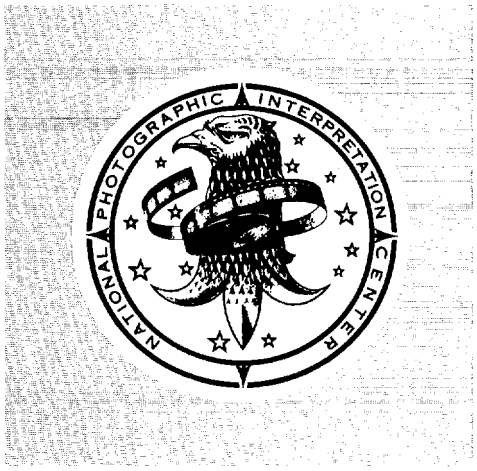
Secret

No Foreign Dissem



NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

NEW APPLICATIONS OF IMAGERY REPORT

Diazo Technique for Detecting Change on Imagery

Secret

NPIC R-03/75

Copy 29

NATIONAL SECURITY INFORMATION
Unauthorized Disclosure Subject to Criminal Sanctions

Classified by 009907
Exempt from General Declassification Schedule
of E.O. 11652, exemption category: 5B(2)
Automatically declassified on:
date impossible to determine

Approved For Release 2001/08/13 : CIA-RDP78B04560A007400010038-3

Diazo Technique for Detecting Change on Imagery

1. This New Applications Branch report describes a photo analysis technique that can be used as an aid to quickly determine growth in urban areas, and capsulizes the results of a pilot study using this technique. The study results from an earlier Office of Basic and Geographic Intelligence proposal to do a survey of some 1,000 Soviet cities to determine and compare quality of life conditions in those cities. The city of Armavir, USSR, was chosen for the pilot study because it is in an area [redacted] 25X1D and is a major railroad and agricultural center. It is on the Kuban River between the Black and the Caspian Seas in the northern Caucasus, about 100 miles east of Krasnodar.

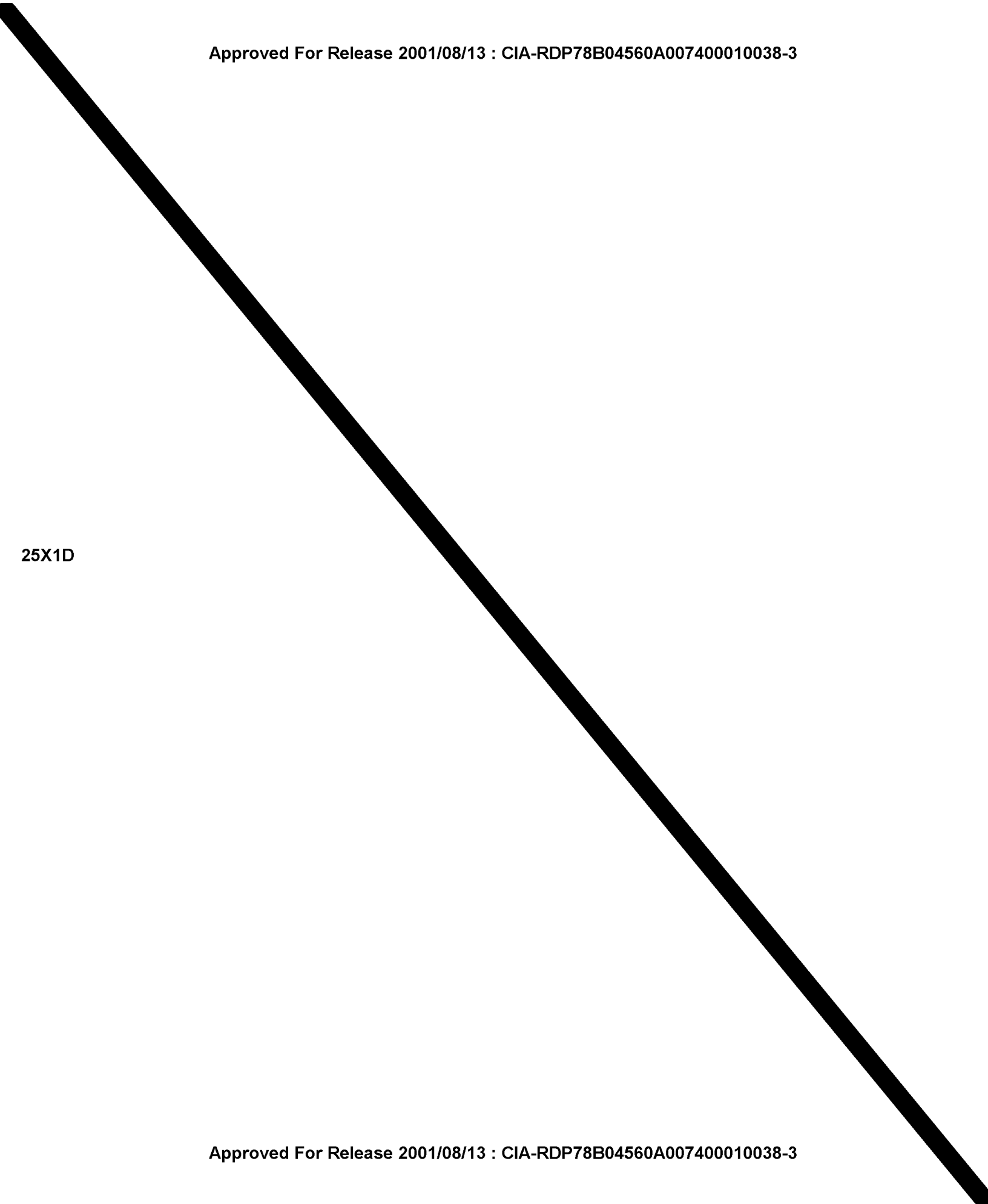
2. To determine city growth for a [redacted] period, a comparison was made between satellite photography of the city taken in [redacted] and [redacted] satellite photography (Figure 1). First a conventional comparison technique was used (method A, Table 1). Photographic prints from the [redacted] satellite missions were enlarged to similar scales and a tedious and time-consuming process of back and forth comparisons was followed to identify which buildings had been razed and to locate all new buildings. These were in turn outlined on an overlay. Where there were questions not answerable by an analysis of the prints themselves, film positives were compared in greater detail using a microstereoscope.

25X1D 25X1D 25X1D 25X1D

3. A second technique (method B) was then employed -- this one involving a diazo color process. For this procedure a film negative from each mission was enlarged to exactly the same scale. Then a different color copy of each enlargement was created by means of a diazo process (exhibits A and B). Blue was used for the [redacted] photography and red for the [redacted] photography. When the two are overlaid, new items immediately show up as red. Where there are no changes the blue and red blend into purple. The reader may demonstrate this technique by overlaying exhibit A on exhibit B.* Film negatives were used instead of film positives because the areas of interest (buildings) are primarily light in tone, and dark tones are required for this technique to be effective. The reason is that in this technique the imagery is overlaid onto colored diazo acetate, and where light penetrates through light areas on the film it burns out or removes the color on the underlying diazo paper. At the same time, light is blocked out by the darker areas, permitting color to remain in those areas on the diazo paper. When different colors are used to represent different time periods, changes between the two are readily detectable. For best results, when using the diazo process the sets of imagery should have similar obliquity, and if possible similar sun angles.

25X1D 25X1D

*Exhibits A and B are contained in folder at the end of this report.



25X1D

Table 1. Techniques Used in Change Detection

Method A	Method B
1. Choose the two sets of imagery. Similar obliquity is desirable. Have enlargement prints made to about the same scale. Time required: 2 hours	1. Choose two sets of imagery with special attention to obliquity and scan angle. Have enlarged film negatives made to the same scale. Time required: 2.5 hours
2. Attach overlay and do a back and forth comparison, city block by city block, for changes. Interpretation time: 12 hours	2. Make a diazo acetate copy of each negative using a different color for each. Overlay the two diazo copies on a light table and changes show instantly. Processing and interpretation time: 2 hours

4. The results of this photo comparison study showed that in the city of Armavir 40 new apartment buildings, and four houses containing apartments, were constructed in the residential areas between [redacted] 25X1D
The number of apartments in each new building was determined by overall size, number of stories, and roof venting, and then comparing with known Soviet structures. Assuming one family per apartment a total of 3,784 additional families were ascertained to be living in apartments in the
25X1D city in [redacted] as opposed to [redacted] During the same five-year period 160 25X1D
new single-family homes were built. However, 100 older homes had also been razed, making the net increase 60. The total increase in families
25X1D living in Armavir between [redacted] based on the above, was 3,844. According to 1970 census figures the typical family unit in that area of the USSR consisted of 3.3 persons, on the average. This, therefore, reflects an increase in the city's population of some 12,500 people
25X1D between [redacted] Also, according to the Soviet census, Armavir had a population of 145,000 in 1970, so this reflects more than an 8.5 percent
25X1D growth during the [redacted] period.

5. Other growth in the city was shown by the addition of 12 new school buildings, a hospital, and two heating plants in the residential areas of the city. Five of the new school buildings (two dormitories and three classroom buildings) were at an educational complex at the edge of town. Sixteen new buildings were constructed within the military areas of the city.

6. In the industrial areas 51 new buildings were constructed during the [redacted] period. This included 14 fabrication buildings, three agricultural storage buildings, three buildings at a meat packing plant, and a new bus depot. 25X1D

QUALITY OF LIFE

7. To establish some indicators that might be used to make city quality of life comparisons generally throughout the USSR, the following items were studied at Armavir: housing quality, industry, public facilities, and environment.

Housing

8. Although there has been a trend over the past [redacted] to build new apartments, a large percentage of the population still lives in single-family homes. The dwellings appear to be in generally good condition and of adequate size and each has a large garden plot adjoining. There are also large areas of individual garden plots on the perimeter of the city, apparently for the use of the apartment house dwellers. 25X1D

9. Most of the new apartment buildings are prefabricated and are generally low-quality structures. This conclusion is based on a comparison with known examples of Soviet apartment buildings.

Industries

10. In addition to a large agricultural storage and shipping facility the city has a vegetable oil plant, meat packing plant, wood-working plants, and several fabrication plants.

11. One woodworking plant includes a labor camp that was used for World War II prisoners and which may still be in use as a prison. Most of the industries are on the edge of the city and are generally separated from residential areas.

Public Facilities

12. Schools, hospitals, shopping, and recreation facilities are located throughout the residential areas. An increase of 12 school buildings and a hospital in the last [redacted] appears to be adequate for the number of new families in the city. The downtown area has wide tree-lined shopping streets, several parks, and an entertainment center. A large bus network services the city. There are also two airfields and a railroad. 25X1D

Environment

13. There is a large amount of sawdust visible on buildings near the woodworking plants. And the location of the meat packing plant adjacent to family dwellings would indicate unpleasant living conditions for some residents in that immediate area. However, because of the types of industries generally present (no heavy stack emissions or effluent) there is little likelihood of a real air or water pollution problem in or around Armavir. There also appear to be adequate sewage disposal measures provided by a sewage treatment plant outside the city.

SUMMARY

14. Two photo interpretation techniques were used in this initial effort to look at city growth over a [redacted] period. One of these techniques, using the diazo process, was found to be very effective for quickly determining changes on imagery. Although this technique would seem to have the most application for determining construction changes in an urban environment, as in this study, the same method could probably be adapted to other uses, such as detecting new buildings and construction at large industrial and strategic facilities; new roads, rail lines and pipelines; and agricultural activity. 25X1D

Project 730287A

25X1A Comments and queries regarding this report are welcome. They may be directed to [redacted] New Applications Branch, Imagery Exploitation Group, NPIC, code 143, extension 3301, or gray extension 3826.

Next 1 Page(s) In Document Exempt