TRANSMITTAL SLIP | DATE 20 Feb 62

TO: [redacted] STAT

ROOM NO. | BUILDING STEWART

REMARKS:

The attached memo from Harry Stoertz to Dir/NPIC is forwarded thru you. Would appreciate your bringing to Art's attention.

STAT

STAT

TID
TPDS
SMB

Army

FROM: [redacted]

ROOM NO. 5C28 | BUILDING LANGLEY [redacted]

E USED. (47)

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TCS-11293/62-KH
20 February 1962
Copy-2

MEMORANDUM FOR: Director, NPIC

SUBJECT: Photographic Quality Necessary for Tank Identification

who?

1. On Friday, 16 February, representatives of the Office of National Estimates and of Army Intelligence briefed Dr. Jerome Wiesner, Scientific Adviser to the President, on our estimates of Soviet tank production and tank inventories. The briefing, prepared at Dr. Wiesner's request, was designed to review our current estimates, the evidence and analysis underlying them, and our degree of confidence in their accuracy. The discussion included both the modern types of Soviet tanks (e.g. T-54, T-10, PT-76) and older types (e.g. T-34, JS-3), in the hands of Soviet forces and other countries.

2. During the course of the briefing, the point was made that aerial photography could sometimes reveal the presence of tanks at factories and tank parks, but often was not sufficient to detect tanks and usually was not sufficient to identify the type of tank. Dr. Wiesner asked what photographic resolution was thought to be necessary. We could not answer specifically, but pointed out that resolution was not the only factor involved and promised to get an answer. ?

3. It is, therefore, requested that you provide us with a brief memorandum responding to the following questions:

(a) What resolution and quality of photography are believed necessary to identify an object of the size and general configuration of a Soviet tank?

(b) What resolution and quality of photography are believed necessary to distinguish tanks from other objects or vehicles of similar size and configuration?

(c) What resolution and quality of photography are believed necessary to distinguish one type of tank from another?

(d) By what means and when are these resolutions and qualities believed achievable?

4. The memorandum should be addressed to Assistant Director, National Estimates, Attention Mr. Stoertz. It will be forwarded under our cover note to Mr. Wiesner. If possible, we wish to reply to Dr. Wiesner no later than COB Monday, 26 February.

5. This request has been coordinated informally with Col. Sanders of Army Intelligence.

HOWARD STOERTZ, JR.
O/NE Staff [redacted] 50X1

DISTRIBUTION:

Orig. and 1: Director, NPIC
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MEMORANDUM FOR:

STAT

+PDS

401

2:00 meeting

(DATE)

requirements,

50X1

DRAFT

[redacted]/TP&DS

23 February 1962

Photographic resolution is dependent on several factors, i.e., object contrast, photographic lens and film used, the dynamics of the system, that is system vibration, shutter speed and efficiency, image motion control and correct exposure. Of course, proper film processing is vital.

Ground resolution is dependent upon Photographic Resolution, the focal length of the camera, and the altitude of the camera system.

Quality of photography is certainly subjective and would depend upon a standard being arrived at. What is high quality today might be average tomorrow.

The questions asked are very vague since no figures are attached.

A state-of-the-art camera system exists that will give 85-90 lines/mm for low contrast target (2:1 brightness ratio which is standard) in a dynamic environment. This gives a ground resolution, when used at 50,000 feet altitude, on the order of one foot.

From AFM 200-50, Photographic Interpretation Handbook, 1953, a scale of 1:2000, with the quality of photography performed then, is necessary to determine the difference between a $2\frac{1}{2}$ and 4 ton truck. The quality of photography in terms of resolution available now is four to five times better than in 1953. Therefore, a minimum scale of 1:8000 is required to do the same thing.

With the above in mind the photography would have to be enlarged. The current quality of the negative material will easily support an enlargement of 20X giving a scale of approximately 1:1000.

Photo interpreters indicate that Soviet tanks are primarily identified by the size and position of the turret. Average tank size is 10 x 20 feet and

turrets, pear shaped, are approximately $2\frac{1}{2}$ to 3 feet across the "bulb" of the pear. Fairly precise measurements could be made of the image of the vehicle.

The requirements can be presently met by both resolution and quality with an existing camera system.

Figure B-35.—SCALES IN INCHES PER MILE AND CENTIMETERS PER KILOMETER AT COMMON R. F.'s.

Common representative fractions	Inches per mile	Centimeters per kilometer	Common representative fractions	Inches per mile	Centimeters per kilometer
1/ 2,500	25.35	40.00	1/ 126,720	0.50	0.79
1/ 10,000	6.34	10.00	1/ 150,000	0.42	0.66
1/ 10,560	6.00	9.48	1/ 200,000	0.32	0.50
1/ 20,000	3.17	5.00	1/ 250,000	0.26	0.40
1/ 24,000	2.64	4.17	1/ 253,440	0.25	0.39
1/ 25,000	2.53	4.00	1/ 300,000	0.21	0.30
1/ 31,680	2.00	3.16	1/ 400,000	0.16	0.25
1/ 40,000	1.58	2.50	1/ 500,000	0.13	0.20
1/ 50,000	1.27	2.00	1/ 506,880	0.12	0.19
1/ 62,500	1.01	1.60	1/ 600,000	0.11	0.16
1/ 63,360	1.00	1.58	1/ 750,000	0.08	0.13
1/ 80,000	0.79	1.25	1/ 1,000,000	0.063	0.10
1/ 100,000	0.63	1.00	1/ 1,013,760	0.0625	0.09
1/ 125,000	0.51	0.80			

Figure B-36.—MINIMUM SCALES FOR INTERPRETATION AND IDENTIFICATION.

This table is designed to indicate minimum acceptable photographic scales for various purposes and should be consulted whenever a military photo mission is being requested. These minimum scales are the educated conclusions of a qualified panel of photo interpreters. It is not expected that they will achieve concurrence with the opinions or experience of all who refer to them. They will, however, serve as a guide to the minimum scales at which object-images can be identified and analyzed. The many variables in atmospheric conditions and film processing to which an aerial photo is exposed will tend to alter these scales. These scales are based on average quality photography currently being produced. Improvements in such factors as image-motion compensation, camera mount vibration, and edge gradient will permit the use of smaller scales.

Column I establishes scales required for recognition of an object class (e. g., motor vehicle, multi-engine aircraft, etc.). Column II represents scales necessary for detailed analysis of specific objects within an object class (e. g., to distinguish 2½-ton trucks from 4-ton trucks, B-29's from B-50's, etc.). The scales in column II are presented for guidance of photo-reconnaissance organizations to use in planning operations designed to photograph specific installations for detailed technical analysis, while those in column I are the minimum scales for normal intelligence requirements. All scales refer to vertical stereo photo coverage. Low-level oblique photography or continuous-strip photography is indicated as extremely helpful in specific instances.

Subject	Breakdown	I Minimum scale identification	II Minimum scale technical analysis
Industry	Industries which lend themselves to interpretation, e. g., coke, iron and steel, petroleum, aluminum, etc.		
	(Typical)	1/30,000	1/12,000
	(Atypical)	1/15,000	1/8,000
	(Petroleum and chemical plants require 1/6,000 for technical analysis.)		
	Industries which do not lend themselves to interpretation; e. g., ball-bearing instrument electronics, etc.	1/10,000	1/6,000 low-level oblique continuous-strip
Defenses	Coastal defenses guns	1/20,000	1/5,000 low-level oblique.
	Heavy AA	1/15,000	1/3,000 low-level oblique.
	Light AA	1/10,000	1/2,000 low-level oblique.
	Searchlight	1/10,000	1/2,000 low-level oblique.
Vehicles	Motor vehicles	1/10,000	1/2,000
Transportation	Rail (to include streetcar)	1/30,000	1/8,000.
	Road	1/30,000	1/5,000.
	(Reliable road surface conditions cannot be given from aerial photography.)		
	Inland waterways	1/30,000	1/10,000
	Bridges (over 100')	1/30,000	1/10,000 oblique

Figure B-36.—MINIMUM SCALES FOR INTERPRETATION AND IDENTIFICATION.—Continued.

Subject	Breakdown	I Minimum scale identification	II Minimum scale technical analysis
Utilities	Sewage	1/20,000	1/10,000
	Water purification	1/20,000	1/10,000
	Gas plants	1/20,000	1/8,000
	Municipal thermal power plant (typical)	1/30,000	1/10,000
	Industrial thermal power plant (typical)	1/15,000	1/8,000
	Central heating plant (typical)	1/15,000	1/6,000
	Hydroelectric power plant	1/30,000	1/10,000
	Power lines (to trace)		1/6,000
Terrain	Major land forms	No limit	1/20,000
	Minor land forms	1/20,000	1/8,000
Vegetation	(Scales given are applicable to optimum season only.)	1/20,000	1/8,000 low-level oblique, continuous-strip
Shipping	Naval vessels—BB, CV, CA, CL (or units larger than DD).	1/25,000	1/12,000
	DD and minor combatant craft	1/15,000	1/7,000
	SS	1/25,000	1/5,000 low-level oblique.
	Merchant vessels:		
	Units above 200'	1/25,000	1/12,000
	Units below 200'	1/15,000	1/5,000
Shipping facilities	Ports	1/25,000	1/12,000
	Docking facilities (piers, wharves, etc.)	1/20,000	1/8,000
	Services (cranes, wharf trackage, etc.)	1/12,000	1/6,000
Electronics	Radar:		
	Fixed	1/10,000	1/5,000
	Mobile	1/8,000	1/5,000
	Fire control	1/5,000	1/2,000
	Communications:		
	Lattice masts	1/15,000	1/8,000
	Stick masts	1/10,000	1/5,000
	D/F:		
	Open adcock	1/18,000	1/11,000
	Portable or unusual types	1/8,000	1/3,000
	Navigation aids	1/18,000	1/11,000
Airports	Major (with facilities and surfaced landing area).	No limit	1/10,000
	Auxiliary (surfaced landing area—no facilities).	1/30,000	1/10,000
	Auxiliary (unsurfaced landing area—no facilities).	1/10,000	1/10,000
Aircraft	Wing span:		
	Under 40 ft	1/10,000	1/2,000
	40 to 60 ft	1/12,000	1/3,000
	60 to 100 ft	1/15,000	1/4,000
	over 100 feet	1/20,000	1/5,000
Personnel	Personnel activity	Unknown	1/5,000 comparative cover essential. Low-level oblique. Continuous-strip (along travel routes including trails).
	Individual personnel	Unknown	1/1,000 low-level oblique continuous-strip.
Structures	Structural analysis	1/12,500	
	Urban area analysis	1/12,500	
Photogrammetry	Tri-met (for air navigation charts)	1/60,000	
	Vertical (for mapping)	1/40,000	
	Supplemental (for air navigation charts and mapping).	1/20,000	

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TP&DS

Vhm AM
to ACL

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1/A - 5' resolution instead of 10'
2/B 2-3 instead of 3' to 5'
3/C 1-2 instead of 2' to 3'

	No	Possibly	Probably
A -		✓	✓
4/E -		✓	✓
N -		✓	✓
CIA -		✓	✓
TID -	No		Possibly
TP+DS -		✓	✓