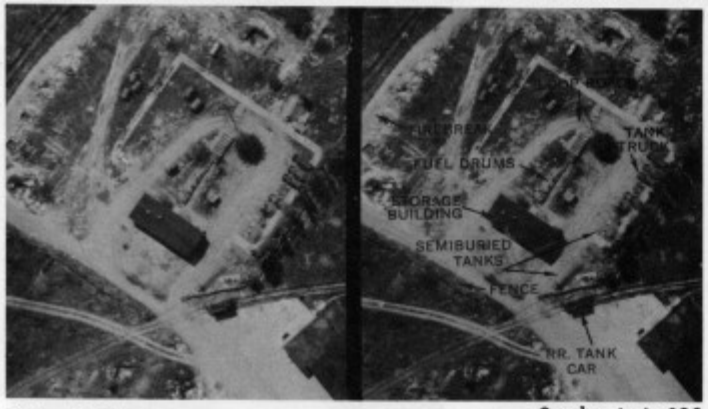


FIG. 4.14 Scale 1:1,600

FIG. 4.15 Scale 1:22,000

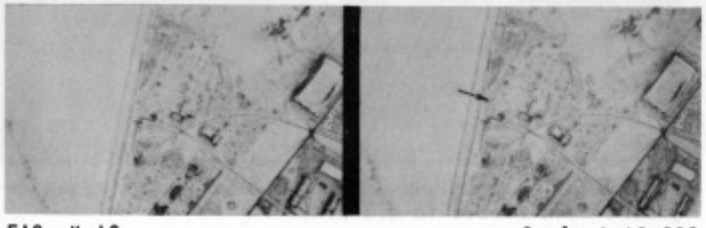


FIG. 4.16 Scale 1:10,000

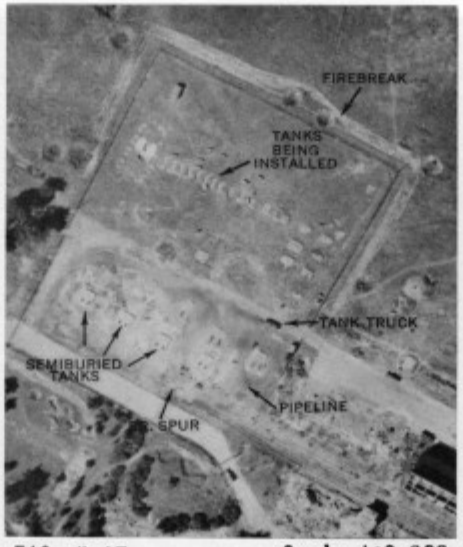


FIG. 4.17 Scale 1:2,300

Soviet semiunderground tank storage areas in Germany.

Note:

FIG. 4.13 Firebreak and loop road.

FIG. 4.14 R.R. tank car. Service openings are visible on tops of storage tanks.

FIG. 4.15 Storage area shown in preceding photo. Positive identification impossible at this scale.

FIG. 4.16 Storage area shown in preceding photo. Note snow cover.

FIG. 4.17 Small tanks being installed.

FIG. 4.18, 4.19 and 4.20 Most recognition features listed on page 4.04 can be easily recognized.

FIG. 4.21 Pipelines from R.R. siding to tops of tanks.

FIG. 4.18 Oblique stereopair

FIG. 4.19 Scale 1:2,300

FIG. 4.20 Scale 1:12,000

FIG. 4.21 Oblique stereopair

Tank Storage, Aboveground

Aboveground tank storage systems are found on many airfields throughout the world. The installations may vary from large tank farms to nothing more than one or two exposed tanks.

(a) Installations with a large storage capacity are generally located near the airfield. These large fuel dumps have a piping system to bring the fuel to the airfield.

(b) Small installations of several storage tanks are located on the airfield. These simple storage systems seldom have elaborate piping facilities. Usually, fuel is pumped directly from the tanks into tank trucks.

In most cases, the exposed fuel storage tanks are easily identified on operational-scale photography. Small tanks located in the airfield building complex or camouflaged tanks are sometimes difficult to detect. Photographic cover showing refueling of tank trucks or filling of storage tanks is helpful in locating these storage areas.

RECOGNITION FEATURES

1. Tanks above ground in vertical or horizontal position.
2. Firebreak or firewall usually surrounds each tank.
3. Railroad or water transportation facilities nearby.
4. Service road to storage area.
5. Pipelines often present in storage area.
6. Tank trucks frequently in area.

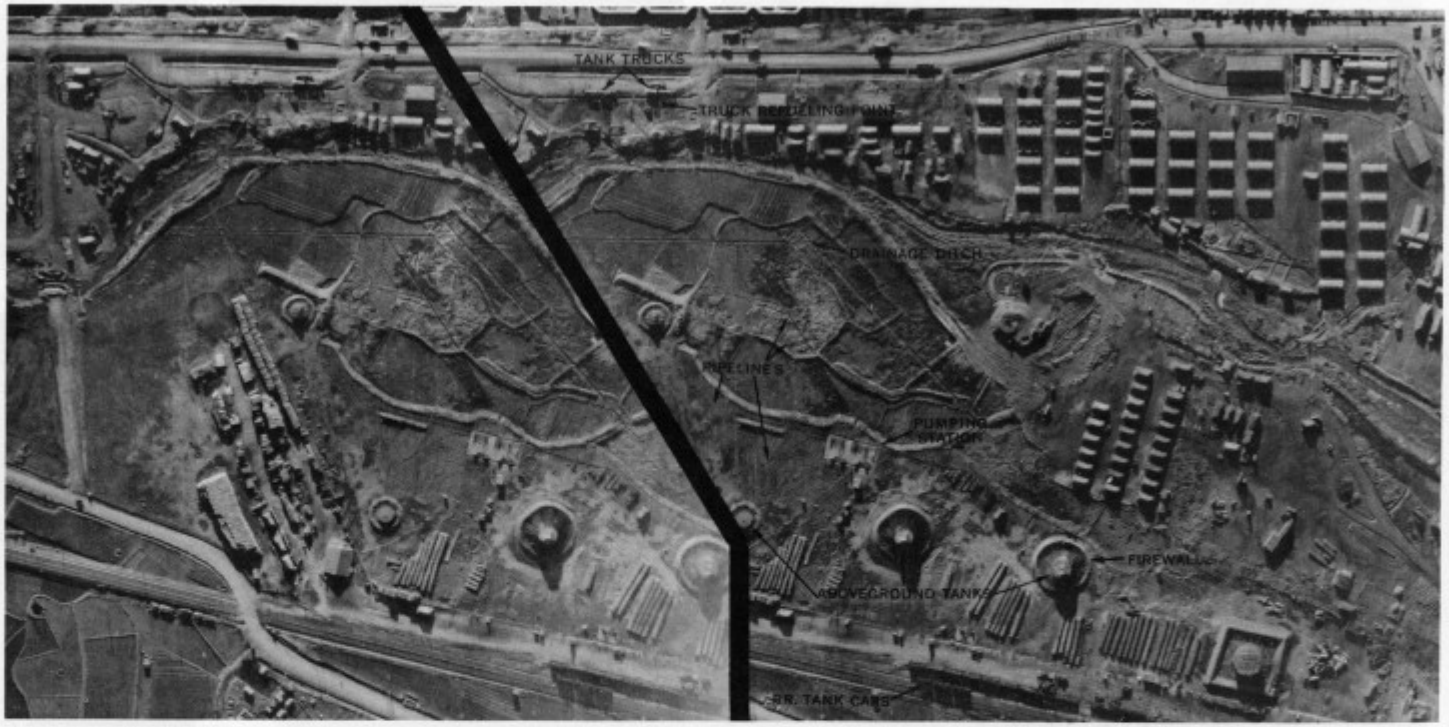


FIG. 4.22 Aboveground tank storage system in South Korea. Tanks camouflaged with netting. Scale 1:4,600

FIG. 4.23 Aboveground tank storage system in U.S.S.R. (False stereo from duplicate vertical photographs used for added clarity) Scale 1:12,000

FIG. 4.24 Aboveground tank storage installation adjacent to airfield in U.S.S.R.

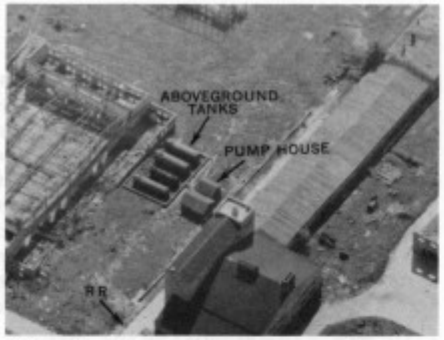


FIG. 4.25 Aboveground tank storage installation. (See Fig. 4.28) Oblique

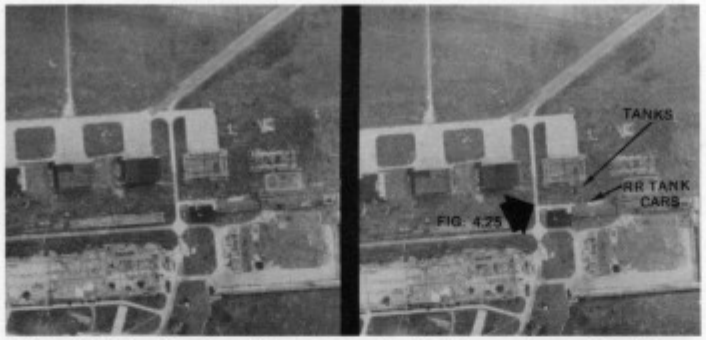


FIG. 4.28 Tank storage installation shown in Fig. 4.25. Austria. Scale 1:10,000

FIG. 4.31 Aboveground tank storage system adjacent to airfield in South Korea. Scale 1:10,000

FIG. 4.26 Aboveground fuel storage tanks. (See Fig. 4.29)

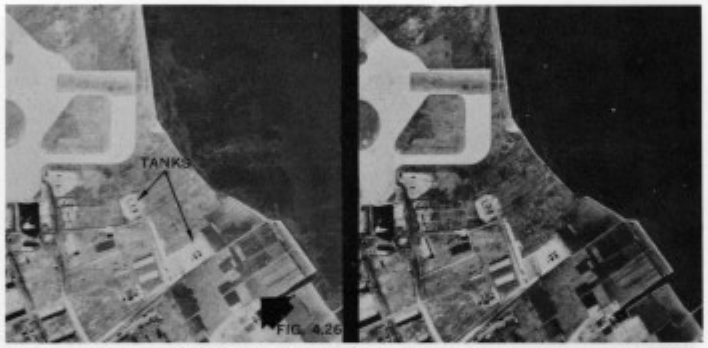


FIG. 4.29 Fuel tanks shown in Fig. 4.26. Japan. Scale 1:15,000

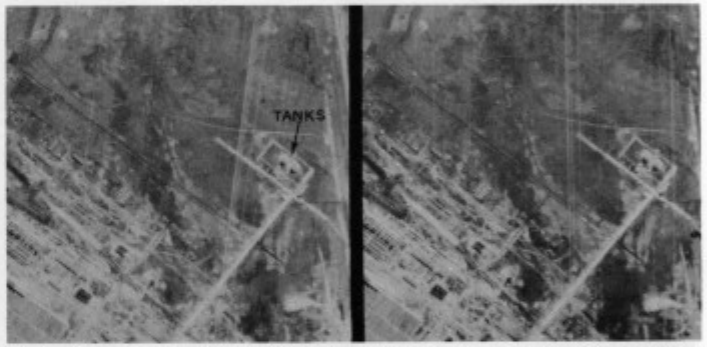


FIG. 4.32 Two aboveground fuel storage tanks at edge of airfield in U.S.S.R. False stereo. Scale 1:14,000

FIG. 4.27 Fuel storage tanks. (See Fig. 4.30) Oblique

FIG. 4.30 Tank farm shown in Fig. 4.27. Pipeline to airfield. Greenland. Scale 1:10,000

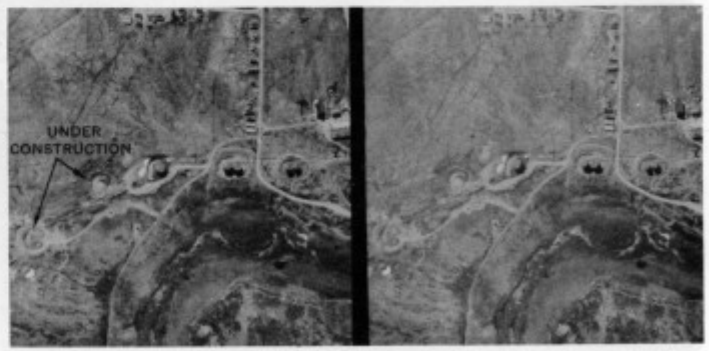


FIG. 4.33 Aboveground fuel tanks adjacent to airfield. Tank foundations and firebreaks under construction. Alaska. Scale 1:10,000

Tank Storage, Underground - without aircraft refueling points

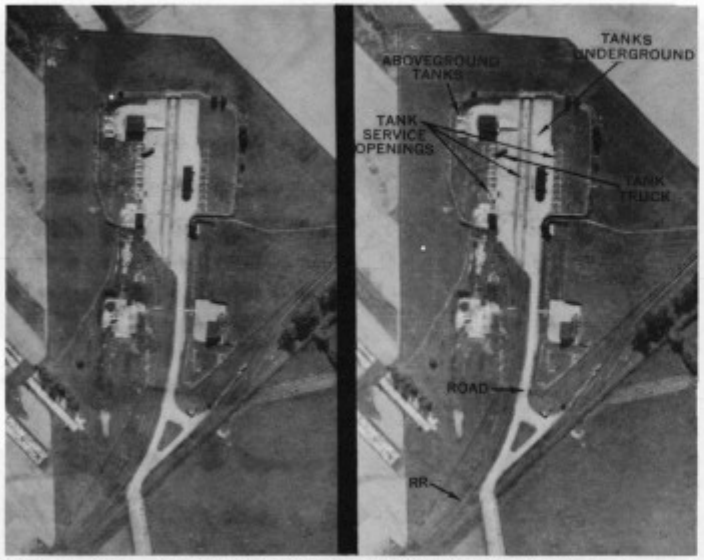


FIG. 4.34 Elaborate underground tank storage area in Sovzone, Germany. Scale 1:3,500

FIG. 4.35 Storage area shown in Fig. 4.34. Two railroad tank cars are on spur track. Oblique stereopair

FIG. 4.36 Storage area shown in Fig. 4.34. Scale 1:20,000

FIG. 4.37 Underground tank storage area adjacent to hangar area. Six tank cars on railroad siding. Scale 1:9,700

FIG. 4.38 Underground tank storage area shown in Fig. 4.37. Note tank trucks in the area. Scale 1:10,700

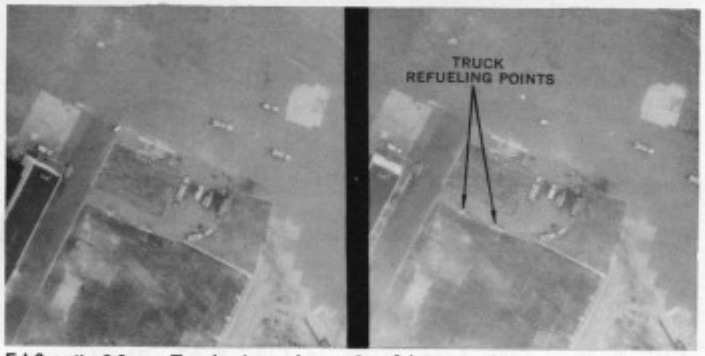


FIG. 4.39 Tank truck refueling points for storage area shown in Fig. 4.37 are visible on this scale of photography. Scale 1:2,600

An underground tank storage installation may be a complex system of buried tanks, pipes, and pumps or nothing more than several buried tanks. The more elaborate installations are usually located on important, permanent civil or military airfields. Less complex installations have been reported on some of the North Korean airfields.

Underground fuel storage systems are difficult to detect, since the identifying features that appear on air photographs are inconspicuous. Many times, photographic cover which shows refueling of tank trucks or filling of storage tanks furnishes the only clues to the location of the storage area.

RECOGNITION FEATURES

1. Storage area located near hangars or adjacent to airfield.
2. Frequently concrete, asphalt or gravel surface above tanks.
3. Access road to storage area.
4. Tank-truck refueling points and tank-filler openings.
5. Railroad or water transportation facilities nearby.
6. Tank trucks frequently in the area.
7. Railroad tank cars, oil barge or tanker often nearby.

Underground tank storage installations with aircraft refueling points are generally located at the more important civil and military airfields. This type of fuel storage system was used at many of the German airfields during World War II. It is likely that the Soviets are using these fuel storage facilities on the German airfields which they occupy.

The refueling points are pits which house a pump and hose. Hinged covers over the pits are flush with ground level when closed. Usually, fuel storage tanks are buried beneath these pits. Refueling installations may be an elaborate "ladder type" servicing area (Fig. 4.41), a "refueling loop" (Fig. 4.42), or isolated refueling points (Figs. 4.43 and 4.44).

Photographic cover showing refueling of aircraft or filling of tanks is helpful in locating such storage areas, which, by their inconspicuous nature, are difficult to detect.

RECOGNITION FEATURES

1. Located on perimeter of landing area or on servicing apron.
2. Refueling points at ground level.
3. Frequently, railroad serves the area.
4. Tone of ground surface above tanks often differs from surrounding area.
5. Tank trucks frequently in area.
6. Aircraft being refueled.

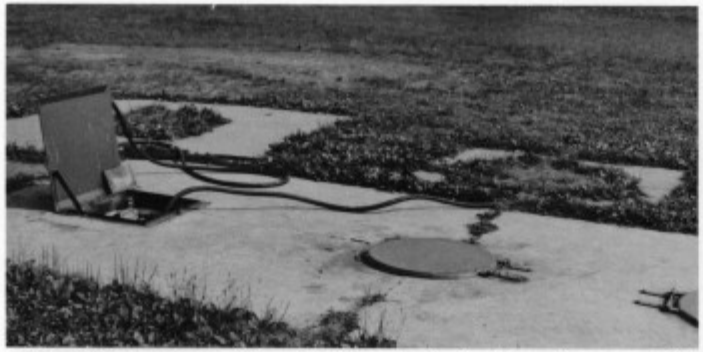


FIG. 4.40 Aircraft refueling point. Trap door on pit is open. U.S.A.

FIG. 4.43 Isolated aircraft refueling points. Trap door open on one pit and tank truck parked alongside another. Sovzone, Germany. Oblique

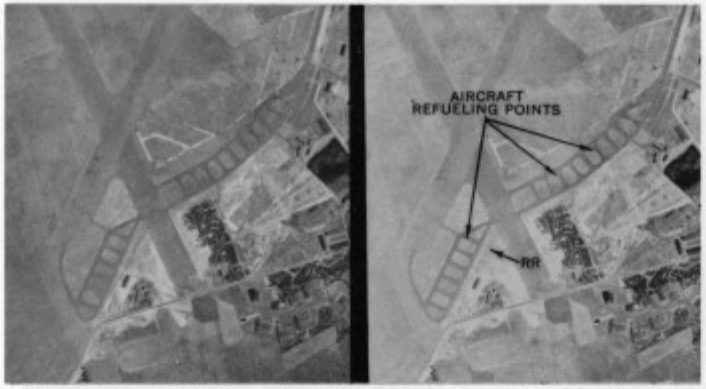


FIG. 4.41 "Ladder type" refueling installation in Germany. Railroad spur services the area. Scale 1:12,000

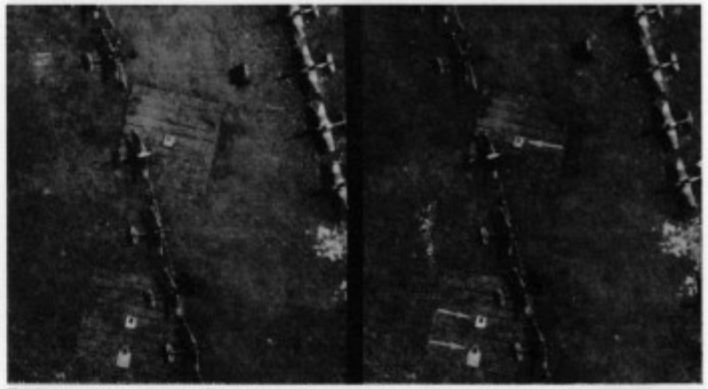


FIG. 4.44 Isolated aircraft refueling points. Note photographic tone and texture over buried tanks. Sovzone, Germany. Scale 1:1,600

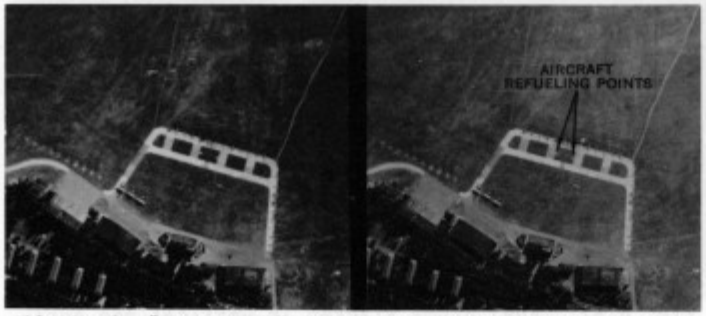


FIG. 4.42 "Loop type" refueling installation. Sovzone Germany. Scale 1:10,000

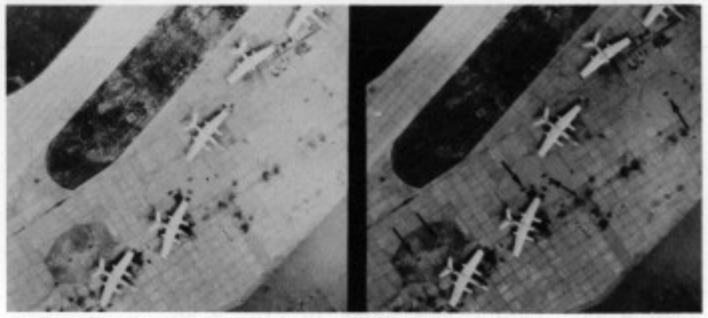


FIG. 4.45 Aircraft refueling points on servicing apron. Sovzone, Germany. Scale 1:2,000

Drum Storage

FIG. 4.46 Fuel drums stored in revetments. USAF, Korea. Oblique

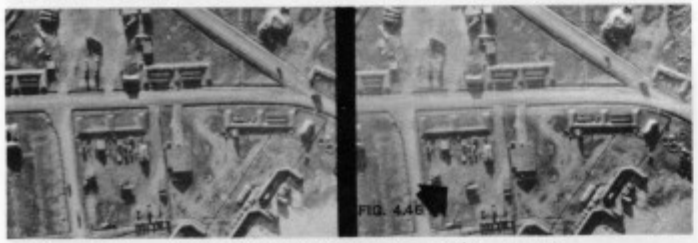


FIG. 4.47 Drum storage shown in Fig. 4.46. Scale 1:3,200

FIG. 4.48 Fuel drums in a Soviet fuel storage area. Sovzone, Germany. Oblique stereopair

FIG. 4.49 Fuel drums shown in Fig. 4.48. Scale 1:1,800

FIG. 4.50 Drum storage shown in Fig. 4.46 taken from the opposite direction. Oblique

FIG. 4.51 Drum storage shown in Fig. 4.46. Scale 1:6,000

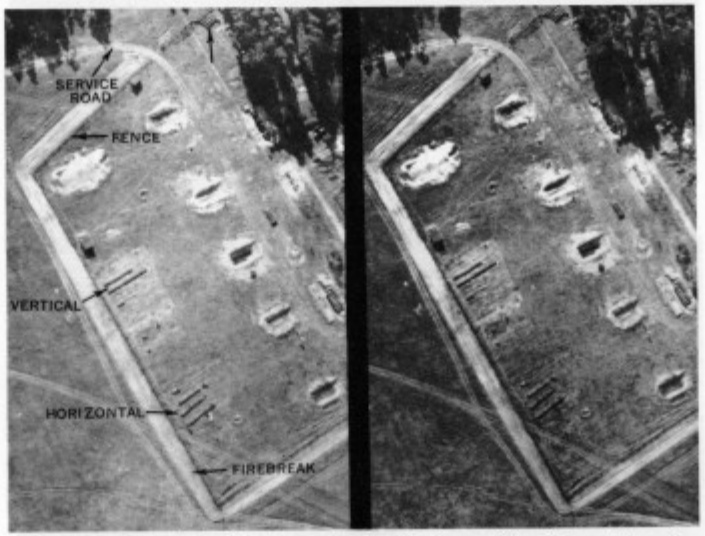


FIG. 4.52 Fuel drums stacked in vertical and horizontal positions. Sovzone, Germany. Scale 1:2,300

Generally, drums are used for oil storage and may be found in most fuel storage areas. They are also used for storage of aviation fuel at temporary or emergency airfields, whereas those fields capable of supporting more sustained flight operations are provided with the systems previously considered.

Fuel drums are difficult to detect on air photographs with scales of 1:5,000 or smaller. The drums may be stored in the open, in revetments, in buildings or in caves. In North Korea fuel drums have been stored in caves adjacent to airfields. Positive identification of drums stored under cover is impossible without reliable ground information or photographs showing fuel drums being moved into or out of such storage areas.

RECOGNITION FEATURES

1. Fuel drums usually stacked horizontally.
2. Storage area located on perimeter of or adjacent to airfield.
3. Service road to area.
4. Fence and firebreak often surround area.

Ammunition and bomb-storage installations unsheltered from blast may be well-developed areas with one or several warehouse-type storage units served by good roads, or nothing more than an isolated area where ammunition and bombs are stored in the open. The more elaborate installations are located at permanent, well-equipped military airfields. Generally these storage areas are easily identified on operational-scale air photographs. Undeveloped storage areas are found at temporary or more advanced military airfields not having complete aircraft servicing facilities. Areas where ammunition and bombs are stored in the open are difficult to detect on air photographs.

Unsheltered buildings are used for storing unfused bombs and ammunition. Fuses, initiators or sensitive explosives are usually stored in blast shelters or small isolated sheds.

RECOGNITION FEATURES

1. Located in isolated areas adjacent to airfield (often wooded areas).
2. Open storage indicated by widely spaced stacks of bombs or ammunition cases.
3. Low, single-storied buildings of uniform appearance.
4. Buildings usually evenly spaced and well separated.
5. Firebreak and fence usually surround the area.
6. Service road from storage area to airfield.
7. Often one or more blast shelters or small, isolated sheds in area.

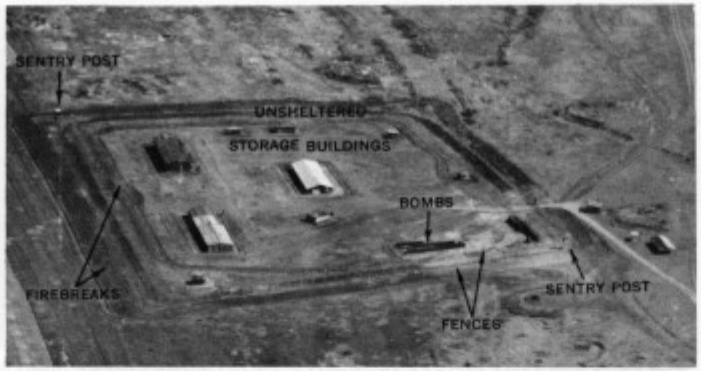


FIG. 4.53 Soviet ammunition and bomb storage area adjacent to airfield in Austria. Oblique

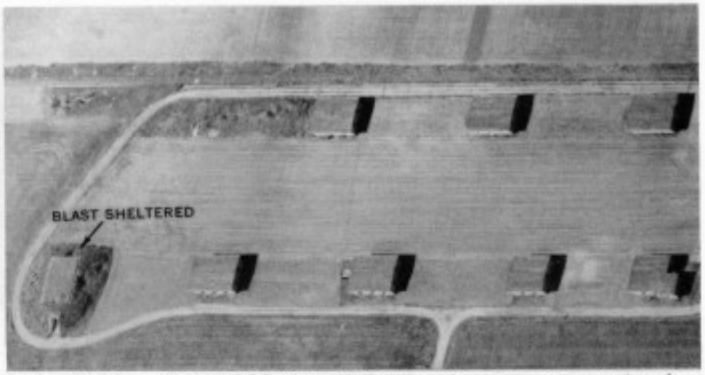


FIG. 4.56 Ammunition and bomb storage area at airfield in Austria. Note blast-sheltered storage unit on left. Oblique

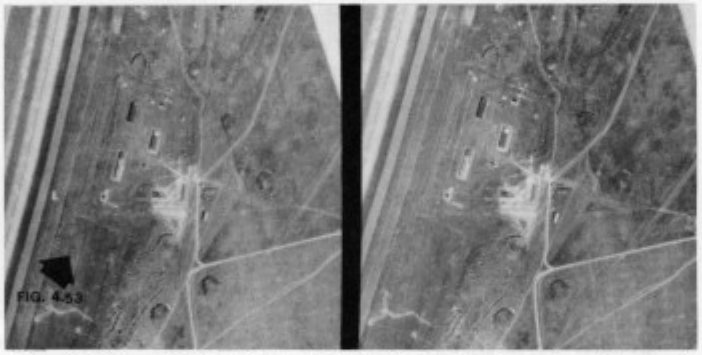


FIG. 4.54 Ammunition and bomb storage area shown in the preceding photo. Scale 1:10,500

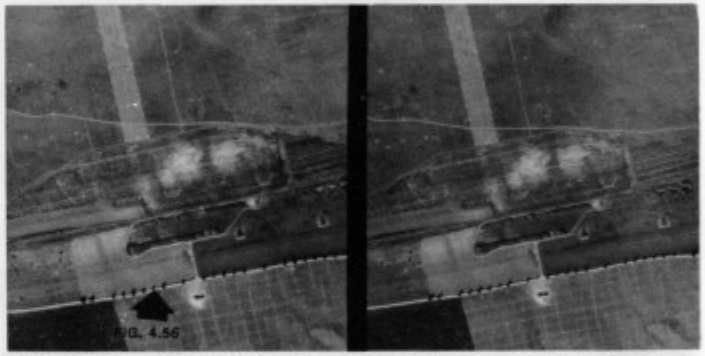


FIG. 4.57 Ammunition and bomb storage area shown in the preceding photo. Scale 1:10,000

FIG. 4.55 Ammunition and bomb storage at a Soviet airfield. Scale 1:22,000

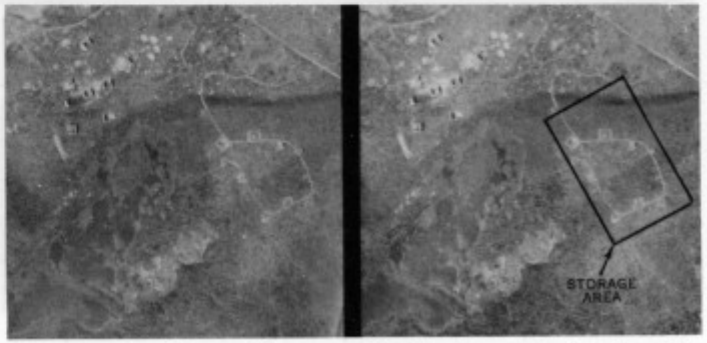


FIG. 4.58 Ammunition and bomb storage at a Soviet airfield. Scale 1:13,000

Ammunition and Bomb Storage, Underground

FIG. 4.59 Cave entrances in hills adjacent to airfield in North Korea. Scale 1:9,500

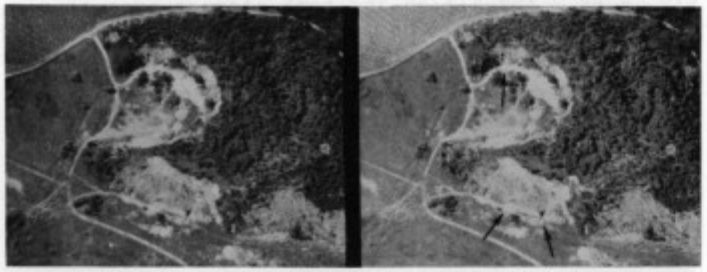


FIG. 4.60 Cave entrances to underground storage at airfield in North Korea. Scale 1:6,000

FIG. 4.61 Same area shown in Fig. 4.60 at a time when the caves were under construction. Note spoil bank in front of entrances and tracks in snow. Scale 1:13,000

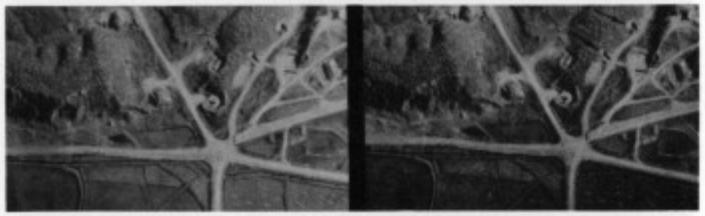


FIG. 4.62 Cave entrances, aircraft revetments, and revetted building in hills adjacent to airfield in North Korea. Scale 1:5,000

Ammunition and bombs are occasionally stored in complex underground installations or in simple caves. Positive identification of this type of storage is impossible without reliable ground information or photographic cover showing ammunition or bombs being moved into or out of the underground structures.

It is reported that the Communist forces in North Korea frequently store ammunition and bombs in caves adjacent to the airfields.

RECOGNITION FEATURES

1. Located in isolated areas adjacent to airfield.
2. Entrance to caves or underground structures.
3. Service road from entrances to airfield.
4. Ammunition and bombs being moved into or out of underground entrances.

Ammunition and Bomb Storage, Blast-Sheltered

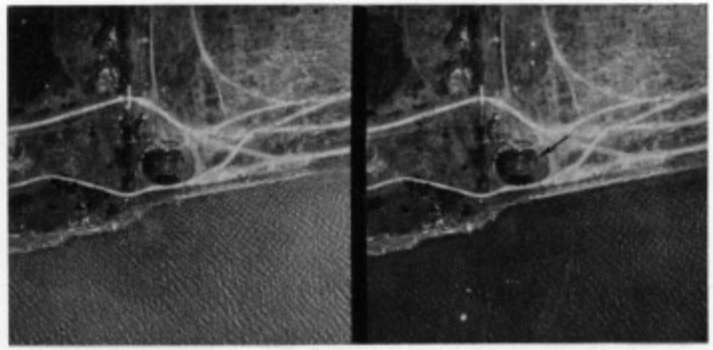


FIG. 4.63 Large, earth-covered, reinforced concrete, ammunition and bomb storage unit on perimeter of North Korean airfield. Scale 1:6,000

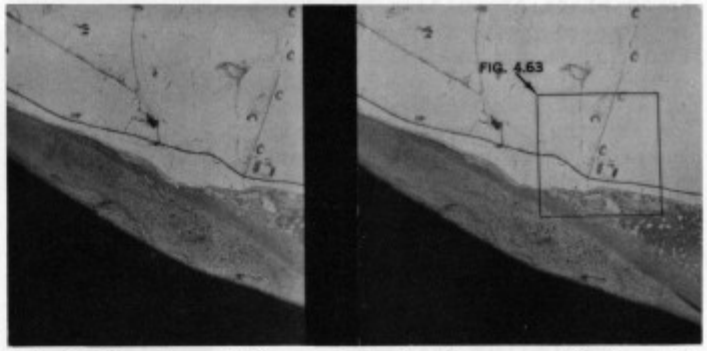


FIG. 4.64 Ammunition and bomb storage unit shown in preceding photo. Note snow conditions. Scale 1:13,500

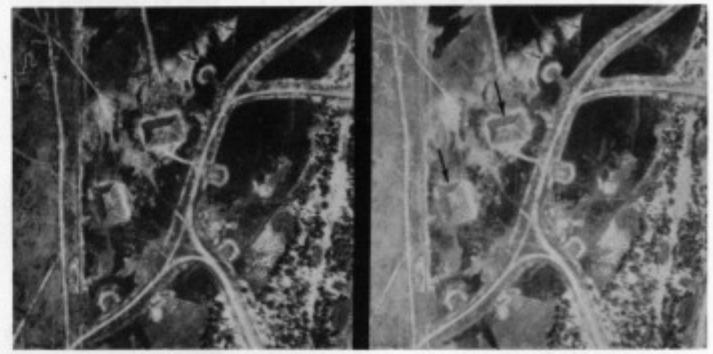
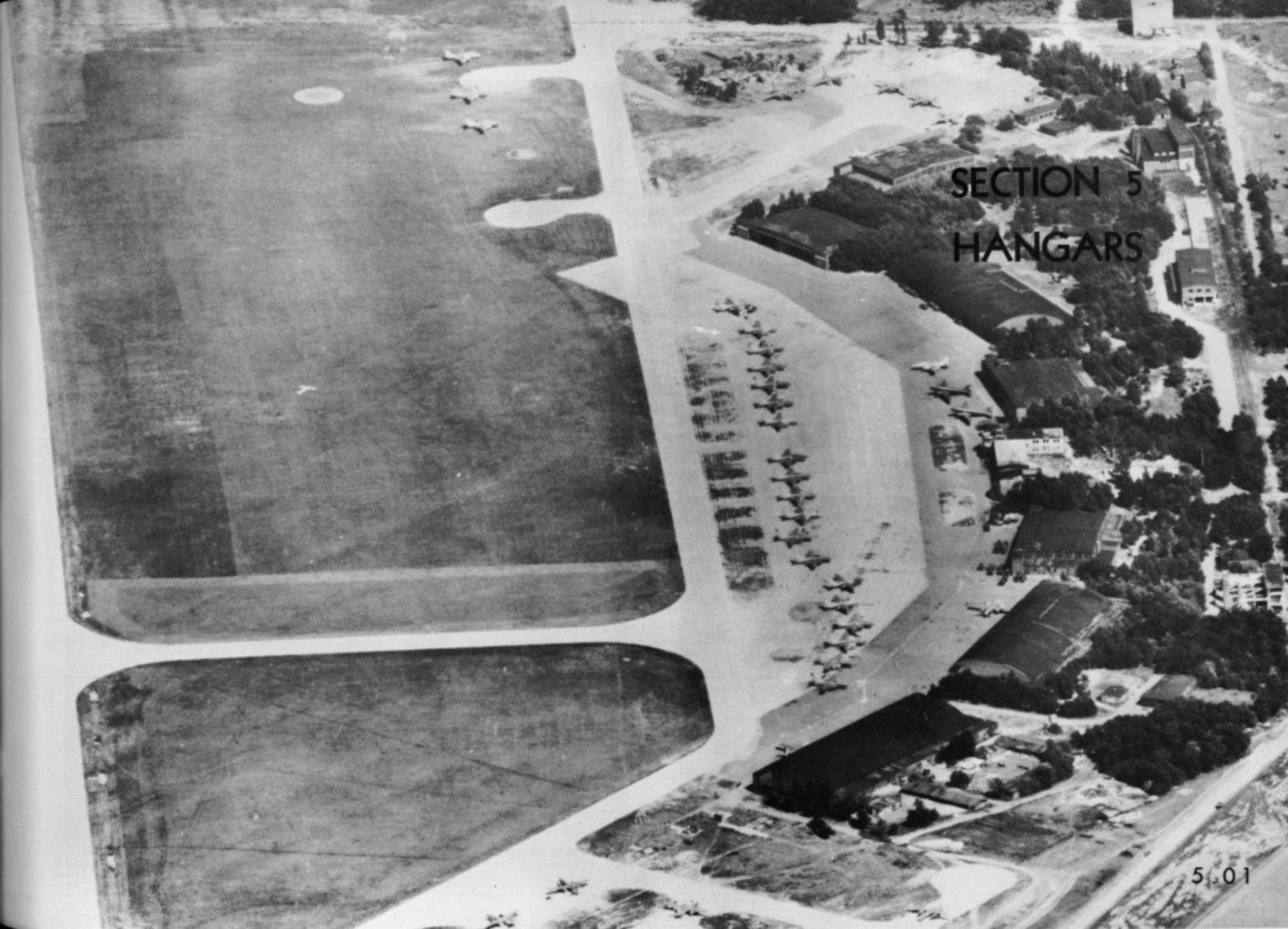


FIG. 4.65 Earth-covered, reinforced concrete, ammunition and bomb storage units in aircraft dispersal area at North Korean airfield. Scale 1:6,000



SECTION 5
HANGARS

Hangars are usually found on permanent civil or military airfields. Auxiliary or emergency airfields seldom have them, but, if present, they are used chiefly for aircraft maintenance and repair and occasionally for storage of supplies or aircraft.

Normally, hangars can be recognized on photographs as the largest buildings located in close proximity to the landing area. In most cases they face an apron. There is a wide variety of sizes and types, but in general they all have a large barn-like appearance. The multiple-bay type, although distinctive in shape, is nothing more than a series of connected hangars. Often, wings and lean-to sheds are attached to the main structure.

Hangars are classified according to the length of the side with doors:

Small	- under 100 ft.
Medium	- 100 to 200 ft.
Large	- 200 to 300 ft.
Very large	- over 300 ft.

Any building wings attached to the front of the hangar are included in the measurement. Classification of a multiple-bay hangar is not determined by over-all length but by the length of the individual bay.

RECOGNITION FEATURES

Primary:

1. Large buildings, usually of sufficient size to accommodate the type of aircraft commonly using the field.
2. Located on perimeter of landing area.
3. Frequently has hard-surfaced hangar apron in front.

Secondary:

4. Usually a part of or near the airfield building complex.
5. Entrance facing or easily accessible to landing area.
6. Doors usually located on longer side.
7. Sliding, folding or overhead doors are at ground level.
8. Aircraft often parked in doorway or on hangar apron.
9. Buildings usually grouped together in some orderly arrangement.
10. Hangar design often repeated on a given field.

HANGARS IN SOVZONE, GERMANY

Many airfields of German construction now occupied by the Soviets are equipped with complete hangar facilities. Generally, there are two or three sizes on each field. Within each size class those on individual fields are usually of the same type. The only uniform design common to numerous fields is the standard repair hangar which measures 420 by 164 feet and has a large wing projecting from either side (See Fig. 5.01). The Soviets have repaired some of the German hangars, but up to 1952 no new hangar construction was reported in this Zone.

HANGARS IN U.S.S.R.

During World War II there was a wide variety of hangar sizes and designs in the U.S.S.R. However, the facilities at individual fields were much less complete than those found on fields of German construction. The Soviets had several types in the small and medium classes that were of standard design. (See pages 5.07 and 5.08)

A variety of construction materials was used by the Soviets. In the northern forest regions many of the smaller hangars were built of wood. In the treeless steepes, steel and concrete or brick construction was more common. Only occasionally was a concrete apron laid in front of the hangar.

The Soviets often used hangars for storage of supplies as well as for maintenance and repair, but seldom for storage of aircraft.

GERMAN HANGARS (SOVZONE)	Pages
1. Very large	5.03 - 5.05
2. Large	5.03 - 5.05
3. Medium	5.05
4. Small	5.05

SOVIET HANGARS	
1. Very large	5.08
2. Large	5.06 & 5.08
3. Medium	
a. Multiple-bay	5.07
b. Shed	5.08
c. Military	5.07
d. Miscellaneous	5.06 - 5.08
4. Small	
a. Hangarettes	5.07
b. Miscellaneous	5.08

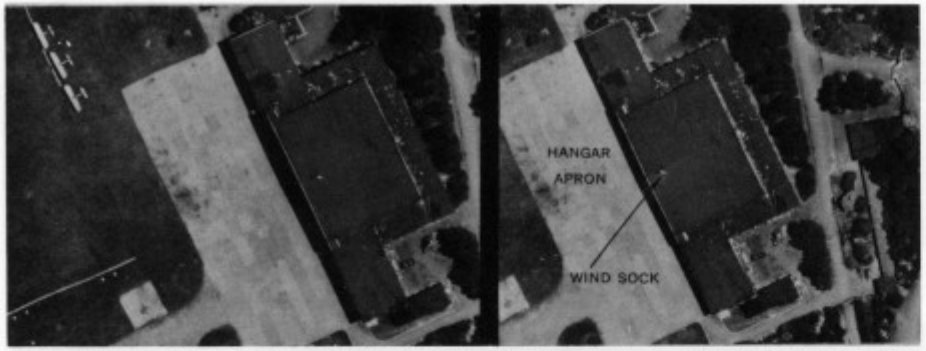


FIG. 5.01 German standard repair hangar of the "very large" class (420' x 164') of World War II construction. Scale 1:2,500

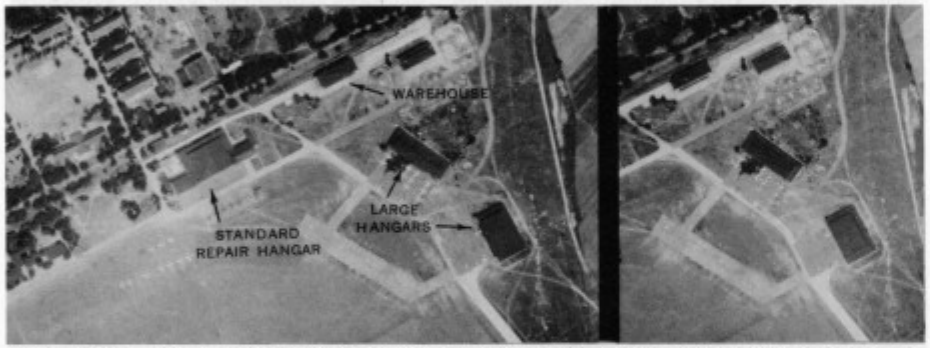


FIG. 5.02 German standard repair hangar and other "large" repair hangars. Scale 1:8,400

FIG. 5.03 Hangars shown in Fig. 5.02. Note that hangars are easily recognized on this scale of photography. Scale 1:21,000

FIG. 5.04 "Very large" hangars (650' x 155' and 740' x 110'). "Large" hangar (285' x 100'). Scale 1:11,000

FIG. 5.05 Two "very large" hangars (350' x 130'); three "large" hangars (270' x 70'). Scale 1:10,000

FIG. 5.06 Hangars shown in Fig. 5.05. Note lean-to extension for work benches and tools on back of the "very large" hangar.

FIG. 5.07 "Very large" German hangars. Note that sliding doors are built to open at ground level.

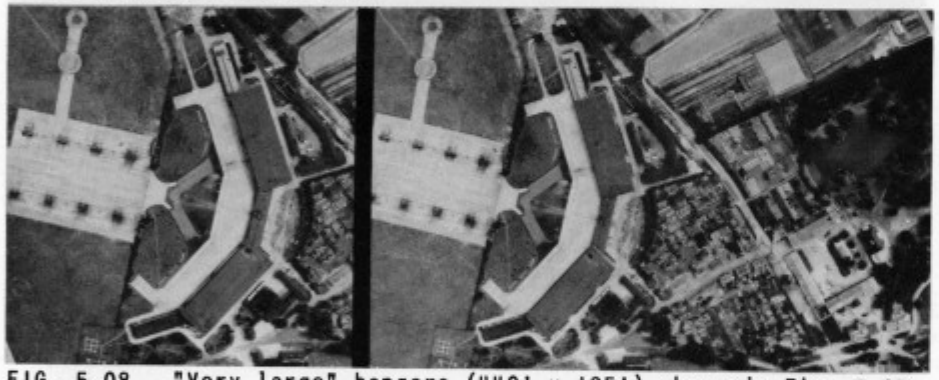


FIG. 5.08 "Very large" hangars (440' x 135') shown in Fig. 5.07.
Scale 1:8,000

FIG. 5.09 Hangars shown in Fig. 5.08 are easily recognized at considerably reduced scale.
Scale 1:24,000

FIG. 5.10 "Very large" and "large" hangars. Observe small wings on sides for sliding doors.

FIG. 5.11 "Very large (360' x 135') and "large" (210' x 135') hangars shown in Fig. 5.10.
Scale 1:10,500

FIG. 5.12 Hangars shown in Fig. 5.10 Note that those in same size group have identical design.
Scale 1:19,000

FIG. 5.13 "Large" German hangars (290' x 165'). Hangar at upper right is totally destroyed. Scale 1:10,000

FIG. 5.14 Hangars shown in Fig. 5.13 are recognizable at greatly reduced scale. Scale 1:25,000

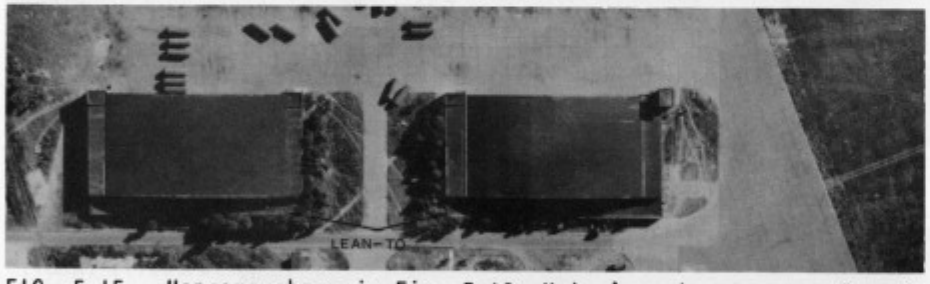


FIG. 5.15 Hangars shown in Fig. 5.13. Note lean-to on rear of each hangar for work benches and tools. Scale 1:2,500

FIG. 5.16 "Small" (90' x 70'), "medium" (160' x 140') and "very large" (640' x 160') hangars. Germany. Scale 1:20,000

FIG. 5.17 "Medium" German hangar (170' x 105'). Scale 1:2,100

FIG. 5.18 Hangar shown in Fig. 5.17. Scale 1:10,000

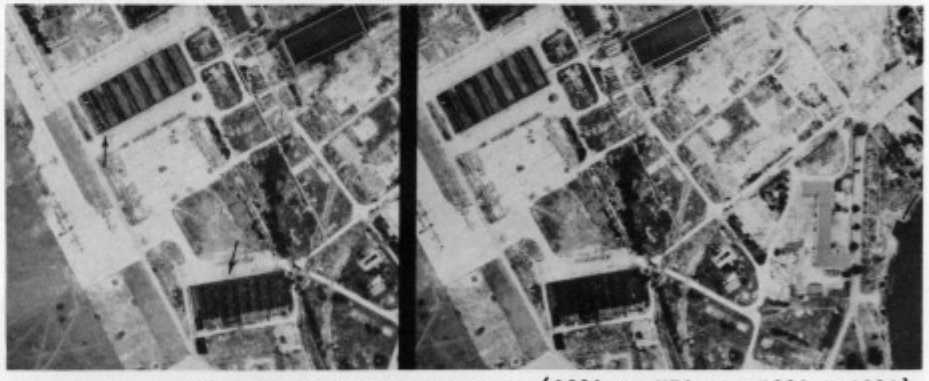


FIG. 5.19 "Very large" German hangars (380' x 175' and 420' x 180') with monitor-type roof. Such types are frequently used for aircraft assembly. Scale 1:7,400

FIG. 5.20 Hangars shown in Fig. 5.19. Scale 1:20,000

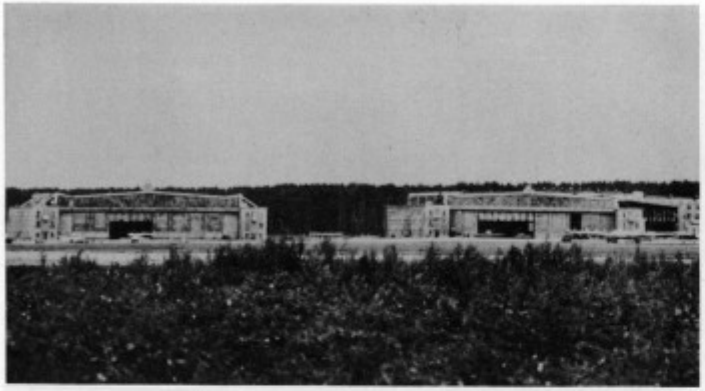


FIG. 5.21

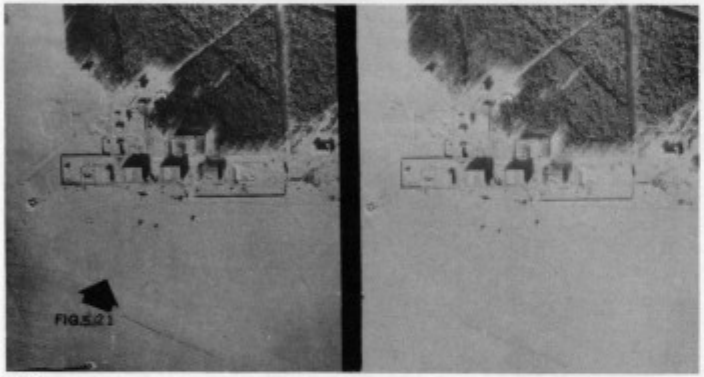


FIG. 5.22 Scale 1:22,000

FIGS. 5.21 and 5.22
Two "large" hangars (280' x 170') on an important airfield in U.S.S.R. Note space in side wings for work shops and offices.

FIG. 5.23
Two of the "medium" size hangars shown in Fig. 5.24.

FIG. 5.24
One "large" and 5 "medium" hangars on a military airfield in U.S.S.R. Note that hangar at lower right has a large wing projecting from one side.

FIG. 5.25
Three of the "medium" size hangars shown in Fig. 5.24).

FIG. 5.26
"Large" hangar of steel and concrete construction on civilian airfield in U.S.S.R.

FIG. 5.23

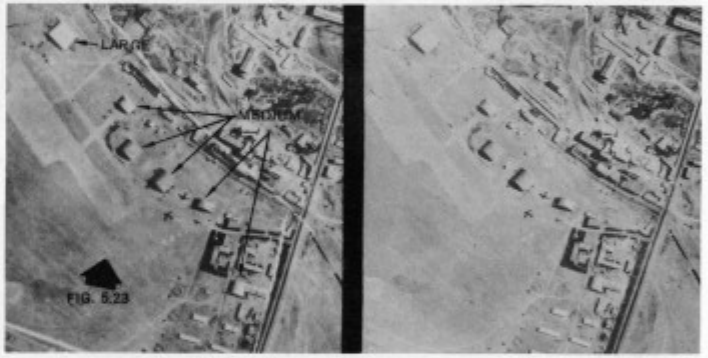


FIG. 5.24 Scale 1:18,000

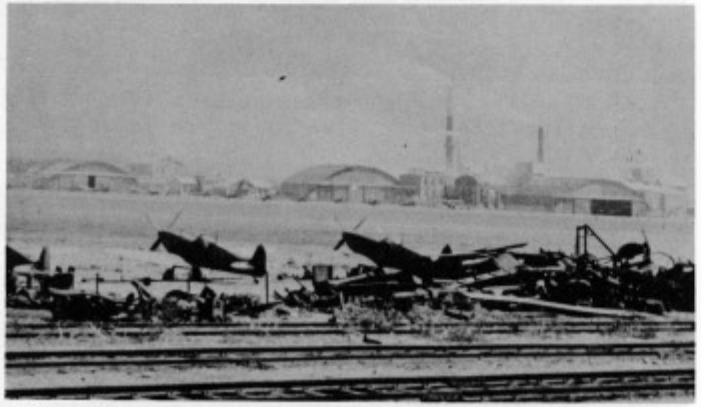


FIG. 5.25

FIG. 5.26

Hangars shown in Figs. 5.27 - 5.30 were commonly found on Soviet military fields during World War II. Size and construction details are somewhat varied, but general design is the same. Distinctive features are the flat gambrel roof, doors at both ends and small projections at each corner to accommodate sliding doors.

Multiple-bay hangars shown in Figs. 5.30 and 5.31 were also a standard design found on many military airfields. The individual bays, as a rule, are 110 by 180 feet and usually are built in multiples of two or three. They have an arched roof and doors at both ends.

Hangarettes shown in Figs. 5.32 and 5.33 are similar to the multiple-bay hangars but are much smaller. Usually they are found in multiples of five. Six of these units housed a Soviet fighter "regiment" of 30 planes. It has been reported that this type is becoming obsolete. For an additional illustration of hangarettes see Fig. 3.66.

FIG. 5.27 "Medium" military hangar having doors at both ends and a flat gambrel roof.

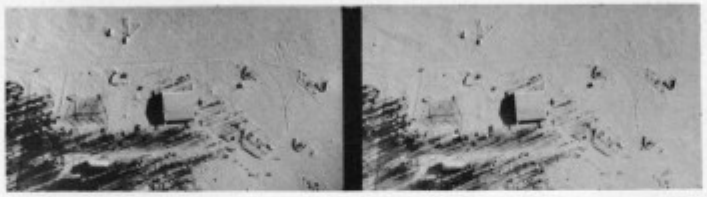


FIG. 5.28 "Medium" military hangar (185' x 185') similar to that in Fig. 5.27. Scale 1:11,500

FIG. 5.29 "Medium" military (175' x 140') and "small" multiple-bay hangars. Scale 1:12,500

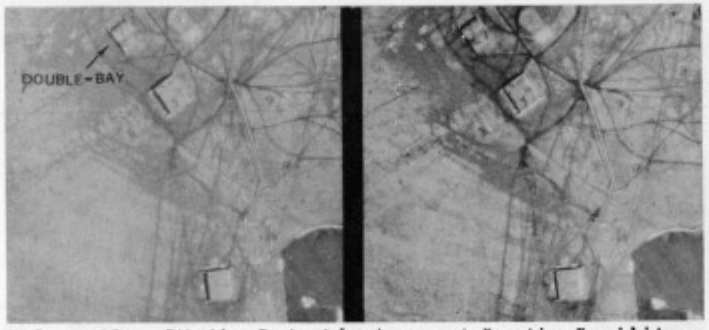


FIG. 5.30 "Medium" double-bay and "medium" military hangars (195' x 240'). The latter, though larger in size, have the same design as those shown in Fig. 5.29. Scale 1:15,000

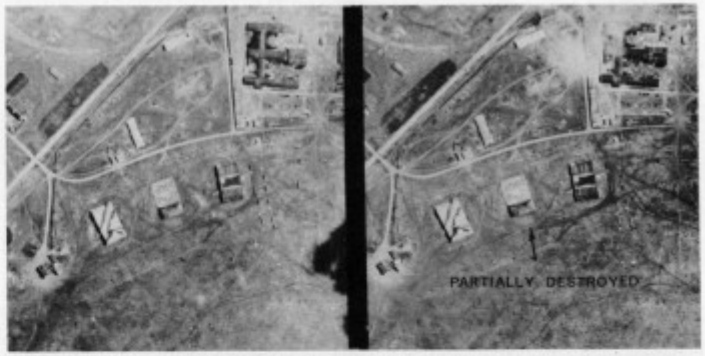


FIG. 5.31 "Medium" triple-bay hangars. Scale 1:15,000

FIG. 5.32 Group of 30 hangarettes partially destroyed. Such a group accommodated one Soviet fighter "regiment". Scale 1:12,000

FIG. 5.33 Destroyed hangarette units being converted to aircraft revetments. Scale 1:9,300

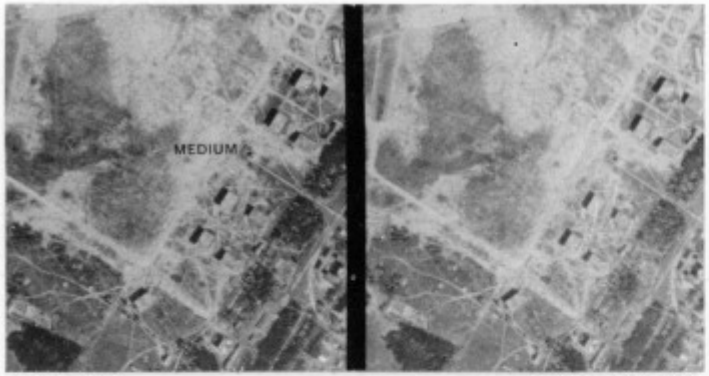


FIG. 5.34 Scale 1:20,000

FIG. 5.35 Scale 1:17,000

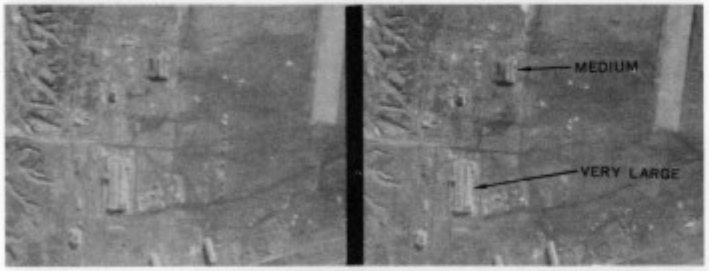


FIG. 5.36 Scale 1:15,000

FIG. 5.37 Scale 1:42,000

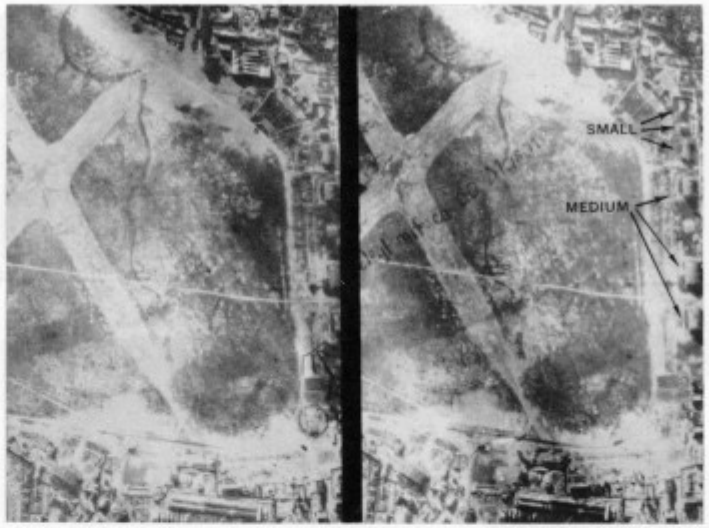


FIG. 5.38 Scale 1:19,000

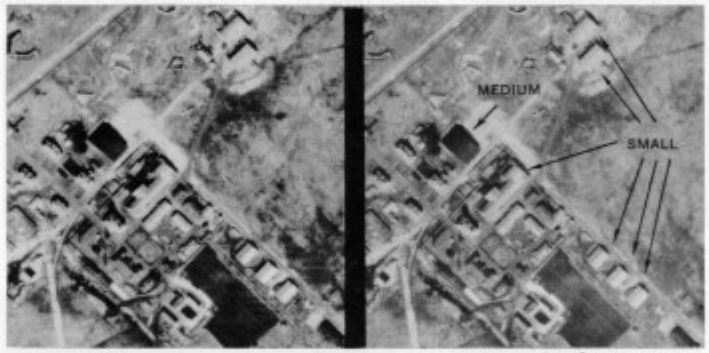


FIG. 5.39 Scale 1:8,000

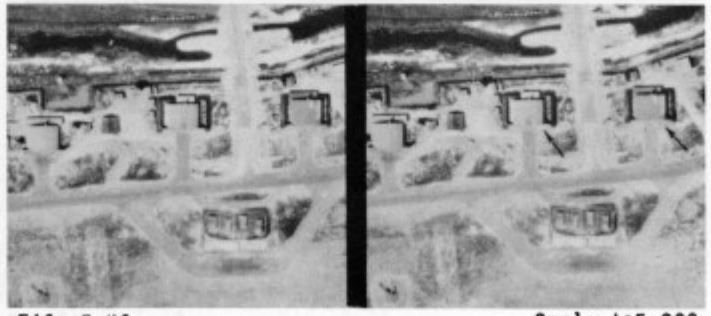


FIG. 5.40 Scale 1:5,000

FIG. 5.34 Standard-type hangars occasionally observed on Soviet fields. They are approximately 200' x 130', have a shed-type roof and are usually arranged in regular groups.

FIG. 5.35 A dirigible hangar. Although seldom found, these are used primarily to house captive balloons used at parachute jump training and barrage balloon training centers.

FIG. 5.36 The "very large" (400' x 180') and "medium" (180' x 110') hangars are located at an aircraft test field. The monitor-type roofs are not common.

FIG. 5.37 On exceptionally small scale photography, hangars can be easily distinguished in the airfield complex even under snow conditions.

FIG. 5.38 A variety of hangars can be seen on this large Soviet field which was built primarily for civil use.

FIG. 5.39 Hangars on a civil field in one of the former Baltic States. Construction differs noticeably from that of Soviet types.

FIG. 5.40 "Small" revetted hangars (80' x 65' and 90' x 70') located on a civilian field (Baltic area).

SECTION 6
OTHER BUILDINGS

OTHER BUILDINGS

Airfields vary in their building developments from fields with no buildings to those with large and complex establishments. In general, all airfield building developments are characterized by the presence of certain functional-type structures of more or less standard design which follow such basic patterns of arrangement as the nature of airfield operations may require. The permanency and capabilities of an airfield are deducible in large measure from the number, size, types and construction of the buildings.

A field equipped with a limited number of structures and few, if any, hangars would indicate that use is limited to refueling and emergency repair. Many such fields without any buildings. were typical of Communist operations both in World War II and in the Korean conflict.

At the other extreme is the extensively developed airfield which usually can be considered a permanent major air facility. Such fields generally are equipped to handle not only the routine servicing of heavy air traffic but also extensive repairs.

The extent and nature of airfield building developments are determined by a number of factors such as:

1. Size of airfield.
2. Number and type of aircraft to be accommodated.
3. Extent of aircraft services — fuel and repair.
4. Extent of personnel services — billeting, recreation etc.
5. Type of use — civilian, military, training etc.
6. Protection from hostile action.
7. Permanence of field.
8. State of completion.
9. Proximity to community facilities — housing, messing, storage etc.
10. Availability of construction materials.
11. Climate.
12. Architectural and other cultural customs of the country.

Although some buildings are difficult to identify on aerial photography, several types have relatively well-defined recognition features. In addition to hangars (covered in Section 5), the types of buildings most commonly encountered on airfields are those used for headquarters, barracks, warehouses and motor vehicle storage. This section covers recognition of these four main types and other buildings of diverse but identifiable uses.

HEADQUARTERS BUILDINGS

Headquarters buildings provide working space and facilities for personnel engaged in two major airfield functions — administration and air operations. Administration is responsible for management and logistics. Air operations handles air traffic and safety control and makes use of such facilities as radio, navigational aids and weather stations.

The two functions, administration and air operations, may be handled in one or several buildings. On lesser fields both functions frequently are carried on in the same building.

The operations headquarters is usually a permanent building, although on some fields mobile stations are used. Permanent buildings are relatively easy to identify because of prominent location and distinctive features, while mobile stations, due to insignificant size and changing position, are difficult to detect.

Buildings used specifically for administration have no design indicative of function. The features listed below should assist in identification.

RECOGNITION FEATURES

ADMINISTRATION BUILDING

Primary:

1. Always is part of airfield building complex.
2. Building is often the most elaborate on the field.
3. Building may differ in construction from other buildings; is frequently of multistory and multiwing design.
4. Surrounding grounds are generally the best or only landscaped area on the field.

Secondary:

5. Location is ordinarily along the main road within the field.
6. Loop-driveway approach may be used.
7. Hard-surfaced motor vehicle parking area is often nearby.

AIR OPERATIONS BUILDING

Primary:

1. Generally is on perimeter of landing area.
2. Usually is part of airfield building complex.
3. A control tower having full view of landing area is usually in evidence.
4. Control tower frequently is located on corner of a hangar.

Secondary:

5. Radio masts and windsocks are commonly on the roof or nearby.
6. Weather instrument enclosure may be near by.
7. A cabin-top tower is often used.
8. Building area may be landscaped.

FIG. 6.01 Air operations building and facilities on perimeter of landing area at large well-developed airfield in Sovzone, Germany. Oblique stereopair

FIG. 6.02 Building and facilities shown in Fig. 6.01. Scale 1:6,300

FIG. 6.03 Administration building on large airfield in Sovzone, Germany. Note multistoried building, elaborate landscaping and loop driveway with parking area. Oblique stereopair

FIG. 6.04 Administration building shown in Fig. 6.03. Scale 1:10,000

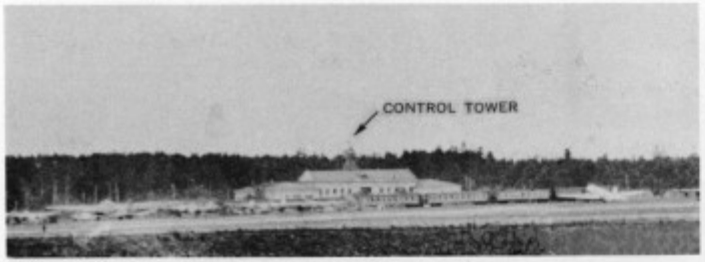


FIG. 6.05

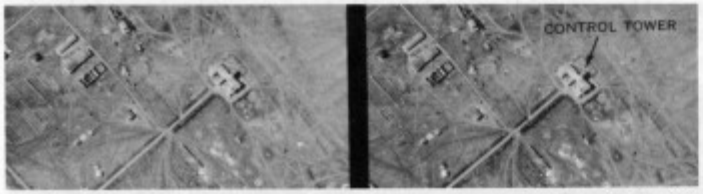


FIG. 6.06 Scale 1:18,000

FIG. 6.07 Scale 1:15,000

FIG. 6.08 Scale 4,800

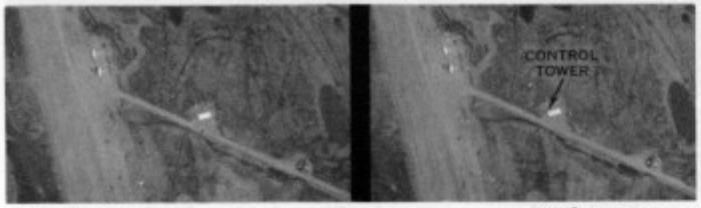


FIG. 6.09 Scale 1:7,500

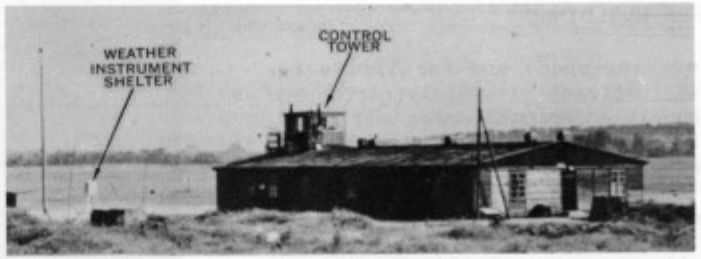


FIG. 6.10

FIG. 6.11 Scale 1:8,500

FIG. 6.12 Oblique stereopair

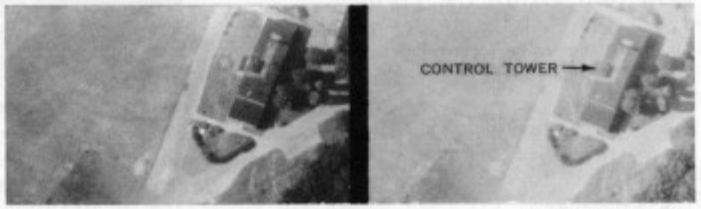


FIG. 6.13 Scale 1:2,500

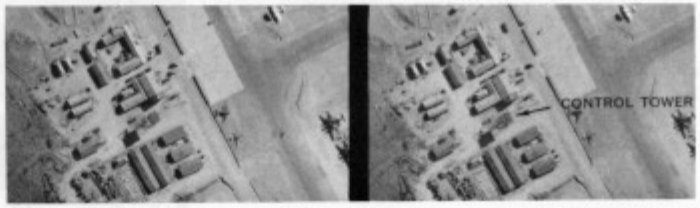


FIG. 6.14 Feb. 1952 Scale 1:4,400

FIG. 6.05 Headquarters building with control tower at large well-established Soviet airfield.
FIG. 6.06 Large Soviet headquarters building and control tower overlooking field. Note multiwing design, landscaping, location at end of main road and vehicle parking space.
FIG. 6.07 Soviet operations building and control tower on perimeter of landing area.
FIG. 6.08 Control tower on large hangar. Alaska.
FIG. 6.09 Control tower may be set back from landing area when there is nothing to obstruct view. Alaska.
FIG. 6.10 Operations shack with control tower constructed on large and important German airfield by the Soviets to replace bombed-out facilities.
FIG. 6.11 Facilities shown in Fig. 6.10.
FIG. 6.12 Control tower on corner of hangar. Note radio masts. Sovzone, Germany.
FIG. 6.13 Control tower on headquarters building. Note wind sock on roof. Sovzone, Germany.
FIG. 6.14 Control tower independent of buildings. Checkered roof shows pilots the location of tower. Shadows are frequently useful as an indication of tower height and shape. USAF, Korea.
FIG. 6.15 Operations building of post-war construction. U.S.S.R.

FIG. 6.15 U.S.S.R. April 1952

PERSONNEL QUARTERS

Airfield personnel are housed either on airfields in specially constructed facilities or in nearby communities.

Quarters provided on airfields are usually barracks-type buildings. Such barracks on the large, well-developed fields, especially near urban areas, are frequently permanent, 2- or 3-storied masonry buildings with a central heating system and extensively landscaped surroundings. Those on the smaller, more remote fields are generally single-storied buildings of light construction, without central heating and with little evidence of landscaping.

Tents are often used as temporary housing, particularly on new airfields where barracks have not been constructed. It has been noted that the Soviets make extensive use of tents to house antiaircraft crews in the vicinity of their emplacements.

Prior to 1952 no conventional barracks-type buildings were observed on Korean fields constructed by Communist forces. Apparently, airfield personnel were housed in nearby towns or farm dwellings.

RECOGNITION FEATURES

Primary:

1. Usually part of airfield building complex.
2. Barracks-type buildings most common.
3. Barracks grouped in systematic order rather than interspersed among other airfield buildings.
4. Usually not more than one or two building designs found in any barracks area.
5. Length of barracks or wings usually from two to five times the width.
6. Buildings seldom more than 50 feet wide.

Secondary:

7. Individual barracks having wings may be H-shaped, L-shaped, or T-shaped.
8. Barracks may be single or multistoried but seldom exceed three stories.
9. Roofs gabled, hipped, arched or shed types; sometimes dormered.
10. Sidewalks often present.
11. Some landscaping may be evident.
12. Outdoor recreation facilities such as volleyball courts, soccer fields or swimming pools may be in or near barracks area.

FIGS. 6.16 - 6.19 Substantial multistoried barracks on important and well-developed airfields in the U.S.S.R.

FIG. 6.16 Scale 1:19,000

FIG. 6.17 Scale 1:15,000

FIG. 6.18 Scale 1:12,300

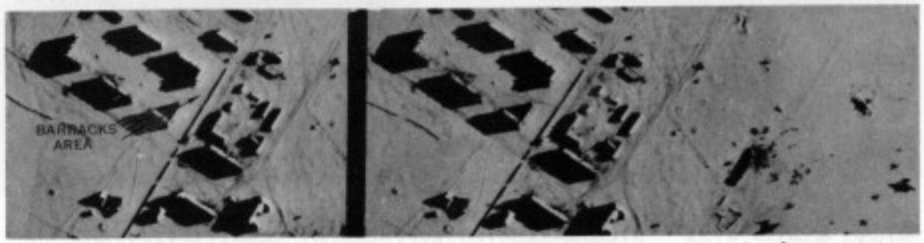


FIG. 6.19 Scale 1:12,500

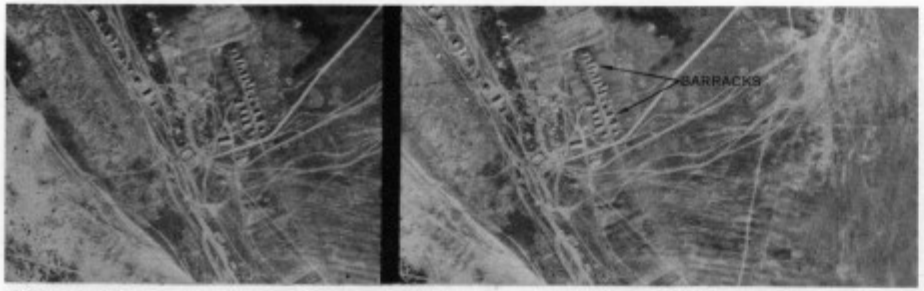


FIG. 6.20 Scale 1:13,000

FIG. 6.21 Scale 1:13,000

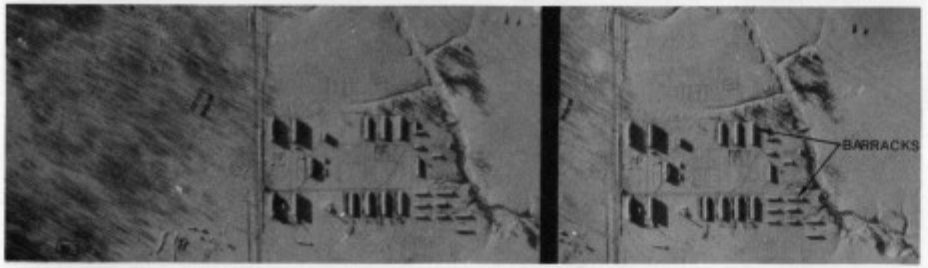


FIG. 6.22 Scale 1:15,000

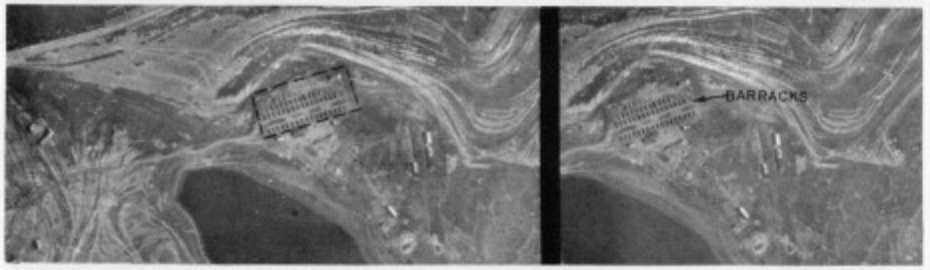


FIG. 6.23 Scale 1:12,500

FIGS. 6.20 - 6.23 Single-storied barracks of relatively light construction on less important and more remote airfields in the U.S.S.R.

FIG. 6.24 Single-storied T-shaped barracks and other buildings for enlisted personnel at large airfield in Alaska. Two front wings of each barracks are of Quonset-type construction. Scale 1:4,800

FIG. 6.25 Multiwing personnel quarters at airfield in Newfoundland. Scale 1:6,000

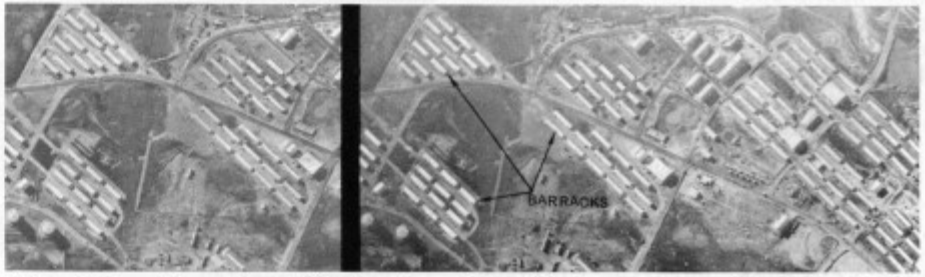


FIG. 6.26 Barracks without wings. Greenland. Scale 1:10,000

FIG. 6.27 Quonset barracks at airfield in Alaska. Scale 1:10,000

FIG. 6.28 Buildings shown in Fig. 6.27. Smaller Quonset huts are barracks, the larger huts serve as mess hall, PX, etc.

Stereogram insert.

Scale 1:20,000

FIG. 6.29 Annotations show features which are fairly typical of personnel facilities in the Soviet zone of Germany. Buildings are commonly multi-storied, of brick or stone construction and have dormered roofs. The area is well landscaped and has a neat, orderly appearance.

Scale 1:1,600

FIG. 6.30 1951

FIG. 6.31 Scale 1:6,000

FIG. 6.32 Scale 1:4800

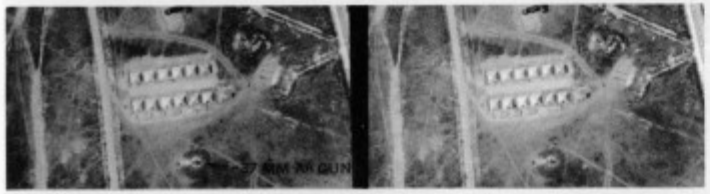


FIG. 6.33 Scale 1:2,900

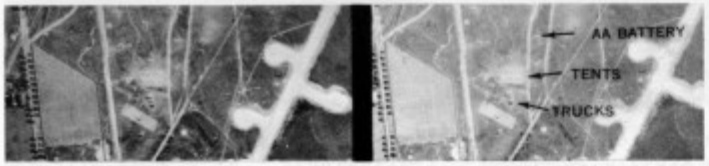


FIG. 6.34 Scale 1:10,000

FIG. 6.35

FIG. 6.36 Scale 1:7,500

FIG. 6.37 Oblique stereopair

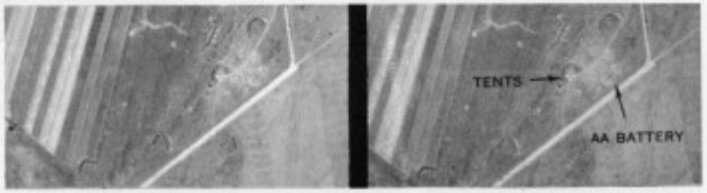


FIG. 6.38 Scale 1:10,500

FIG. 6.39 Scale 1:12,500

FIG. 6.30 USAF personnel tents (approximately 12-man capacity) on airfield under construction.

FIG. 6.31 Tents similar to those shown in Fig. 6.30

FIG. 6.32 Square pyramidal tents and small barracks at airfield in Alaska.

FIG. 6.33 Square pyramidal tents (about 17' x 17') of the type most commonly used by Soviet AA crews. Each tent houses about four men.

FIG. 6.34 Tents shown in Fig. 6.33. Note trucks parked nearby. An AA position can be seen at top of photo.

FIG. 6.35 Large rectangular tent and three smaller square tents near a medium AA battery (see Fig. 6.36). Sovzone, Germany

FIG. 6.36 Tents shown in Fig. 6.35. Observe six-gun AA battery.

FIG. 6.37 Tents of the type illustrated in Fig. 6.33. Note six-gun AA position between groups of tents. Sovzone, Austria.

FIG. 6.38 Three of the tents shown in Fig. 6.37.

FIG. 6.39 Large tents probably used by airfield construction crew. U.S.S.R.

STORAGE FACILITIES

Methods of storing supplies and materials (except fuel and ammunition, which are covered in Section 4), range from temporary open storage to use of permanent, specially constructed warehouses.

Temporary storage in unsheltered piles or in tents is usually found on fields under construction and where existing permanent storage facilities are insufficient. Well-established fields generally have adequate warehousing.

The extent of warehouse space necessary for a given airfield is determined in large measure by its accessibility. At airfields in large urban areas where supplies are readily obtainable, reserve stocks do not need to be held in the quantity required by those more remotely situated. For example, at Arctic fields, which depend on one or two boatloads of supplies in the short ice-free season, extensive storage facilities must be maintained.

RECOGNITION FEATURES

WAREHOUSES

Primary:

1. Usually part of airfield building complex.
2. Generally situated along a railroad spur if rail facilities serve airfield.
3. Buildings usually rectangular with length 2 to 5 times width.
4. Roads generally present for trucking materials to and from warehouses.
5. Evidence of considerable track activity in area.
6. Ramps frequently used for loading rail cars or trucks.

Secondary:

7. Loading ramp often has overhanging roof.
8. An apron may be in front of ramp or building entrance to permit turning and backing of trucks.
9. Piles of supplies may be found on ramp or on ground nearby.
10. Seldom landscaped.

In three theaters of Communist operations, differences have been noted in warehouse methods and facilities:

1. Soviet Germany

Many large airfields of German construction have warehousing facilities of fairly standard type. As illustrated in Fig. 6.40, these facilities are distingusihed by the following features:

a. Dimensions of approximately 180 by 55 feet.
b. Two-storied construction.
c. Very low-pitched ridge or hip roof.
d. Elevator penthouse extending a few feet above roof.
e. Location on railroad siding.
f. Arrangement for unloading rail cars directlv into one side of building and for loading trucks from opposite side.
g. Overhanging roofs on each side of building to shelter loading and unloading operations.
h. Long loading ramp for trucks extends from one end of building along rail tracks.
i. Framework supporting block and tackle extends from unloading ramp across rail tracks and is used to unload flat cars.

2. U.S.S.R.

During World War II there was no apparent standardization of warehouse design within the U.S.S.R. Size of buildings and type of loading facilities varied from field to field and generally were less complete than in Germany. On aerial photographs they often resembled barracks.

3. North Korea

No conventional types of warehouses have been constructed by the North Korean forces. It appears that storage has been kept to a minimum and that use has been made of such facilities as native dwellings, revetments and caves.

FIG. 6.40 German World War II warehouse and related facilities. Scale 1:2,600

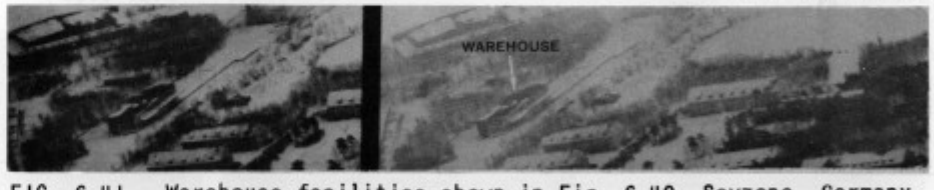


FIG. 6.41 Warehouse facilities shown in Fig. 6.40. Sovzone, Germany. Oblique stereopair

FIG. 6.42 Warehouse facilities shown in Fig. 6.40. Sovzone, Germany. Scale 1:9,500

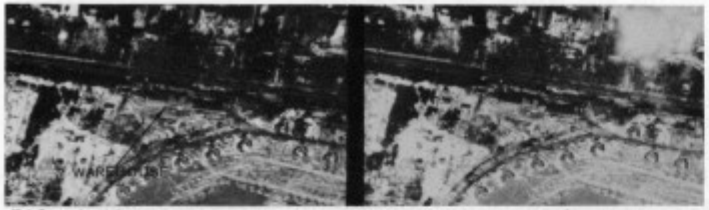


FIG. 6.43 Scale 1:12,000

FIG. 6.44 Scale 1:15,000

FIG. 6.45 Scale 1:5,000

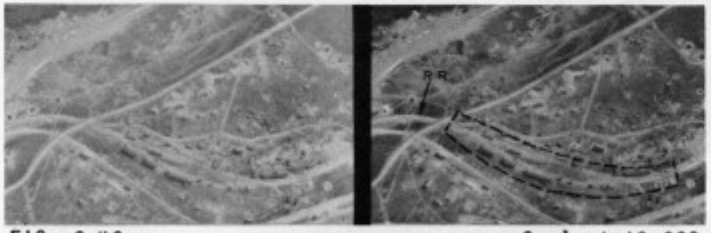


FIG. 6.46 Scale 1:13,000

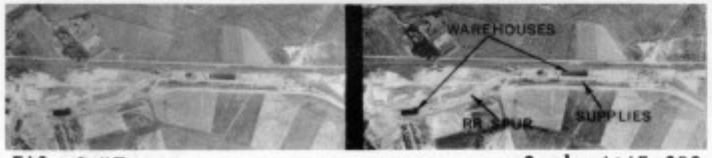


FIG. 6.47 Scale 1:15,000

FIG. 6.48 Scale 1:13,000

FIG. 6.49 Scale 1:20,000

FIG. 6.50 Scale 1:4,800

FIG. 6.51 Scale 1:6,500

FIG. 6.52 Scale 1:6,000

FIG. 6.43 Warehouse and facilities in Sovzone, Germany. Observe well-marked pattern of truck tracks in snow.

FIG. 6.44 Soviet warehouses. Presence of trucks and evidence of track activity are clues to warehouse identification.

FIG. 6.45 Four large Soviet warehouses in U.S.S.R. Fairly complete facilities include railroad, unloading platform, and hard-surfaced truck roads and aprons.

FIG. 6.46 A number of airfield warehouses along rail spur. U.S.S.R.

FIG. 6.47 Warehouses along railroad. Note supplies piled nearby. Germany.

FIG. 6.48 Warehouses on both sides of rail spur. U.S.S.R.

FIG. 6.49 Soviet storage area with four warehouses. Materials stacked in open.

FIG. 6.50 Storage and supply area showing warehouses of various sizes, unsheltered piles of supplies, rail spurs, truck roads and unloading platform. Alaska.

FIG. 6.51 Storage area with supplies deposited in the open, in aircraft revetments and in tents. South Korea.

FIG. 6.52 Unsheltered materials piled along rail spur. U.S.S.R.

MOTOR VEHICLE STORAGE

Available information for the years up to 1948 indicates that storage facilities for motor vehicles were seldom provided on airfields in the U.S.S.R.

On fields of German construction in Sovzone, Germany, garages of more or less standard size and arrangement are generally provided for vehicle storage.

In North Korea vehicles are frequently parked in special motor vehicle revetments or aircraft revetments.

RECOGNITION FEATURES
MOTOR VEHICLE REVETMENTS
NORTH KOREA

1. Measure approximately 25 by 11 feet.
2. Rectangular shape.
3. Earth-mounded walls.
4. Usually scattered singly within dispersal areas.
5. Rows of 5 to 15 revetments, spaced about 10 feet apart, may be found near AA batteries.

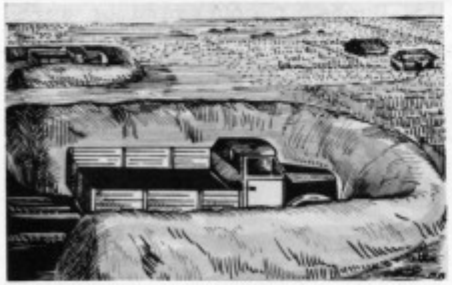


FIG. 6.53 Typical motor vehicle revetment. North Korea.

FIG. 6.54 Motor vehicle revetments near heavy AA battery in North Korea. Covering has been removed from two trucks in revetments at right.

FIG. 6.55 Motor vehicle revetments shown in Fig. 6.54. Scale 1:10,000

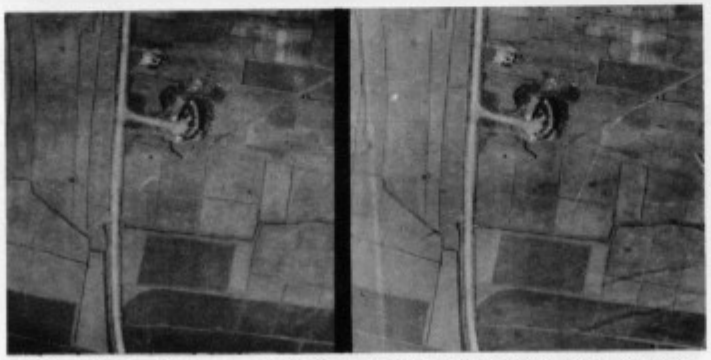


FIG. 6.56 Motor vehicle storage in aircraft revetments. North Korea. Scale 1:4,000

FIG. 6.57 Two motor vehicle revetments adjoining taxiway on North Korean airfield. 1:7,500

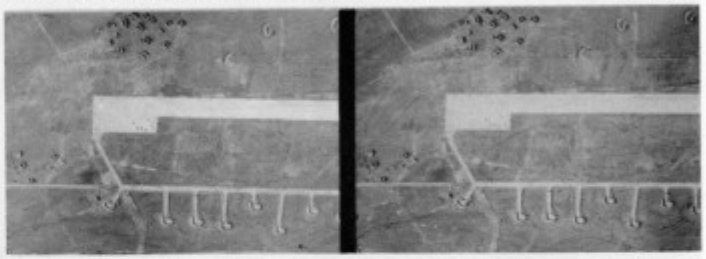


FIG. 6.58 Motor vehicle revetments shown in Fig. 6.57. Scale 1:16,500

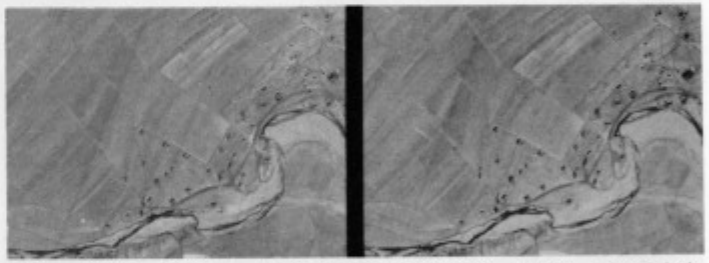


FIG. 6.59 Motor vehicle revetments, most of which are occupied. North Korea. Scale 1:10,000

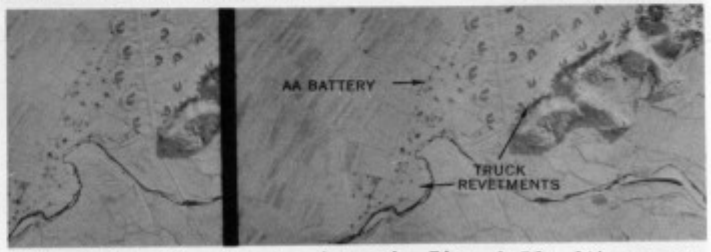


FIG. 6.60 Revetments shown in Fig. 6.59. Others may be seen at base of hill. Observe heavy AA battery. Scale 1:18,500

FIG. 6.61 Stereo-triplet of garages in Sovzone, Germany. Scale 1:2,250

FIG. 6.62 Garage (300' x 34') shown in Fig. 6.61.

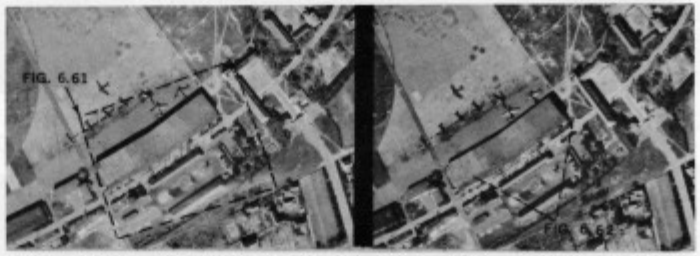


FIG. 6.63 Garages shown in Fig. 6.61. Scale 1:9,000

FIG. 6.64 Garages shown in Fig. 6.61. Scale 1:20,000

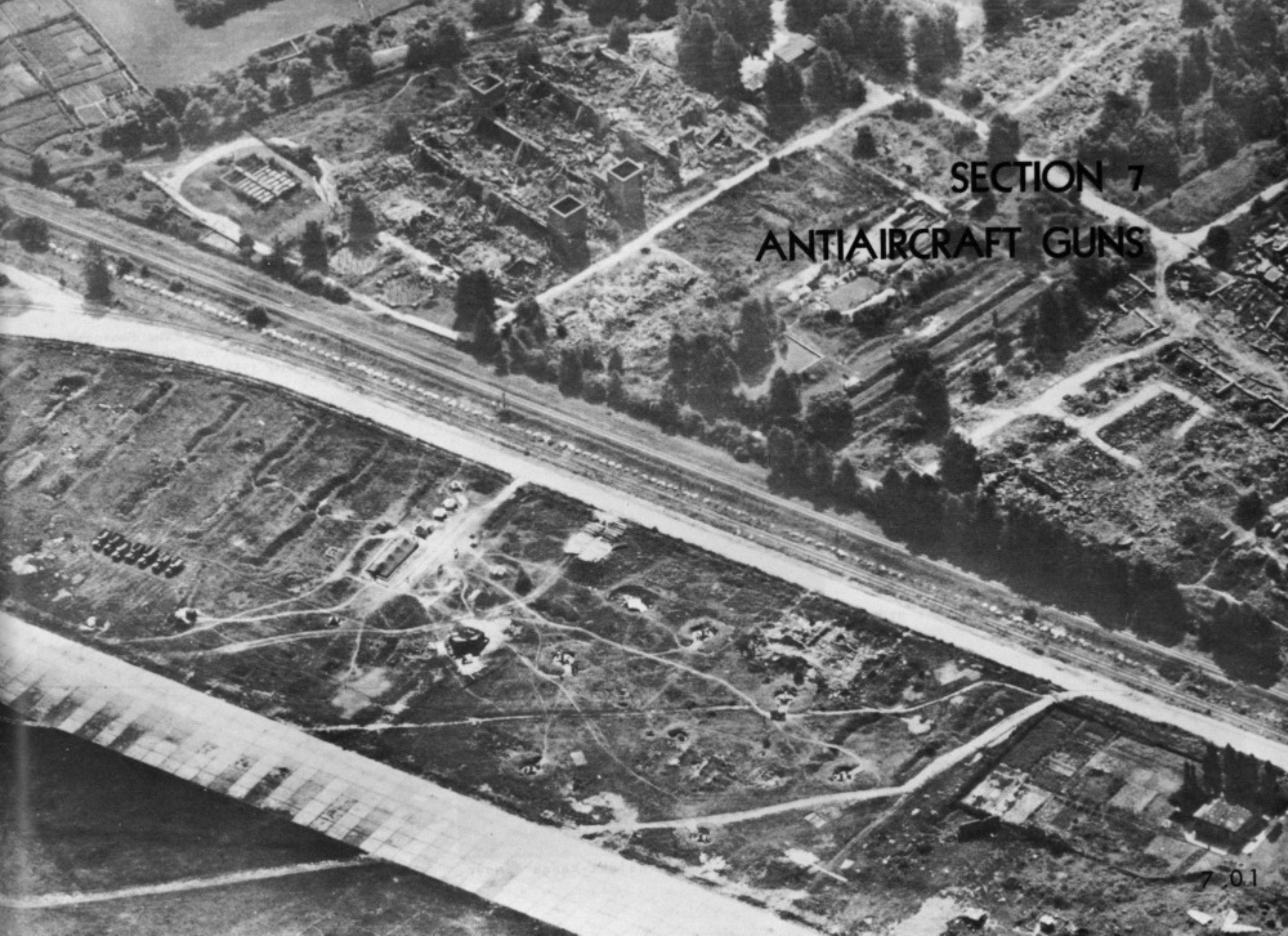
RECOGNITION FEATURES
GARAGES
SOVIET ZONE OF GERMANY

Primary:

1. Part of airfield building complex.
2. Generally single-storied.
3. Individual buildings are long and narrow.
4. Each garage generally has a width approximating either 35 or 50 feet.
5. Usually a U-shaped arrangement of three buildings with a fourth sometimes placed to form a quadrangle.
6. Repair shop with monitor roof frequently forms one end of a quadrangular building arrangement or is close by.

Secondary:

7. Occasionally an open shed-type building within the garage area is used for additional storage.
8. Courtyard formed by buildings may be hard-surfaced; frequently has landscaped islands.
9. Refueling facilities generally present.
10. Grease pit or ramp sometimes present.
11. Gate often at entrance to courtyard.
12. Occasionally a hard-surfaced apron is present.
13. Doors at courtyard or apron level.
14. "Doorstops" sometimes visible.
15. Well-developed track pattern may be evident.
16. Motor vehicles may be seen moving in or out of buildings or parked close by.



SECTION 7
ANTIAIRCRAFT GUNS

General Features

Conventional antiaircraft artillery is divided into two basic categories:

Heavy guns - antiaircraft of 75-mm. or heavier.

Automatic weapons - antiaircraft less than 75-mm.

Heavy guns are designed primarily for defense against high level bombardment, while automatic weapons are designed to combat high speed, low level aerial operations. Both classes of antiaircraft are highly mobile and are deployed to meet the requirements of the battle situation.

Photo interpreters seldom have trouble locating antiaircraft batteries because of their characteristic layout when emplaced for firing. The heavy antiaircraft battery normally consists of 4, 6, or 8 guns in circular revetments with a fire control station nearby. Automatic weapons generally are emplaced in circular or diamond-shaped revetments and may occur singly or in groups of four or more. This type of antiaircraft seldom uses a separated fire control station.

Antiaircraft guns are usually located on or near the airfield in a commanding position, affording an all-around field of fire. Heavy guns are frequently located on or in close proximity to the probable bomb release line. Location of automatic weapons varies from placement on or immediately adjacent to the object defended to a widely dispersed pattern around the airfield.

In 1952 the following guns formed the foundation of the Soviet antiaircraft defenses:

85-mm. heavy antiaircraft gun
37-mm. automatic antiaircraft gun
12.7-mm. antiaircraft machine gun

These guns are standard in the Soviet antiaircraft divisions and have been supplied in quantity to virtually all Satellite Nations.

The standard Soviet antiaircraft fire control unit consists of a PUAZO-3-type electro-mechanical gun director, a DYA-type height-range finder, a gun-laying radar which is a modification of the U.S. SCR-584, and a portable power plant.

For more details see "The Photographic Interpretation Manual on Soviet Weapons and Vehicles" (USAF 1952).

FIG. 7.01 Soviet 85-mm. heavy AA gun.

FIG. 7.03 Soviet 37-mm. automatic AA gun.

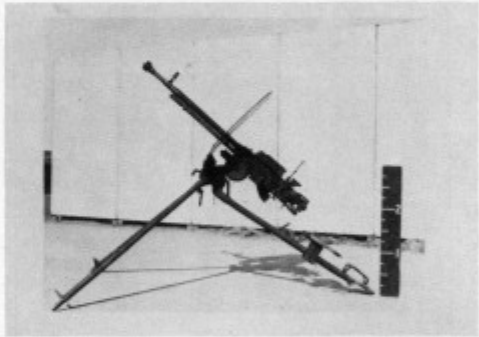


FIG. 7.05 Soviet 12.7-mm. heavy machine gun.

FIG. 7.02 AA PUAZO-3 gun director.

FIG. 7.04 AA DYA height-range finder.

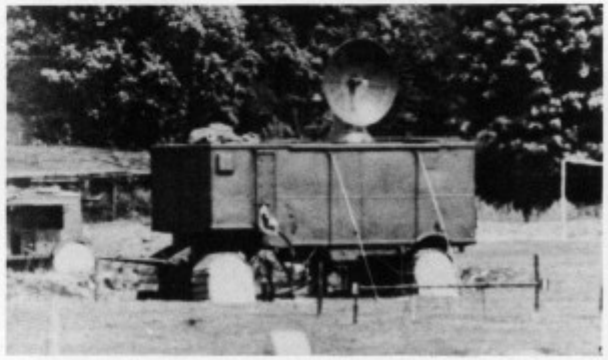


FIG. 7.06 AA gun-laying radar.

85-mm.
HEAVY ANTIAIRCRAFT BATTERY

RECOGNITION FEATURES

Primary:

1. Group of 4-, 8- or 12-gun revetments.
2. Gun revetments form a distinctive pattern.
3. Revetments circular; about 20 feet in diameter.
4. Entrance into revetment at least 7 feet wide.
5. Fire control unit in center or immediately adjacent to gun revetments.

Secondary:

6. Buildings or tents for gun crew may be in close vicinity.
7. Trucks usually nearby.
8. Cable junction box or boxes in center of battery.
9. Cable lines from junction box to guns.
10. Track activity around battery.

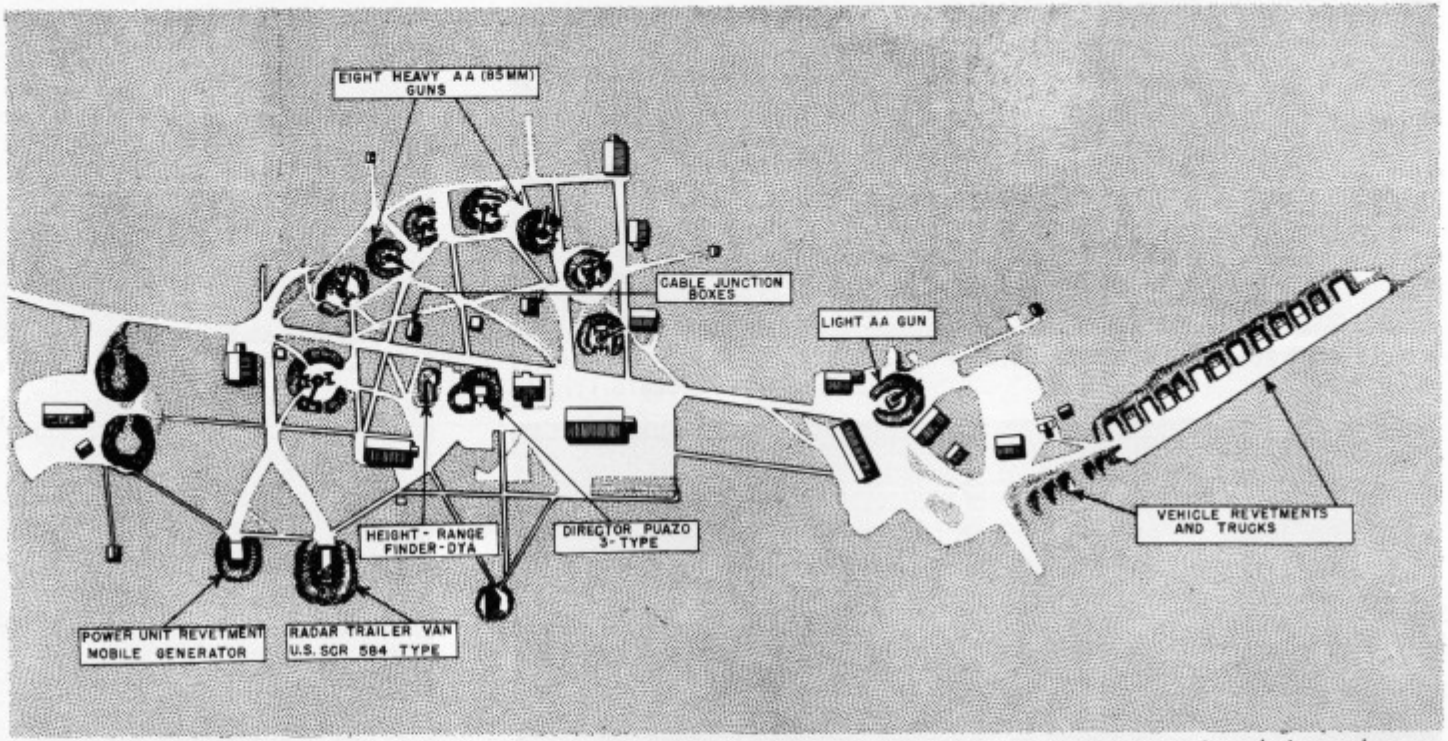


FIG. 7.07 Sketch of 85-mm. AA gun battery with fire control unit. See Figs. 7.08 and 7.09 for photographs.

FIG. 7.08 Eight-gun 85-mm. AA gun battery in North Korea. See Fig. 7.07 for sketch. Scale 1:7,000

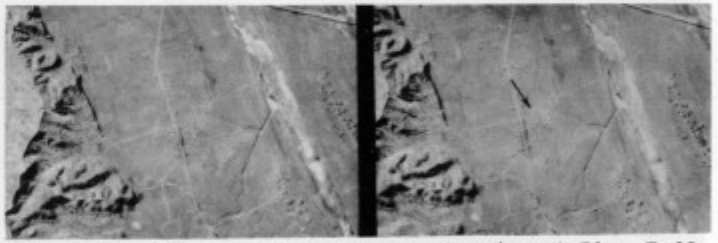


FIG. 7.09 Gun battery shown in sketch and Fig. 7.08. The characteristic battery layout is distinctive at this small scale on original photos. Scale 1:44,000

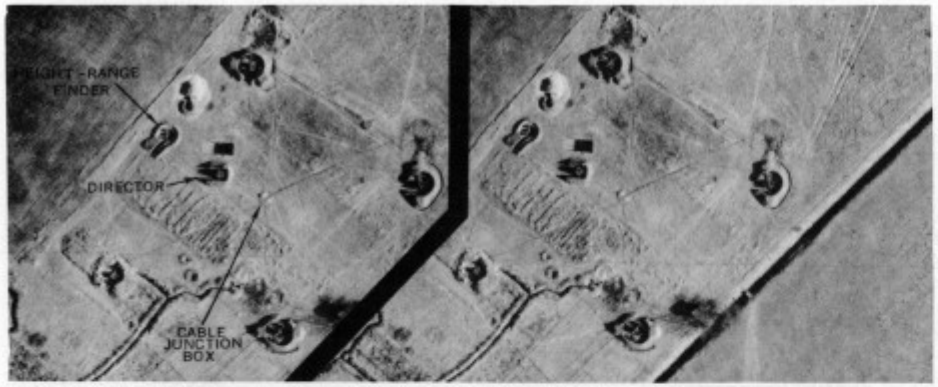


FIG. 7.10 Four-gun 85-mm.AA battery at a Soviet airfield in Germany. Scale 1:1,600

FIG. 7.11 Occupied eight-gun 85-mm.AA battery in North Korea. Observe track activity. Scale 1:10,000

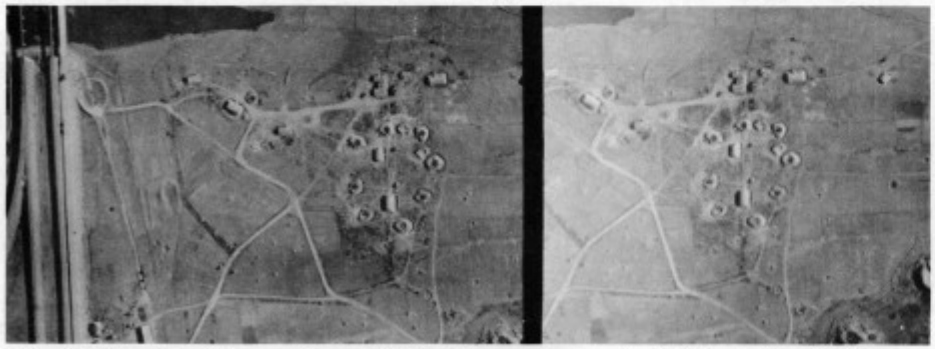


FIG. 7.12 Eight-gun heavy AA battery at an airfield in North Korea. Note blast walls constructed across entrances to gun revetments. Scale 1:6,000

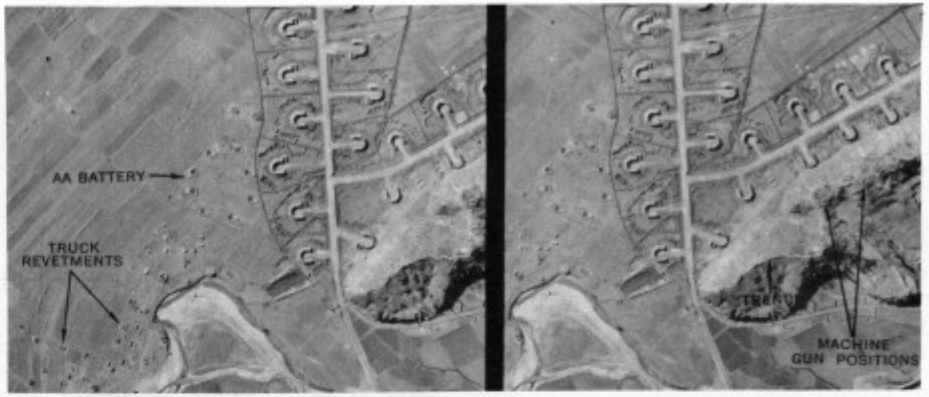


FIG. 7.13 Eight-gun heavy AA battery in North Korea. Scale 1:10,000

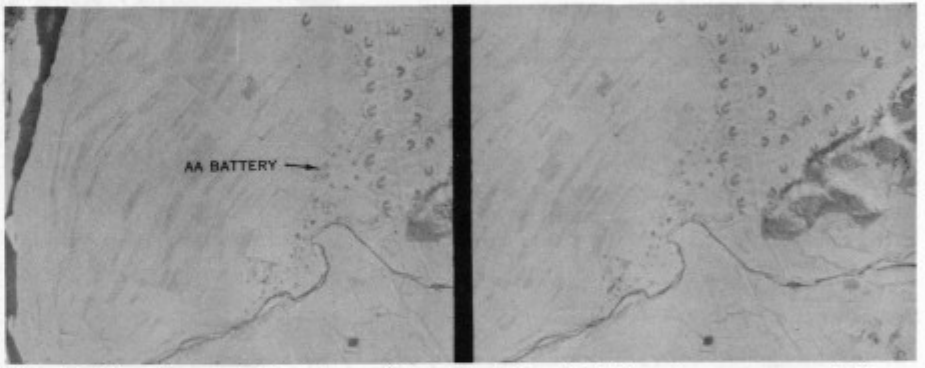


FIG. 7.14 Heavy AA Battery (shown in Fig. 7.13) under snow conditions. Not occupied. Scale 1:20,000

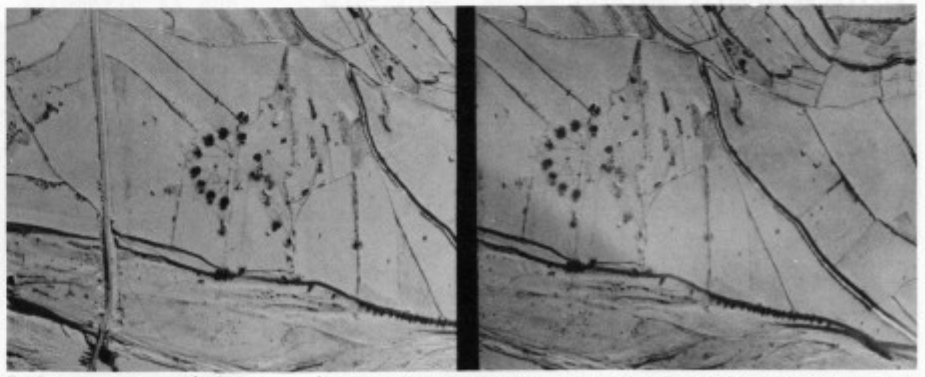


FIG. 7.15 Eight-gun heavy AA battery at a North Korean airfield. Note track activity in snow. Scale 1:6,800

37-MM. AUTOMATIC ANTIAIRCRAFT GUNS

RECOGNITION FEATURES

1. One-to eight-gun batteries.
2. Revetments circular or diamond shaped; 9 to 15 feet in diameter.
3. Entrance to gun revetments approximately 7½ feet wide.
4. Seldom have a separate fire control unit.
5. Often a small revetment for command post near guns.

For other illustrations of 37-mm. automatic antiaircraft batteries see Figs. 6.36 and 6.37.

FIG. 7.16 Soviet four-gun 37-mm. automatic AA battery. Scale 1:1,100

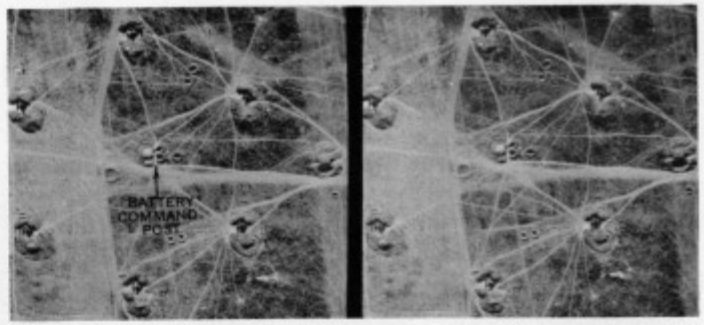


FIG. 7.17 Six-gun 37-mm. automatic AA battery at a Soviet airfield in Germany. Scale 1:2,200

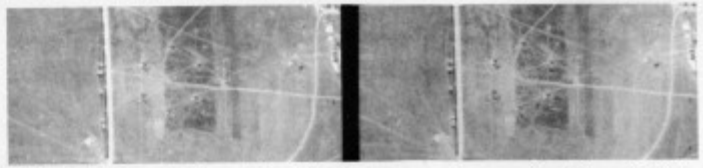


FIG. 7.18 Automatic AA battery shown in Fig. 7.17 Scale 1:9,600

12.7-MM. ANTIAIRCRAFT MACHINE GUNS

RECOGNITION FEATURES

1. Gun pit about 10 feet in diameter.
2. Gun pits may be single or in groups.
2. No fire control unit associated with guns.
4. Trench often connects gun pits.

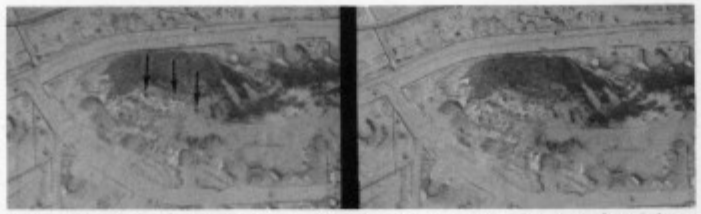


FIG. 7.19 AA machine gun pits on hill overlooking an airfield in North Korea. Scale 1:6,000

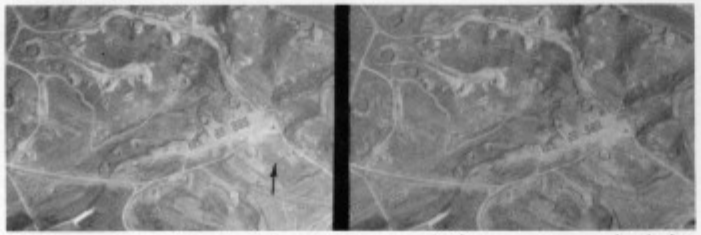


FIG. 7.20 AA machine gun positions connected by trenches at airfield in North Korea. Scale 1:17,000

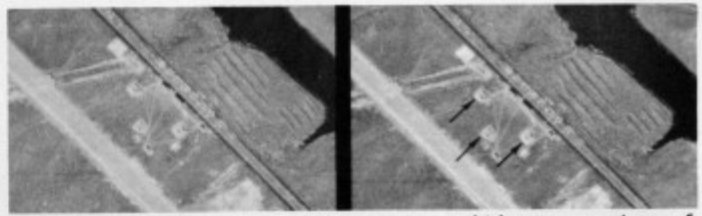


FIG. 7.21 Elevated machine gun positions on edge of airfield in U.S.S.R. Scale 1:5,000

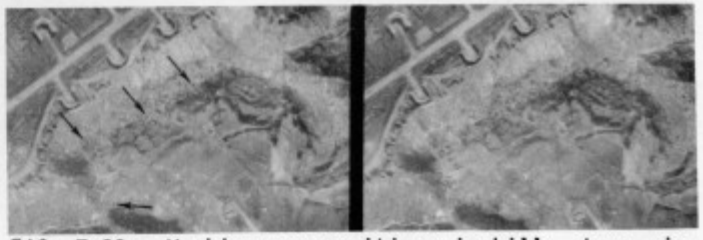


FIG. 7.22 Machine gun positions in hills above airfield in North Korea. Scale 1:6,500

SECTION 8
NAVIGATION FACILITIES

Airfield facilities for regulating air traffic and aiding pilots in all-weather flying, fall into two general categories:

A. Visual navigation aids

B. Radio and radar navigation aids

Minor airfields with limited air traffic generally have nothing more than a few field markers to designate landing and take-off areas and to indicate wind direction. Large airfields usually have complete facilities for controlling and regulating air traffic.

Identification of navigational facilities at airfields may determine the presence of such features as an air raid warning system and whether night and blind-flying operations are possible.

VISUAL NAVIGATION AIDS

Visual navigation aids consist of markers and lights on the airfield, which indicate to the pilot the field boundary, landing area, direction of landing or take-off, wind direction, etc. Field markers are designed to be easily recognized by pilots when circling the field and can be identified on most aerial photography at scales of 1:10,000 or larger. Most lighting installations, except those for approach lighting, are so small and inconspicuous that they are difficult to locate on aerial photographs with scales smaller than 1:2,000. Although the light emplacements for approach lighting systems are small, they form a distinctly identifiable pattern off the end of the runway.

FIG. 8.01 Wind sock indicates wind direction, and is usually mounted on hangar roof or control tower. Sovzone, Germany. Scale 1:2,500

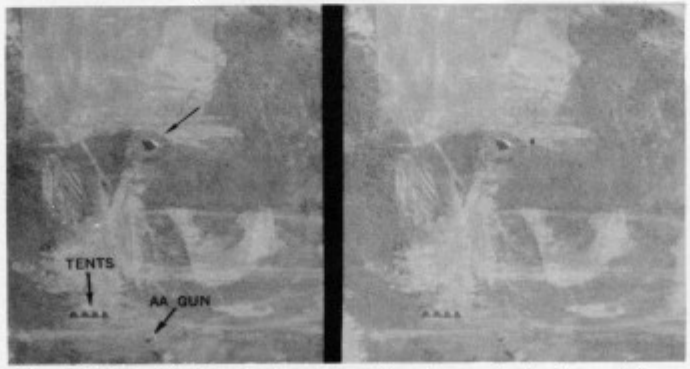


FIG. 8.02 Tetrahedron indicates wind direction. U.S.A. Scale 1:4,000

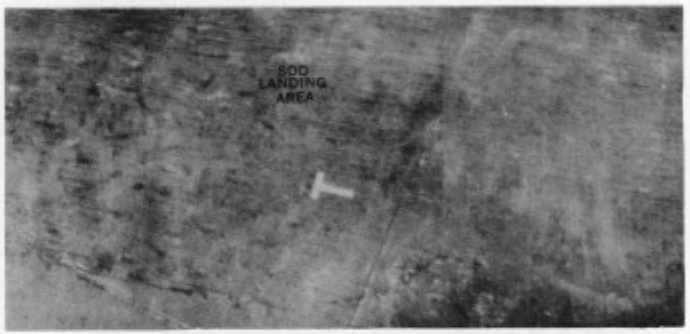


FIG. 8.03 Landing tee indicates direction of landing and take-off. These are found on most Soviet airfields. Sovzone, Germany. Scale 1:2,500

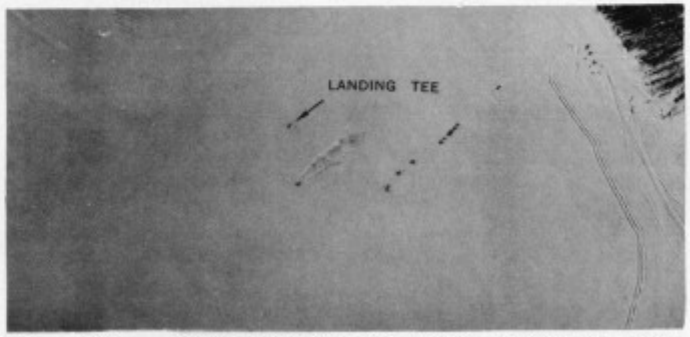


FIG. 8.04 Black landing tee used on top of snow. Note aircraft taking off. U.S.S.R. Scale 1:11,500

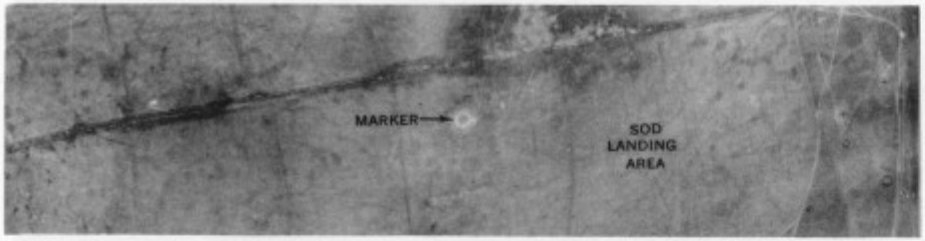


FIG. 8.05 Type of marker used on many Soviet airfields during World War II. Small line projecting from circle indicates north.
U.S.S.R. Scale 1:9,000

FIG. 8.06 Runway markers. Figure 6 indicates azimuth of 60 degrees, letter R indicates right hand runway, and seven tallies indicate runway to be 7,000 feet long. Code system may vary from country to country.
Alaska. Scale 1:4,700

FIG. 8.07 White markers delimit edges of sod runway.
Austria. Oblique

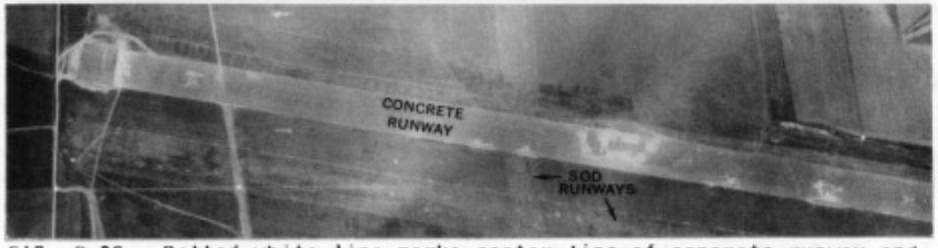


FIG. 8.08 Dotted white line marks center line of concrete runway and edges of sod runways. Austria. Scale 1:10,000

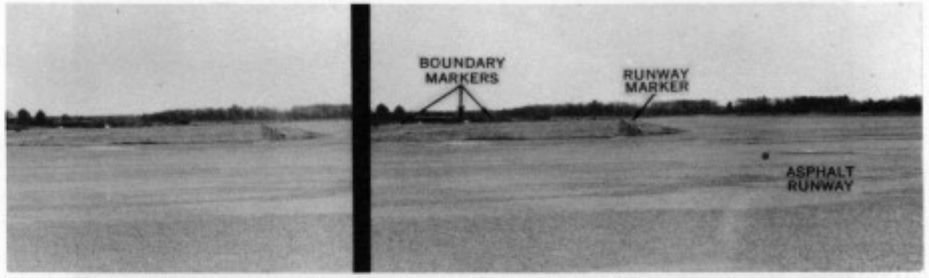


FIG. 8.09 Boundary and runway markers with lights outline perimeter of field and edge of runways. U.S.A.

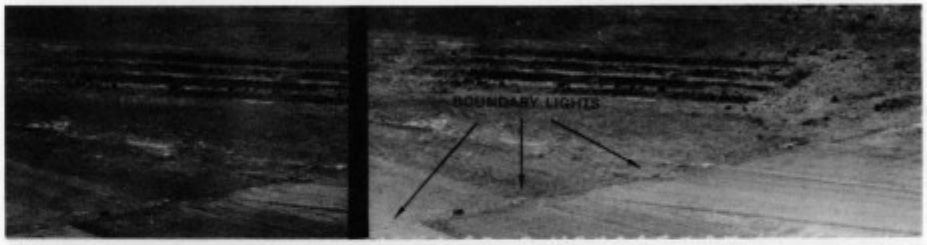


FIG. 8.10 Boundary lights along fence.
Sovzone, Germany. Oblique stereopair

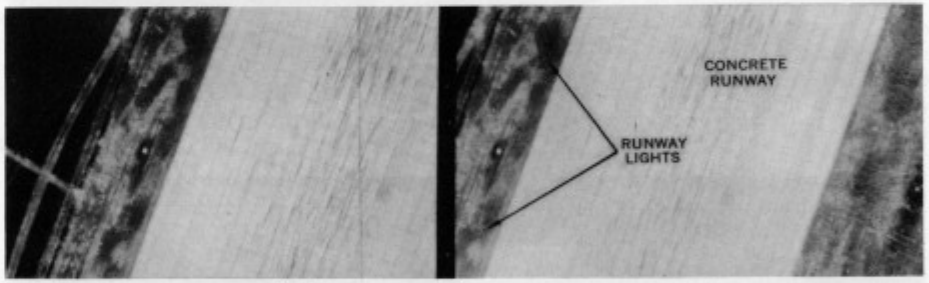


FIG. 8.11 Runway lights. Dark line between lights is buried wire.
Sovzone, Germany. Scale 1:1,900

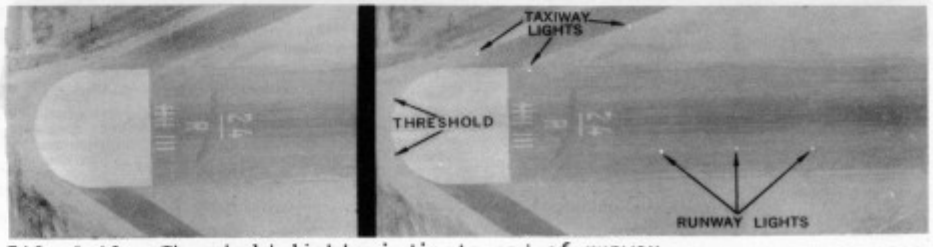


FIG. 8.12 Threshold lights indicate end of runway.
Alaska. Scale 1:4,700

293820 O—54—6

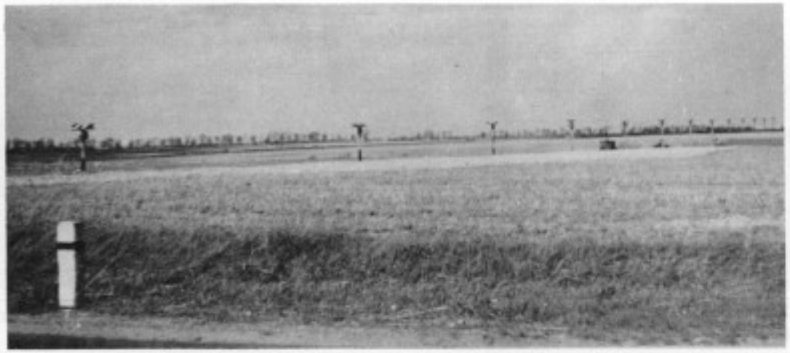


FIG. 8.13 Approach lighting system. Lights extend out from landing area. Pilot follows lights in to touchdown point. Sovzone, Germany.

FIG. 8.14 Approach lighting system shown in Fig. 8.13. Oblique stereopair

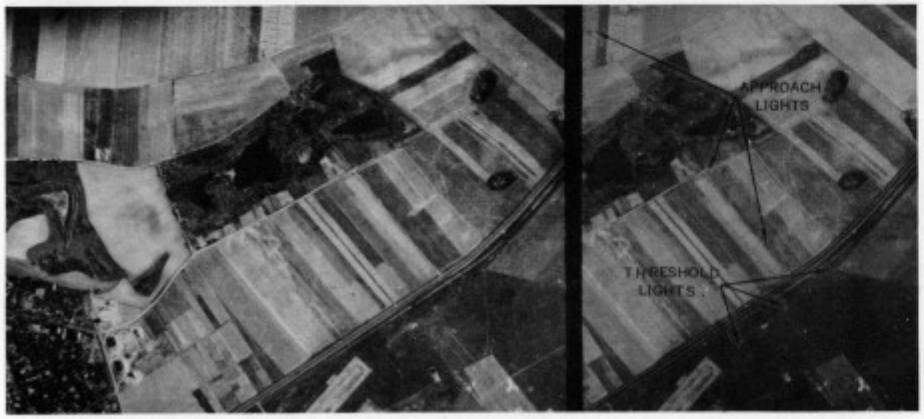


FIG. 8.15 Approach lighting system shown in Fig. 8.13 with threshold lights at end of runway. Scale 1:9,500

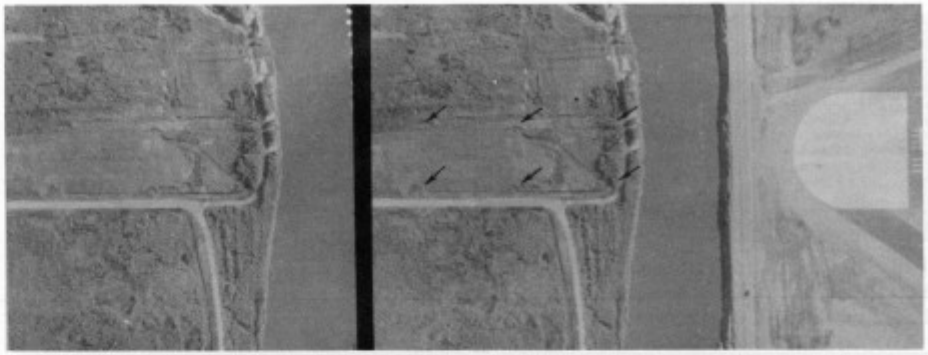


FIG. 8.16 Approach lighting system with double line of light poles. Alaska. Scale 1:4,700

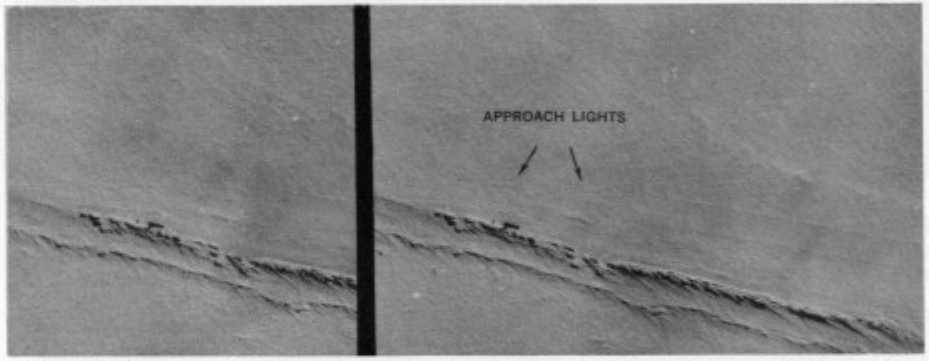


FIG. 8.17 Approach lighting system using single line of light poles. Shadows of poles are visible on snow. Alaska. Scale 1:10,000

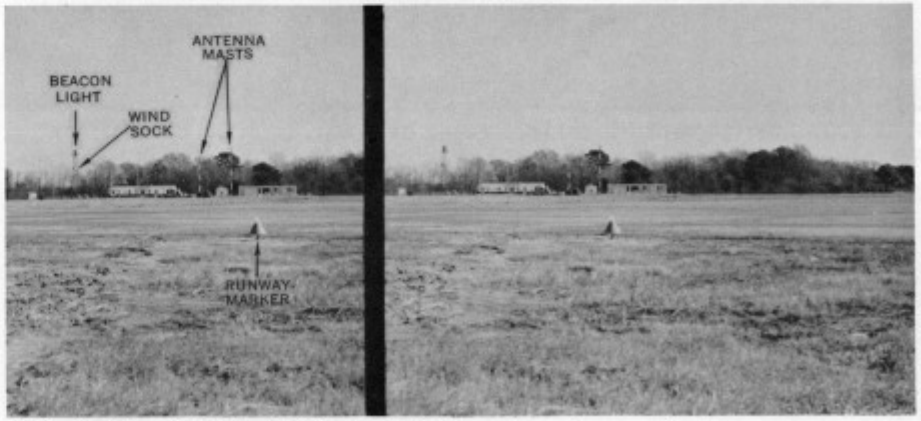


FIG. 8.18 Beacon light and wind sock on tower. Note runway marker with light. U.S.A.

Radio and radar navigation aids are electronic installations that transmit voice or code signals to direct pilots in landing and taking-off and in flying in the vicinity of an airfield. The most general types of installations are: ground-air communications, radio homing beacons, marker beacons, beam approach systems, instrument landing systems, ground control approach systems and air-traffic surveillance radars. There are many other types of radio and radar installations such as early warning radar, interceptor control, etc., but airfield traffic control is not their primary use.

GROUND-AIR COMMUNICATION SYSTEM

The airfield ground-air communication system consists of a simple voice-transmitting and receiving station. Such an installation normally is found at all airfields having considerable air traffic. The antennae generally are on or near the control tower. This type of system is practically impossible to locate on aerial photography, but its existence may be deduced from the presence of antennae masts, which are discernible only on large-scale or close-range oblique photography. (See Figs. 8.19 - 8.21)

RADIO HOMING BEACON

A radio homing beacon is an electronic airfield installation which transmits signals to aircraft primarily for homing and position-finding purposes. This beacon is usually low powered. It is used to direct the pilot to the field and may also be used to aid him in descending through cloud cover to an altitude safe for contact landing. Ordinarily, it is located within three miles of the airfield and is in line with the center of the runway. The radio homing beacon is difficult to identify on aerial photographs, since it has no readily recognizable features. (See Figs. 8.22 - 8.24)

BEAM APPROACH SYSTEM

A beam approach system is an electronic installation similar to the radio homing beacon and furnishes the pilot a single beam for azimuth guidance to the landing area. The beacon which transmits the azimuth path is located at the downwind end of the runway. An inner marker beacon (about 1000 feet from the end of the runway) and an outer marker beacon (about 2 miles from the end of the runway) signal the pilot his distance from the touchdown point. The pilot must use his altimeter for elevation control. Beam approach landing equipment is usually portable and may be carried in a truck and trailer. When the system is in operation, its layout forms a small but distinctive pattern, which can be recognized on most aerial photography at scales of 1:8,000 or larger. (See Figs. 8.25 and 8.26)

INSTRUMENT LANDING SYSTEM

An instrument landing system provides both lateral and vertical beam signals which give the pilot a glide path to the end of the runway. The electronic equipment for the system is easily portable and usually is in place only for immediate use. When in operation, its arrangement follows a standard pattern similar to the beam approach system. A beacon, which transmits the azimuth path, is located at the upwind end of the runway centerline. A second beacon, which transmits the glide path, is located just off the runway and opposite the touchdown point. Three marker beacons (inner, middle and outer) are located out from the downwind end of the runway about 500 feet, 3500 feet and 4.5 miles, respectively. These signal the pilot his distance from the end of the runway. Identification of this installation is difficult on aerial photography having scales smaller than 1:8,000.

GROUND-CONTROL APPROACH SYSTEM

The ground-control approach system uses precision radar beams to guide the pilot to the airfield. Radar operators watch the course of the aircraft and radio exact landing instructions to guide the pilot to the touchdown point. The equipment is mounted on a truck and trailer. When the system is in operation, equipment normally is located about 500 feet from the side of and 2000 feet from the end of the runway and is on the left side of the pilot when he is landing. Photo recognition features are truck, trailer and radar antennae, which are difficult to identify on photography at scales of 1:10,000 or smaller. (See Figs. 8.27 - 8.29)

AIR-TRAFFIC SURVEILLANCE RADAR

An air-traffic surveillance radar is used as an aid in regulating air traffic around a field. The radar operators watch the course of each aircraft flying in the region of the field and radio instructions to the pilot. The only recognition feature is the radar antennae system which usually is located in a position high enough to command an unobstructed view of the area around the field. The air-traffic surveillance radar is difficult to recognize on photography with scales smaller than 1:8,000. (See Figs. 8.30 - 8.32)

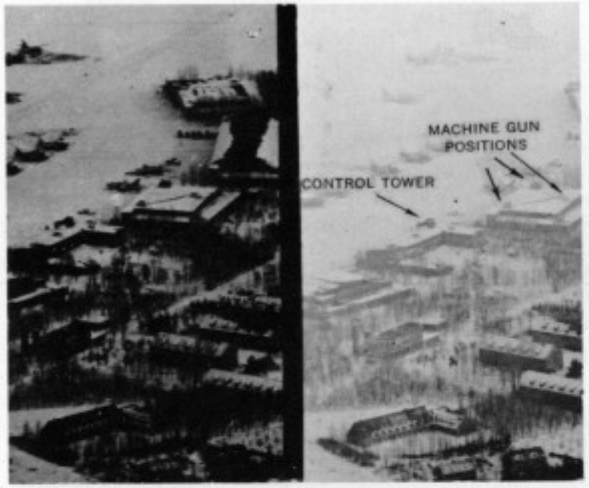


FIG. 8.19 Antenna masts indicate location of control tower. (See Fig. 8.20 for vertical view.) On the hangar roof are three structures without masts, which are machine gun emplacements.
Sovzone, Germany. Oblique Stereopair

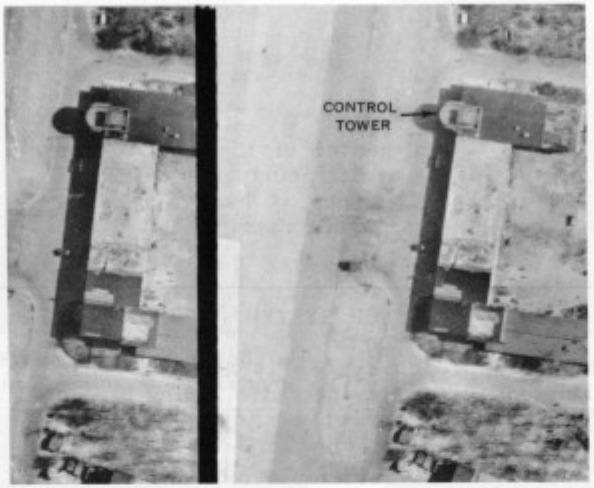


FIG. 8.20 Control tower shown in Fig. 8.19. Note that in large-scale photography only the shadows of the antenna masts are visible.
Scale 1:1,500

FIG. 8.21 Control tower with ground-air radio antenna masts. Ordinarily only the shadows of masts can be recognized on vertical photography. Details of the antenna arrangement are sometimes discernible on large-scale low-oblique photographs. U.S.A.

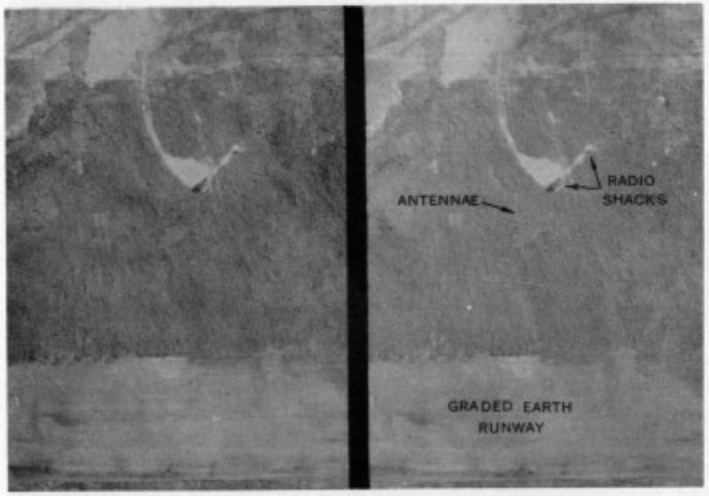


FIG. 8.22 Direction-finder and homing beacon station at airfield in U.S.A. Supports for antenna masts and shadows of the masts are barely discernible at this scale. Note that masts are not located around radio shack.
Scale 1:4,000

FIG. 8.23 Direction-finder and homing beacon station at airfield in U.S.S.R. Station similar to the one shown in Fig. 8.24

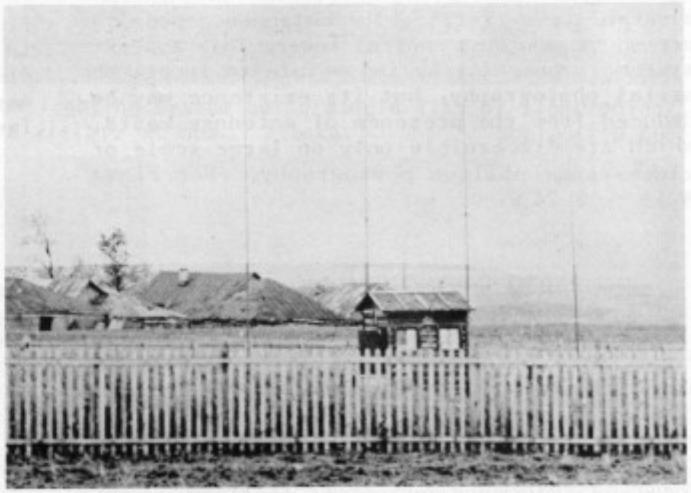


FIG. 8.24 Direction-finder station used for position finding lies adjacent to airfield in U.S.S.R.

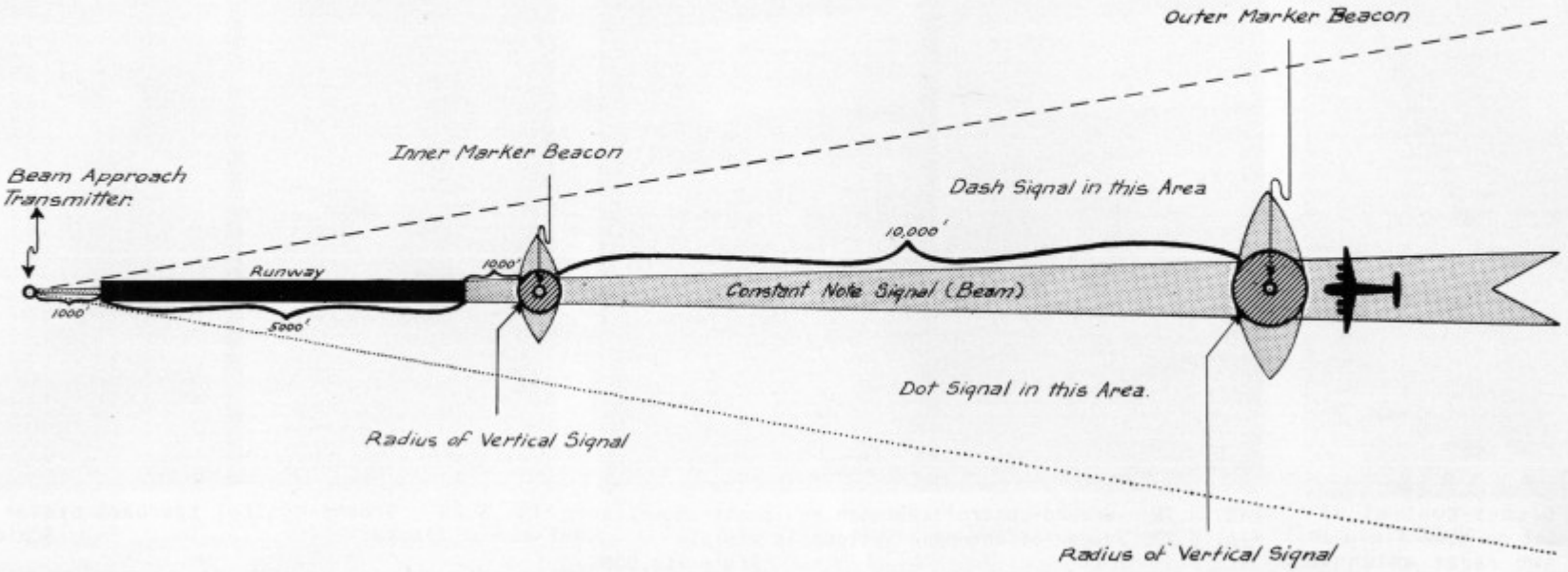


FIG. 8.25 Sketch of typical beam approach landing system. Beam approach transmitter furnishes the signal for azimuth guidance. Inner and outer marker beacons signal the distance from end of runway.

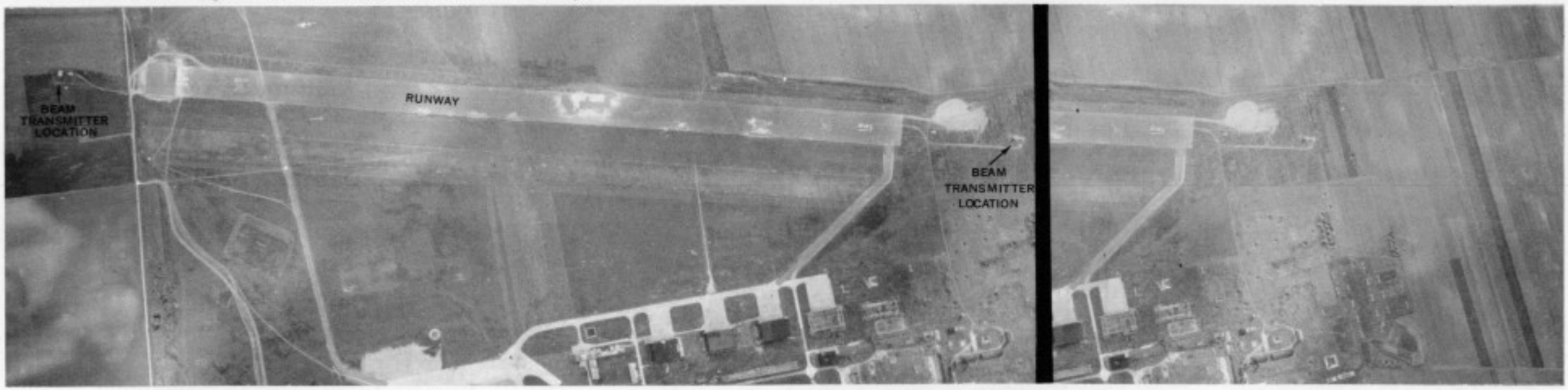


FIG. 8.26 Part of beam approach landing system showing locations for beam transmitter. Notice that they are in line with center of runway. The beam transmitter is portable and can be moved to either end of the runway. Austria. Scale 1:9,500

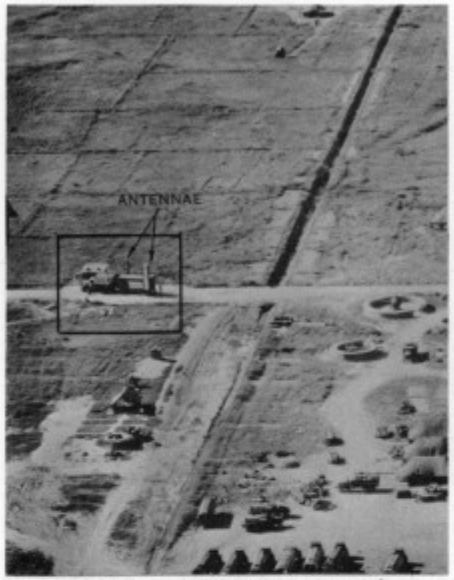


FIG. 8.27 Ground-control approach equipment on USAF field in Korea. Note two radar antennae systems on trailer. See Fig. 8.28 for vertical view. Low Oblique

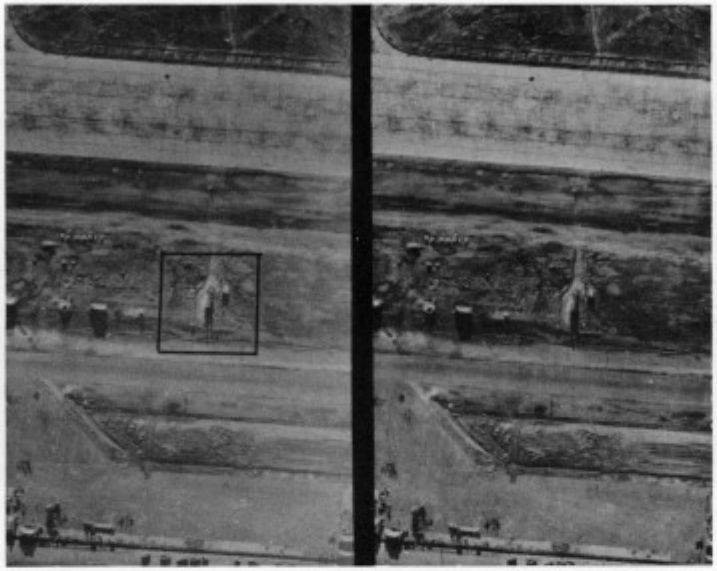


FIG. 8.28 Ground-control approach equipment shown in Fig. 8.27. Shadow of antennae systems is visible. Scale 1:3,000

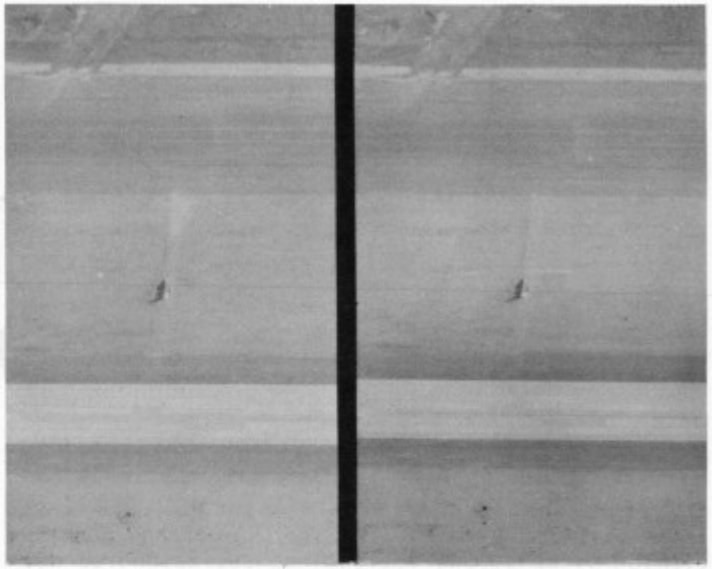


FIG. 8.29 Ground-control approach system on USAF Field in Alaska. Scale 1:3,500

FIG. 8.30 Antennae system for air-traffic surveillance radar at large airfield in the U.S.A.

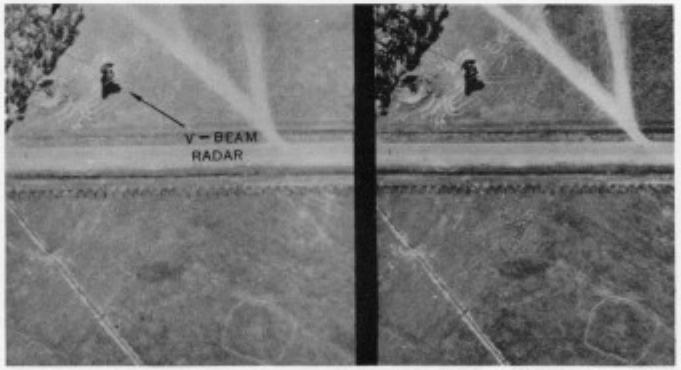


FIG. 8.31 Soviet V-beam radar equipment at airfield in Germany. This equipment may be used for air-traffic surveillance. Scale 1:2,400

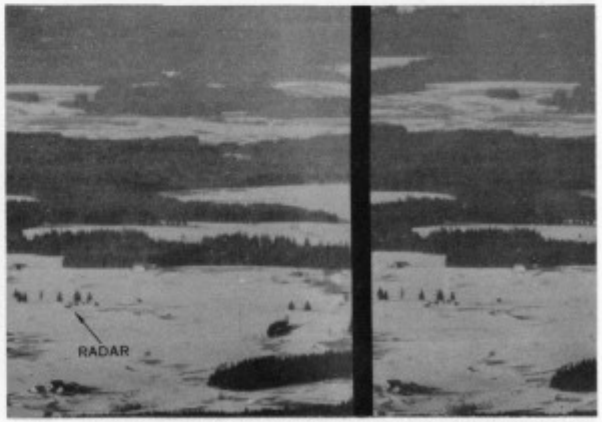
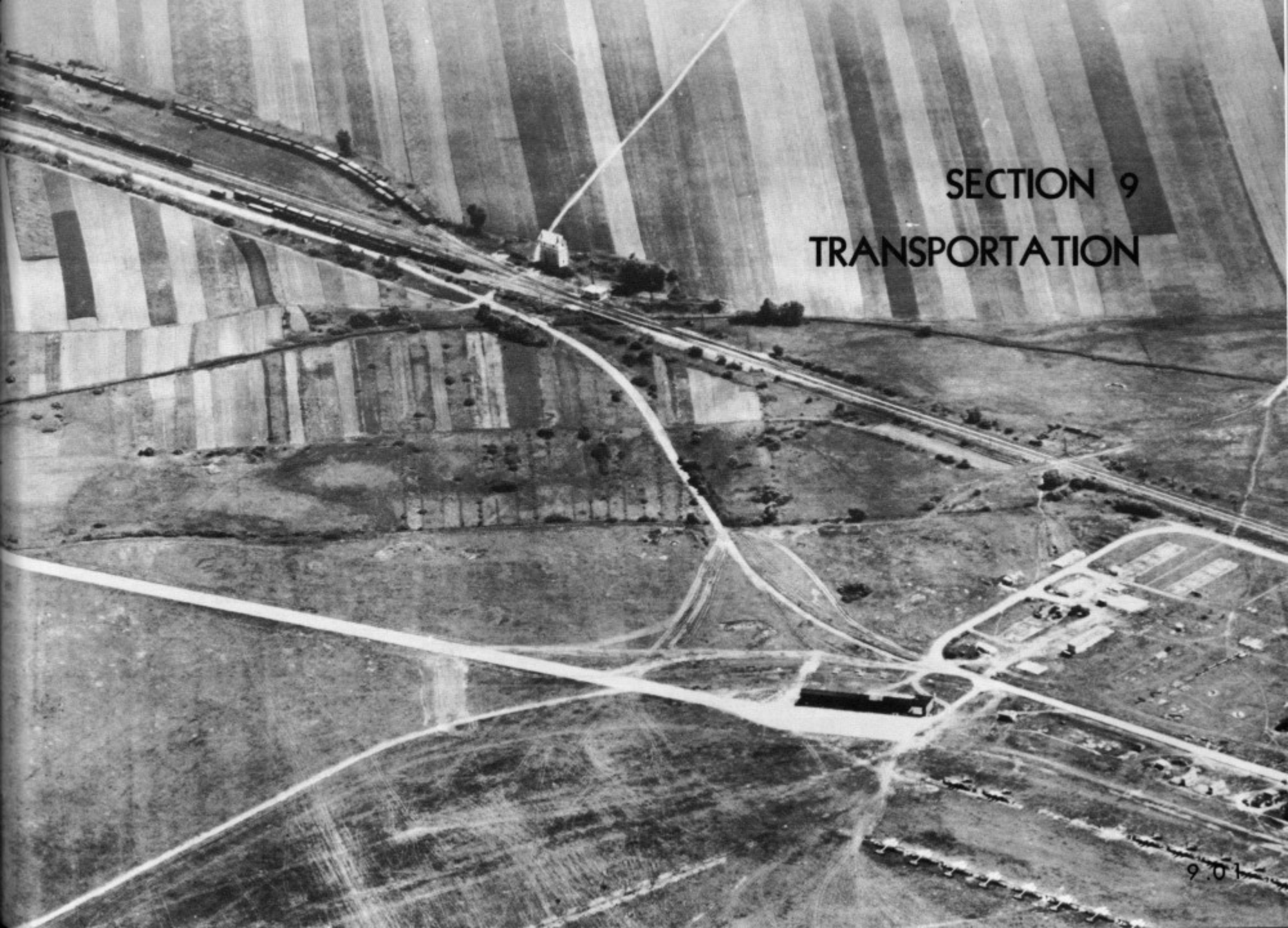


FIG. 8.32 Soviet V-beam radar equipment. Germany. Oblique Stereopair



SECTION 9
TRANSPORTATION

TRANSPORTATION

The most common means of moving supplies and personnel to or from an airfield are by motor transport, water transport, railroads and aircraft. In some parts of the world and in certain situations where these means are infeasible, the use of animal and human transport may predominate.

When relying on photo interpretation alone, a certain amount of inference may be necessary in assessing transportation facilities. In the case of a field entirely lacking in motor roads, railroads or waterways, transfer of supplies must be assumed to be through use of aircraft or animals and, perhaps, human porters.

Following are discussions of the various types of transportation and the outstanding recognition features of each:

1. RAILROADS

Railroads associated with airfields may be built for permanent service or merely for temporary use during construction or improvement of the fields. Permanent railroad installations generally have spur tracks or sidings serving such facilities as fuel storage tanks, warehouses and heating plants.

It is frequently difficult for the photo interpreter to differentiate between railroads and highways. When presence of rail tracks cannot be determined and rolling stock is not in evidence, the following features may aid in distinguishing rail lines from motor roads:

a. Horizontal alignment without sharp twists and turns — curves gradual.

b. Vertical alignment without sharp dips and rises - grades gradual.

c. Spurs and sidings fork at relatively slight angles.

d. Beam-type bridges commonly used.

e. Rights-of-way clear of trees.

f. Tone on aerial photographs usually dark gray.

2. MOTOR TRANSPORT

Except in remote and isolated regions, most airfields are accessible by motor vehicle. Even where supplies are moved almost entirely by rail or water, roads are usually present. Those serving airfields vary from wide, hard-surfaced highways to rutted byroads.

In contrast to rail lines, motor roads tolerate much sharper curves and steeper grades (except those of very high construction standards); make right-angle turns; infrequently utilize beam-type bridges; and commonly have trees within rights-of-way. Tone of roads on aerial photographs is usually light gray to white except for asphalt which varies from dark to light gray.

3. WATER TRANSPORT

An airfield, though favorably located with respect to water transportation, may be supplied largely by other means. In evaluating waterways for transport suitability and extent of use, it is important that the photo interpreter consider the following:

a. Presence of cargo ships, barges, tugs etc.

b. Presence of piers, wharves and unloading facilities.

c. Navigability of waterway — width, depth, obstructions etc.

d. Rail or truck transshipment points located along waterway.

e. Pipelines from shore to fuel storage tanks.

f. Warehouses located along waterway.

g. Motor vehicle track activity along shore.

h. Supplies piled near shore.

4. AIR TRANSPORT

Primary dependence on air supply is limited ordinarily to very remote airfields and to times of emergency. Although the photo interpreter may surmise use of air transport, due to lack of other accessible facilities, his only conclusive proof of such use is the presence of cargo planes. Such evidence is difficult to gather from aerial photography.

5. ANIMAL AND HUMAN TRANSPORT

In North Korea and similar areas, the Soviets have made considerable use of humans and animals for transporting supplies. The detection of humans and animals on aerial photographs is also difficult, since lines of transport do not necessarily follow roads, and because their images are generally too hard to identify on operational photography.

FIG. 9.01 Spur to hangar area. Scale 1:3,500

FIG. 9.02 Siding at unloading platform near administration building. Oblique Stereopair

FIG. 9.03 End of spur used for coal delivery. Note coal supply along tracks. Oblique Stereopair

FIG. 9.04 Railroad system serving large important airfield in Sovzone, Germany. Scale 1:20,000

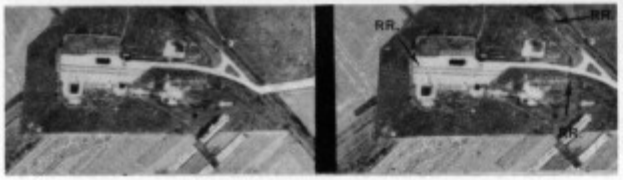
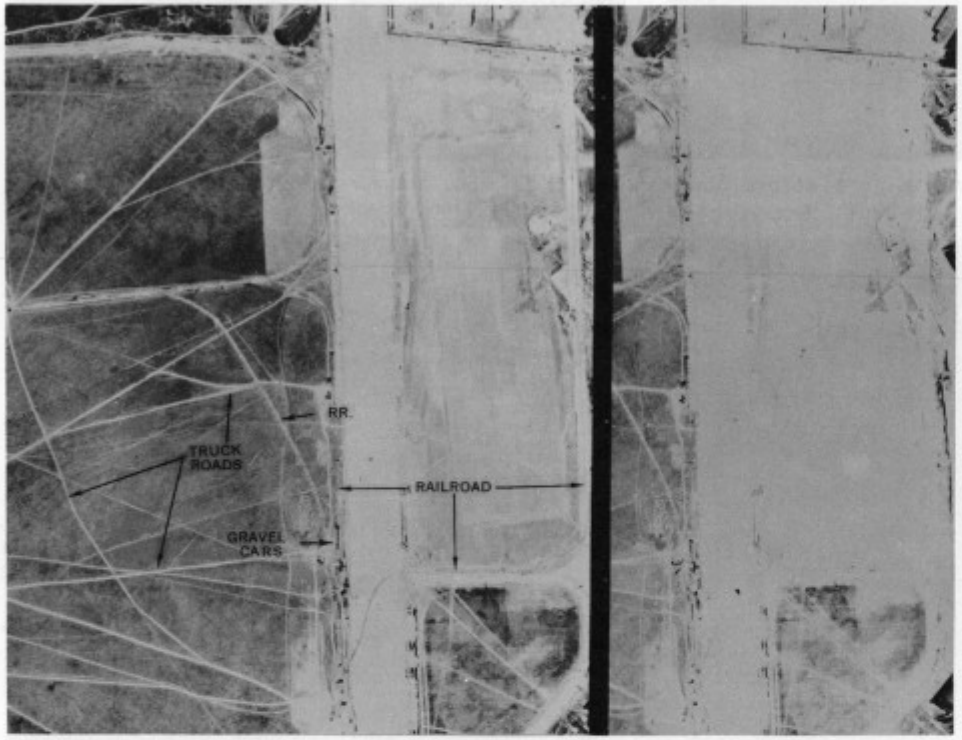


FIG. 9.05 Double-track spur at underground fuel storage area. Scale 1:9,500

FIG. 9.06 Rail fork from main line to airfield. Oblique Stereopair

FIG. 9.07 Cars on spur line to main building area. These cars do not appear in Fig. 9.04



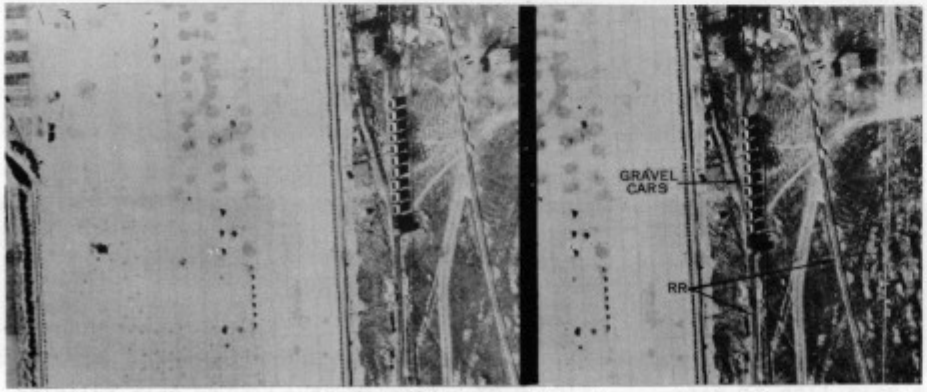


FIG. 9.09 Temporary rail facilities and truck roads in Fig. 9.08. At this scale, ties and rails are more easily identified. Scale 1:1,600

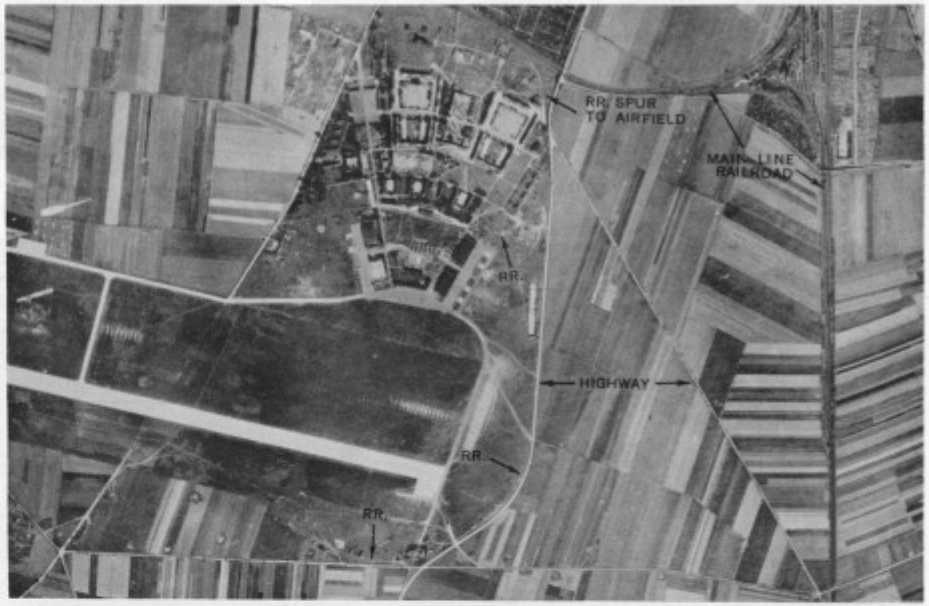


FIG. 9.10 Motor roads and railroad serving large airfield shown on upper single photo and lower stereopair. Scale 1:22,000

At this scale the most distinguishable features for railroads are the gradual curves, relatively acute angles of forking, and darker tone. Note that main line railroad has wide right-of-way clear of fringing trees. Spur rail line, though difficult to detect, will not be confused with motor road because of regular alignment—a motor road of this width generally would be quite irregular.

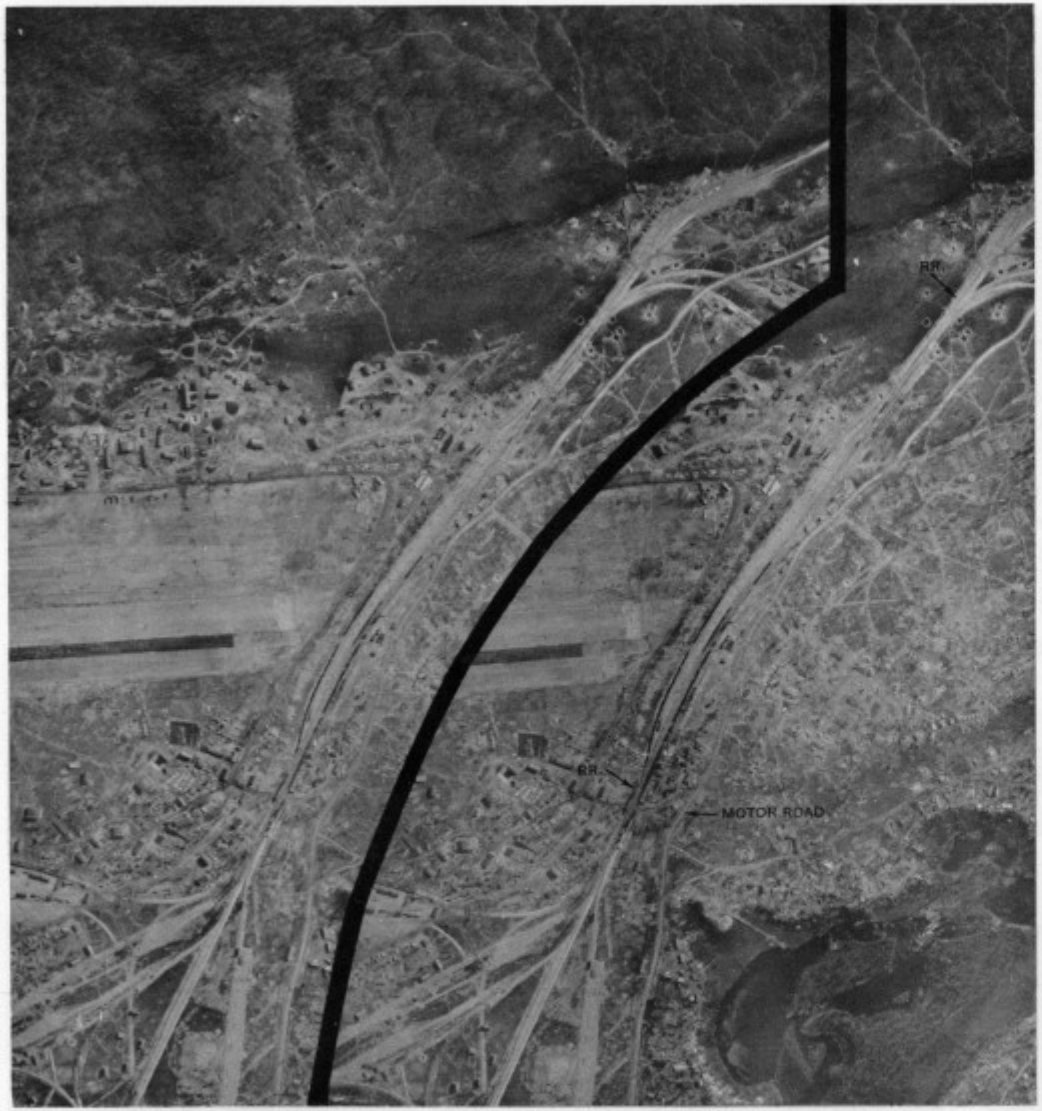


FIG. 9.11 Transportation system at airfield in north European Russia. The rail pattern of long regular curves is sharply contrasted with that of meandering motor roads. Field construction and improvement, rather than normal operating requirements, account for much of the relatively extensive railroad layout. Scale 1:13,000

FIG. 9.12 Transportation facilities for airfield in central European Russia. Primary motor roads to this field are distinguished from the railroad by their right-angle turns. Russian airfields characteristically have a maze of secondary roads and tracks among various facilities on the fields. Scale 1:18,000

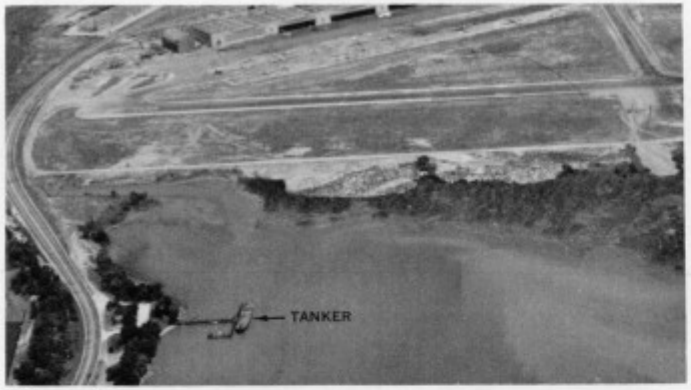


FIG. 9.13

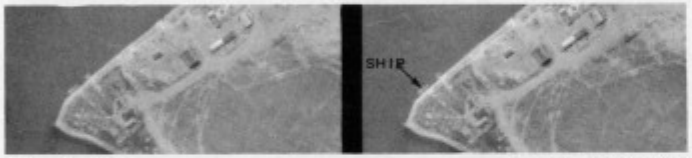


FIG. 9.14 Scale 1:13,000

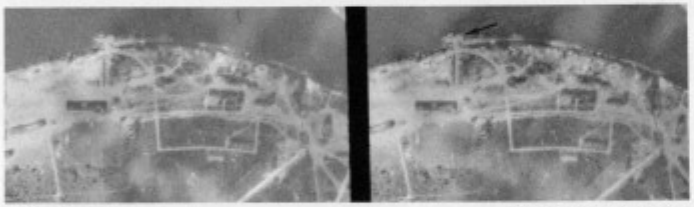


FIG. 9.15 Scale 1:15,000

FIG. 9.13 Tanker unloading fuel for large airfield in U.S.A.
FIG. 9.14 Ship and smaller craft anchored offshore at airfield in U.S.S.R.
FIG. 9.15 T-head pier at airfield in U.S.S.R.
FIG. 9.16 T-head pier facilities used for ocean transport at airfield in Aleutian Islands.
FIG. 9.17 Port facilities used for ocean transport at large airfield in Greenland. Note landing craft along shore, piers, and pipe lines for moving fuel from tankers to storage tanks. Water standing on ice gives mottled appearance to bay.
FIG. 9.18 Winter scene of barges pulled up on shore at airfield in Alaska. Barges are used for moving supplies from ship to shore when beach conditions preclude use of docks.
FIG. 9.19 Ocean-going supply ship beached on shore of airfield in Alaska.
FIG. 9.20 Unloading facilities for handling water transport at airfield in Germany. Facilities include railroad spur, motor roads and warehouse.

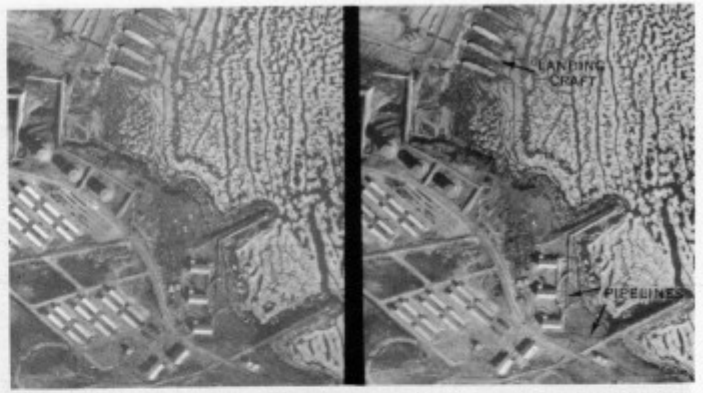


FIG. 9.17 Scale 1:10,000

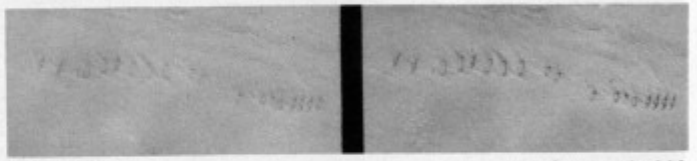


FIG. 9.18 Scale 1:10,000

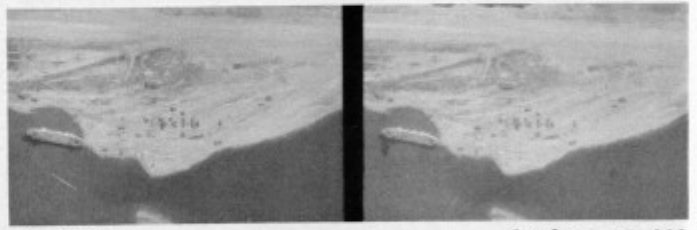


FIG. 9.19 Scale 1:15,000

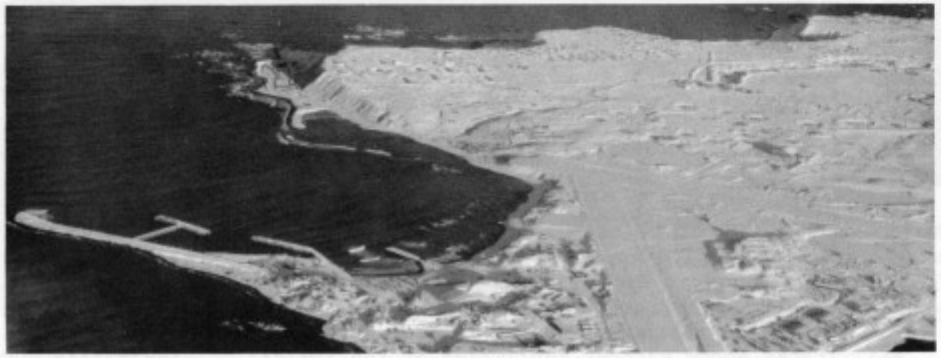
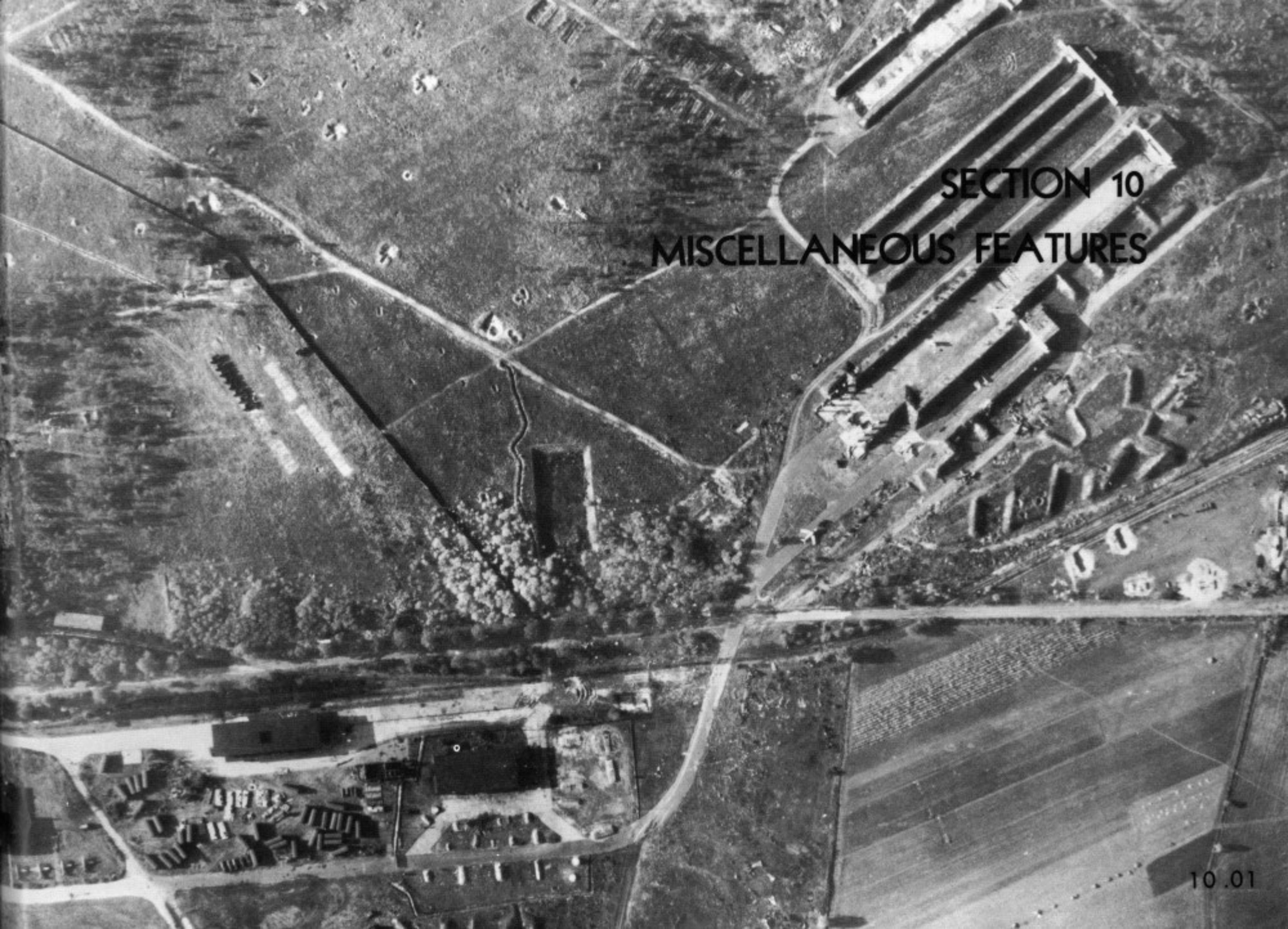


FIG. 9.16

FIG. 9.20 Scale 1:17,000

FIG. 9.21 Isolated landing strip in Arctic U.S.S.R. Since there are no railroads, motor roads or water transport facilities, supply is by aircraft and animal or human transport. Although some food and other light supplies may be brought in by wagons or pack animals along the rut road indicated, heavy equipment and fuel supplies undoubtedly are furnished by air. Scale 1:8,000

FIG. 9.22 Remote airfield in Arctic USSR. There are neither railroads nor motor roads and no evidence of use of water transport. Lack of these facilities, remoteness of the field and the extreme difficulty in moving supplies by animals or humans during most of the year, point to reliance on air supply. Scale 1:13,000



SECTION 10

MISCELLANEOUS FEATURES

BASIC CONSIDERATIONS

An airfield is essentially an area prepared for the accommodation, landing and take-off of aircraft. Among the terms often used synonymously with airfield are those which apply to fields of various sizes and purposes such as: air base, airdrome, airport, airstrip, emergency landing ground, landing strip, auxiliary airfield and air depot.

The size and complexity of an airfield depend upon the purpose for which it was constructed and upon its stage of development. A most rudimentary type of construction is a sod or earth surface for emergency landings. At the other extreme are large airfields with long, hard-surfaced runways and complete facilities for refueling, repair, navigation, storage, supply, billeting and defense.

Airfield capability is determined by the number, size and type of aircraft which can be supported under sustained operations. The size and type of aircraft which can operate from a field depend primarily upon the length and weight-bearing capacity of the runway. Therefore, in judging the strategic importance of an airfield, primary consideration is given to the runway, the other facilities being of lesser importance in this evaluation. There is, however, a fairly close correlation between runway capability and the other services provided on a field. Airfields with long, heavy-duty runways commonly have extensive facilities for servicing many large aircraft.

Type of Photography

Vertical aerial photographs at scales of 1:10,000 to 1:15,000 have been found to be satisfactory for interpretation of airfields. At times, photographs at scales of 1:5,000 or larger or close-range obliques are needed to clarify individual details and to identify small installations such as navigation aids. In this publication, vertical photographs at varying scales, high-altitude and close-range obliques, and ground photographs are used to illustrate airfield features and facilities to the best advantage possible.

Aerial photographs taken on panchromatic film with a minus-blue filter are adequate for airfield photo interpretation. This film is usually given an exposure time which is adjusted to the average light reflectance of the general area being photographed, but this exposure time does not always bring out needed details of specific objects. For example, runway surfaces often appear very light in tone and show no pattern or texture details. With film exposed for light reflectance of the runway, it is likely that pattern and texture will be clearly apparent on the photo. In many instances, photography with the exposure time adjusted to the light reflectance of a specific object will be particularly helpful in clarifying individual details.

In temperate zones, seasonal changes may affect the appearance of certain airfield features and facilities. For example, a semiunderground fuel storage area may have snow cover which obscures both the firebreak surrounding the area and the openings on top of fuel tanks. Even though these two photo recognition features cannot be identified, other features not affected by snow cover can be recognized and used for proper identification of the area. A few winter photographs are included in this publication to illustrate the effect of snow on the appearance of certain installations.

Scope

The keys in this volume are intended to assist the photo interpreter and the photo reader in analysing and evaluating aerial photos of any airfield. No attempt has been made to classify airfields by the region or country in which they occur, although each photo caption gives a general location, which should aid the interpreter who is studying the characteristics of airfields in a particular region. It will be noted that emphasis has been placed upon airfields in Europe and Asia.

Deceptive measures such as concealment, camouflage and decoys, which are sometimes used at military airfields, are not included in this publication. These measures are covered in *Photographic Interpretation Manual on Deception: Concealment, Camouflage and Decoys*, Directorate of Intelligence, Headquarters USAF, which is now in preparation.

The bibliography appended to this publication lists reference material which may be useful in airfield photo interpretation.

METHOD OF PRESENTATION

Important airfield features and facilities have been classified into several broad groups such as antiaircraft defenses, hangars, transportation, etc., which are readily identifiable on aerial photographs. The illustrated table of contents will assist in determining the group classification of a specific feature or facility. Each section of the volume is devoted to a single broad group.

Material is presented in the form of keys, of which three types are utilized:

(1) Integrated-selective - lists and illustrates the photo recognition features identifying an object or condition. In using this type of key, the photo interpreter determines whether the object or condition being studied has the recognition features listed, and whether its image is comparable to the images in the key.

(2) Essay - describes objects and conditions by means of text and illustrations. When using an essay type of key, the photo interpreter decides whether the object or condition under study is the same as that which is described.

(3) Dichotomous - systematically lists photo recognition features of objects or conditions by means of a graphic series of paired and contrasting recognition characteristics. To make the dichotomous type of key more effective, an illustration of each identifiable object is included. This type of key requires that the photo interpreter examine and identify the recognition features of an object or installation in a *prescribed sequence* and that each step in the sequence be *correctly interpreted*, if positive and final interpretation is to result.

DRAINAGE PATTERNS

Most airfields have drainage systems of some type. Although these facilities are generally too deeply buried or are confined within areas too small to leave any identifying features, there are cases where drainage patterns are evident on aerial photography. The usual systems are open ditches, underground tile and a combination of the two.

Open-ditch drainage is confined to the area outside the landing strip and ordinarily is discernible as a network of open trenches.

Where underground drainage is not deeply buried under natural surface, a regular pattern of light-gray or white earth scars may outline the arrangement of the system. On vertical photos this pattern appears as parallel, regularly spaced lines, commonly rectangular or herringbone in arrangement. Where drainage systems have been recently installed under natural surfaces, scars are usually quite noticeable. With passage of time their prominence may or may not diminish.

FIG. 10.07 Open-ditch drainage between taxiways and revetments on Communist-constructed field in North Korea. Scale 1:10,000

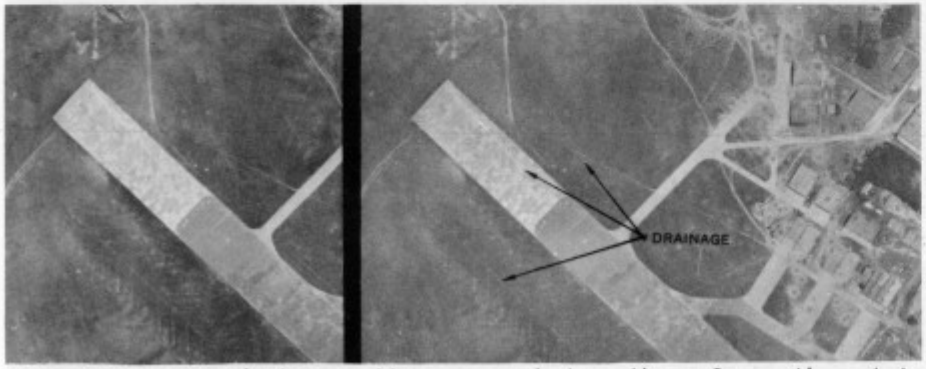


FIG. 10.08 Herringbone pattern on packed earth surface adjacent to both sides of runway indicates underground tile drainage. North Korea. Scale 1:11,000

AIRCRAFT CRATES

Crates for shipping aircraft wings, fuselages and other components may be seen occasionally on airfields. They are roughly the same size and shape as the aircraft parts which they are designed to carry. Crates are most likely to be seen near railroad unloading platforms or around hangar and workshop areas. Aircraft in various stages of assembly are often nearby.

FIG. 10.09 Several types of crates containing jet aircraft components lie near railroad unloading point at a Soviet airfield in Germany. Two crates alongside railroad and to left of warehouse have been opened, exposing fuselages. Scale 1:1,750

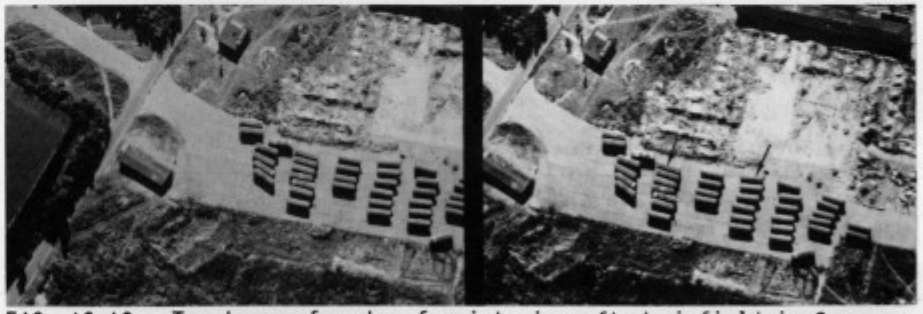


FIG. 10.10 Two types of crates for jet aircraft at airfield in Sovzone, Germany. Scale 1:2,600

FIG. 10.11 A later view of the airfield shown in Fig. 10.10 with more crates in evidence. Scale 1:23,000

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JET BLAST MARKS

Use of an airfield by jet aircraft frequently can be deduced when engine blast marks appear as burned-off patches on grass or as blackened patches on snow. The marks are roughly elliptical to elongate in shape and are from 75 to 150 feet long. On sod surfaces they are light gray or white in tone; on snow they are black. Blast marks are commonly found as a row of parallel 'scars' conforming to aircraft line-up.

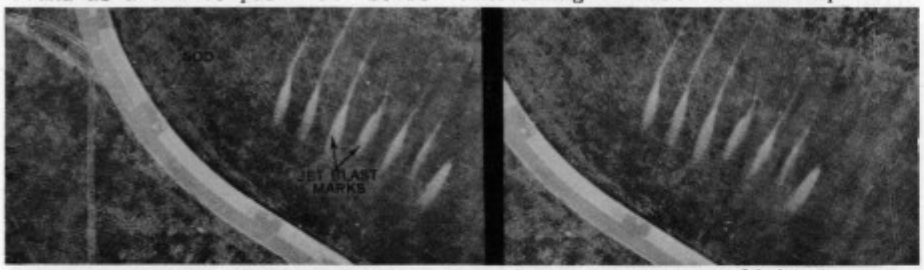

FIG. 10.12 Jet blast marks on sod surfaces appear very light in tone. Sovzone, Germany. Scale 1:2,600

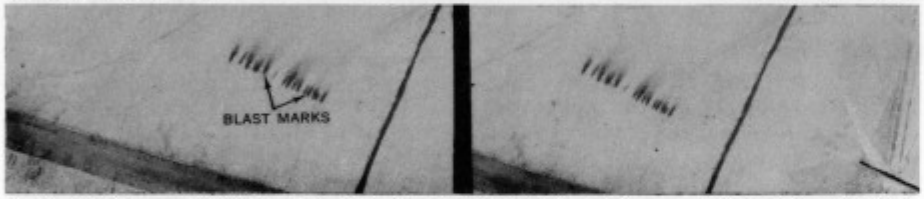

FIG. 10.13 Jet blasts marks in snow appear dark. Sovzone, Germany Scale 1:10,000

SECURITY FENCES

The Soviets have constructed board fences on many of their airfields in Germany. These fences hide construction activities and new types of aircraft. They also aid in controlling the movement of personnel to and from restricted areas. Fences may be located to obstruct view of an airfield from nearby highways or railroads.

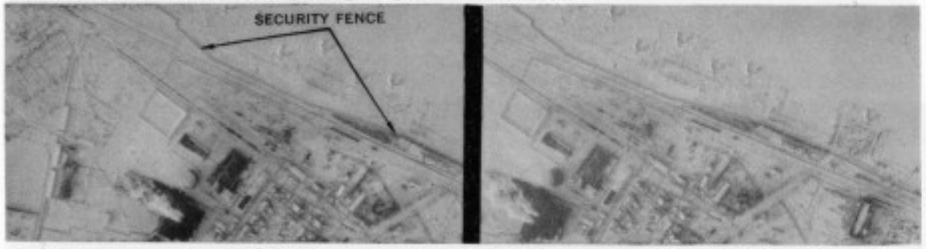

FIG. 10.14 Security fence erected between airfield and railroad to hide airfield activities and restrict access. Sovzone, Germany Scale 1:11,000

FIG. 10.15 Security fence along airfield boundary near building area. Sovzone, Germany. Scale 1:10,300

FIREBREAKS

Storage areas on Soviet airfields frequently are protected from grass fires by plowed firebreaks, 25 to 100 feet wide. Although most common around fuel and ammunition storage (see Section 4.00), they are also used to protect other supplies stored in the open or in buildings. On aerial photographs they appear as closely spaced, roughly parallel lines and are considerably lighter in tone than the adjoining sod.

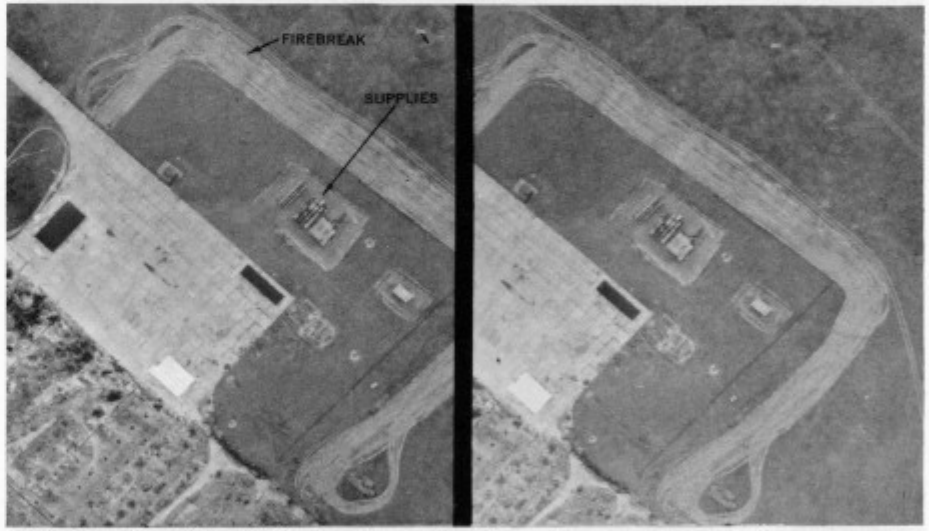

FIG. 10.16 Plowed firebreak protecting storage area. Sovzone, Germany. Scale 1:3,000

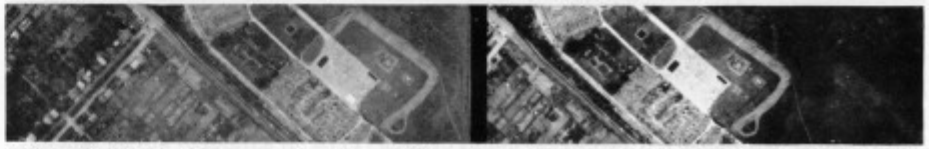

FIG. 10.17 Smaller scale view of firebreak in Fig. 10.16. Scale 1:11,000

AIRFIELD CONSTRUCTION

As a rule, airfield construction and improvement activity are easily recognized on aerial photographs. Since most construction of this type requires grading, freshly exposed earth is usually in evidence and will appear very light in tone on photographs taken on panchromatic film. Other clues to such activity are the presence of construction equipment and extensive vehicle tracks.

FIG. 10.18 Concrete runway under construction at a World War II German airfield in the Sovzone, Germany. Scale 1:21,000

TRANSFORMER STATIONS

Transformer stations at airfields are usually small sub-stations. Ordinarily they cannot be seen on photography of scales smaller than 1:5,000. The sub-station may be recognized as an open cage-like structure with a power line leading to the transformers. The station is generally located in the building complex and surrounded by a fence.

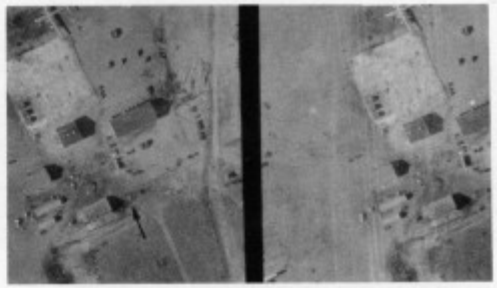

FIG. 10.19 Transformer station at an airfield in the U.S.A. Scale 1:4,800

WATER STORAGE TANKS

An aboveground water storage tank or standpipe may be found on some airfields. It appears as a tower-like structure, taller than surrounding buildings, and casts a conspicuously heavy shadow. Such tanks are located in or near the building complex.

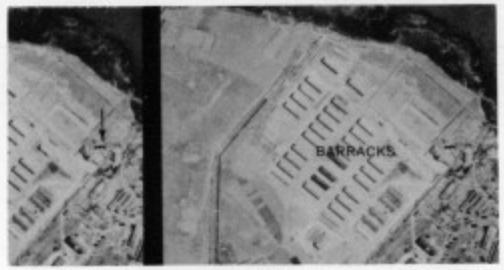

FIG. 10.20 Standpipe adjacent to administration building at airfield in the U.S.S.R. Scale 1:16,000

SECTION 11
OPERATIONAL CAPABILITIES

OPERATIONAL CAPABILITIES

The most important criterion of the operational capability of an airfield is the type of aircraft which can operate from it over sustained periods. This in turn is determined principally by the length and type of surface of the runway.

The length and type of runway surfaces have been correlated with types of aircraft in developing an airfield classification system. The specifications and explanation of this classification prepared jointly by the Directorate of Intelligence, Headquarters USAF and the Office of Naval Intelligence, Navy Department (USAF and USN, 1952), are as follows:

CLASSIFICATION OF AIRFIELDS

CLASS	OPERATION CAPABILITY	MINIMUM RUNWAY LENGTH	RUNWAY SURFACE
1	Sustained operation of HB-MB* and Jet Light Bombers. Weight bearing capacity 120,000 pounds or more.	7000'	Permanent
2	Limited operations of HB-MB and sustained operations of Jet Tactical Support Fighters.	6000'	Permanent Temporary
3	Potential HB-MB operations, presently capable of sustained operations of Jet Interceptor Fighters; easily improvable to Class 1.	5000'	Permanent Temporary
4	Light Transports, Reciprocating Engine Fighters and limited Jet Fighters.	4000'	Permanent Temporary Natural
5	Other operational airfields, or potentially important airfields.	2000'	Permanent Temporary Natural

RUNWAY SURFACES:

Permanent - Asphalt, brick, concrete, tar macadam, maintained coral, etc.
Temporary - Steel matting or metal planking, graded earth, gravel, laterite, etc.
Natural - Grass, earth or sand and clay, etc.

* HB - Heavy Bombers
MB - Medium Bombers

CLASS	EXPLANATION OF CLASSIFICATION
1	**Heavy Bombers - Medium Bombers and Jet Light Bombers.** Airfields with runways of 7,000 feet or more in length with permanent surface and currently capable of sustained operation of aircraft weighing 120,000 pounds or more. In the absence of specific information on weight-bearing capacity, classification is determined by length and type of surface and other contributory information such as the type of aircraft using the field and aircraft revetment size.
2	**Limited Heavy Bombers - Medium Bombers and sustained Jet Tactical Support Fighters.** Airfields from which medium bombers have operated or airfields that possess some of the characteristics required in Category 1 above, but which by virtue of length, designed bearing capacity, and/or present condition, do not meet all the standards prescribed for Category 1. Airfields with runways less than 6,000 feet in length are not included in this category.
3	**Potential Heavy Bombers - Medium Bombers and sustained Jet Interceptor Fighters.** Airfields which do not meet the standards for Categories 1 and 2 above, but which are easily improvable to support operations of medium bomber or heavy bomber aircraft. Factors given primary consideration in selecting these fields are: length and weight-bearing capacity of the existing runway(s), the nature of the subgrade, field extensibility, obstructions and accessibility to transportation facilities. Airfields with runways of less than 5,000 feet in length are not included in this category.
4	**Light Transports, Reciprocating Engine Fighters and Limited Jet Fighters.** Those airfields with runways of 4,000 feet in length or greater, with either permanent, temporary, or natural surfaces, that do not meet the standards of Categories 1, 2 and 3 above.
5	Other operational or potentially important airfields or those airfields of 2,000 feet in length or over which do not meet the standards prescribed for Categories 1, 2, 3 and 4.

Classification of airfields suitable for transport aircraft is made in accordance with the type of runway required for bomber aircraft of equivalent weight and characteristics.

In using this system to classify an airfield, reliance is not placed entirely on appearance of the runway. Though runway length and surface conditions may appear to meet the specifications of a class, there may be other *known* characteristics of an air facility which require that it be placed in a lower class. Reasons for this may include: obstructions, deteriorating or sub-standard runway surface, extreme elevation, or specific information on weight bearing capacity.

SOVIET AIRFIELDS

Soviet specifications on runway lengths and surfaces in relation to types of aircraft are not known. However, photography of newly constructed airfields in the Soviet Zones of Europe and in North Korea, combined with other intelligence, indicates fairly definite patterns of airfield design and capabilities. Trends observed in these theaters are thought to reflect practices within the U.S.S.R. The Soviets are constructing many new airfields and are improving facilities on existing fields by laying new runways or extending old ones. In practically all cases, runway lengths indicate suitability for use by jet aircraft. The pattern of new construction is usually one of a single concrete runway with a loop taxiway. In the Eastern European States, major Soviet airfields are divided into two general categories (USAFE, 1951): one category has "heavy" runways suitable for medium and heavy bombers and the other category has "light" runways suitable for fighter-type aircraft. The heavy runways, usually 260 feet wide, have 10 to 12 inches of concrete on top of 16 inches of compacted stone and gravel. The light runways, usually 200 feet wide, generally have 8 inches of concrete on top of 16 inches of compacted stone and gravel. Diagrams in Figs. 11.01 and 11.03 illustrate these two types.

While the Soviets will most certainly use hard-surfaced runways to the fullest extent available, it is believed that for jet fighters they would not hesitate to use natural-surface runways when necessary (USAFE 1952). Their willingness to use airfields considered inadequate by Western standards is borne out by their operation of jet aircraft from natural-surface fields (See Fig. 11.11). However, it is estimated that of the many natural surface airfields available to the Soviets and potentially suitable for jet aircraft, a very high percentage would require extensive logistical and communications improvement to be serviceable. The Soviets are believed capable of providing the necessary equipment, manpower and communications to utilize a great many of these fields, and it is estimated that they would do so if it should be considered necessary.

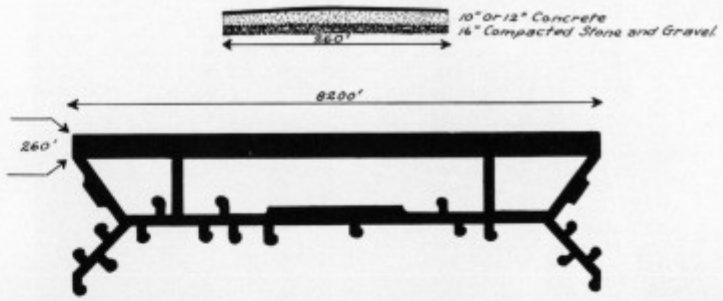

FIG. 11.01 Diagram of a typical Soviet bomber base and cross section of its "heavy" runway. This is a Class I airfield.

FIG. 11.02 Class I airfield in Sovzone, Germany. Runway length of 8,200 feet and reported capacity of 180,000 pounds per wheel meet Class I standards. Note how closely this field conforms to typical bomber base in Fig. 11.01. Oblique stereopair

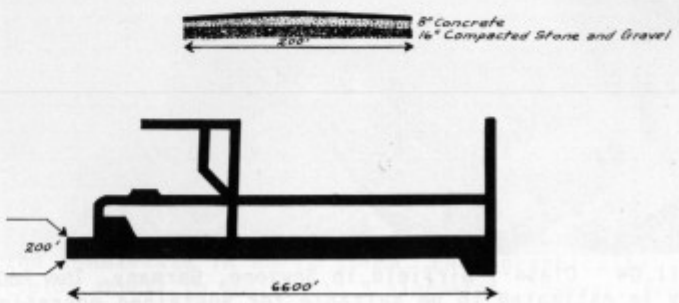

FIG. 11.03 Diagram of a typical Soviet fighter base and cross section of its "light" runway. This is a Class 2 airfield.

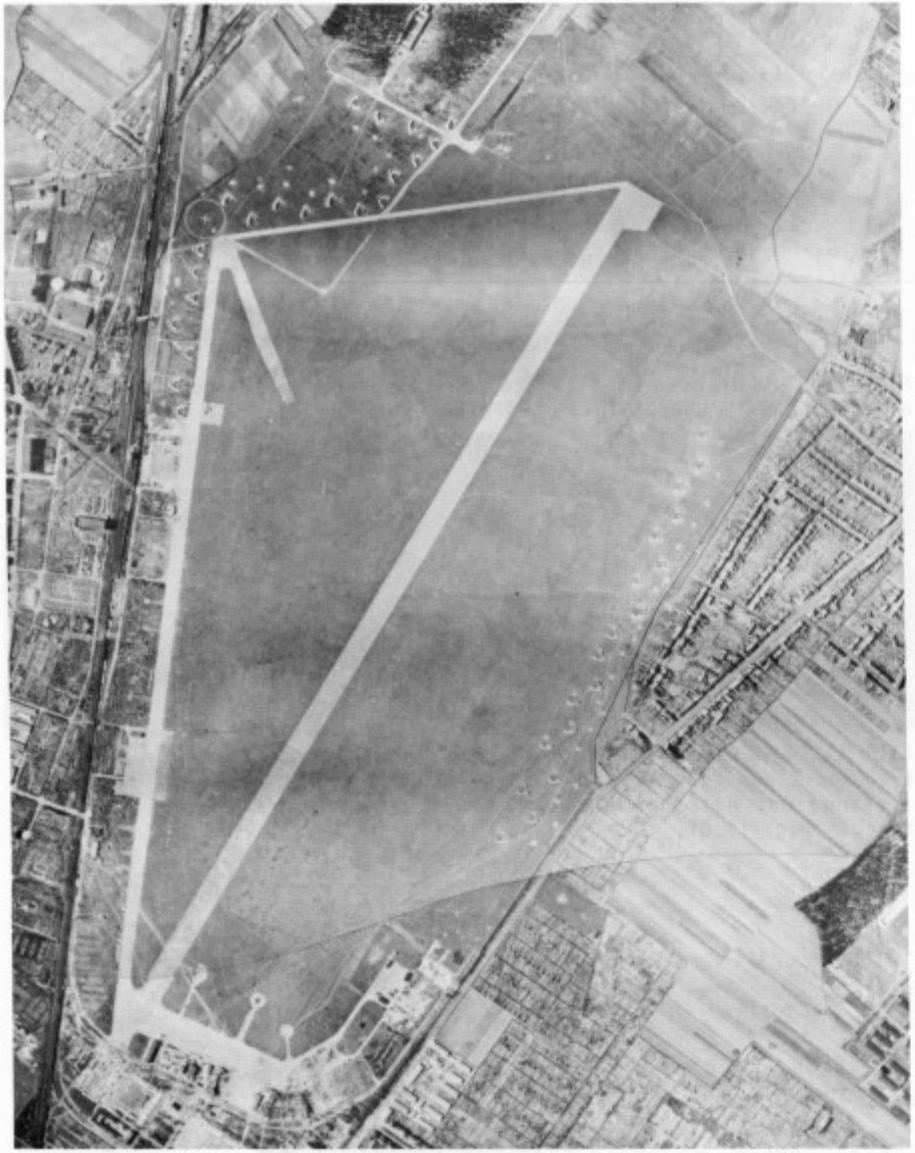

FIG. II.04 Class I airfield in Sovzone, Germany. The 7600' concrete runway is estimated to be suitable for sustained operations of Heavy and Medium Bombers and Jet Light Bombers. It should be noted that lack of major repair facilities, hangars, and other buildings does not lower the classification. Scale 1:14,000

FIG. II.05 This Class 2 airfield in the Sovzone of Germany meets the minimum requirements of a 6000' runway. Surface is concrete, estimated to be capable of sustaining operations of Jet Tactical Support Fighters and for limited use of Heavy and Medium Bombers. Scale 1:9,500

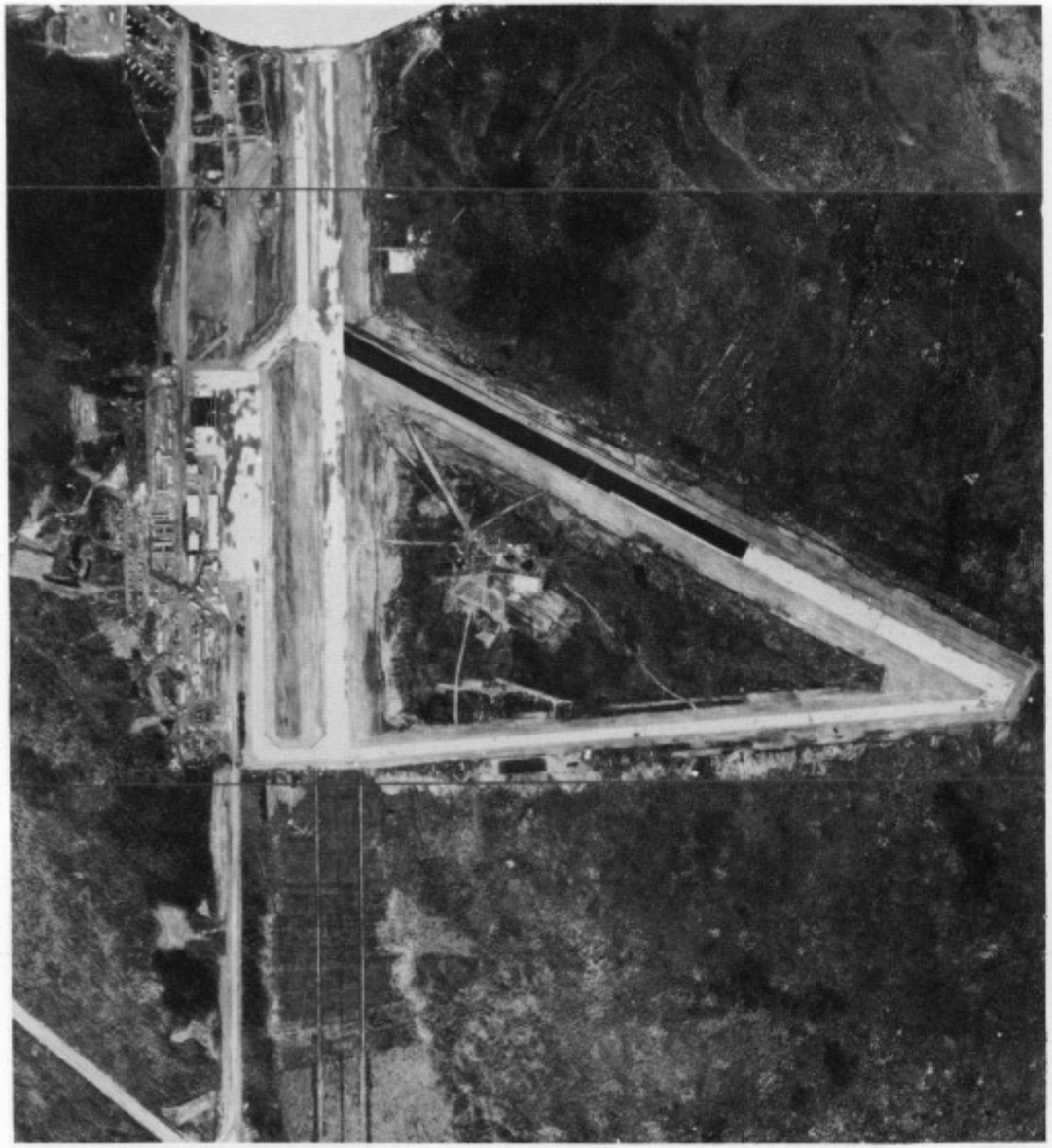

FIG. 11.06 Class 3 airfield in Alaska with asphalt runways 5,100' and 5,000' long. This field meets the Class 3 standards for runway length and weight-bearing capacity, field extensibility, obstructions and transportation facilities.

Scale 1:12,000

FIG. 11.07 Scale 1:15,000

FIG. 11.08 Scale 1:17,600

FIGS. 11.07 and 11.08 Class 3 airfields constructed by the Communists in North Korea. Photographically, these fields appear to meet Class 2 standards, however, presence of fighter revetments in an area of tactical operations and the fact that ground information indicates the runways will not support Heavy or Medium Bombers require that these fields be placed in Class 3.

FIG. 11.09 Class 4 airfield in U.S.S.R. with 4,900' graded earth runway.
Scale 1:12,000

FIG. 11.10 Class 4 airfield of Japanese construction in North Korea. Runways are asphalt over concrete and are 4,140' and 3,200' long.
Scale 1:10,000

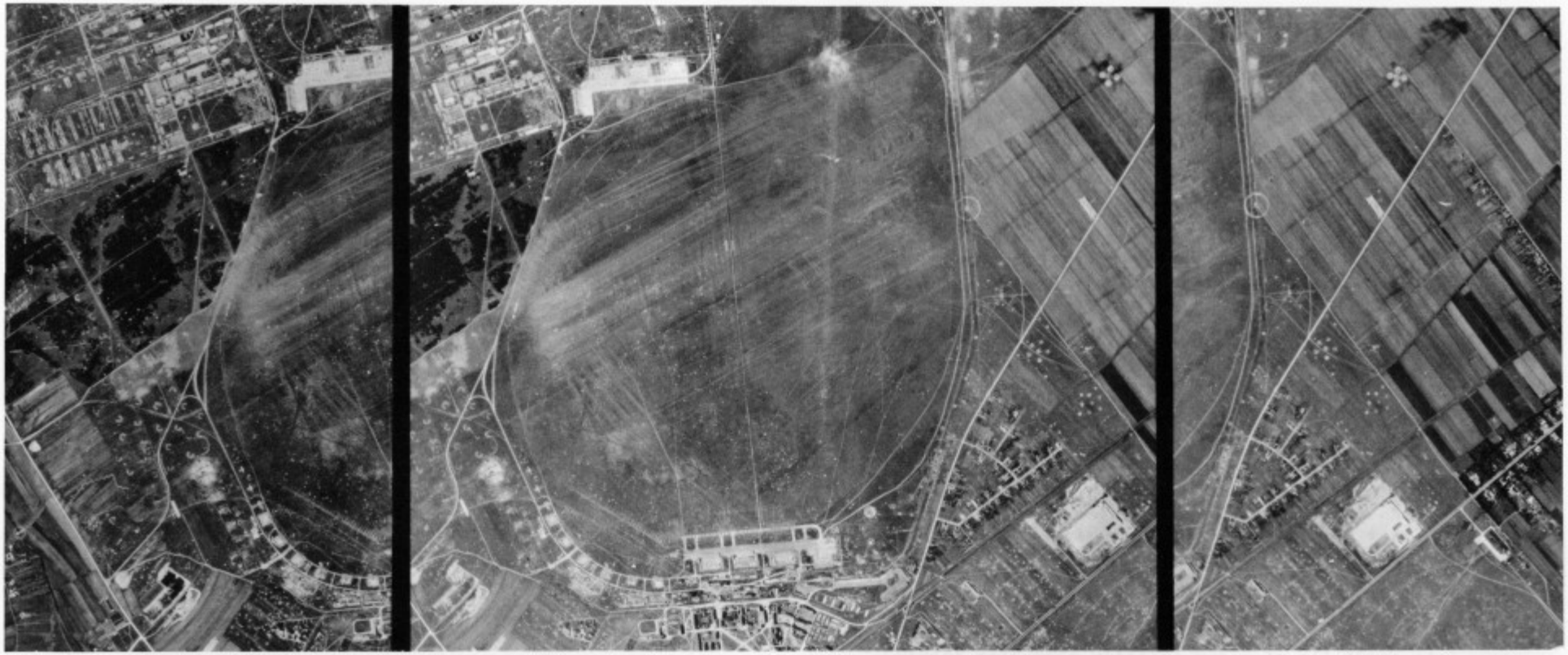

FIG. II.II Class 4 airfield in Sovzone, Germany. This natural-surface field with a 7,300' landing surface is used by jet fighter aircraft as indicated by MIG 15s lined up on apron and by jet blast marks on field. Scale 1:19,000

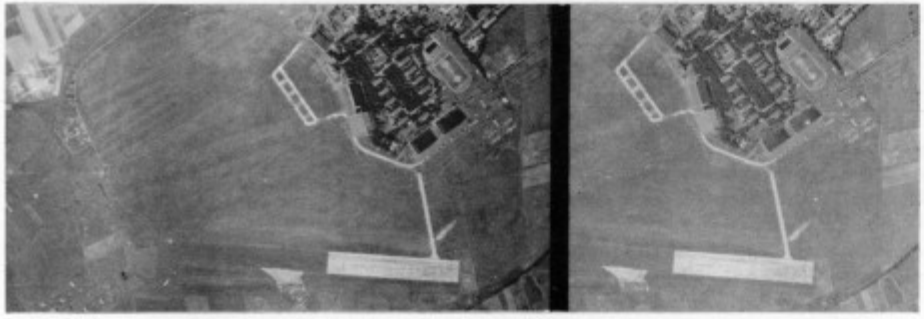

FIG. II.I2 Class 5 airfield in Sovzone, Germany with 3,450' asphalt and concrete runway. Although this is a very well-laid-out and well-equipped airfield, the short runway limits the types of aircraft that can be handled. Scale 1:21,000

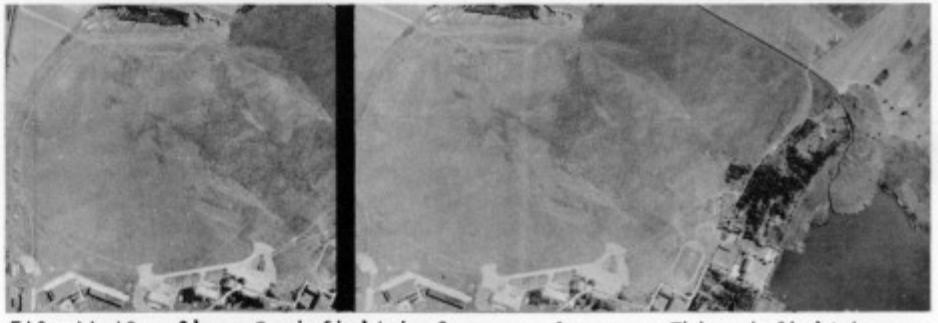

FIG. II.I3 Class 5 airfield in Sovzone, Germany. This airfield has a sod surface with a maximum run of about 5,000'. There are no designated runways. Nature of the landing surface will not support the sustained operations required for Class 4. Scale 1:20,500

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USAFE (1951) The increasing significance of air facilities. *USAFE Air Intelligence Summary*. no. 12, Dec. 1951, p. 3,5 and 6. (SECRET)

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In preparation
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General characteristics of World War II airfields. Copiously illustrated with vertical aerial photos, including stereopairs.

USAF [no date] *Development of photographic intelligence, vol. VIII: Interpretation of aircraft and airfields*. Directorate of Intelligence, Headquarters USAF, 88 p., illus. (CONFIDENTIAL)
Valuable for general characteristics of various types of German air installations constructed during World War II.

USAF (1952) *Photo interpretation manual: Identification of Soviet aircraft*. Directorate of Intelligence, Headquarters USAF, 76 p.; Appendix 1., 15 p., illus. (SECRET)
A loose-leaf guide to selected types of Soviet and Satellite aircraft. Includes ground and air-to-air photos, scaled diagrams with brief descriptions, annotated vertical aerial stereopairs, and oblique stereopairs. Appendix (UNCLASSIFIED) covers photo interpretation methods for use in aircraft interpretation. Reprinted as AFM 200-41.

USAF (1953) *Air Force Manual 200-50: Photographic interpretation handbook*. Headquarters USAF, illus., maps, glossary, appendices. (UNCLASSIFIED)
Current reference material basic to all types of military photo interpretation. Covers the nature of photographic interpretation, reconnaissance photography, techniques, maps, photo interpretation reports, copy preparation, and reproduction.

USAF and USN (1951 et seq.) *Airfields and seaplane stations of the world*. Directorate of Intelligence, Headquarters USAF, and Office of Naval Intelligence, Navy Department, vols. 1-39, illus. (SECRET)
Current intelligence on airfields throughout the world, excluding the United States. Gives a recent evaluation of each airfield. Each volume contains an index to the series.

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