1.2 A reentry vehicle from the Zenit satellite revealing the camera ports. Photograph: Maryanna Nesina.

registration itself testifies to the skill of the printers in the military map printing factories across the former Soviet Union. The quality of printing reflects the level of training and the reliability of humidity-control equipment and the electricity supply at the time.

While national mapping was undoubtedly used among other types of information sources, the successful launch of the Soviet program of Zenit satellites in 1962 saw an increased reliance on reconnaissance imagery (fig. 1.2). Yet the plans, especially, include information that would have been virtu-ally impossible to derive from remote sensing, such as the names of factories and the products manufactured there, and indications of the load capacity of bridges, for example. The maps also include disused railways and old

Many hundreds of specific symbols were devised to differentiate in as much detail as possible the purpose and construction of individual buildings, the religion of places of worship, the type and density of vegetation and crops, and the nature of the terrain and coast. Appendix 5 presents a small sample of these symbols and annotations. Colors and hachuring are used to identify, for example, built-up areas where non-fireproof buildings predominate, or city blocks where the majority of buildings are high-rise multi-story structures. A hierarchy of about twenty classes of size and style of lettering of names is used to denote the size and status of towns and cities; similarly, navigable rivers are named in uppercase letters, non-navigable in lowercase.
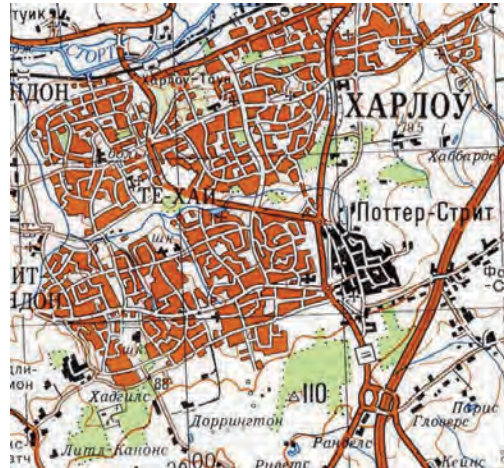
Of particular interest to the cartographer and the potential map user were means of travel and "the going" (the ease of traversing the terrain). Railroads, roads, mountain passes, ferries, and bridges are indicated with as much detail as possible, as are forests and rivers that might impede progress. For this purpose, the distinct symbols and colors are supplemented by a convention of annotation, whereby important dimensions, characteristics, and numeric values are shown alongside.

The depiction of railroads is enhanced with information such as the number of tracks and whether or not electrified, and the position and importance of station buildings. For roads and tracks, the quality, number, and width of carriageways and surface material are shown together with the overall width of clearance. Similarly, the months when mountain passes are open and the dimensions and carrying capacity of ferries and bridges are annotated, as are the type of trees and their typical height, girth, and the clearance between them in forests, and also the speed of flow, depth, and bed of rivers. Of course, not all the specified information could be collected in every case; what is surprising is how much of this hard-to-obtain detail is shown on maps of non-USSR territory. This gathering of data is discussed in chapter 3.

The symbols, the colors, and the annotation conventions are minimally depicted in the marginalia of smaller-scale sheets (fig. 2.3) and generally not at all on the large-scale topos, but are defined in officers' guides [39] and cartographers' handbooks [40], the latter amounting to some 220 pages. A series of simplified colorful wall posters was produced for training purposes (figs 2.4 to 2.8). Some versions of the tables of symbols have been translated into English [1, 7, 9].

**2.5** Training poster 2, "Local Items," 1968.

2.6 Training poster 3, "Railways and Structures," 1985.

2.14A 1:100,000 sheet M-31-001, Harlow, UK, 1964 edition.

2.14B 1982 edition of M-31-001, Harlow, UK, showing growth of the town and arrival of a motorway. Note that the district of Potter Street, Поттер-Стрит, which was misnamed "Стрит-Поттер" on the 1964 sheet, is corrected.
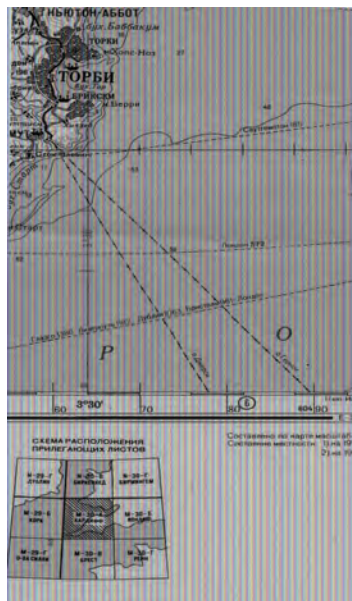

2.15A Original March 1985 print code "E-3 III 85-Ср" on 1:500,000 sheet M-30-1, Cardiff, UK. (Incidentally, Cardiff is a strange choice for the name of this map—the city is right on the edge of the sheet. Exeter, Plymouth, and Swansea all appear, and any one of these would have been more appropriate.)
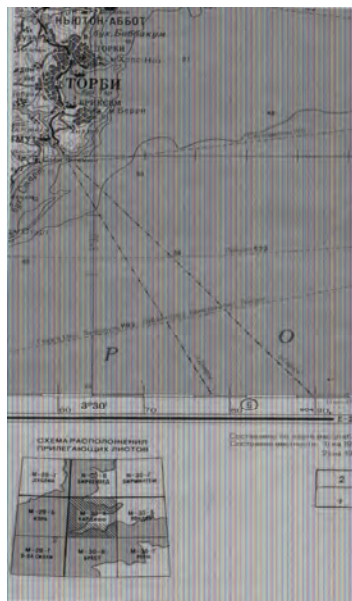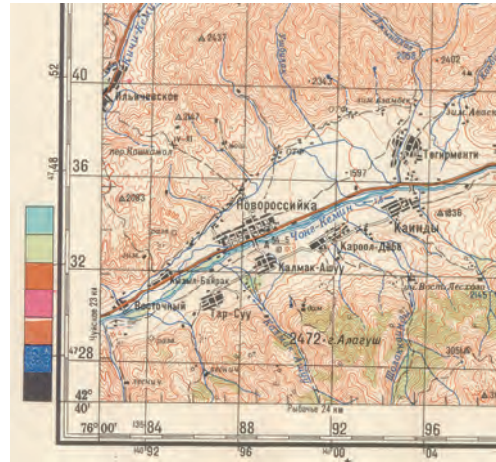

**2.15B** M-30-1, reprint of January 1989, with print code "E-24 I-89 Л."

2.15C Both printings have the same edition date of 1985 in the top right corner.
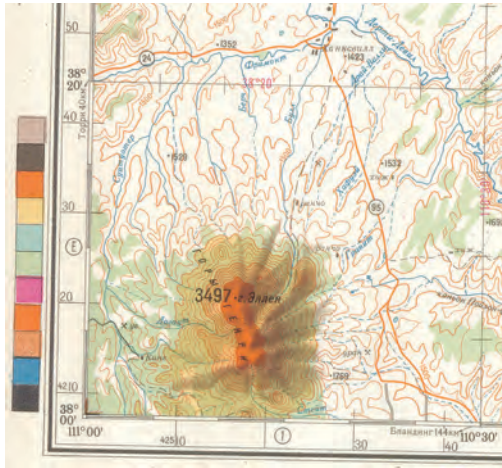
2.16A Lower left corner of small-scale (1:500,000) sheet J-12-2, Grand Junction, Colorado, showing color registration block, latitude and longitude values and grid, and Gauss-Krüger graticules.

2.16B Lower left corner of medium-scale (1:200,000) sheet K-43-11, Almaty, Kazakhstan, showing latitude and longitude values, two sets of Gauss-Krüger values (the outer set being applicable to the adjacent zone), and a G-K-based grid.
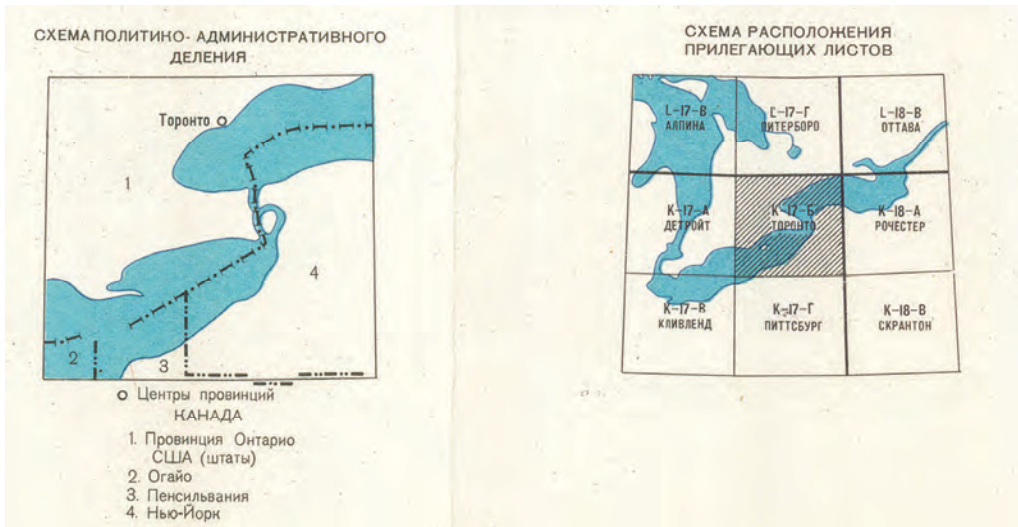
2.17 Lower right of 1:500,000 sheet K-17-2, Toronto, 1981, showing diagram of political boundaries, with Toronto identified as provincial center (o). Political entities are listed as follows: Canada: 1. Province of Ontario; USA: 2. Ohio, 3. Pennsylvania, and 4. New York. The diagram of neighboring sheets shows L-17-B, Alpena, Michigan; L-17-Г, Peterborough, Canada; L-18-B, Ottawa, Canada; K-17-A, Detroit, Michigan; K-18-A, Rochester, New York; K-17-B, Cleveland, Ohio; K-17-Г, Pittsburgh, Pennsylvania; and K-18-B, Scranton, New York.

2.20 Top edge of SK-63 1:25,000 sheet W-27-31-B-a (W-27-031-3-1), 1980, published by the GUGK. This covers an area north of the town of Serov in Sverdlovsk Oblast on SK-42 sheet O-41-014-1.

only of USSR territory. Examples are shown in figures A1.47, A1.54, and A1.56. Another example is shown in figure 2.20, labeled W-27-31-B-a "Секретно" (Secret), with no map title or other geographic identifier.

In East Germany, the equivalent to SK-63, maps for civil authorities with reduced map content and positional inaccuracies, were known as AV (Ausgabe für die Volkswirtschaft, or Edition for the National Economy). They are described in the volume edited by Dagmar Unverhau [32]. Other Warsaw Pact countries established similar local coordinate systems; the JTSK in Czechoslovakia, the EOTR in Hungary [26], the 1965 system and the GUKiK-80 in Poland [30], and the Stereo-70 in Romania.

CITY PLANS—MILITARY SERIES

The city plan series differs from the regular topographic map series in three important respects:

1. The sheets are rectangular, the edges being defined on Gauss-Krüger coordinates.

2. The coverage is non-continuous across a country, as the plan of each chosen city is designed as a single entity so that a set of sheets is centered on and covers just the required urban area.

3. They generally have a street index, a written description of the locality (Справка, or spravka), and "important objects" highlighted and listed.
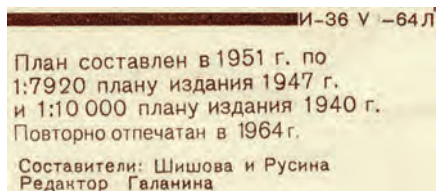
City plans use the G-K projection and Coordinate System 1942. It is

2.23 A composite of the four sheets of the city plan of London, 1:25,000, 1982, with the inner margins removed to show the unified composition.
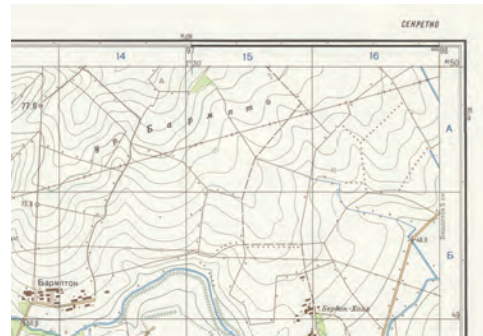

2.24 Corner of Darlington, UK, 1:10,000, 1976, showing second set of Gauss-Krüger coordinates (applicable to the adjacent G-K zone) outside the margin.

3.1 Belfast, 1:10,000, printed May 1964, Leningrad. The text reads: "Plan compiled 1951 from 1:7920 plan 1947 edition and 1:10,000 plan 1940 edition, reprinted 1964. Compilers: Schischova and Rusina. Editor Galakina."
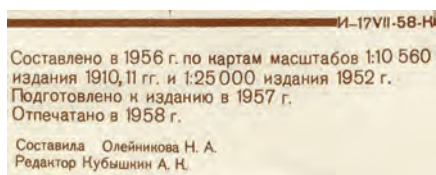
3.2 Kilmarnock, UK, 1:10,000, printed July 1958, Kiev. The text reads: "Compiled 1956 from map scale 10,560 edition 1910, 11 and 1:25,000 edition 1952, prepared for publication 1957, reprinted 1958. Compiler Olienikova H. A. Editor Kubyschkin A. K."
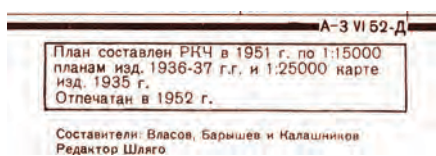

3.3 Zurich, 1:15,000, printed June 1952, Moscow. The text reads: "Plan compiled РКЧ 1951 from 1:15,000 plans of 1936–37 and 1:25,000 maps of 1935. Printed 1952. Compilers: Vlasov, Baryshev and Kalashnikov, Editor Schlyago."

satellite), the plans include a declaration in the margin citing the specific source mapping from which the sheet is derived. An early example is the plan of Sari, Iran, which states: "Plan compiled 1943 from 1:5000 and 1:15,000 photo-surveys of 1941 and visual reconnaissance 1943, printed 1944."

Figures 3.1, 3.2, and 3.3 show typical examples of the declaration of the sources used to derive data for the plans. In the case of British cities, the fact that the Ordnance Survey used imperial scales rather than metric scales helps to identify the sources mentioned. The Belfast plan, for example, specifies one source as "the 1947 edition of the 1:7920 plan." This is 8 inches to the mile, the same as the Ordnance Survey Belfast street plan, which was reprinted in 1947. It also cites a "1:10,000 scale plan of 1940," providing intriguing evidence of the possession by the Russians of captured German *Planheft* mapping, which was produced during the Second World War for the planned invasion of Britain. Unlike Soviet maps, the German maps were photo enlargements of standard Ordnance Survey six-inches-to-the-mile maps (1:10,560) enlarged to 1:10,000 and overprinted with additional detail, specifically targets for bombing raids (an example is seen at fig 3.64).

It is evident that these early Soviet plans were indeed derived from the respective British Ordnance Survey maps. However, it is also clear that sourc-
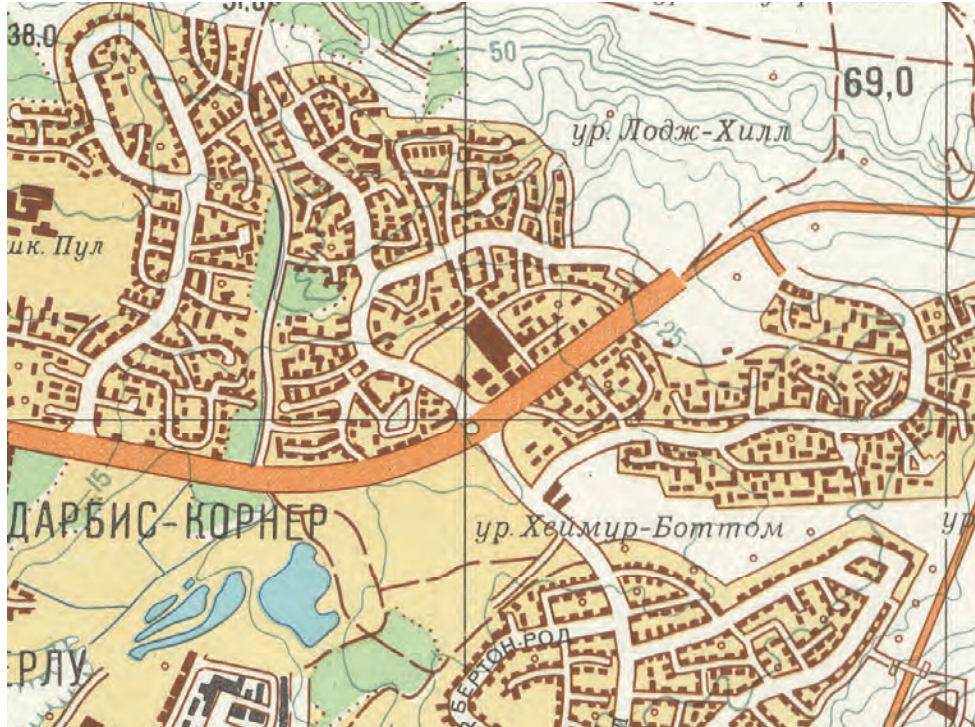
A rather confusing situation is seen at Alexandria, Virginia, on the Washington, DC, plan (compiled 1973, printed 1975), figure 3.20, which shows information not yet portrayed on the latest USGS maps but also omits some developments that are on the US map. Figure 3.21 shows the 1965 US sheet and figure 3.22 the same revised in 1971 (changes in purple). The Soviet sheet shows a new housing area south of Huntington Avenue, but not the new L-shaped building opposite. It shows one new building south of the trailer park (labeled "храт" [church]) and the new road north of the railway, but not the other building by the trailer park, the one on the opposite side of Telegraph Road, or the new interchange at the north end of Telegraph Road.

Many of the city plans show areas of new housing developments with street names omitted, indicating that the layout has been taken from aerial images and that no local maps or directories were available to provide the names (if the names were known, they would have been shown). Examples are shown in figures 3.23 and 3.24. Another example can be seen in figure 3.9, in the area to the east of the river.