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USSR Report

TRANSPORTATION

(FOUO 3/81)

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UDC 629.7.338.07.001.(022)

OPERATIONS RESEARCH IN CIVIL AVIATION

Moscow ISSLEDOVANIYE OPERATSIY V GRAZHDANSKOY AVIATSII in Russian 1980 (signed to press 30 Jun 80) pp 2, 256

[Annotation and table of contents from book "Operations Research in Civil Aviation", by Ivan Semenovich Golubev, Radiy Vladimirovich Sakach, Yevgeniy Leonidovich Loginov and Yevgeniy Georgiyevich Pinayev, Izdatel'stvo "Transport", 1700 copies, 256 pages]

[Text] In this book, the problems of operating the civil aviation system are dealt with, the basic productive and service operations are described, and methods of assessing their efficiency based on systems analysis and use of economic and mathematical methods are given. Also discussed are problems in optimization of management and planning of the sector.

This book is intended for scientific workers and may be used by engineers and students in civil aviation VUZ's.

It contains 67 illustrations, 7 tables and a bibliography of 95 titles.

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ECONOMICS OF THE AVIATION INDUSTRY

Moscow EKONOMIKA AVIATSIONNOY PROMYSHLENNOSTI in Russian 1980 (signed to press 22 Apr 80) pp 2, 366-368

[Annotation and table of contents from book "Economics of Aviation Industry", by Sergey Aramovich Sarkisyan and David Elkunovich Starik, Izdatel'stvo "Vysshaya shkola", 10000 copies, 368 pages]

[Text] In this textbook, the basic questions of the economics of the aviation industry are dealt with. Covered are the role of the aviation industry in the national economy and in defense of the country, and the scientific principles of management and planning of the sector. A major part is devoted to the questions of the economics of scientific and technical progress and to the economic substantiation of decisions made at the stages of development, production and operation of aviation systems. Pointed out are ways and means of raising production efficiency, labor productivity and work quality.

Designed for VUZ students of aviation specialties.

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BOOK ON CITY AIR TRANSPORTATION SERVICES NOTED

Moscow GOROD I AVIATSIYA in Russian 1980 (signed to press 16 May 80) pp 2, 182-183

[Annotation and table of contents from book "City and Aviation", by A. I. Borodach, B. N. Mel'nikov, V. I. Chernikov and G. I. Berdnik, Stroyizdat, 183 pages]

[Text] This book contains basic data on air transportation facilities established to service the city: airports for modern aircraft and flying vehicles with short and vertical takeoff and landing; heliports and city air terminals. Discussed are the requirements for locating air transportation facilities with respect to the city with regard to ensuring convenient interaction with it, preventing the unfavorable effects of aviation noise on the population, ensuring conditions for efficient operation of air transportation facilities and observing requirements for airship flight safety. Dimensions of territories needed for construction of airports, heliports and city air terminals are given. Basic principles for organizing passenger transportation between the city and the airport are set forth.

This book is intended for architects and specialists working in city building and planning of air transportation facilities.

It contains 40 tables, 87 illustrations and a bibliography with 22 titles.

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RAILROAD

NEW EDITION OF SOVIET BOOK ON RAILCARS PUBLISHED

Moscow VAGONY: KONSTRUKTSIYA, TEORIYA I RASCHET in Russian 1980 signed to press 18 Aug 80 pp 2-7, 14-15, 437-440

/Annotation; excerpt of introduction; chapter 1, section 1; excerpt of chapter 1, section 3; and table of contents from book by L. A. Shadur, doctor of technical sciences, professor: "Railroad Cars: Design, Theory and Analysis", Izdatel'stvo "Transport", third edition, revised and expanded, 15,500 copies, 439 pages/

/Text/ Annotation

This book describes the equipment, the selection of technical-economic parameters and overall dimensions and also the modern methods of analyzing railcars for strength. In comparison with the second edition, the third edition has been revised and expanded in connection with changes that have taken place in the designs, ratings and methods of designing railcars in recent years.

The book is to be used by students in railroad institutions of higher learning. It can also be used by engineering and technical workers in the railroad car maintenance facilities and in the railroad car building industry, who are engaged in designing, operating and repairing railroad cars.

/Excerpt from introduction/

Students specializing in "railroad car building and railcar facilities" study "Railroad cars", which deals with:

-designs of railcars and their assemblies, which differ in variety and in some cases in considerable complexity;

-ratings of railcar parts for strength and stability;

-the fundamentals of designing railroad cars (selection of technical-economic parameters, overall dimensions), methods of testing railcars and their assemblies.

These matters are studied in lectures, in laboratory and practical studies, in production practice, and in performing course and degree projects.

The study discipline "Railroad cars" is based on knowledge gained by students when studying other disciplines of the their course work, especially higher mathematics and theoretical and construction mechanics. In turn, the "railroad cars" course is the basis for studying subsequent disciplines such as "Railroad car dynamics", "Containers", "Refrigeration equipment of railroad cars and air conditioning", "Automatic brakes", "Railroad car electrical equipment", "Technology of railroad car building and the repair of railcars", "Organization and planning of production at railroad car building and repair enterprises", "Automatic equipment and the automation of production processes", "Railroad car management" and others. In addition, many of the theories of these disciplines are used in the "railroad cars" course.

Since the first and second editions of this textbook were published, important scientific research has been done, new designs of railroad cars and their assemblies have been developed, and there have been changes in the study plans of the institutes. All of this is reflected in this new edition of the textbook, which differs from the earlier editions in the following areas:

-a more complete outline of the theory of reliability and service life in regard to railroad car designs. In the fourth and other chapters methods for evaluating the fatigue strength of railroad car parts are outlined, including ways to evaluate the strength reliability of the elements of the railroad car design;

-an outline of the ratings of railroad cars using computers, which provide the receipt of more complete and precise solutions when reducing labor intensiveness. Digital computers are used to determine the optimal parameters of freight cars, to calculate the carriage underframes, the boilers of tank cars and others which bear the basic loads of a railroad car's elements;

-a justification for the new designs of railroad cars and their parts. In particular, chapters 11, 12 and 13 have been expanded, which are devoted to designs of freight and passenger railroad cars, and also chapters 5, 7 and 10 and others (hollow axels, pnuematic shock absorber suspensions, new automatic uncouplers, absorption equipment, etc.);

-an outline of new methods for analyzing the parts of railroad cars (analyzing the axels of wheel pairs, three-layer walls of railroad car bodies, and boilers of tank cars and others);

-the development of methods for the economic analysis of railroad car designs.

In connection with this chapter 3 was significantly expanded to include a description of a new methodology for determining the basic parameters of a railroad car. Other chapters of the textbook also contain technical-economic analysis.

As in previous editions, the textbook includes reference material which direct the student to sources that provide more information or that for the first time ever outline the question being studied. Learning materials and other literature are also indicated which contain examples of calculations, reference data and so forth.

This textbook structure was chosen not only in response to the problems of outlining an extensive course in a comparatively small volume, but also out of a desire to awaken in the student a wish to pursue independent study of some topic or another thereby helping the engineer to acquire the skills that he so needs in this work.

As in previous editions of this textbook, the international system of units was used. In particular, voltage and pressure are expressed in pascals (Pa) or in megapascals (MPa). In many cases when translating old units into new figures are rounded to 2 percent, i.e., 1 kgs/mm^2 $\approx$ 10 Mpa and 1 kgs/cm^2 $\approx$ .1 MPa. Since this rounding is used in both estimated and allowable voltages, it is not reflected in the accuracy of the results.

The carrying capacity of a railroad car, as a measure of the maximum cargo carrying capacity, is expressed in units of mass, i.e., in kilograms (kg) or tons (t). However, when analyzing railroad cars for strength and studying railroad cars for vibrations and for other calculations, the carrying capacity is expressed in newtons (N), kilo-newtons (kN) or mega-newtons (MN) based on the relationship between mass and force, i.e., by multiplying the mass by the acceleration g.

The railroad car container, viewed as its mass, is expressed in kg or t. In strength and other calculations, the container is expressed as the weight (force of gravity) in N, kN or MN.

The linear load, which represents the relationship of the sum of the carrying capacity and container to the length of the railroad car, is used to determine the mass of the train and is expressed in kilogram-meters or ton-meters. In calculating the strength of bridges and other such calculations, results are expressed in newton-meters, kN-meters and MN-meters.

Axle load is used in a similar way. However, since axle load is used in the textbook predominately to evaluate the strength of wheel pairs and other railroad car parts, this paramters is given in kN.

In preparing the new edition of the textbook the authors received valuable advice and comments from their co-workers of the departments of "railroad cars and the railroad car service" of the transportation institutes, scientific-research institutes, railroad car building plants and others. The authors are greatly indebted to them all for their help in improving the textbook.

Chapter 1. General Information on Railroad Cars

1.1 Description of the Railroad Car Park and Its Classification

Railroad transport, which is the basic form of transportation in the USSR, is very important to the Soviet Union. The normal operation of railroad transport requires the appropriate development and smoothness of operation in all of its links - sectors. The railroad car service and its foundation, the railroad car park, is one of the most important and complex sectors of railroad transport.

A unit of railroad rolling stock used to convey passengers or cargo is called a railroad car.

Of great importance are the efficiency of railroad car designs and their technical-economic indicators, which determines the convenience of conveying passengers, the carrying capacity of the railroads, the feasibility of extensively adopting comprehensive mechanization and automation when manufacturing and repairing railroad cars, and also their operation (the formation of trains, carrying out loading and unloading operations and so forth), and the amounts of capital investments and the cost of shipments.

The present-day railroad car park is remarkable for its diversity in types and designs. This is made necessary by the need to satisfy various requirements for shipments: the greatest carrying capacity of railroads, providing for the comfort of passengers, preserving the valuable qualities of perishable cargoes, preventing damage to fragile cargoes, protecting cargoes from moisture, universality, the maximum use of cargo carrying capacity and others.

These factors determine the complexity of railroad car designs, which are equipped with automatic braking systems, automatic coupling systems, undercarriages, which ensure motion at high speeds, the necessary smoothness, little resistance and so forth. Depending upon their use, railroad cars are equipped with thermal insulation, heating, refrigeration, air conditioning, electrical equipment and other devices.

Modern forms of traction make it possible to form heavy freight trains, to develop high speed motion and to make non-stop runs over great distances. This determines the requirements to ensure reliability and long service life of railroad car designs, to monitor their condition within short periods of time, including in inconvenient conditions of the inspection at the railroad stations. Traffic safety is the most important requirement upon the layout and maintenance of railroad cars.

There are railroad cars that are not self-propelled, which can only be moved by locomotives. There are also self-propelled railroad cars, which are called railway motor cars; these cars have their own power plant for motion (motor cars, transfer-cars, diesel trains) or they receive power from a contact grid (electric trains, metro cars).

Railroad cars are broken down by purpose, technical description and place of operation.

Railroad cars are broken down into two basic groups - passenger and freight cars.

A passenger car has a body, which is a closed facility with all basic equipment needed for passengers (equipment for sitting or reclining, heating, air conditioning and ventilation systems, toilets, convenient entrances and exits and so forth).

The passenger car park consists of cars for conveying passengers, dining cars, mail, baggage and special purpose cars.

Depending upon the distance of conveyance passenger cars differ in their layout. Passenger cars are broken down as follows:

-long distance, for conveying passengers over long distances. There are both compartmented and non-compartmented passenger cars. They are equipped with "hard" and "soft" benches for reclining and are therefore called "hard" or "soft" cars;

-local transport, for conveying passengers over shorter distances, predominately during the day. These cars have convenient seats for sitting;

-suburban, for conveying passengers over short distances within a relatively short period of time (1 - 2 hours); they are equipped with benches (hard or semi-hard) for sitting;

dining cars, for feeding passengers during their journey. The car has a room for eating, a kitchen, pantries for refrigerating and storing food stuffs and other sections;

-mail cars, for conveying mail cargo. The car has storage rooms and a large room for postal operations and facilities for service personnel;

-baggage cars, for conveying the baggage of the passengers on the train. These cars have storage rooms with loading and unloading equipment and facilities for service personnel;

-mail and baggage cars are used as mail and baggage cars on sections of railroads that convey small numbers of passengers.

Special purpose passenger cars include laboratory cars, duty cars, sanitation cars, club cars and so forth.

Depending upon the type of cargo transported, freight cars are broken down as follows:

-covered freight cars are used to transport grain and other friable cargoes, requiring protection from precipitation, and for transporting packaging materials and valuable cargoes. The car has an enclosed body and is usually equipped with hatches and doors.

-gondola cars are used to transport bulk freight (ore, coal, fluxes, timber, and so forth), containers, various equipment and so forth. The car has an open body, and is usually equipped with doors and unloading hatches;

-flat cars are used to transport long and bulky cargoes (timber, sheet metal, construction materials and unfinished construction materials), containers, motor vehicles, etc. These cars have floor boarding on a frame and usually sides that can be lowered;

tank cars are used to transport liquid and gaseous cargoes (oil, kerosene, gasoline, lubricants, compressed gases, etc.) The railcar body serves as a special reservoir (boiler), usually cylindrical in shape, which has hatches for filling and emptying the cargo;

-isothermal cars are used to transport perishable freight (meat, fish, milk, fruit and so forth). The body of these cars have insulation and equipment for creating the needed temperature and humidity levels. Present-day isothermal cars are constructed in the form of independent refrigeration sections with a central cooling plant or a complete set of cooling equipment in each car (independent refrigerator car). Previously we had railroad cars with ice-salt cooling;

-special purpose freight cars are used to transport freight that requires special handling. This group of cars includes transporters for carrying heavy and bulky cargoes, motor vehicle carriers, cars for carrying cement, cattle and other specific freight. There are also railroad cars which are used by the railroads themselves (railroad car shops, and railroad cars for auxilliary and fire trains and others).

Depending upon their technical description, passenger and freight cars are further broken down as follows:

-by number of axles -2-,4-,6-, 8-, and multi-axle cars. There are both bogie and non-bogie railroad cars;

-by material and manufacturing technology of the body - all-metal, with wooden or metal shell, basically welded with individual riveted units;

-by carrying capacity, size of container, load upon the wheel pair on the rails, load on one meter of track and other parameters;

-by size of rolling stock, to which they comply, and by width of the railroad guage - wide-guage and narrow guage.

By place of operation railroad cars are broken down into general line-operated and industrial transport. General line-operated railroad cars are permitted to operate on the entire railroad network of the USSR. Industrial transport railroad cars, if their designs fully comply with norms for calculations for strength and for railroad car designing of mainline railroads and with the requirements of the Rules of technical operation (PTE), are permitted on the tracks of the USSR Ministry of the

Railways. Railroad cars of other designs, which do not comply with these requirements, can be operated only only on intra-plant tracks and on other closed industrial tracks.

/Excerpt of Chapter 1, Section 37

In 1971 - 1975 railroad transport received 373,000 mainline freight cars, which was 1.5-fold more than in the previous five-year period. Industrial transport was also equipped with special railroad cars with an increased carrying capacity. At this stage the fitting out of the passenger car park with improved, comfortable, all-metal cars was completed. Railroad transport received 15,400 such railroad cars during the five-year plan.

A great deal of attention was devoted to improving the technical status of the operational park of freight cars through modernization: equipping the axle boxes with roller bearings, replacing wooden shells on gondola cars with metal shells, equipping covered freight cars with self-sealing doors, replacing flanged bogies with bogies having cast side frames and above-shock beams, and also replacing outdated brake designs with improved versions. During this period extensive theoretical and experimental research was conducted, which resulted in the building of experimental models of new passenger and freight cars. The Kalinin railroad car building plant produced a series of railroad cars for the "Russkaya troyka" train (RT200), which is to operate at a speed of 56 meters per second (200 kilometers per hour). The freight car park is being augmented with progressive types of railroad cars - 8-axle gondola cars and tank cars, all-metal covered freight cars, new refrigerator sections and motorized cars and flat cars for transporting large-cargo containers, and others.

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