



**TRANSPORTA un  
SAKARU  
INSTITŪTS**

**TRANSPORT AND  
TELECOMMUNICATION  
INSTITUTE**

**2000**

**ANNUAL REPORT**



*TSI*

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**TRANSPORT AND TELECOMMUNICATION INSTITUTE**

**2000**

**ANNUAL REPORT**

Riga – 2001

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## 1. Information About the High School

High school name:	Transport and Telecommunication Institute (Transporta un sakaru institūts)
High school legal status:	Joint-stock company
Registration number, place and date:	Reg. No. 000345890, Riga, September 6, 1999
Main type of business activity:	Higher education, Research
Address:	Lomonosova iela 1, Rīga, LV-1019, Latvia
Telephone:	+371-7100650
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Bank account data:	PAREKSS BANKA Bank code 301101708 Account No 0002063907 AS «Transporta un sakaru institūts» Lomonosova iela 1, Rīga, LV-1019 LV 40003458903
Licence issue date:	October 13, 1999
Study Programmes licensed:	<ul style="list-style-type: none"><li>• Bachelor of Engineering Sciences in Electrical Engineering and Electronics;</li><li>• Master of Engineering Sciences in Electrical Engineering and Electronics;</li><li>• Professional study programme in Electrical Engineering and Electronics;</li><li>• Bachelor of Sciences in Computer Science;</li><li>• Master of Sciences in Computer Science;</li><li>• Bachelor of Social Sciences in Economics;</li><li>• Master of Social Sciences in Economics;</li><li>• Bachelor of Social Sciences in Management Science;</li><li>• Master of Social Sciences in Management Science;</li><li>• Professional study programme in Transport and Business Logistics;</li><li>• Professional study programme in Business Administration on Transport.</li></ul>

Approval date of High School Satversme (Constitution):	May 30, 2000 (protocol No.1)
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Rector:	Eugene Kopytov
Persons with the first signature right:	Egons Lavendelis - Chairman of the Board; Igor Kabashkin – Vice-Chairman of the Board.

## **2. Brief Historical Background**

On August 12th, 1999 the Cabinet of Ministers of the Latvian Republic issued a resolution to start the liquidation process of the Riga Aviation University (RAU) as a state-founded high school. Some of the aviation-related study programmes, the academic staff and the infrastructure supporting those programmes became part of the Riga Technical University.

After RAU liquidation the major part of RAU academic staff was left without a permanent job. In order to keep the scientific and academic staff of the formerly existing high school, as well as to allow a substantial number of students to continue their studies in the programmes previously chosen, on September 6th, 1999 a joint-stock company "Riga Aviation University" (JSC "RAU") was registered.

On September 16th, 1999 JSC "RAU" presented an application for granting a licence to 11 academic and professional education study programmes to the Ministry of Education and Science.

On October 6th, 1999, advised by the Ministry of Education and Science, in order to avoid any confusion of the JSC with the formerly existing state high school, the name of the join-stock company was changed. The new name it therewith received was JSC "Transport and Telecommunication Institute" (TTI).

On October 13th, 1999, the Transport and Telecommunication Institute was granted a licence N 04038 with the right to provide higher education in 11 academic and professional education programmes.

## **3. The High School Aim and Objectives**

### **3.1. Actuality of transport education and research problems**

The creation of the united European transport market without restrictions or barriers to access, based on harmonised conditions of competition, is becoming one of the principal objectives of the common transport policy in Europe.

Beneficial Latvian Republic geographical location in the point of European Transit crossroads East-West and North-South directions activated intensive development of the Latvian Transport infrastructure.

In the recognition that a modern transport system is of exceptional national and economic importance, the Latvian government has elaborated the National Transport Development Program (1996-2010). This program contains the main strategic guidelines for the planning of an efficient transport system to satisfy the continually growing demand of the national economy.

One of the main tasks for reaching this goal is development of education and science in the field of transport on the basis of:

- development of promising and internationally harmonised study programmes;
- ensuring an efficient organisation of research activities;
- development of the new-type integrated (horizontal) research projects and educational programmes.

Within the framework of science harmonisation process, the Scientific Council of Latvia in 1998 approved a new area of science - "Transport science". So, a special importance and priority of research in this area was therewith acknowledged.

Actuality of the above mentioned factors is the background for the foundation of the "Transport and Telecommunication Institute.

### **3.2. TTI aim and objectives**

#### ***Aim:***

To provide competitiveness of the Latvian economy, a specially in the sector of transport, information technology and electronics by means of training specialists for both domestic and international market on the basis of modern education and science technologies with their harmonisation and integration on the international level.

#### ***Objectives:***

- Formation of an interdisciplinary education environment in the sphere of transport and infotelecommunication;
- Organisation of professional and academic education in the sphere of transport in accordance with the modern transport technologies' development and the dynamic process of changes in the market needs;
- Intensive research and consulting activities development.

Aim and objectives provided:

- in EDUCATION – by means of:
  - preparation of highly qualified specialists in different spheres of transport and telecommunication;
  - implementation of modern education methods, principles and technologies in study process, active use of computer technologies;
  - continuous improving of the study programmes in order to ensure a better understanding of the newest scientific achievements, fundamental knowledge and practical skills in all the transport, telecommunication and related sciences;
  - harmonisation of the study programmes at the international level.
- in RESEARCH – by means of:
  - realisation of national and international programmes and projects in transport and others areas oriented on education integration, development and improvement;
  - participation in the remarkable national and international research programmes and projects for the improvement of academic staff professional qualification;
  - involvement of students in the regional and international research activities, which are important for Latvia.

### **3.3. Guarantees of the aims and objectives achievement**

The guarantees that the aim and objectives shall actually be achieved are the following:

- involvement in study process of highly qualified scientific and academic staff with an impressive experience in pedagogical work and research;
- the Transport and Telecommunication Institute academic staff representatives as leading executives are involved into the State scientific programme "Latvian Transport System Optimisation" realisation;
- the TTI academic staff have a good knowledge, skills and experience previously received in international educational and training programmes;
- the co-operation with the regional and international professional organisations in universities, as well as with their professors and scientists;
- active participation of the high school and its staff members in the projects within the frame of EU 5th Framework programme.

## **4. High School Management**

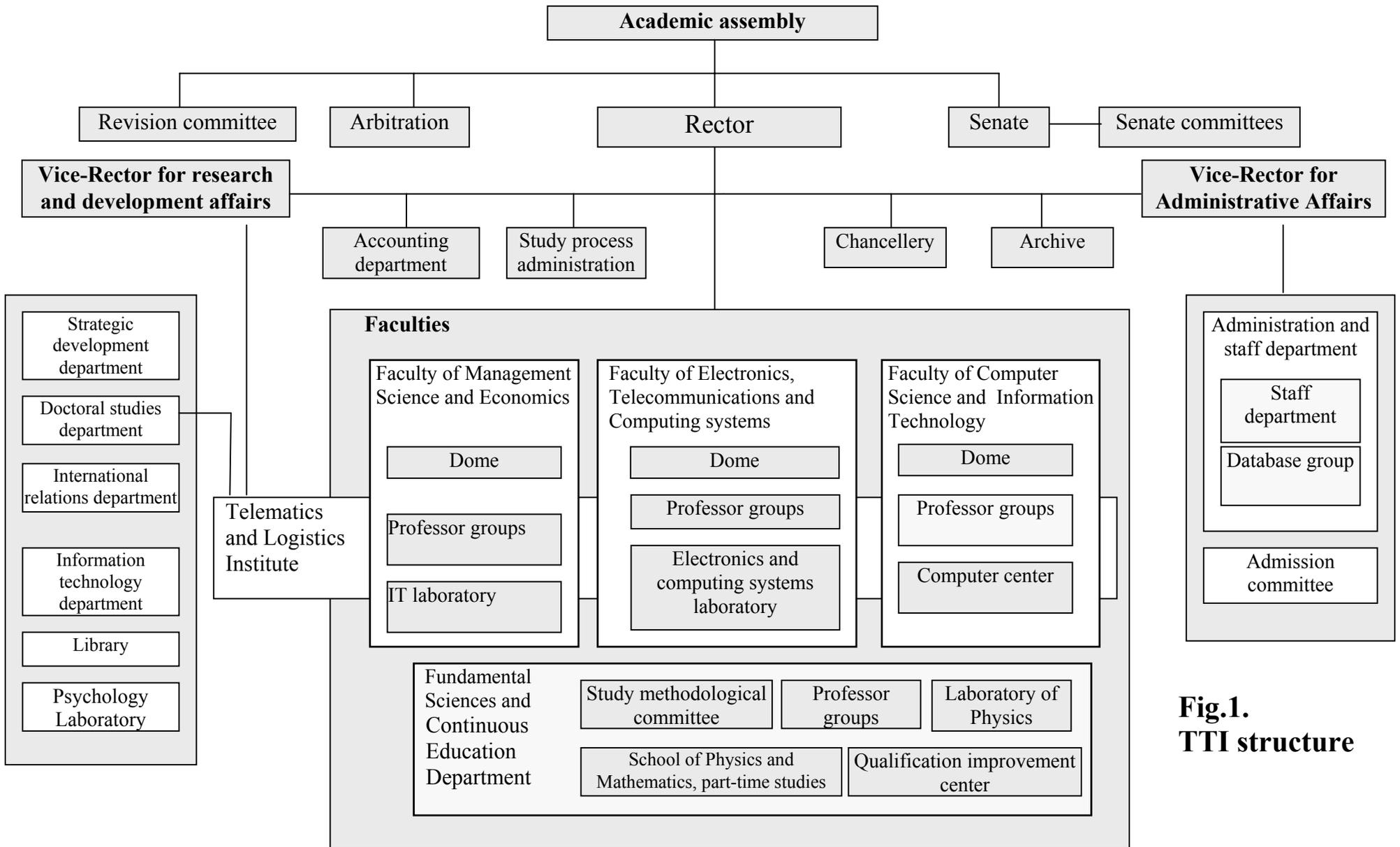
The high school management was organised in full accordance with the LR law "On Higher Education Establishments" and the democracy principles declared in the TTI Satversme (Constitution).

The Transport and Telecommunication Institute organisational structure is presented in Fig.1.

The normative documents regulating the high school major functions realisation technology, as well as TTI and its structural units management bodies operation principles are:

- TTI Constitution;
- Regulations on Revision Committee;
- Regulation on Arbitration;
- Set of TTI Regulations and Decisions of the TTI Senate.

The high school academic staff representatives and students are welcome to investigate texts of all the TTI normative documents in the TTI library.



**Fig.1.**  
**TTI structure**

## 5. Study Process Organisation and Management

### 5.1. General characteristics of the TTI study programmes

In accordance with the LR Ministry of Education and Science licence TTI carries out 11 higher academic and professional study programmes. The list of study programmes, number of students and academic staff are shown in Table 1.

Each year TTI trains students in all the study programmes at the Bachelor's and Master's degrees and professional education levels.

Table 2 contains information on the number of TTI graduates starting from the moment of the high school foundation.

Table 1

Information about TTI study programmes

Faculties	Number of students	Study programmes	Academic staff			Technical staff
			Total	of which		
				Dr/ Dr.Hab degree, (%)	Full-time, (%)	
Faculty of Electronics, telecommunications and computer systems	214	• Bachelor of Engineering Sciences in Electrical Engineering and Electronics	31	21 (67,7%)	25 (80,6%)	5
		• Master of Engineering Sciences in Electrical Engineering and Electronics	14	14 (100%)	13 (92,8%)	
		• Professional study programme in Electrical Engineering and Electronics	29	21 (75,6%)	25 (86,2%)	
Faculty of Computer science and information technology	532	• Bachelor of Sciences in Computer Science	42	27 (64%)	29 (69%)	8
		• Master of Sciences in Computer Science	19	16(84%)	12 (63%)	
Faculty of Management Science and Economics	491	• Bachelor of Social Sciences in Economics	29	18 (62%)	18 (62%)	3
		• Master of Social Sciences in Economics	19	14 (73,7%)	12 (63,2%)	
		• Bachelor of Social Sciences in Management Science	28	19 (67,9%)	17 (60,7%)	
		• Master of Social Sciences in Management Science	19	14 (73,7%)	12 (63,2%)	
		• Professional study programme in Transport and Business Logistics	27	20 (74,1%)	18 (66,7%)	
		• Professional study programme in Business Administration in Transport	28	21 (75%)	19 (67,9%)	
<b>Average in TTI study programmes:</b>				<b>74,3%</b>	<b>70,48%</b>	

Table 2

Information about TTI graduates from the moment of the high school foundation

Graduates	Faculty *)	Number of graduates		
		2000	2001	Total
Bachelor's degree	FMSE	59	46	105
	FETCS	52	46	98
	FCSIT	71	54	125
	Total	182	146	328
Master's degree	FMSE	35	33	68
	FETCS	20	7	27
	FCSIT	10	13	23
	Total	65	53	118
Specialists with a higher professional education degree	FMSE	7	9	16
	FETCC	1	-	1
	Total	8	9	17
<b>TOTAL:</b>		<b>255</b>	<b>208</b>	<b>463</b>
FMSE – Faculty of Management Science and Economics FETCS – Faculty of Electronics, Telecommunications and Computer Systems FCSIT – Faculty of Computer Science and Information Technology				

## 5.2. Study process organisation

A study year at TTI is divided into two semesters (spring and fall), each having a duration of 20 weeks, which corresponds to 20 credit points to be obtained. In accordance with the LR law "On higher education establishments" one credit point is equivalent to one week of load undertaken by students.

Students' academic load includes both tutorials (in contact with the teacher) and independent work. The amount of tutorials shall not exceed 50% of the total academic load.

The tutorials incorporate auditorium lessons, passing tests and examinations, practical lessons, consultations and other types of work in contact with the teacher.

Independent work assumes such types of activities as preparation for the lessons, performing all kinds of tasks and academic projects, working with study literature and other sources of information, independent development of practical skills.

## 5.3. System of knowledge assessment

Evaluation of students' knowledge is performed in accordance with the Ministry of Science and Education instruction.

A better objectivity of students' knowledge assessment is attained by means of performing the following activities:

- Written and oral testing examination forms are used in combination.
- Public presentation and defence of academic projects (workshops and conferences) is practised.
- Among the attestation and qualification commissions' members are specialists from other high schools, leading representatives of state, public and commercial organisations.

Each student will take a combination of compulsory and optional modules. The student learning objectives are defined in terms of knowledge and understanding. In-course Assessed Written Assignments are used to assess knowledge and understanding in depth. They also serve to assess the critical skills of retrieval, organisation and analysis of information, reasoning, deduction and critical thought, and written communication. In-course projects are used to assess the ability to conduct and report on empirical work; team-working and oral presentation skills are assessed in this way. Attainment in the in-course assessments is indicative of the student's acquisition of appropriate attitudes to learning and self-awareness of deficiencies.

A candidate's performance in each study course (module) is assessed separately. Examinations in respect of modules taught by the Department are taken normally when the module ends: modules taught only in Semester 1 are examined in the assessment period at the end of Semester 1. Modules taken only in Semester 2 or spanning the two semesters are examined in the assessment period at the end of Semester 2.

The objectives of unseen examination papers are to assess the candidate's:

- core knowledge and understanding of prescribed topics;
- ability to present, display and use knowledge and understanding in a structured and coherent manner.

Answers are assessed for:

- content - information relevant to the question posed;
- comprehension - demonstration of understanding and critical thinking in relation to the topic and issues discussed;
- presentation - display of knowledge and understanding in a structured and logical fashion, with coherent linking of arguments.

The objectives of assessed written work are:

- to develop and assess ability to retrieve information relevant to a particular problem or topic;
- to develop and assess ability to present an in-depth argument and to integrate and apply knowledge from diverse sources;
- to develop cogency, clarity and critical thinking;
- to act as a focus for self-directed learning.

The objectives of quantitative and empirical assignments are:

- to develop and assess ability to apply quantitative techniques and empirical methods;
- to develop and assess ability to interpret and critically evaluate the results of empirical work;
- to act as a focus for self-directed learning.

Assignments will be assessed for:

- content - information relevant to the question posed;
- comprehension - demonstration of understanding and appreciation of relevance of concepts, techniques and results;
- presentation - the structure and clarity of written answers.

## 5.4. Quality assurance

Ensuring a high quality of study process is one of the high school's prime aims. How successfully it is achieved determines TTI graduates' competitiveness in the labour market. The structure of the TTI education services quality management system is presented on Fig.2.

The achievement of this aim is based on the mutual and genuine interest of all the study process participants (academic staff, students and administration) in improving quality of study process.

To control the study quality, TTI organizes questionnaires where study programmes, courses, faculty work quality and administration achievement to ensure the study process are evaluated. The evaluation of the questionnaire results gives grounds to conclusions and proposals of the study process quality improvement:

1. To provide the teachers with the possibilities to improve the knowledge of subject methodology (visual aids, public presentation skills, information presentation way (degree of complexity, coherence, explanation skills, comprehensibility, clarity), exposition of the material, etc.).
2. To increase the role of practical and independent work in certain study courses (in many cases students mention they would like to have more group work, independent work, seminars, discussions, practical workshops, examples, practical tasks, projects, tests, handouts, in other words, things that would contribute to better understanding and relationship to real life, thus advancing their professional education).
3. To improve the organization of academic work in general and study courses in particular (to have a lesson time-table in good time at the beginning of the semester, to inform the students timely about the changes in the time-table, to start and finish the lessons on time, not to miss the lessons, etc.).
4. To evaluate the study courses that are considered too complicated by the majority of the students - is it connected with real difficulties or does it have a subjective reason?
5. For the academic staff - to evaluate the results of the opinion poll.

The Deans and heads of the Professor groups, responsible for the study programmes, regularly meet their students to hear their proposals and suggestions for the improvement of the study process. The heads of the TTI and Faculties selectively take part in lectures and seminars and evaluate the lecture afterwards. The study quality is improved by small teamwork, systematic assessment of knowledge, analysis and evaluating of tests and practical work, public discussion and analysis of reports and project works. At least three teachers from the corresponding study programme take part in the year project discussion and evaluation.

The study programme evaluation is managed by the Board of Studies, which reports to the Faculty Duma. The Faculty operates systematic and comprehensive mechanisms for eliciting student and staff opinion on the effectiveness of its study programmes in achieving desired outcomes.

These mechanisms include the following:

- Student perceptions of the teaching and supported learning associated with each module are systematically elicited by anonymous questionnaires, distributed towards the end of the teaching period in respect of each module.
- Student perceptions of the Department's study programmes are systematically elicited by anonymous questionnaires, distributed towards the end of the academic year.
- General issues arising from student questionnaires and staff feedback are reviewed by the Teaching and Learning Committee, and where appropriate recommendations are made to the Board of Studies and Faculty Teaching Committee.
- Student representation on the Faculty Duma and on the TTI Senate Committees.

Internalisation of the study process plays an important part in ensuring its quality. Since the first days of operation TTI has a wide cooperation with different foreign Universities (see Chapter 12). Exchange of teachers is an important element of ensuring study quality; therefore we have guest lecturers at TTI, and some TTI teachers have had an in-house training in foreign Universities, preparing study programmes and lecture courses.

TTI and its study programme have been accredited in different international organizations (see Chapter 12).

A scheme setting out the basic principles of the internal quality control system operation is given in Appendix 1.

## **5.5. Study programmes management**

The efficient operation of the programmes is ensured by the TTI normative documents. The context of normative documents is correlated with the LR law "On Higher Education Establishments", instructions of Ministry of Education and Science, TTI Rector orders and the Senate decisions.

The principles of the structural units participation in the management of the programmes, as well as the list of related documents are set out in Appendix 1.

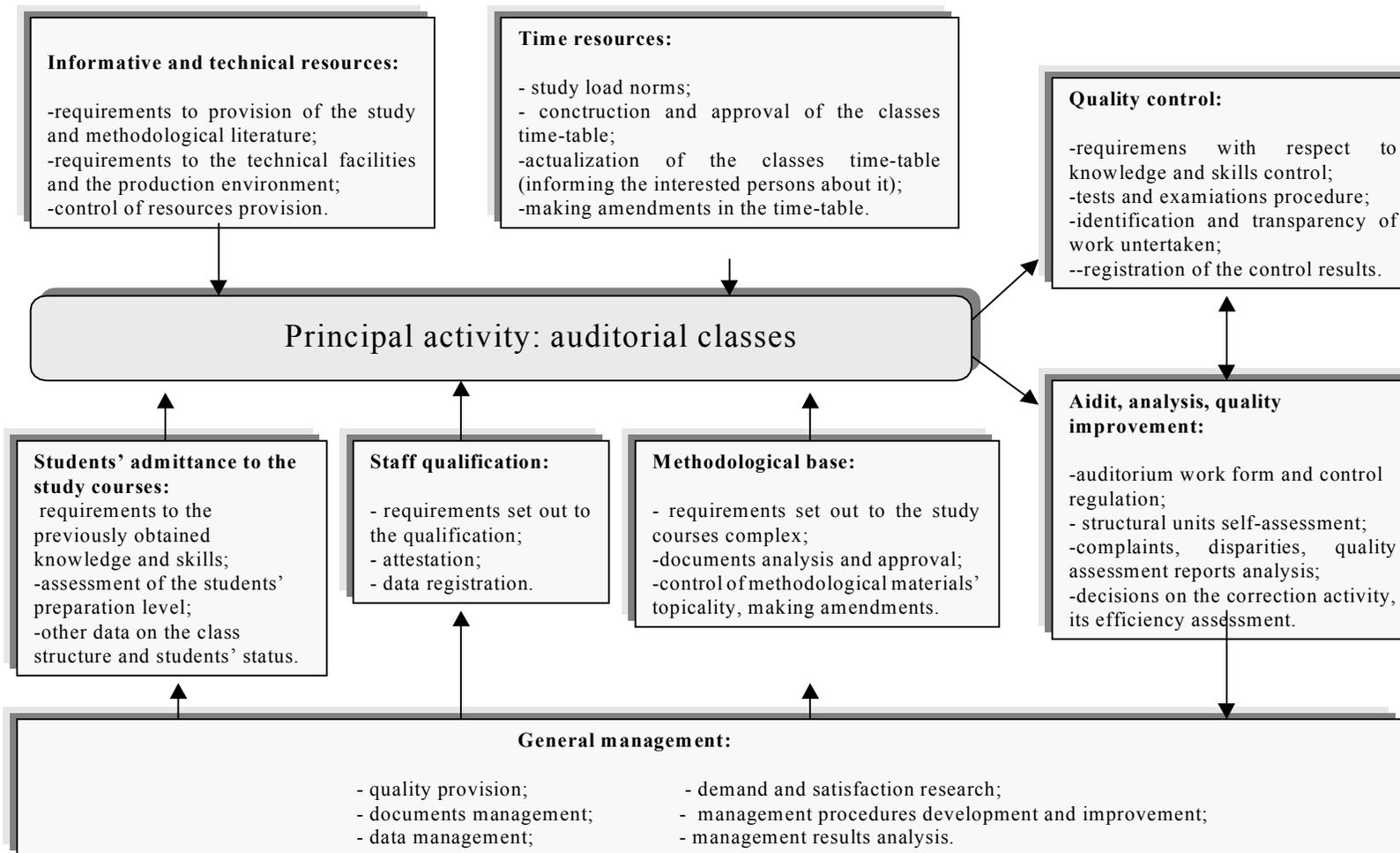
## **6. Academic staff**

The study process at TTI is provided by 104 persons' academic staff and 16 representatives of the technical staff.

The academic staff characteristics are presented in Table 1.

On average, study programmes are provided by academic staff, 74,3% of which hold a Doctor or Hab.Doctor degree, and 70,48% of which are employed by TTI on the full-time basis.

The most recent publications of the academic staff members and their research activities are presented in the Appendix 7.



**Fig.2. Structure of the TTI education services quality management system**

## 7. The high school resources and financial statement

### 7.1. Premises and rooms

For the study process realisation the high school use two buildings situated in 1 Lomonosova str., Riga. Their total area is 5338,5 sq.m.:

- 9-storey building (lit. N 72) - leasing agreement for a 10-year period – 4183,8 sq.m.
- 2-storey building (lit. N 71) – leasing agreement for a 99-year period – 658,0 sq.m.
- additional laboratories in building lit.N 68 – leasing agreement for a 3-year period – 334,7 sq.m.
- additional auditorium classes in building lit.N 3 – leasing agreement for a 3-year period – 162 sq.m.

The distribution of the premises for the study process purposes is presented in Table 3.

Table 3

Premises distribution for the study process needs

	Name of the premises	Area, sq.m.
1.	Auditoriums	2021,7
2.	Laboratories	422,9
3.	Staff rooms	687,8
4.	Assistance room (cellar, 1st and 2 <sup>nd</sup> floor halls, etc.)	1722,8
5.	Library	350,6
6.	Canteen, cafeteria	132,7

Following students' request, the high school also leases 3 campus premises (Lauvas str., 10A Reznas str. and 25A Prusu str., Riga). The approximate number of students living on campuses each study year is 100.

The sport training are conducted on the basis of RAU sports complex in according with agreement.

The high school has applied for the privatisation of the premises used in the study process. The documents were handed in to the LR Privatisation Agency and the Ministry of Education and Science.

### 7.2. Technical and computer facilities

TTI ensures the study programmes realisation on the basis of own technical facilities and services, as well as the training and production equipment supplied by the high school partner organisations and enterprises.

### 7.2.1. High school own facilities

During the period since TTI foundation the following laboratory classes have been created (financed by TTI own investments):

- two laboratory classes for physics;
- two laboratory classes for electronics;
- transport telematics laboratory;
- telecommunications laboratory;
- 7 computer classes.

The major equipment available in the above mentioned laboratories is listed in Appendix 2.

### 7.2.2. Utilisation of the partner organisations and enterprises training and production equipment

TTI has concluded a number of co-operation agreements with a large number of organisations and enterprises. They stipulate for a mutual utilisation of these partners' material resources. On the basis of these agreements the high school has received an opportunity to make use of the material resources and technical facilities shown in Table 4.

Table 4

Technical facilities of TTI partner organisations  
that are used in the study process

Organisations	Type of technical resources
“Latvijas Gaisa Satiksme” “Aeronavigation service”	Telecommunications, radio navigation and radio location equipment, which is used in the aircraft traffic management, incl. equipment working on the basis of the satellite technology. Simulators for pilots, controllers. Test, measurement, diagnostic and control equipment for maintenance of electronic systems.
JSC “RRR-Radiotehnika”	Acoustics laboratory, measurement stands, workplaces for the radio equipment designers and mounting specialists
JSC “Alfa”	Semiconductors production equipment that is used in the semiconductors construction, measurement and control
Auto transport association “Latvijas Auto”	Laboratories of transport systems and a computer laboratory at a training center
Rīga free port	Port facilities and production documentation
Airport “Rīga”	Airport facilities and production documentation

### 7.2.3. Computer facilities

There are 162 computers at the Transport and Telecommunication Institute for study process and administrative work operation. Majority of these computers are also provided with Internet-access. The computer facilities analysis is given in table 5.

All the computers at the Institute are connected in a local network. The computers of the administration and teaching staff are supplied with personal ink or laser printers. All the computers have access to highly powerful network digital printers.

All the faculties and the major structural units are additionally supplied with scanners (11), copier machines (15), presentations equipment and other facilities that are necessary for the use of modern study methods and information technology applications.

All computers of the administration and academic staff as well as computers in four computer laboratories are provided with Internet-access.

TTI also covers the expenses of its staff on the Internet-access from their home PC's.

Table 5

Computer facilities

Auditorium	CPU type	Amount	RAM	HDD	Notes
4-100	Pentium III	25	64 Mb	10,2 Gb	
4-303	Pentium III	15	128 Mb	10,2 Gb	Internet
4-304	Pentium II	12	32 Mb	6,4 Gb	Internet
4-305	Pentium II "Celeron"	12	64 Mb	6,4 Gb	Internet
		3	32 Mb	6,4 Gb	
4-306	486 WorkSt. SUN	10	16-32 Mb	0,4-1,5 Gb	
		2	8 Mb	40 Gb	
4-411	Pentium II	8	32 Mb	6,4 Gb	
4-512	486	10	32 Mb	400 Mb	Laboratory of Electronics
A-217	"Celeron"	2	32 Mb	6,4 Gb	Laboratory of Physics
Main building hall	486	2	16 Mb	400 Mb	E-mail terminals
Library	Pentium III	8	128 Mb	20,2 Gb	Internet
Administration and teaching staff	Pentium III, Pentium II	53	64...128 Mb	5...20,2 Gb	Internet
<b>TTI total:</b>		<b>162</b>			

### 7.3. Library facilities

TTI library is currently occupying a 120 sq.m. area. In accordance with the high school development plan, in October 2001, reconstruction of the building (lit. N 71), which is leased by the Institute for 99 years, shall be finished. The 1st floor of this building is allotted to a library.

These premises are planned to be used for the funds' storage purposes, a periodicals hall, a reading-rooms, a computer centre with an Internet-access, a copy centre, an electronic catalogue.

General description of the library's funds is supplied in table 6.

The description of periodicals subscription is presented in Appendix 3.

Table 6

General information on the library funds

Type of the fund	Units	Amount
1. Study literature	Books (volumes)	4288
2. Scientific and technical literature	Books (volumes)	8246
3. Scientific and technical Journals and Magazines - incl. in English	Amount of subscriptions of periodicals	124 75
4. Newspaper subscription, - incl. In English.	Amount of subscriptions	11 3
5. Electronic publications	CD-ROM, floppy disk	64

### 7.4. Editing and publishing activities

At the high school's disposal there is an editorial and a small publishing house facility. Their principal objective is to prepare and then to publish study course materials and other methodological literature with a small circulation (up to 100 copies). If the circulation exceeds 100, then the study and methodological literature is published in a professional typography.

TTI regularly publishes the following printed editions:

- scientific magazines;
- monthly study newspaper, "TSInfo";
- books and working papers.

All the magazines and study material published by the high school are provided with international bibliographic indexes ISSN and ISBN.

**a) Scientific magazines published by TTI:**

- *Journal of Transportation World Wide* - ISSN 1093-8826

*Host organisation:*

University of Nebraska at Omaha (USA)

*Co-Sponsor Organisations:*

NASA Kansas Space Grant Consortium (USA)

NASA Nebraska Space Grant Consortium (USA)

Transport and Telecommunication Institute (Latvia)

World Aerospace Education Organisation

Editor: Brent Bowen, Aviation Institute, UNO

Co-editor: Igor Kabashkin, Transport and Telecommunication Institute, Latvia

- *Computer Modelling and New Technologies* - ISSN 1407-4591
- *Computer Modelling and New Technologies (on-line)* - ISSN 1407-5814

Editor: Igor Kabashkin Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia

Co-editor: Yuri. N. Shunin. Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia

- *Transport and Telecommunication* - ISSN 1407-6160
- *Transport and Telecommunication (on-line)* - ISSN 1407-6179

Editor: Igor Kabashkin Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia

**b) Study and methodological literature published by TTI:**

During the last 1,5 years the high school has published 36 study books.

## 7.5. Financial Statement

In 2001 TTI has successfully completed its financial activity audit, which covered the period of the Institute's operation from the very foundation in 1999. The audit was performed by a widely recognised international company "PriceWaterhouse Cooper's". The auditor's report is presented in Appendix 4.

The data on TTI consolidated cash flow in 2000 are presented in Table 7.

Table 7

Consolidated TTI cash flow articles, 2000

Income / expenses articles	Ls	%
<b>Income</b>	733514	100
of which:		
tuition fees	519048	70,76
research activity	206390	28,14
equipment leasing	4671	0,64
sponsor assistance	945	0,12
percentage income accrued on the account balance	2460	0,34
<b>Expenses</b>	733514	100
of which:		
salaries, incl. bonuses paid of profits	248675	33,90
employer social insurance payments	62728	8,56
expenses connected with scientific projects realization	201170	27,43
rent and municipal payments	63294	8,64
equipment, study facilities, books	26072	3,56
advertising, Internet, telecommunication networks	45069	6,15
stationery	6458	0,87
services to other organisations	6483	0,88
travelling allowances, conferences	2707	0,37
regular refurbishment	18780	2,56
other	5822	0,79
Profit (investment in the infrastructure)	46258	6,30

## 8. Research Activities

The academic staff of high school actively participates in the realisation of a number of research projects - both Latvian-scale and international, financed by the foreign foundations. Students also become participants of such work - they contribute the crucial aspect of a creative environment. For them such experience is an outstanding opportunity to prepare a Bachelor or a Master's thesis at a high scientific level.

Major forms of research work at the high school are the following:

- Organisation of conferences at an international level, republic-wide and within the high school;
- Publishing three scientific technical magazines, one of which - in USA;
- Taking part in the realisation of 6 European scientific projects;
- Taking part in the realisation of 3 state national research programmes;

- Taking part in the realisation of research projects which were ordered by Latvian or foreign organisations and enterprises (in 2000 nine such projects with the total sum of 206 390 Ls have been completed, and in 2001 - 9 agreements have already been reached and part of them have already been completed. The total sum of these projects in 2001 reached 285 800 Ls).

In 2000 the profit gained from the research projects realisation reached 28% of the total high school budget.

TTI develops a permanent tradition of organising a Master's degree student's scientific conference each year. Participation in this conference is compulsory. In 2001 64 Master's degree students have participated in this conference with their presentations.

Another tradition at TTI is student's participation in the Republic-wide and international conferences, often making presentations of their papers and research work results. For instance, 26 TTI students took part in the Nordic Baltic Transport Research Conference that took place in Riga, on April, 13th-14th 2000, 14 students participated in the 2nd Baltic Sea Region Communications Forum which also was held in Riga, on September, 26th-27th, 2000. As for the TransBaltica 2001 conference that was held on July 7th--8th, 29 TTI students took part in it.

A more detailed information on the research projects carried out by the TTI staff, major fields of their research activities and the most recent scientific publications is to be found in the Appendix 7 of the report.

## **9. Terms of the Staff Remuneration**

The remuneration of the high school academic and assistance staff is determined in accordance with the legislation currently in force and shall not be lower than the minimal rate determined by the LR Cabinet of Ministers. The sum of the remuneration is determined on the basis of an individual employment agreement concluded between the employer and the employee.

## **10. Work with Students**

### **10.1. Principles of admission policy**

Students admission to the high school is organised in full accordance with the LR law "On higher educational establishments", the Ministry of Education and Science requirements that are further set out in a more detailed manner in the TTI admissions regulations which are approved by the Senate each year and then announced to those interested in entering the TTI not later than 5 months before the beginning of the studies.

### **10.2. Advertising and public relations**

The publications concerning opportunities of studying at TTI have both informative and marketing nature. These are designed for both specialists seeking opportunities of further education and school-leavers just making their first choice in future profession and career.

The sources of such information are:

- web-site of the Institute (www.tsi.lv) as well as web-sites of the partner organisations;
- brochures and posters published by the Institute;
- advertisements in mass media:
  - newspapers (Dienas Bizness, Diena, Neatkarīgā Rīta Avīze, СМ-вести, Бизнес & Балтия, Образование и карьера, TSInfo, Digital Times, Weekend etc.);
  - television (TV-3, LTV-2, LNT and cable TV channels);
  - radio (Doma laukums, PIK, SWH);
- taking part in exhibitions (Skola-2000, Skola-2001);
- "open door" days, Olympiads in Mathematics, Physics, Informatics and Social Sciences organised for schoolchildren;
- meetings of the Institute top management with secondary schools staff;
- other types of activities (conferences, competitions, meetings, etc.).

The advertising and informative work undertaken with respect to the programmes currently under consideration is performed in a complex way.

### **10.3. System of tuition fees**

The tuition fees system is developed in accordance with the LR law "On higher education establishments". The fees are determined individually for each study programme and each study form (full time or part-time studies). The payment orders are paid for by the students themselves or other physical or juridical persons with or without additional conditions which is all specified in the mutual agreement. Special discounts are granted to individual students with a special Rector order. The TTI students, just as any other establishment students, have the right to use the benefits and loans stipulated for in the LR state normative documents.

Additional from the above mentioned, the TTI students have the rights to receive a tax-free target-financing loan:

- at Parex Bank;
- at the JSC "Transport and Telecommunication Institute".

The principles of receiving the loan are set out in the corresponding special regulations. The relevant procedure is then performed by a committee, which was elected especially for this purpose.

The successful students who show outstanding ability and talents in creative work, for the purpose of their material stimulation, can be granted the personal scholarships of Parex Bank. Their amount is 200 USD per month. The total scholarship fund assigned by the bank for these purposes is 10 000 USD per year.

### **10.4. Studies Opportunities for International Students**

In accordance with the LR law "On Education" and LR law "On higher education establishments" the foreign citizens are allowed to study at the high school.

At the present moment 67 foreign students from 15 countries are studying at TTI. These are Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, India, Israel, Kazakhstan, Russia, Lebanon, Lithuania, Morocco, Mongolia, Peru and Sri-Lanka.

In 2000 and 2001 22 foreign students from 7 countries have successfully graduated from TTI and received their higher education diplomas.

## 10.5. Evaluation of TTI graduates prospects in the labour market

Transport is one of the primary sectors in the economy of Latvia. Share of the Transport and Communication sector in the Gross Domestic Product of Latvia is 17,8%. The share of the transport services in the total value of Latvia goods and services export is approximately 25%. Also, about 34% of all the investment capital is being allocated in the sphere of transport.

In the environment of a dynamically developing transport sector a constant demand for qualified specialists arises. That is especially true with respect to such spheres as Transport management, Transport logistics, Electronic systems of transport management, Economic provisions for the operation of small and medium transport enterprises.

An opinion poll which involved employees of 54 transport organisations and firms and which was conducted by the Latvian Transport education and development association in the framework of the transport system optimisation programme realisation, provided the following answers to the question about the usefulness and necessity of training specialists in the corresponding study programmes.

Table 11

The usefulness of training specialists in the study programmes

<b>Study Programme</b>	<b>Training is useful, %</b>	<b>Training is not useful, %</b>	<b>Difficult to answer, %</b>
Transport management	94	4	2
Transport logistics	98	-	2
Electronics	78	6	16
Economics	82	16	2
Computer science	81	15	4

Analysis of the opinion poll results provides evidence of the transport enterprises' high demand for the specialists trained at TTI, in all the study programmes.

A similar conclusion can be reached as a result of the "Latvian Transport Development Programme" (1996-2010) materials analysis. Above mentioned is shown that the specialists trained at the Transport and Telecommunication Institute have good prospects in the Latvian labour market.

## 10.6. TTI programmes assessment by students and employers

The programme assessment analysis has been performed with the help of questionnaires that were offered for filling in to students and employers. The analysis and summary have been performed in a differentiated way, i.e. separately for junior and senior courses, as well as for the employers.

Students' assessment may be summarized as follows:

- has changed for the better 43%,
- has not changed 45%,
- has changed and became worse 12%,

The average number of points assigned to the programme: 7,5 (in a 10-point system).

The programmes features that were assessed the lowest:

- support with handouts, reference materials, software, etc.
- lecture halls modern technical equipment
- extracurricular activities (sport games, excursions, parties, etc.).

Employers' assessment:

Attitude to specialists training at TSI:

- interested 90%,
- indifferent 10%,

The graduates' qualities that are considered to be the most important:

- professional knowledge 83%,
- computer literacy 43%,
- knowledge of foreign languages 43%,
- ability to work in a team 33%.

## 10.7. Students self-government. Students' cultural and sports life

Students' self-government at the high school is organised in compliance with the LR legislation. Its operation is controlled by the Regulations on the TTI Students' self-government.

Students have representation rights in all the TTI democratic institutions.

Once a month the high school students publish their newspaper, where the most crucial life and rest problems of students are being discussed.

TTI use of the biggest cultural and entertainment centres in Riga for the extracurricular activities of students. For example, the traditional party of "conferment into students" took place in the "Nautilus" night club, the action "Youth against drugs" was organised in the Vermanes park, the Christmas and New Year party - in the musical centre "Vernisāža".

The high school pays a lot of attention to sport. All the organisational problems of sports events at TTI lie within competence of the TTI sports club. The high school regularly organises competitions in football, volleyball, basketball, chess and other kinds of sport. The Institute sportsmen successfully participate in the University Olympiad of Latvia and other competition. For example, in 2000 the TTI team won the 3<sup>rd</sup> place in the chess competition, while in 2001 - the 1<sup>st</sup> place, which gave TTI an opportunity to represent Latvia in the European teams championship. In 2001 the TTI volleyball team won the 3<sup>rd</sup> place on the Latvian championship (group B), while the football team won "gold" - 1<sup>st</sup> place in the group B. A number of students have also achieved remarkable results in the individual kinds of sport.

## **10.8. Organisation of students' internship**

For the purpose of obtaining practical skills as well as developing the theoretical base, students in all the study programmes take an internship. After completion of the theoretical disciplines envisaged in the 2<sup>nd</sup> year, students' introduction internship is taking place. Its main purpose is to introduce students to the information and technological systems used by organisations and enterprises. After having completed the internship, students will have to prepare a report.

The practice foreseen to be undertaken after the 3<sup>rd</sup> year assumes that students shall have the task of developing the fragments of complete system or technology that would be performed in accordance with the individual tasks.

During the 4<sup>th</sup> year of studies students are supposed to take a pre-diploma internship. During that period students are engaged in the thesis project development. This complex of internships shall serve as a basis for the thesis preparation.

TTI has agreed upon the students' internship realisation at more than 20 firms and organisations. The largest numbers of students were directed for internship at the JSC "RRR-Radiotehnika", JSC "Parex Bank", such enterprises as "Latvijas Gaisa Satiksme", "Rīgas Brīvosta", "Aeronavigācijas Services".

## **11. Co-operation with organisations in Latvia**

### **11.1. Membership in the Latvian professional associations and unions**

TTI is a member of the following Latvian organisations and actively participates in their operation:

- Latvian Transport Development and Education Association;
- Association of the High Schools Founded by Juridical Persons;
- Intellectual Property and Innovations Academy;
- Latvian Virtual Education Association;
- Latvian Autotransport Association "LAUTO";
- Latvian Engineers Association;
- Latvian Electrical Engineering and Electronics Manufacturing Association.

### **11.2. Co-operation with Latvian high schools and professional education centres**

TTI has concluded co-operation agreements and actively co-operates with the following educational establishments:

- University of Latvia;
- Latvian Maritime Academy;
- Information Systems Management High School;
- Riga International High School of Economics and Business Administration;
- Baltic Russian Institute;

- Social Technologies Institute;
- Riga International Management Study Centre;
- ANS (Aeronavigācijas serviss) Training Centre;
- Latvian Autotransport Association “Latvijas Auto” Training Centre;
- Riga Managers School;
- Study centre “RIMAN”.

## **12. International co-operation**

### **12.1. TTI membership in international professional associations and unions**

TTI and its employees are members of the following international organisations (and actively participates in their operations):

- International Civil Aviation Organisation;
- European Association for International Education;
- International Telecommunication Academy;
- International Centre for Engineering Education;
- World Aerospace Education Organisation;
- Air Transport Research Group;
- Institute of Electrical and Electronics Engineers;
- Association for Computing Machinery;
- Society of World Conference on Transport Research;
- Association for Computing Machinery;
- New York Academy of Science;
- International Academy of Ecology and Life Protection Science;
- Nordic Research Society;
- International Association for Automotive and Road Engineering Education;
- EURO Working Group on Transportation
- International Association of Science and Technology for Development.

### **12.2. Co-operation with foreign high schools**

TTI has concluded co-operation agreements in the academic and research sphere with the following foreign organisations:

- Andrey Cohen College, New York, USA;
- Linköping University, Sweden;
- Helsinki University of Technology, Finland;
- London University, UK;
- University of Sheffield, UK;
- University of Hertfordshire, UK;
- Technical University of Berlin, Germany;
- Tartu Aviation College, Estonia;

- Vilnius Technical University, Lithuania;
- Institute of Transport Economics, Norway;
- Politechnica Warszawska, Poland;
- Politechnica Swietokrzyska w Kielcach, Poland;
- Tashkent State Aviation Institute, Uzbekistan;
- Ukrainian National Technical University “Kiev Polytechnic Institute”, Ukraine;
- Civil Aviation Academy of Kazakhstan, Kazakhstan;
- Belarus State Economical University, Belarus;
- Moscow State Automotive and Road Institute (Technical Institute), Russia;
- Toliatti Polytechnic Institute (The Tatischev Volga University), Russia;
- Nizhny Novgorod Technical University, Russia;
- Moscow State Academy of Motor and Tractor Mechanical Engineering, Russia;
- Siberian Aerospace Academy, Russia;
- Moscow State Technical University after N.E. Bauman, Russia;
- Baltic State Academy of Fishing Industry Fleet, Russia;
- The Gagarin Russian State Research Experimental Centre for Cosmonaut Training, Russia.

### **12.3. Co-operation in the international research projects**

TTI currently participates in the realisation of 6 European research projects and in some research projects within the frame of “Northern Dimension” initiative. In the framework of these projects the Institute actually co-operates with tens of European scientific and educational institutions.

Information about these projects is presented in the Appendix 7 of the Report.

### **13. The high school development plan**

Preparation of the high school's yearly and long-term development strategy is one of the prior objectives of the Institute's management.

The TTI development strategy is aimed at achieving the major goal of the high school - improvement of the academic and research work.

The short-term and long-term strategic development plan is prepared and coordinated by the TTI Vice-rector for research and development affairs, as well as the strategic development and analysis department.

The strategy of the high school development foresees a 5-year time span operation. It takes into account the situation in the state higher education system, the high school resources, its needs, strengths and weaknesses singled out in the course of the SWOT analysis. TTI performs SWOT analysis on a yearly basis in the framework of high school top management special training.

The major trends in the high school strategic development are:

- Consolidation the high school positions in the market of educational services;
- Entering the international market and consolidation positions in it;
- Improvement of the study programmes taking into account the dynamic changes that are going both in the Latvian and world markets;
- Integration into the European higher education system, expansion of the international contacts;
- Intensification of international exchange programmes for students, academic staff and TTI managers.
- Improvement of the study process quality and staff qualification, as well as the high school infrastructure modernisation;
- Increase in the research activities and the number of the organised conferences; improvement of published scientific magazines quality;
- Renewing the high school academic staff while keeping its professional level and traditions.

The Institute's strategic development departments together with the high school top management representatives prepared the high school long-term development plan. The plan has been approved by TTI Senate.

## 14. The High School Self-Assessment Summary

Analysis of the high school operation during a two-year period allows drawing the following conclusions.

We consider the following to constitute positive features of the high school operation:

- Remarkable dynamics of the high school development which has been achieved in the two years since its foundation;
- Precise positioning of the high school in the educational services market and labour market;
- Perfectly defined accent on the national issues of Latvia in all the TTI study programmes, scientific research activity and development strategy;
- Positive trends with regard to the high school integration into the European and world-wide education;
- High scientific and pedagogical potential of the academic staff, integration of studies and research activities;
- Administration and academic staff is highly motivated with respect to the high school activities successful development;
- Students actively participate in the high school management and strategic planning;
- The structure of the programmes presented for accreditation, their realisation management, students' knowledge assessment and control systems are in full compliance with the LR law "On higher education establishments", as well as with the ERASMUS ECTS recommendations;
- Results of the comparative analysis show that TTI programmes are in compliance with the leading Latvian high schools (LU, RTU) as well as European high schools;
- Introduction of computers and information technology into the study process, as well as personalization of students' access to these systems, ensure the high quality and modern standard of the programmes realisation.

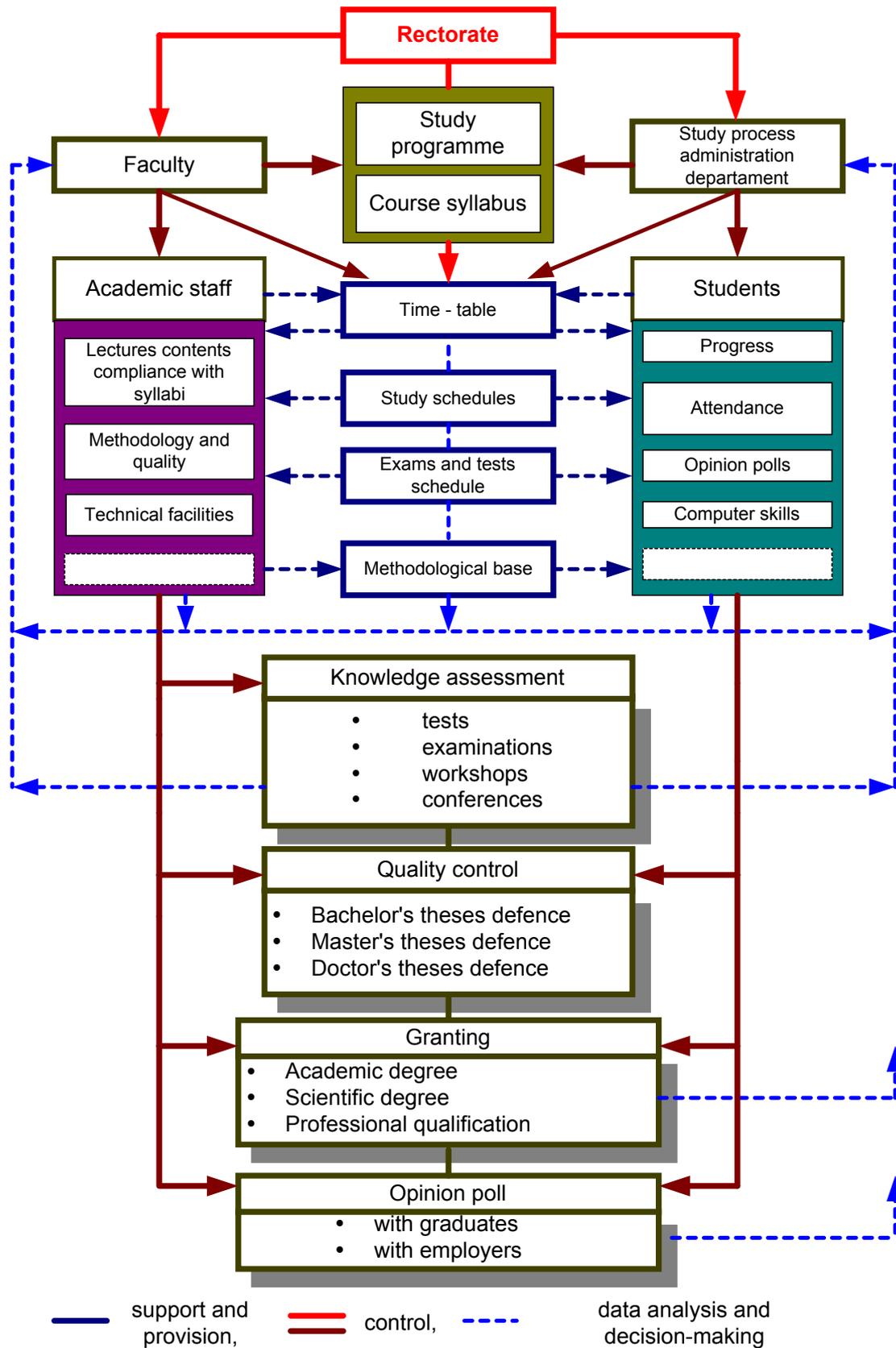
On the whole, the Transport and Telecommunication Institute's study programmes, academic staff, research activities, technical facilities, quality management system and development strategy are in compliance with the requirements of the LR legislation.

Results of self-assessment were discussed and approved by the TTI Senate, on 17 January 2001 (protocol N1), 11 April 2001 (protocol N3) and 5 July 2001 (protocol N5).

# **A P P E N D I C E S**

## Internal Quality Control System

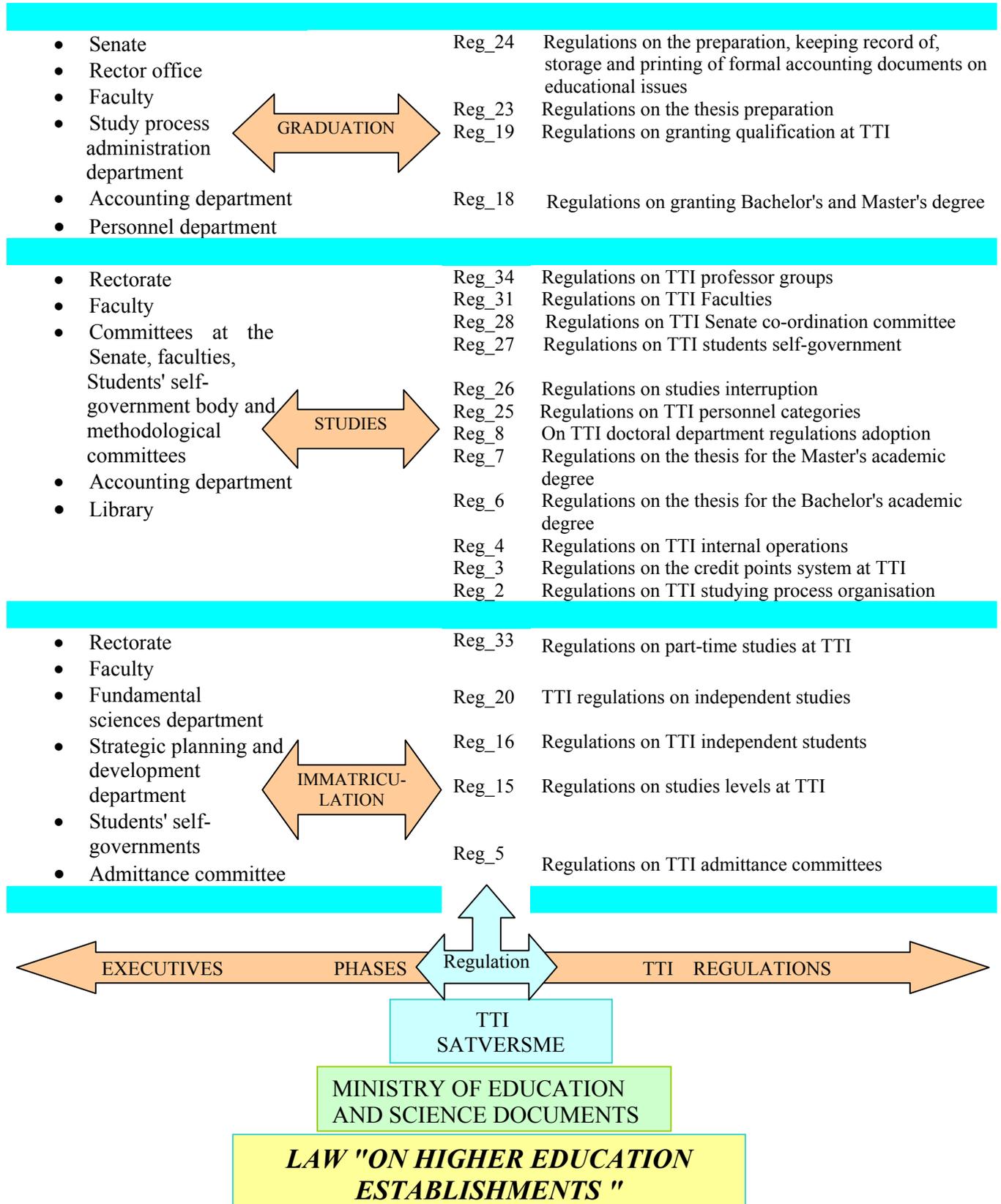
## Appendix 1



**Appendix 2**

**STUDY PROGRAMME MANAGEMENT**

Efficient management of the study programme is ensured with the help of a range of regulative documents - TTI Rector orders and Senate decisions that are produced in compliance with the law "On higher education establishments" as well as the Ministry of Education and Science documents:



**Appendix 3**
**Study laboratories facilities**

Class	Laboratory	Laboratory facilities:	Amount
A-213	Physics and electronics laboratory	Feed blocks :БНН4,Б5-50 Generators: Г6-26, ЛГН- 207В Г3-18 Oscillographs: С1-77, С1-83 Voltmeters: В7-16А, В7-22А, В7-35, В7-37 Modulators: УМ-2 Measuring instrument: Е7-11 Fault detector УДМ-1, Quality measurer Е9-4 Microscope МИМ-7 Stroboscope	5 6 10 4 8 10 6 5 5 5 1 3 3 1
4-512.	Computer modelling and electronic systems laboratory	PC "Pentium II" (with modelling software "Electronic Workbench 5.0", as well as "MatCad" un "MatLab"); PC АТ-386; Laboratory stands ЛЮ-20; Laboratory facilities: •Measuring instruments Л2-43; •Voltmeters. В7-21, В7-37; •Generators: Г3-102	8    8 8 3 2 4
4-514.	Electronic devices laboratory	Laboratory stands ЛЮ-20 Laboratory facilities: Oscil. С1-49, С1-55, С1-70; Voltm. В3-38, В3-57, В7-37; Generators: Г3-102, Г5-54	4 3 3 2
4-507.	Communication facilities and measuring equipment laboratory	Radio stations: • Polet 2 • Baklan • Majak Laboratory facilities: Oscil. С1-49, С1-55, С1-70; Voltm. В3-38, В3-57, В7-37; Generators: Г3-102, Г5-54	4 4 3 3 5 2

**Computer facilities**

Auditorium	CPU type	Amount	RAM	HDD	Notes
4-100	Pentium III	25	64 Mb	10,2 Gb	
4-303	Pentium III	15	128 Mb	10,2 Gb	Internet
4-304	Pentium II	12	32 Mb	6,4 Gb	Internet
4-305	Pentium II "Celeron"	12	64 Mb	6,4 Gb	Internet
		3	32 Mb	6,4 Gb	
4-306	486 WorkSt. SUN	10	16-32 Mb	0,4-1,5 Gb	
		2	8 Mb	40 Gb	
4-411	Pentium II	8	32 Mb	6,4 Gb	
4-512	486	10	32 Mb	400 Mb	Laboratory of Electronics
A-217	"Celeron"	2	32 Mb	6,4 Gb	Laboratory of Physics
Main building hall	486	2	16 Mb	400 Mb	E-mail terminals
Library	Pentium III	8	128 Mb	20,2 Gb	Internet
Administration and teaching staff	Pentium III, Pentium II	53	64...128 Mb	5...20,2 Gb	Internet
<b>TTI total:</b>		<b>162</b>			

**Facilities purchased but not yet installed**

Class	Laboratory	Laboratory facilities:	Amount
Warehouse	Telecommunication laboratory	Radio station Polet 2	6
		Radio station Baklan	6
		Radio transmitter SPRUT-1	4
		Radio transmitter Polet-2A	12
		Receiver Polet	25
		Wide-band amplifier	2
		Radio station Majak	3
		Total:	58

Seven Computing Halls dedicated for the use of the TTI students are located in the main TTI building. These halls house a large number of Pentium PCs and several laser printers – some colour and black and white. In addition to word-processing, graphics and spreadsheet packages a range of specialist transport software is provided in parallel to the needs of the taught programmes. Manuals are kept in the TTI Library. The TTI Computing Halls are managed by qualified engineers.

In addition, the Faculty of the Computer Science and Information Technologies maintains a PC laboratory. An extensive range of software is supported. A range of documentation is available from the Faculty of the Computer Science office for all students and academic staff.

The Institute is well provided with Information Technologies (IT) facilities. The Institute's network connects the TTI academic community to each other and the rest of the world. TTI is extending its networked communications facilities and improving on-line access to information from both internal and external sources. The network is used by staff and students to exchange electronic mail and files, update information, and access a wide range of software, word processing, spreadsheets, statistical analysis, and data base software. Courses and workshops covering a wide range of IT applications – from an introduction to using the PC, through to word-processing, e-mail, UNIX applications, and the Internet are also available. Students are required to familiarise themselves with the TTI's Rules and Regulations for the use of computing facilities.

Open access computer laboratories with UNIX & NT workstations are available for long hours. All students have their own e-mail. The Computing Service provides extensive computing facilities for all students. Most Institute courses have a computing element and, as you would expect, the facilities within each Faculty reflect the software used on those courses. Computing service supports the TTI teaching, research and administration and helps students make best use of information and communications systems.

Help is available via a range of introductory documents (also available on-line on World Wide Web pages), on-line tutorials and the access to passworded Intranet parts of TTI Web page. The access to passworded parts of TTI Web page allows students the opportunity to use a variety of electronic version of the teaching courses. This can offer advice on more detailed specifications. Telecommunication Institute may be accessed via the World Wide Web (WWW). The Uniform Resource Locator (URL) is: **<http://www.tsi.lv>**.

Constantly updated TTI WWW-site contains the actual information about staff, courses and current research projects as well as contact information, admission requirements and other.

**Appendix 4****Subscription on periodical Journals and Magazines***Journals*

1. AeroBoeing
2. Air Traffic Magazine
3. Air Traffic Technology International
4. Association for Computing Machinery Transactions on Database Systems
5. Association for Computing Machinery Transactions on Information Systems
6. Association for Computing Machinery Transactions on Modeling and Computer Simulation
7. Association for Computing Machinery Transactions on Software Engineering and Methodology
8. Aviation Security
9. Cargovision (KLM Cargo)
10. CAT (Civil Aviation Training)
11. CAD/CAM/ CAE Observer
12. Communications of the ACM
13. Communications Technology International
14. Computer Innovative Technology for Computer Professionals
15. Computer Modelling and New Technologies
16. Computing in Science & Engineering
17. CORDIS focus
18. DB-2 Magazine. Strategies & Solutions for the Database Professional
19. EAIA Forum
20. E-pasaule
21. EURO Bulletin
22. European Quality
23. Fast. Airbus Industry
24. IEEE Aerospace and Electronic Systems Magazine
25. IEEE Circuits and Systems Magazine
26. IEEE Communications Magazine
27. IEEE Computer Graphics and Applications Magazine
28. IEEE Design & Test Magazine
29. IEEE Distributed Systems Magazine
30. IEEE Engineering Society Newsletter
31. IEEE Engineering management Review
32. IEEE. The Institute
33. IEEE. The Interface
34. IEEE Internet Computing Magazine
35. IEEE Intelligent Systems Magazine
36. IEEE Multimedia Magazine
37. IEEE Network. The magazine of Global Internetworking
38. IEEE Region & News
39. IEEE Signal Processing Magazine
40. IEEE Spectrum
41. IEEE Software Magazine
42. IEEE Transactions on Aerospace and Electronic systems.

43. IEEE Transactions on Applied Superconductivity
44. IEEE Transactions on Circuits and systems I: Fundamental Theory and applications
45. IEEE Transactions on Circuits and systems II: Analog and Digital Signal Processing
46. IEEE Transactions on Computers
47. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
48. IEEE Transactions on Education
49. IEEE Transactions on Engineering management
50. IEEE Transactions on Fuzzy systems
51. IEEE Transactions on Intelligent Transportation systems
52. IEEE Transactions on IT Professional
53. IEEE Transactions on Knowledge and Data Engineering
54. IEEE Transactions on Neural networks
55. IEEE Transactions on Reliability
56. IEEE Transactions on Software Engineering
57. IEEE Transactions on Semiconductor manufacturing
58. Intelligent Transportation Systems (ITS) International
59. Internet Protocol Journal
60. Jane's Airport Review
61. Journal of Aviation Transportation World Wide
62. Latvijas auto
63. Latvijas ekonomists
64. LR Saeimas un Ministru kabineta ziņotājs
65. MS&T (Modelling, Simulation and Training). The International Defence Training Journal
66. News from Rohde & Schwarz
67. The New World of Communications
68. Nordic Road & Transport Research
69. On the New World of Communication
70. Proceedings of the IEEE
71. Reliability Society Newsletter
72. RTD Info. Magazine for European Research
73. Safety Letter. Eurocontrol
74. Sakaru pasaule
75. The Sciences
76. Studing abroad
77. TransFormation. The International Newsletter of the IRU Academy
78. Transport and Telecommunication
79. Transportas (Transport Engineereing)
80. Wireless Telecommunication
81. Ziņojums par Latvijas tautsaimniecības attīstību
82. Автомобильный транспорт
83. Банковские технологии
84. Банковское дело
85. Бюллетень деловой информации. Нормативные акты ЛР.
86. Бюллетень транспортной информации
87. Внешняя торговля
88. Вопросы экономики
89. Вертолет
90. Вестник коммерческого транспорта
91. Гражданская авиация
92. Деньги и кредит

93. Европейское качество
94. Железнодорожный транспорт
95. Зарубежная радиоэлектроника
96. Коммерсант Baltic
97. Компьютер Пресс + CD
98. Компьютер сегодня (PC magazine)
99. Латвияс экономистс
100. LAN журнал сетевых решений
101. Логинфо
102. Логистика
103. Международный экспедитор
104. Методы менеджмента качества
105. Мир Internet
106. Мировая экономика и международные отношения
107. Мир INTERNET
108. Мир ПК
109. Новости аэронавигации
110. Открытые системы (СУБД)
111. Программирование
112. Радио
113. Радиолобитель
114. Радиотехника
115. Риск
116. Российский экономический журнал
117. САПР
118. САПР и графика
119. Сети
120. Сети и системы связи
121. Стандарты и качество
122. Транспорт и транзит
123. Транспортное дело России
124. Финансы
125. Хакер

### *Newspapers*

126. Izglītība un kultūra
127. IEEE the Institute
128. IEEE Region & News
129. IEEE. The Interface
130. Бизнес & Балтия
131. Digital times
132. Образование и карьера
133. Республика
134. Час
135. Diena
136. Dienas Bizness

Translation from Latvian original

**AUDITORS' REPORT**

**To the shareholders of "Transporta un sakaru institūts" A/S**

We have audited the annual accounts on pages 3 to 16 of "Transporta un sakaru institūts" A/S for 2000. These annual accounts include the balance sheet as at 31 December 2000, related profit and loss account, statement of changes in equity and cash flow statement for 2000, note disclosures and the management's report. These annual accounts are the responsibility of the Company's management. Our responsibility is to express an opinion on these annual accounts based on our audit.

We conducted our audit in accordance with International Standards on Auditing. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the annual accounts are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the annual accounts. An audit also includes assessing the accounting principles used and significant estimates made by the Company's management, as well as evaluating the overall annual accounts presentation. We reviewed the management's report for consistency with other parts of the annual accounts. The representatives of the Company have provided all information and explanations required by us. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the annual accounts give a true and fair view of the financial position of "Transporta un sakaru institūts" A/S as at 31 December 2000, and the results of its operations and cash flows for the year then ended. These annual accounts have been prepared in accordance with the law On the Annual Accounts of Companies of the Republic of Latvia.



PricewaterhouseCoopers SIA



Kristīne Potapoviča  
personal code: 191167-13054  
certified auditor  
certificate No. 99

15 May 2001

# Academic Activities

## Education Opportunities

Latvian higher education institutions are governed by the Law on Higher Educational Establishments.

Following categories of higher education are available at TTI:

- Academic Higher Education Programmes based upon the fundamental and applied science and lead to Bachelor's Degree and Master's Degree. These programmes are research based and lead and comprise a thesis at the end of each stage.
- Professional Higher Education Programmes provides knowledge and skills for professional activities.

Transport and Telecommunication Institute offers an ever-increasing range of academic, professional education and research programmes with both scientific and vocational bias leading to Bachelor's, Master's, Doctoral Degrees and Higher Professional Qualification Diplomas.

A wide range of part-time and full time study opportunities are available and encourage applications from students with different and diverse backgrounds. Our full-time courses attract students from Latvia and overseas. In case this form of study is impossible, one alternative is to take a part-time study course with the prolonged duration of studies.

## Programmes Available

### *Bachelor's Degree Programmes (BSc)*

The TTI offers a wide range of undergraduate degrees (BSc).

These awards usually involve 4 years full-time study or 4,5-5 years part-time study. All programmes require a relevant secondary school certificate or its equivalent.

The goal of Bachelor's Degree is to provide the basic academic education to train qualified specialists who can suit the employer's needs. Study beyond the first degree provides an exciting and rewarding challenge providing students with necessary theoretical and practical skills with highly qualified instructors, applying new technologies in study process.

Achieving a Bachelor's Degree Diploma involve taking a final Bachelor's thesis project. A written thesis is to be prepared by student under the supervision of lecturers on the course.

Bachelor's Degree Programmes available are listed below:

- Bachelor's Degree in Computer Science with specialization in:
  - Computer Science
  - Computer Technology of Business Administration
  - Web Design and Electronic Commerce
  - Computer Network Technology and Network Administration
  - Computer Science in Statistics and Insurance
  
- Bachelor's Degree in Electronics and Electrical Engineering with specialization in:
  - Computer and Computer Systems Hardware
  - Semiconductor Electronics and Semiconductor Technologies
  - Telecommunication Systems
  - Computer Networks
  
- Bachelor's Degree in Management Science with specialization in:
  - Transport Management
  - Quality Systems Management
  - Business Management
  
- Bachelor's Degree in Economics

### ***Master's Degree Programmes (MSc)***

The Institute offers an extensive selection of postgraduate taught courses (MSc) for students wishing to study on a full-time or a part-time basis. Master's Programmes are designed to extend knowledge and in-depth skills in fields you have studied more generally at undergraduate or equivalent level.

These programmes are designed to bring you to the frontiers of your chosen subject. Study beyond a first degree provides an exciting and rewarding challenge. Postgraduate qualifications can enhance your career prospects and open the door to fresh opportunities in the fast changing world of business and technologies or pave the way to opportunities in academic or applied research.

These awards usually involve 2 years full-time, or 2,5 year part-time study with basic Bachelor's Degree or Engineering Diploma. Achieving a Master's Degree Diploma involve taking a final Master's thesis project. A written thesis is to be prepared by student under the supervision of lecturers on the course and must contain an original contribution to the subject.

Master's Degree Programmes available are listed below:

- Master's Degree in Computer Science
- Master's Degree in Electronics and Electrical Engineering with specialization in:
  - Radiolocation and Radionavigation
  - Computer Simulation of Semiconductor Technologies
  - Digital Technologies of Telecommunications
  - Optoelectronic Telecommunications
  - Computer Systems and Networks
  
- Master's Degree in Management Science with specialization in:
  - Transport Management
  - Quality Systems Management
  - Business Administration
  - Financial Management
  - Banking Management
  
- Master's Degree in Economics

### ***Higher Professional Programmes***

These awards usually involve 1,5 years full-time study or 2 years part-time study with basic Bachelor's Degree or 5 years full-time study or 5,5 years part-time study with basic secondary school education.

Achieving an Engineering Qualification Diploma involve taking a final Engineering diploma project. A written diploma project is to be prepared by student under the supervision of lecturers on the course.

Higher Professional Programmes available are listed below:

- Higher Professional Programme in Electronics and Electrical Engineering with specialization in:
  - Air Navigation Systems
  - Computer-Aided Design Systems
  - Production and Designing of Radio Electronic Equipment
  - Transport Telematics
  
- Higher Professional Programme "Transport and Business Logistics"
  - Transport Logistics
  - Business Design and Business Logistics
  
- Higher Professional Programme "Transport Management"

### ***Doctoral Degree Programmes***

Students wishing to follow a post-Master's research programme will need to submit a detailed research proposal outlining their area of specialist study, the resources they expect to use to conduct their research and an initial indication of the expected outcomes of their programme.

The Latvian Council of Science sets the procedures for the awarding of Doctoral Degree. All Doctoral Programmes require submitting the Doctoral Thesis. The Doctoral Degree can be obtained by Doctoral Thesis public defending.

Doctoral Degree Programmes available are listed below:

- Doctoral Degree in Computer Science
- Doctoral Degree in Electronics and Electrical Engineering
- Doctoral Degree in Management Science
- Doctoral Degree in Economics
- Doctoral Degree in Telematics and Logistics

### **Vocational and Continuing Study**

It is possible to obtain the second higher education for holders of bachelor's degree and diploma of the higher professional education. In this case the duration of training will compile 2 years. The training process is organized according to the module principle taking into account the individual needs of the student. The content of training meets the newest international standards and programmes. The training process is organized according to the module principle that guarantees the harmonious combination of the basic and special disciplines, a flexible reaction on the market requirements, an effective adjustment to the particular applied field.

# Research Activities

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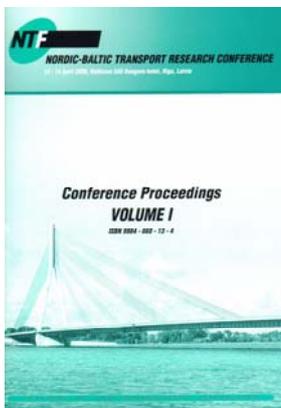
# 1. International Conferences and Workshops

organized in co-operation with Transport and Telecommunication Institute

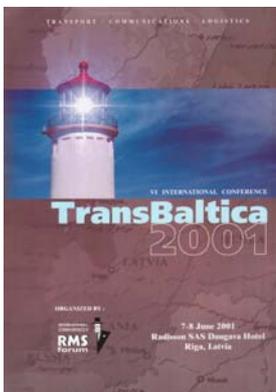


**2000:**

The International Workshop "Concept of the Modern Airport as the Point of the International Intermodal Network and its Business Environment". 16 February 2000, Riga, Latvia

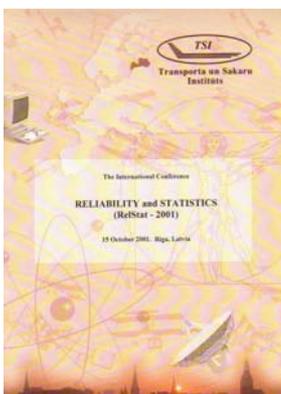


Nordic-Baltic Transport Research Conference. 13-14 April 2000, Riga, Latvia



**2001:**

The 6<sup>th</sup> International Conference "TransBaltica 2001". 7-8 June 2001, Riga, Latvia.



The International Conference "Reliability and Statistics (RelStat - 2001)". 15 October 2001, Riga, Latvia

## 2. Research Projects

### 2.1. European Research Projects

1. “RAILSERVE-Thematic Network on Rail Freight Services” (Contract N 1999-TN.10025 by the European Commission, DG Transport and Energy, Competitive and Sustainable Growth programme of the 5-th Framework Programme, task 2.3.3/1).
2. COST-340 «Towards an European Intermodal Transport Network» (Technical Committee on Transport of European Commission for Co-operation in the Field of Scientific and Technical Research).
3. COST-342 «Parking Policy: Effects on mobility and the local Economy» (Technical Committee on Transport of European Commission for Co-operation in the Field of Scientific and Technical Research).
4. FLEET “Flexible Learning in European Transport” (European Programme Leonardo da Vinci project).
5. Thematic Network on GNSS-2 (GALILEO project within the frame of 5-th Framework Programme - DG TREN).
6. Full Airport A-SMGCS Test Trials (GALILEO project within the frame of 5-th Framework Programme - DG TREN)

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#### **Research Project RAILSERV “Thematic Network on Rail Freight Services” (2000-2003)**

Research Project RAILSERV is funded within the frame of 5-th Framework Programme by European Commission DG TREN (contract nr. 1999-TN.10025).

#### ***Goals***

The goals of RAILSERV are:

- to define results and recommendations from research projects as well as demonstration and pilot activities which will further the process of revitalising rail freight business
- to recommend activities, including new proposals, for implementation

#### ***Basis and means for achieving results***

The basis for achieving the RAILSERV goals are the following activities:

- EU research: papers and directives
- International developments and innovations including relevant national R&D activities
- Best practise – EU, other advanced European countries, USA and progressive companies

And the means are:

- Assistance from TREN

- Co-operation with relevant international organisations and associations (UIC, UNIFE, EIA, Community of European Railways, AEIF, UIRR, Freight Leaders Club)
- Stakeholders of the programme – clients, railway and logistic operators, rail related industry
- Expertise of the Consortium experts, Consultative Council and Cluster experts

### ***The cluster work***

The work itself is carried out in clusters. Four of these have been established:

- Support in improving the business environment of freight rail operators in the international market
- Utilisation of the added value to rail freight business from development of the trans-European freight rail network
- Support of interoperability on networks and services
- Support to the development of a single market for railway equipment including rolling stock

The basic tasks of each of these current four clusters are to fulfil the objectives mentioned above for the Thematic Network as a whole; namely, identify and seek consensus on new activities related to ongoing work, demonstration or pilot projects, and contribute to social and environmental objectives.

The main work of RAILSERV will be carried out in clusters. Four such cluster have been set up:

- *Cluster 1.* Support to improving the business environment of freight rail operators in the international market
- *Cluster 2.* Utilisation of the added value to rail freight business from development of the trans-European freight rail network
- *Cluster 3.* Support of interoperability on networks and services
- *Cluster 4.* Support to the development of a single market for railway equipment including rolling stock

Experts from Transport and Telecommunication Institute participate in investigations of Cluster 3.

### **Cluster 3 Activity Sheet**

#### **Cluster 3. SUPPORT INTEROPERABILITY OF NETWORKS AND SERVICES**

##### *Goal:*

- To define results and recommendations from research projects and from pilot and demonstration activities which will support the development of rail freight services dependent on the uninterrupted movement of freight trains (in the first stage with minimum delays at border crossings and hubs)
- To recommend necessary activities, including new proposals, for implementation.

##### *Objectives:*

To minimise delays and improve reliability on the network by:

- Improving the organisation of international services
- IT and paperless work

- Implementing ERTMS
- Harmonising standards
- Supporting the development of human resources (e.g. through mechanisms such as fellowships and grants) and social policy (e.g. employment support to SMEs)
- Examining opportunities to revive and promote rail as an environmentally friendly and safe transport mode

*Topics:*

- Harmonisation of standards and technical directives (e.g. Community directive on interoperability of the trans-European high speed rail system that is now being implemented)
- Border crossing procedures – reduce delays and begin planning for non-stop services
- Information technology (IT) innovations (e.g. paperless freight documentation)
- Signalling and command/control systems
- Billing and tracking systems
- Timetable integration
- Telecommunication systems
- Cost management

*Outputs:*

- Concrete actions to be taken by the parties involved in rail freight services.
- Needs for further research in a number of fields that will enhance rail freight services.
- Potential demonstration projects in which the ideas generated by the network will be evaluated and verified

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## **COST 340 Action “Towards a European Intermodal Transport Network: Lessons From History” (2000-2004)**

### **Objectives**

The main objective of the Action is to contribute to the creation of a European intermodal transport network by defining a framework of references and concepts to guide current European policy in this area.

This will be achieved by identification and analysis of the obstacles that transport intermodality has encountered to date in order to propose methods for solving the most significant problems.

### **Programme/Deliverables**

The choice between different modes of transport studied over the long term, will be assessed in order to understand the historic characteristics of intermodality in Europe in the following specific areas :

- flow of tourists between the north and south of Europe
- freight traffic on inland waterways

The history of network connections between different modes of transport since 1945 has contributed to defining the possibilities for developing a European intermodal transport network.

The project will:

- study national and European policies that have tended to favour this connection since 1945
- define the stages and characteristics associated with national/international and national/local network connections.

The interoperability of different geographic networks (intramodal) and of different transport networks (intermodal) is the key to the set up of an effective European intermodal transport network. The project will therefore seek to identify the conditions which permit this interoperability by analysing successful case studies in the following areas:

- interoperability through technical standardisation (e.g. Europallet).
- interoperability through commercial cooperation (e.g. air and rail reservation systems).
- intramodal interoperability between national networks, (e.g. high speed rail).

The researchers will work together in thematically defined teams which will meet periodically (four seminars are planned). They will use and improve upon existing statistical data bases (e.g. mobility and freight traffic in Europe) and computerised bibliographies.

The results of the Action will include:

- a comprehensive summary of existing research which will address the contribution of the work to the definition of concepts of intermodality, linkage connections and interoperability and to the assessment of political and technical factors which have encouraged or slowed the creation of a European intermodal transport network
- case studies (presented in accordance with the common principles defined by the research team in order to allow comparison)
- a critical bibliography

## **Background**

Creation of a European intermodal transport network is a high-priority objective of the European Community and one to which it has dedicated studies, specific legislation and very considerable funds. Successful creation of such a network should take into account the lessons to be learned from correct analysis of the already long history of the integration of European transport networks. Earlier research; completed by the authors of this project and their correspondents in several COST member countries, has already demonstrated the historical importance of the concepts of intermodality, interconnection and interoperability. The project is thus based on the postulate that detailed knowledge and rigorous historical analysis of the various transport policies, envisage or put into effect since 1945 can significantly improve understanding of current issues involved in the creation of a European intermodal transport network, of the conditions that would make this possible and of the obstacles encountered to date. Numerous studies in transport geography and economics have been completed on waterway, road, rail and air transport networks in different countries and these will provide key input.

This project will complement existing knowledge with new historical research, thereby summarising and extending its conclusions in order to establish a solid basis for the creation of a European intermodal transport network.

### **Benefits to Different Users**

The principal users of the results will be national decision-makers and experts charged with developing current transport policy. The Action will provide:

- a critical definition of conceptual tools - addressing intermodality, network connection of differing transport modes, interoperability of different geographic networks (intramodal) and different transport networks (intermodal)
- an assessment of historic and current experiences
- extended knowledge of the field (European transport networks) to which the decision-makers' strategic analysis and action is applied

## **COST-342 Action “Parking Policy Measures and their Effects on Mobility and the Economy” (1999-2002)**

### **Objectives**

The main objective of the Action is to produce guidelines in order to increase the available knowledge on best practice in parking management and in parking policies and their effect on mobility and the economy. These guidelines will contain information, including examples of case studies, on the effect of the various management measures and policies.

Another important objective of this Action is the dissemination of the knowledge gained through the organisation of international and national workshops, technical visits, participation in congresses etc.

### **Programme / Deliverables**

The actual work to be carried out consists of the following steps:

- carrying out additional research.
- carrying out a structured analysis of the drawn up measures;
- the setting up of national inventories - according to the above mentioned framework - of parking policy measures and their effects;
- the formulation of standard approaches for parking management;
- the formulation of standard procedures for the description and analysis of parking policies and their effects as they relate to the objectives of this study;

The deliverables of COST 342 will be:

- A report describing standard parking management measures and the standard procedures for the description and analysis of parking policy measures.

- The reports on the national inventories. There should be one of these reports for each country participating in the inventory-phase.
- A Guideline of best practices on parking management and of best practices on parking policy.

## **Background**

Increasing car-ownership and usage are adversely affecting accessibility to towns and cities as well as other types of business area (e.g. industrial sites, office blocks etc.). The provision of extra road capacity cannot keep up with demand. Other measures such as the reduction of car-use will be inevitable because it is not possible to continue providing extra road capacity. Parking policy is recognised as a potentially important tool in restricting demand for more roads.

It cannot be stressed enough that a good parking policy is an important tool in maintaining and enhancing the 'urban quality' of our towns and cities. It also plays an important role in the success of intermodal passenger transport systems. Parking policies have to be implemented by local authorities.

At the local level the perceived disadvantages of reduced parking very often outweigh the estimated effects of enhanced accessibility. The main explanation for this situation is a lack of knowledge on the effects of parking policy measures. Because of this, measures are often taken too little and too late. At the same time much experience and some research results exist concerning parking policies and their effects on car-mobility and the economy. The problem is that the information on these experiences and research is distributed throughout Europe (and America and Japan).

Based on some initial research it can be concluded that combining existing knowledge in a structured and concise way will result in an impressive insight into the effects of parking policy-measures. Since much information is available, the result of a co-ordinated inventory and analysis can almost immediately be turned into guidelines for best practice on parking policy.

A European approach has the advantage of providing a much larger body of knowledge upon which to draw. The greater variety in types of measures and conditions under which they were applied provide a much better basis for developing specific guidelines compared to a national effort only.

## **Benefits to different users**

Policy makers at the local level will much better be able to estimate and communicate anticipated effects of intended policy measures. Needless discussion can be overcome and the proper policy, given a particular situation, can be selected and agreed upon.

Experts at the local level in charge of the preparation or implementation of a parking policy then have a sounder basis upon which to make their decisions.

Policy makers at the national level can much better estimate what can be done locally to fulfil national formulated policy-goals.

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## **Leonardo da Vinci Project FLEET2 - Flexible Education in European Transport (1999-2001)**

The project provides flexible learning for long distance lorry drivers across Europe.

### **Starting Point**

Many long distance lorry drivers are employed by SMES which cannot easily release them for training. Lorry drivers are ambassadors for their firms when abroad and so training is essential. Flexible learning is ideal for this group.

### **Project Activities**

- Training needs analysis
  - Training of trainers in producing flexible learning material
  - Preparation of flexible learning materials
  - Piloting of materials produced
  - Translation of materials produced
  - Production of multi-media language CD ROM
  - Piloting of CD ROM
  - Translation of CD ROM into languages of the partnership
  - Training of trainers in evaluating the effectiveness of the training materials produced
- Evaluation of project activities.

### **Results**

Three training modules in English, Dutch, Danish and Spanish:

- Safety and Cargo (Dutch, English)
- Customer Care (English, Spanish)
- Intercultural Understanding (Danish).

Multi-media language CD ROM in English, Danish, Dutch and Spanish covering:

- Customers
- Problems.

Training of trainers in:

- production of flexible learning materials
- evaluation.

The project has also resulted in the formation of a transnational network for training in the road haulage industry.

### **Funding**

The FLEET project is funded by the LEONARDO programme and the project partners.

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## Thematic Network on GNSS-2

### (GALILEO project within the frame of 5-th Framework Programme - DG TREN)

Taking into account forecasted traffic demand the vital role of satellite navigation applications cannot be overestimated in future air navigation system. It is proposed to join the efforts of interested aviation participants such as airline, service provider, research and training entities with respect to the practical evaluation of the GNSS benefits for aviation applications.

Participants are to validate and confirm the GNSS effectiveness level as a sole navigation mean for all phases of flight up to the CAT I precision approach (first 2 years of the Program) and up to the CAT II, CAT III precision approaches along with the D-GNSS based ASMGCS (rest part of the Program).

#### Objectives

It is proposed to carry out Trials program *in* order to validate a number of GNSS applications. It is supposed that the trials will cover practical validation of concerned parameter values (as integrity, accuracy, availability and continuity) for different phases of flights. Installation of differential corrections ground station in Riga International Airport will allow to form the GBAS-function up and validate precision D-GNSS approaches as well.

#### *Brief description of the work:*

- Development of the Project Plan;
- Development of the test methodology;
- Development of the Analyses procedures;
- Co-ordination of the Parties IM activity;
- Implementation of GBAS;
- Conduct of the trials and data recording;
- Results analyses;
- The GNSS Training course design, based on the achieved results;
- GNSS International seminar;
- GNSS Training for Aviation specialists.

#### *Expected results:*

- Practical validation of GNSS effectiveness (in terms of estimated values of accuracy, availability, continuity, and integrity) for different aviation applications, based on coordinated efforts made by the involved participants.
- Recommendations of the gradual GNSS implementation at the National level;
- Involvement of East European countries specialists in the above-mentioned activity, aiming increase of awareness and understanding, leading to the coherent GNSS implementation over the globe.

## Full Airport A-SMGCS Test Trials

### (GALILEO project within the frame of 5-th Framework Programme - DG TREN)

Traffic forecast indicates permanent growth tendency, making airport as a very critical "bottle neck" element in term of overall capacity limitation. The present Proposal is focused on A-SMGCS test trials based on ADS-B technology together with D-GNSS component. Actual airport environment will be used in conjunction with advanced aircraft avionics to carry out the above-mentioned trials. It is expected that the trials will demonstrate the efficiency of state of the art technology in order to support the work of international organizations *in the matter*.

#### *Objectives*

- to demonstrate the efficiency of ADS-B technology for Surface Movement Guidance and Control;
- to estimate an accuracy of satellite positioning with differential correction in real airport environment;
- to estimate stability to interference of the VHF datalink as well as STDMA media access protocol;
- to develop and validate Surface Movement Guidance and Control procedures;
- to develop methodology and algorithms of ADS-B data processing and display.

#### *Brief description of the work:*

The work will include the following basic phases:

- development of the Project Plan;
- development of requirements for SMGC System of the Riga International Airport;
- development of appropriate procedures for SMGC;
- training of Air Traffic Controllers;
- development of airport layout for ADS data display;
- development of appropriate software for ADS data display;
- development a Trials Programme;
- investigation of a set of significant parameters to be registered during the tests;
- development of methodology for tests estimation;
- installation of STDMA ground station at the Riga International Airport;
- execution of the Demonstration Trials;
- processing trials data.

#### *Expected results:*

- Practical validation of datalink technology, 1differential correction an procedures;
- Experimental values of an accuracy and stability to interference;
- Software for ADS-B data processing and display;
- Methodology and algorithms of data processing and display;
- Set of procedures for Surface Movement Guidance and Control;
- Real environment with all components to be used in advanced test trials to adapt and validate technologies and procedures in the future.

## 2.2. Latvian National development and research programmes

- Latvian Transport Development Programme (1996-2010)
- Optimization of Latvian Transport System (1999 – 2001)
- EDITRANS project “INTEGRATED TRANSPORT INFORMATION SYSTEM” (1999-2000)

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### Latvian Transport Development Programme (1996-2010)

#### *Background*

The National Transport Development Programme is a document of plan character that constitutes the activities (actions, tasks, types of activities) of economic, organizational, institutional nature and other-type of programmes falling within one system. It is worked out for 15 years period (years 1996-2000 and 2001-2010).

In order to solve the problems with regard to development of separate transport sectors the sector (roads, road transport, sea transport, railways transport, air transport, road safety) development state programmes have already been worked out. At these programmes the problems of complex nature were touched upon vaguely or completely ignored. For instance, transport statistics, transport system integration, etc.

#### *Goal*

The key goal of the National Transport Development Programme is to ensure the planned development of the efficient transport system in order to satisfy the constantly growing demand of the national economy and people for quantitative and qualitative transport that demonstrates safety, firm guarantees and reasonable costs.

#### *Main objectives*

- to maintain, to rehabilitate and to develop transport infrastructure (roads and bus terminals, railways and railway stations, sea ports, airports, airfields and air traffic control systems corresponding national social and economic requirements;
- to establish efficient passenger and goods transport system that could ensure the needs of people and the national economy for transport services;
- to expand international transport operations (export, import, transit) that could facilitate social welfare and economy rising; to form transport corridors that could provide more extensive possibilities for the state transport infrastructure, vehicles, the telecommunication system to join international transport operations and to facilitate the development of the national economy sectors, including that of tourism;

- to integrate transport systems:
  - by interlinking the traffic network, constructing access roads for ports, railways and roads, ensuring coordination of sea ports, airports, bus stations and railway stations by developing integrated utility of traffic networks, coordination and data base,
  - by ensuring correlation between modes of transport and developing combined transports,
  - by developing logistics: putting in order and developing freight terminals, freight distribution centres and warehousing,
  - by cooperating with the neighbouring countries and integrating into the European transport system;
- to ensure highly reliable traffic safety at all modes of transport, to guarantee transportation safety;
- to ensure establishment of planned environmentally friendly transport system developing transport infrastructure, regulating and aiding modes of transport and their flows, using high quality fuel and lubricants, minimizing environmental impact of all modes of transport, improving carriage of hazardous goods;
- to set up the transport information and statistics system that could enable to provide all transport service suppliers and customers with operative information in the most convenient and precise way but the respective services to gather and process statistical information; that could enable all transport related institutions and organizations to utilize these data in analysing, planning, forecasting and in passing decisions with regard to transport operations;
- to establish harmonized system of transport legislation and institutional regulations that could efficiently regulate the activities within the transport sector, eliminate legal vacuum as well as could provide legal basis for implementation of the State Programme on Development of Transport Sectors and the National Transport Development Programme;
- to guarantee for the transport sector a necessary number of qualified specialists and high standard practical and fundamental research works by improving professional training, qualification, re-training, academic education level, preparation of scientists and developing fundamental and applied sciences.

### ***Sub-programmes***

The National Transport Development Programme consists of the following Sub-programmes:

1. Maintenance and development of transport infrastructure;
2. Improvement of transport services;
3. International (export, import, transit) transport operations. Transport corridors, cooperation with neighbouring countries and integration into the European transport network;
4. Integration of transport systems;
5. Traffic safety;
6. Establishment of the environmentally friendly transport system;
7. Transport statistics and information infrastructure;
8. Transport legislation and institutional regulations;
9. Education and science.

## **Optimization of Latvian Transport System (1999 – 2001)**

### **Project Aims and Tasks**

Programme aim is to create the bases for the development of the intelligent transport in the Latvian Republic, as well as for the implementation of the scientific research to assist the competitiveness of branches on the regional and global level and to perform the forming of the efficient and ecologically friendly multimodal transport systems.

Main Starategic Tasks:

1. to join the national, regional and international transport and general branch research, development, innovation and education programmes and projects;
2. to implement research, harmonization of the higher education and qualification studies, transport and related branches, integration on the national and international level.

### **Sub-Programmes**

#### **a) Transport Telematics and Logistics**

this direction encloses the Latvian transport, including the elaboration of the multimodal, telecommunication and information supply by the methodological base for the creation of the transport information and telecommunication supply intergated system on its base. For the development of transport multimodal system integrated model and its utilization to analyze the sources of data obtaining. With the aim to update the information to develop data reception and constant actualization methodology.

#### **b) Transport Quality Management Systems**

this direction contains process (technology) management, reliability, safety and environment harmonization supply united methodological elaborations, agreed and optimized separate transport areas full value systems, efficient methods and rational principles, realizing the performance of the research in the direction of the education and qualification training integration and implementation of the multimodal and interregional transport corridor highly efficient harmonized management and quality system.

#### **c) Transport Research and Education Harmonization**

it is foreseen to elaborate transport profession, speciality and professional qualification harmonized scheme and qualification descriptions, as well as education establishment quality system methods and pilot-projects. On the basis of the elaborated methods to create qualification profession and qualification education establishment accreditation system. The conformity of students of the Latvian higher school learning various specialities of the transport directions to the forecasted needs of the Latvian national economy will be modelled, and the model of the forecast of the demand of transport specialists will be elaborated.

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## **EDITRANS project**

### **“INTEGRATED TRANSPORT INFORMATION SYSTEM”**

**(1999-2000)**

#### **Background**

The development potential of Latvian transit transports from information technology perspective has been studied earlier in multiple related studies including *Development concept for Latvian Integrated Transport Information System (ITIS) (1998)* and *Latvian Online Transport Information Exchange (1999)*.

This study is one logical step in specifying the new ITIS concept and making the implementation plan for the new system to act as a “virtual logistics service center” in Latvia and providing state-of-the art products and services to the transportation industry and its clients. It has been seen in many international projects that the role of intelligent tracing and tracking of cargo flows will become more and more important both from logistics services providers’ and users’ point of view. This is an essential part in the ITIS concept.

#### **Goals and objectives**

The generic goal of the project is to increase the competitiveness of Latvia by means of information technology and telecommunications solutions in logistics. The ultimate objectives of the implementation of the new system should lead to:

- Increased cargo volumes via Latvia
- Less costs of the logistics chain as a total
- Quicker turnaround times
- Less paper based routines
- Increase of Latvian image as a state-of-the-art logistics center in the Baltic Sea area
- Integration to European Union procedures, relevant to logistics

The final result of this project to the contracting party (Latvian Ministry of Transport and users) will be a clear, concrete statement and action plan of how to implement the new ITIS system including intelligent tracing and tracking. The study should also highlight what the benefits to the Latvian transportation industry and their clients are.

ITIS is a project aimed at providing all transport logistics companies and their clients a new technical architecture and service solution including EDI (Electronic Data Interchange) services with current and emerging new standards.

The outcome from the project will be thus:

- description of the mission and business concept of ITIS, the goals and expected costs and benefits for the parties
- description of the technical architecture and service components of the new ITIS
- concrete implementation plan to achieve the goals.

## 2.3. International research projects

Project	Customer	Contractor	Period
1. Self-timed Finite State Machine (FSM) Design	South Bank University, UK	Igor Lemberski	2000-2002
2. Efficient Controller State Encoding Method for Low Power	Dutch Organization for Scientific Research	Igor Lemberski	2000-2001
3. Computer-aided identification of graphic images post applications	"Bell+Howell" company, USA	Eugeny Heifecs	1999-2002
4. Development of the Main Principles of Reorganization and Improvement of the Efficiency of CIS Regional Aviation Enterprises Activity on "Kaliningradavia" Example	Kaliningradavia, Russia	Igor Kabashkin	2001
5. Development of Business Plan of Mode 2 (VDL 2) Aviation Data Transmission Network Implementation in Kazakhstan	Kazakhstanavia,, Kazakhstan	Igor Kabashkin	2001
6. Developmenmt of Topology of ATN Network of the Republic of Kazakhstan and Determination of the Optimal Routing Architercture	Kazakhstanavia, Kazakhstan	Igor Kabashkin	2001

## 2.4. Research projects in Latvia

Project	Contractor	Period
Development of the principles of ANS Company activity in the fields of telecommunication and the assesment of the economical efficiency of its assignment to the independent business	R.Kopitov	2000
Information search, analysis of methods of the determination od potentially conflict situations of the aircraft and the survey of the existing systems Forming of the requirements to the functionality counting the operation algorithms of "ATRACC" complex (Riga Airport)	I.Kabashkin	2000
Development of dangerous approach prevention systems for the utilization by ATC Centre of Riga Airport	S.Orlov V.Kutev	2000
Forming of methods of characteristic assesment of flying field survey system operation of Riga International Airport with the use of GNSS information in the differential mode	O.Dzhalilov	2000
Computer systems and networks reconfiguration methods and algorithms	A. Latkov	1999-2001
Methods and algorithms for reconfiguration of the computer systems and networks under conditions of variable working load and element faults	A. Latkov	1999-2001

Analysis of tendencies of VDL Mode 4 utilization in CNS/ATM and the development of the main approaches to its use in Air Traffic Management system of Latvia	I.Kabashkin	2000
Development of Air Traffic Control systems maintenance programme for improvement of the reliability of Air Navigation Service	I.Kabashkin	2000
Survey of the perspective methods of ATM supply with the use of GPS/GLONASS and INMARSAT satellite systems	O.Dzhalilov	2000
Survey of the main European research projects in the fields of transport telematics.	I.Kabashkin	
Development of Operational Requirements and Determination of the Main Functional Potentialities of Mobile Object Control System on the Territory of the Airfield	E.Kopitovs	2001
Development of Construction Concept and Operation Schemes of Mobil Aviation Systems for Real Weather Observation	I.Kabashkin	2001
Development of Standard Requirements to the Modern Systems of "Ground-Air" Voice Communication Supply in UHF Range for the Further Utilization in the Consulting Projects and Tender Competitions	I.Kabashkin	2001
Scientific and Technical, Expert and Consulting Services in the Area of ANS Activities	I.Kabashkin E.Kopitov S.Orlov	2001
Development of Complex Assessment Method of Economical Efficiency for Improvement of Metrological Support in Industry	V. Tomilin	2001
Methods of Efficiency Improvement of ATC Immovable Objects Alarm without Constant Presence of Personnel	K.Kutev	2001
Statistical inferences and efficient decision making on small samples of the data	N. Nechval	1999-2001
Mathematical modelling and fundamental properties calculation of disordered condensed media	Y. Shunin	1999-2001

## 2.5. The main directions of staff research activities

### Integrated Transport Information System

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.

Members: Eugene Kopytov, Dr.Hab.Sc.Eng, I.Yatskiv, Dr.Sc.Eng, A. Berezhnoy, M.Sc

#### *Topic of Research*

The key goal of Integrated Transport Information System (ITIS) design is to ensure competitiveness of Latvian logistics operations by investing to the infrastructure and supporting services including information technology. ITIS is not one single system in Latvia, but a process in implementing new logistics and telematics applications in a phased and managed way.

The main research activities within the frame of IT IS are:

- Setting up Electronic Data Interchange Service Centre in Latvia;
- Co-operation between Customs and border crossing functions in information exchanging;
- Latvian National Intermodal Portal definition and to create a virtual single point of entry to the telematics services relating to all modes of transport;
- Port Community System design, the main idea of which is the “single desk principle” to simplify the user’s access to several services via one system interface without switch between several different systems.

#### *Selected Papers*

1. Kabashkin I. Development of the Integrated Information Network for Multimodal Transport System // Proceedings of the International Conference "Distributed Computer Communication Networks (DCCN'97)", November 4-8, 1997, Tel-Aviv, Israel.- 1997, Tel-Aviv, 97-100.
2. Kabashkin I. A Complex Information Support for Management and Modelling of Multi-modal Transport System // Proceedings of the Seventh International Special Conference of IFORS (SPC-7) "Information Systems in Logistics and Transportation". Gothenburg, Sweden, 16-18 June 1997.
3. Kabashkin I. The Integrated Model of Information Infrastructure for Multimodal Transit Transport System//DIKU Report N 97/23, Proceedings of the Nordic Operation Research Conference NOAS'97. - University of Copenhagen, Denmark, 1998, 255-263.
4. Kabashkin I. Integrated Information Environment for Multimodal Transport System // Proceedings of International Scientific Symposium “Traffic Connection Between the Baltic and the Adriatic/Mediterranean, 22-23 November 2000, Zagreb, Croatia. – 27-32 p.

## Intelligent Transport Systems

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.

Members: I. Zarumba, Dr.Sc.Eng, Irina Yatskiv, Dr.Sc.Eng, A. Berezhnoy, M.Sc

### *Topic of Research*

The Intelligent Transport Systems (ITS) are analysed in a theoretical framework to determine their deployment application potential and what standards must be maintained to maximize the efficiency of the various deployments.

The purpose of the study is to identify the ITS user services appropriate for Latvia and Riga metropolitan area and develop a Strategic Deployment Plan and National ITS Architecture based on user services.

The study summarizes the resulting impacts of ITS deployments identified in numerous case studies and evaluations into different categories:

- Freeway Management Systems
- Traffic Signal Systems
- Incident Management Programs
- Multimodal Traveller Information Systems
- Intermodal transport and terminal management
- Transit Management Systems
- Electronic Toll Collection Systems
- Electronic Fare Payment
- Advances in navigation systems
- Optimisation of traffic management
- Support for public transport
- Support for pedestrians
- Parking information systems
- Emergency management
- Electronic Data Interchange between freight operators
- Hazardous goods and flow monitoring and incident notification

### *Selected Papers*

1. I.V.Kabashkin. Main Activities in Latvian Transport Sector of the Intelligent Transport Systems Programmes // Computer Modelling and New Technologies – 1998. – Vol. 2. – P. 61-65.
2. Igor Kabashkin. Transport Telematics.- Riga, 1999, 342 p.
3. Kabashkin I., Zarumba I. Urban Transport Development Programme: Case Study in Latvia // Proceedings of the International Conference “Modelling and Management in Transportation”. October 12-16, 1999. Poznan-Cracow, Poland. – Vol. 2, 313-318 pp.
4. Kabashkin I. Integrated System Approach for Riga Metropolitan Transport Development Programme //Computer Modelling and New Technologies.- Vol. 3, 1999.

## Intermodal Transport Networks

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.  
Members: I.Yatskiv, Dr.Sc.Eng, A. Pankov, Dr.Sc.Eng, A.Berezhnoy, M.Sc

### *Topic of Research*

The main objective of the research actions is to provide a framework of analysis that can act as a decision aid in transport policies and a set of recommendations that will help to establish the priorities to be given to different projects involving trans-European connections and intermodal transport.

The research activity has been directed towards:

- evaluating European and national projects and public decisions concerning transport networks;
- exploring the factors favourable to the establishment of transnational and intermodal infrastructures, and to the creation of transport networks integrated at all the European, national and regional European levels. When necessary, analysing the obstacles which hindered or even excluded these factors;
- analysing the actors' strategy in each country's private sector, and the strategy of professional organisations and interest groups representing the different modes of transport;
- showing the benefits of intermodality in a context characterised by a continuous growth of transport demand and by the current integration of the European area (East-West; North-South). Showing how these advantages will benefit the government and national organisations in charge of representing the different modes of transport at the European level;
- analyse and modelling of policy, administrative, economic, financial and management decisions taken to solve the problems that have arisen to date owing to the integration of transport networks.

### *Selected Papers*

1. Kabashkin I. Development of the Integrated Information Network for Multimodal Transport System // Proceedings of the International Conference "Distributed Computer Communication Networks (DCCN'97)", November 4-8, 1997, Tel-Aviv, Israel.- 1997, Tel-Aviv, 97-100.
2. Kabashkin I. The Main Activities of Research and Technological Development in the Field of Latvian Intermodal Transport // Proceedings of the 3-rd International Conference "Baltic Transit Gateway'98". 11-12 June, 1998, Riga, Latvia. - Riga, 1998, 88-92.
3. Kabashkin I. The Integrated Model of Information Infrastructure for Multimodal Transit Transport System//DIKU Report N 97/23, Proceedings of the Nordic Operation Research Conference NOAS'97. - University of Copenhagen, Denmark, 1998, 255-263.
4. Kabashkin I. Strategic Modelling of Intermodal Transport System // Proceedings of 2-nd International Moscow Logistic Forum'2000. February 1-4, Moscow, 2000. – 55-56.
5. Kabashkin I. Integrated Information Environment for Multimodal Transport System // Proceedings of International Scientific Symposium "Traffic Connection Between the Baltic and the Adriatic/Mediterranean, 22-23 November 2000, Zagreb, Croatia. – 27-32 p.

## Maintenance of Air Navigation Systems

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.

### *Topic of Research*

The research activity has been directed towards:

#### *Reliability-centered maintenance.*

- Complex analysis and modeling of reliability and maintainability of air traffic control systems
- Design for reliability-centered maintenance
- Life-cycle cost analysis of air navigation systems environment
- Analysis and modeling of logistic support for maintenance system
- Computer aided simulation of maintenance process

#### *Reliability programme development*

- Reliability estimation, prediction, and growth plan
- Participate in all design reviews
- Reliability apportionment
- Plan and conduct reliability tests
- Perform statistical analysis of test data
- Maintain reliability data system
- Provide assistance to production, quality assurance, purchasing
- Write reliability specifications for purchased items
- Identify causes of reliability degradation

#### *Maintainability programme development*

- Maintainability analysis
- Maintainability modelling
- Maintainability predictions
- Failure modes and effects analysis
- Preparation of inputs to the detailed maintenance plan and logistics support analysis

### *Selected Papers*

1. Kabashkin I. Reliability Dynamic Model Based on Petri Net Application for Systems with Built-in Test Equipment // Proceedings of the 5-th International Conference "Aircraft and Helicopters Diagnostics" AIRDIAG'97. 11-12 December, 1997, Warszawa, Poland. - Warszawa, 1997.
2. Kabashkin I. Computer-based Training Strategies for the Future Air Navigation Technologies // Proceedings of the 9-th International Conference on College Teaching and Learning "Teaching, Learning and Technology: A Global Search for Innovative Learning Strategies". April 15-18, 1998 Jacksonville, Florida. - Florida, USA, 1998.
3. Kabashkin I. Satellite-Based Communication Systems for Air Traffic Management: Transition Period Problems of the New Technologies Operation // Proceedings of the International Conference "Global and Regional Infotelecommunication Structures: Fiber-optic, Satellite and Mobile Communication Networks and Systems", Athens, Greece, 14-16 December, 1998. – Athens, Greece, International Telecommunication Academy, 1998, 70-75.
4. Kabashkin I. Reliability-centered Maintenance of Air Navigation Systems. – Riga, 2000. - 61 pp.

## Remote Control, Monitoring and Redundancy for Air Traffic Control Systems

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.  
Members: Gennady Gatovka, Eng.

### *Topic of Research*

1. Analysis, modelling and planning of the integrated control and monitoring systems of the on-ground complexes of navigation and radiolocation aids of air traffic control systems. The development of human machinery interface and software of the mentioned integrated complexes. System operator console is realised on the basis of standard PC-compatible computer. The opportunity of the individual monitoring and control of each of ATC systems is foreseen, as well as the opportunity of the group monitoring of the complex of one direction landing aids or one functional group (landing system, marker, locators, etc.) Mentioned complexes are operating in Tallinn Airport (Estonia) and Sheremetjevo Airport (Moscow, Russia).
2. Standby automatic switchable redundancy for multichannel radio centers of air traffic control systems: analysis and modelling of reliability and effectiveness of operating. There was developed the complex allowing to reserve controller communication radio stations of the on-ground radio centers by the reserve radio stations, the number of which is smaller that the number of communication channels. All operations of the re-tuning of radio station frequencies and commutation of the low-frequency voice channels are performed automatically. Technical decisions realised in the given complex are defended by 9 patents. The mentioned complexes are operating in 12 airports of CIS States, in particular, in Sheremetjevo Airport (Moscow, Russia).

### *Selected Papers*

1. I.V. Kabashkin. Dynamic Reliability Models of Complex Engineering Systems Based on Petri Nets. Automatic Control and Computer Sciences. Vol. 31, N 3, pp. 46-51, 1997.
2. I.Kabashkin. Reliability Dynamic Model Based on Petri Net Application for Systems with Built-in Test Equipment // Proceedings of the 5-th International Conference "Aircraft and Helicopters Diagnostics" AIRDIAG'97. 11-12 December, 1997, Warszawa, Poland. - Warszawa, 1997.
3. I.Kabashkin. Satellite-Based Communication Systems for Air Traffic Management: Transition Period Problems of the New Technologies Operation // Proceedings of the International Conference "Global and Regional Infotelecommunication Structures: Fiber-optic, Satellite and Mobile Communication Networks and Systems", Athens, Greece, 14-16 December, 1998. – Athens, Greece, International Telecommunication Academy, 1998, 70-75.
4. Igor Kabashkin. Reliability of Communication Channels for Air Traffic Control Systems with Periodical Sessions of Communication and Different Test Strategies // Abstracts of International Conference "Aviation Reliability (AviaRel'99)". April 20-21, 1999. Riga, Latvia. – P. 46.
5. Kabashkin I. Reliability Models of Telecommunication Systems Based on Petri Net Applications. //Proceedings of the Annual Conference of the Operational Research Society of Italy "Optimisation Models of Operational and Strategic Decisions in Finance, Telecommunication and Transportation". September 18-21, 2000, Milan, Italy.

## Urban Transport Development Programme

Head: Igor V. Kabashkin, Dr.Hab.Sc.Eng, Prof.

Members: I. Zarumba, Dr.Sc.Eng, R.Kopitov, Dr.Sc.Eng, I.Yatskiv, Dr.Sc.Eng, A.Berezhnoy, M.Sc

### *Topic of Research*

The main goal of the research is investigation and identification of the Riga city transport problems as set of interrelated parts (all transport modes, land-use, decision-making and financing processes) on the base of system approach and Riga City Transport Development Concept elaboration.

The main research activities within the frame of this concept are:

1. Improvement of normative and legislative systems relating to the city traffic processes:
  - a complex systemised approach to the identification and solution of the task aimed at the efficiency of the city traffic system functioning.
2. Traffic light modernisation concept for the City of Riga:
  - modernisation of traffic light objects;
  - construction and modernisation of communications;
  - preparation of the project for the City Traffic Management Centre.
3. Development of public transport in Riga:
  - determination of priority for public transport;
  - optimisation of the route network;
  - increase of cost effectiveness of municipal enterprises;
4. Analyse and modelling of parking places organisation on the streets and multi-storey garages.
5. Development of urban transport telematics:
  - establishment of information system for passengers.
  - automatic incident detection;
  - adaptive urban traffic control systems;
  - parking information systems;
  - VMS (Variable Message Signs)-based traffic control;
  - emergency management;
  - RDS (Radio Data System)-based and GSM-based navigation and route guidance;
  - digital maps;
  - electronic payment and tolling;
  - public transport information systems;
  - fare collection systems;

### *Selected Papers*

1. Kabashkin I., Zarumba I. Identification and Modelling of Urban Transport System: Case Study in Latvia // Proceedings of the Eighteenth IASTED (International Association of Science and Technology for Development) International Conference "Modelling, Identification and Control". February 15-18, 1999, Innsbruck, Austria.- 114-116.
2. Igor Kabashkin. Transport Telematics.- Riga, 1999, 342 p.
3. Zarumba I., Kabashkin I. Riga Transport Development Programme 1999-2003 // Proceedings of the 4-th International Conference "Baltic Transit Gateway'99". Research and Development in the Modern Transportation Technology. May 27-28, 1999, Riga, Latvia. – 30-33.
4. Kabashkin I., Zarumba I. Urban Transport Development Programme: Case Study in Latvia // Proceedings of the International Conference "Modelling and Management in Transportation". October 12-16, 1999. Poznan-Cracow, Poland. – Vol. 2, 313-318 pp.
5. Kabashkin I., Zarumba I. Riga City Transport Development Programme // Computer Modelling and New Technologies, Vol. 4, N 1, 2000. – 84-87 p.

## **Development of the implementation Plan of VHF Data Link Mode 2 network (VDL 2)**

Head: Sergey Khankhaldov, Dr.Sc.Ing.;

Members: Sergei Temerbekov, Dr.Hab.Sc.Ing, Vadim Stroitelev, Dr.Sc.Ing

### ***Topic of Research***

The implementation of a VHF data link network will provide operational benefits to airlines operating airspace and provide the infrastructure needed to implement CNS/ATM operations.

This project provides an overview of the rationale for expansion of the GLOBALink/VHF service; outlines the benefits of data link to the airlines and to the region; describes the equipment required to implement the service in region.

The main research activity has been directed towards:

- Overview of the Aeronautical Telecommunication Network (ATN) concept
- Overview of the Planned Data Link System
- Air-Ground Data Link Description
- Benefits Available from service implementation
- Description of Data Link Equipment

### ***Selected Papers***

- EUROCONTROL. ATN Workshop. Volume I, II. Luxembourg 1997.
- 

## **Development of Aeronautical Telecommunication Network (ATN)**

Head: Sergei Temerbekov, Dr.Hab.Sc.Ing, Prof.

Members: Sergey Khankhaldov, Dr.Sc.Ing., Victor Golosov

### ***Topic of Research***

The main research activity has been directed towards:

- Aeronautical Telecommunication Network (ATN) concept
  - The ATN users in Republic of Kazakhstan
  - The ATN requirements
  - Substantiation of ATN topology
  - Development of the addressing plan
  - Development of ATN structure
  - Structure and required characteristics of the ATN equipment
-

## **Aerodrome Traffic Movement, Information & Control System**

Head: Robert Sviklo, Chief of Tower

Members: Vladislav Chaschin, Yury Boot, Eduard Agapitov

### ***Topic of Research***

The key goal of Aerodrome Traffic Movement, Information & Control System (ATMICS) development is to start preparation for implementation of new air navigation technologies at airport. ATMICS will unite different air navigation and aerodrome services in one information system for better cooperation, faster reaction in case of emergency situation.

This project will be realized step by step including different activities:

- Building up a Data Fusion electronic center for processing of data from different sources: radars, satellite systems, flight data processing systems, etc.
- Realization of detailed electronic aerodrome map with Active Layout functionality.
- Analysis of ADS (Automatic Dependent Surveillance) technology as a major technology for the traffic control on the surface of aerodrome.
- Realization of Data Link information interchange between airport and air navigation services
- Implementation of A-SMGCS (Advanced-Surface Movement Guidance and Control System) functionality inside the ATMICS system.

### ***Selected Papers***

- Materials from A-SMGCS International Symposium. Stuttgart, Germany June 1999

## **Statistical Interferences and Efficient Decision Making on Small Samples of the Data**

Head: Nicholay A. Nechval, Dr.Hab.Sc.Ing., Professor

Members: Konstantin N. Nechval, M.Sc.

### ***Topics of Research and Main Results***

The present research has been devoted to the further development and perfection of methods of statistical analysis and efficient decision making on small samples of the data. This problem remains today perhaps the most difficult and important of all the problems of mathematical statistics that require considerable efforts and great skill for investigation. The greater part of results obtained in mathematical statistics have nice asymptotic properties, i. e., ones are efficient on large samples of the data. However, in practice, we deal, as a rule, with small samples.

It is assumed that the following problems will be considered on small samples of the data:

Goodness-of-fit testing and hypothesis testing for truncated distributions.

Goodness-of-fit testing and hypothesis testing on censored samples of the data.

Detection, recognition, classification and adaptive control under conditions of incompleteness of obtained information.

The fundamental approaches that will be used for investigations, are both the transformation of the observed data and the principle of invariance.

The results obtained will be used in such fields as digital signal and image processing, decision making in economics, diagnosis in medicine, control in ecology, etc.

This research has been supported in part by a research grant GR-96.0213 provided by the Latvian Council of Science and the National Institute of Mathematics and Informatics of Latvia.

### ***Selected Publications***

- Nechval, K.N. and Nechval, N.A. (1999). Constructing lower simultaneous prediction limits on observations in future samples from the past data. :COMPUTERS AND INDUSTRIAL ENGINEERING, Vol. 37, 1999, pp. 133-136.
- Nechval, N.A. and Nechval, K.N. (1999). Applications of invariance to estimation of safety stock levels in inventory model. COMPUTERS AND INDUSTRIAL ENGINEERING, Vol. 37, 1999, pp. 247-250.
- Nechval, N.A. and Nechval, K.N. (2000). Adaptive optimization in stochastic systems via fiducial approach. CASYS (International Journal of Computing Anticipatory Systems), Vol. 6, 2000, pp. 309-327.
- Nechval, N.A. and Nechval, K.N. (2000). Detecting a change point in a sequence of small area statistics. STATISTICS IN TRANSITION, Vol. 4, No. 4, March 2000, pp. 699-710.
- Nechval N.A., Nechval K.N., Heimanis B.M. (1998). Variational approach to adaptive optimization of stochastic systems. CYBERNETICS AND SYSTEMS '98, R. Trappl (ed.), Vol. 1, Vienna: AUSTRIAN SOCIETY FOR CYBERNETIC STUDIES, 1998, pp. 44-49..
- Nechval, N.A. and Nechval, K.N. (2000). State estimation of stochastic systems via invariant embedding technique. CYBERNETICS AND SYSTEMS'2000, R. Trappl (ed.), Vol. 1. Austrian Society for Cybernetic Studies, Vienna, 2000, pp. 96-101.
- Nechval, K.N. and Nechval, N.A. (2000). Adaptive control of airline booking levels. In: CYBERNETICS AND SYSTEMS'2000, R. Trappl (ed.), Vol. 2. Austrian Society for Cybernetic Studies, Vienna, 2000, pp. 507-512.

## **Computer Networks, Analysis and Optimal Projection of Computer Networks, Modern Network Technologies**

Head: Aleksej Latkov, Hab.Dr.Sc..Ing., Professor

Members: Alfred Asars M.Sc., Jekaterina Petrova

### ***Topics of Research and Main Results***

Practical Method for Estimation of Network Stochastic Characteristics

The Study of Modern Networks Technologies Typical Structures Effectiveness.

The mathematical and scale models of networks and fragments of networks for investigating performans of Computer Networks with homogenous and geterogenius flows of transaction.

### ***Selected Papers***

- Method of Investigating the Telecommunication Networks. Queues, Flow, Systems, Networks”, Minsk, 1999. Pp.106-110
- A.Latkov, A.Asars, J.Petrova. Performance evaluation of the fragments of Transport Information Systems. In Proceeding of Nordic-Baltic Transport Research Conference. Volume II.2000 Pp. 54-58

## **Extraction of Geometrical and Electrophysical Features of Lightning Channels from Spherics**

Principal Investigator: Dr.Hab.Sc.Ing., Professor Jury A. Krasnitsky

### ***Topics of Research and Main Results***

Methods for extracting of geometrical and electrophysical features of lightning channels from spherics is investigated. It is suggested that the lightning EMF radiation pulse model is based on antenna array theory approach: it is supposed that the lightning channel is equivalent, in a definite sense, to discrete antenna array with elementary radiators formed by channel structural inhomogeneities.

The inverse problem is to evaluate the number, positions and “weights” of these radiators from spherics waveform records. It seems the conventional signal processing methods are not fully consistent with the problem mentioned above because of space-time varying character of spherics. It will be expected that it is reasonable to create a certain wavelet transformation for spherics waveform processing.

### ***Selected Bibliography***

- Ju. A. Krasnitsky. VHF vacuum tube devices: Topics with MATLAB illustrations. - Riga, RAU, 1998, 96 pp. (in Russian)
- Ju. A. Krasnitsky. Thin structure of atmospherics. - 11th Int. Conf. on Atmospheric Electricity (ICAE '99) *Short Pap.*: Guntersville, USA, 1999, p. 9
- Ju. A. Krasnitsky. Thin structure of atmospherics. - 11th Int. Conf. on Atmospheric Electricity (ICAE '99) *Proceedings*: Guntersville, USA, 1999.

## **Subsurface Radar Sounding**

Head: Dr. Hab. Sc. Eng., professor Valery Kutev

Members: M. Sc. Alexander Krajnukov, Dr.Sc.Ing. Alexander Alexandrov, Dr.Sc.Ing., Alexander Grakovsky

### ***Topics of Research and Main Results***

Methods and facilities of subsurface radar sounding for geological, archaeological and ecological applications are investigated. Ground Penetrating Radar (GPR) can be used as main technical devices for many practical works in this area. Limitations as well as the advantages of the radar subsurface sounding methods over the traditional geophysical methods are investigated in detail by mean of solving the following problems: mathematical modelling of GPR; development of GPR signals digital processing new methods; analysis of conditions for GPR signals propagation in different soils and development of the concrete recommendations for GPR practical applications. Examples of such applications are: radar measurements of snow cover height, freshwater ice thickness and ice accumulation to forecast floods; determination of lakes and rivers degree of silting; efficient detection lignin leakage places in pipe-line and underground storages.

### ***Selected Bibliography***

- В.Кутев, В.Карпунин, В.Метелкин, М.Финкельштейн Подповерхностная радиолокация. М.: Радио и Связь, 1994, 216 с.
- В.Кутев, А.Крайнюков. Моделирование тракта формирования отраженных сигналов в задачах подповерхностной радиолокации слоистых земных покровов. Сборник научных трудов РАУ, Рига, 1995, с.17-23.
- А.Александров, А.Граковский, В.Кутев, В.Строителев. Цифровая обработка данных георадара на основе структурных особенностей отраженных сигналов. Сборник научных трудов РАУ, Рига, 1995, с.24-31.
- В.Кутев Методы и средства подповерхностной радиолокации в решении экологических задач. Тезисы докладов Международного научного симпозиума «Экология, авиация, техносфера – взгляд в третье тысячелетие», Рига, 2-5 дек. 1996 г., Рига, 1996. с.49.
- А.Александров, А.Граковский, В.Кутев, В.Строителев Метод обработки данных средств дистанционного зондирования природной среды на основе морфологического анализа отраженных сигналов. Сборник докладов Международного научного симпозиума «Экология, авиация, техносфера – взгляд в третье тысячелетие», Рига, 1997, с.128-133.
- V.A.Kutev, S.Molokov and D.M.Emmrich Magneto-hydrodynamic flow in a rectangular duct in a cusped magnetic field. 1999, Physics of Fluids, Vol. 11, Issue 4, pp. 931-939.
- В.Кутев, А.Крайнюков Математическое моделирование в задачах радиолокационного подповерхностного зондирования слоистых сред. Тезисы докладов международной научно-технической конференции «Современные научно-технические проблемы ГА». М., МГТУ ГА, 1999, с.210-211.

### **Development of New Structures for Digital Filters**

Headr: Dr.Hab.Sc.Eng., Professor Vitaly Yeremeyev

Members: B.Sc.Eng. A.Matveyev, B.Sc.Eng. A. Anufrieva, M. Sc.Eng. A.A.Zinchenko,  
M. Sc.Eng. O. Mizinenko, M. Sc.Eng. E. Matosov.

### ***Topics of Research and Main Results***

The study is done in the area of new digital technologies. New structures for digital filters with most effective program realizations (maximum of performance particularly) are described. Some wave structures are designed. These can be used to achieve top characteristics of the frequency domain. Systems with frequency characteristics have been constructed which are invariant to multipliers capacity limitation.

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## **Improving of Radio Systems and Complexes Efficiency by Means of Reception and Processing Equipment Optimization**

Head: Dr.Hab.Sc.Ing., Professor Jury Sikerdzitsky

Members: Dr.Sc.Ing. Alexander Mrochko, Dr.Sc.Ing. Oleg Djalilov

### ***Topics of Research and Main Results***

Efficiency of many radio electronic systems and complexes is determined, in common case, by types of using signals and its modulation mode in transmitter devices as well as features of using radio receivers construction, it's noise immunity and electromagnetic adaptation.

In this research work specific algorithms are developed for improving of radio systems and complexes efficiency by means of reception and processing equipment optimization

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## **Study and Development of Non-traditional and Ecological Vehicle**

Head: Vladimir Shestakov Hab.D., Prof.

Members: Rostislav Schavinskis Eng., Dmitri Titov Eng., Tomas Bebrish, Postgraduate student

### ***Topics of Research and Main Results***

Using of the new aerodynamic schemes, favourable effect of screen on the aerodynamic characteristics, chassis on the air cushion.

A developed device for the dynamic maintenance - wing-in-ground effect craft has already passed the flight test. With its help, unique results about such device characteristics, methods of development and flight tests are obtained. By the result of this development more than ten inventor's certificate are obtained. A developed device has already passed the levitated running trial and accepted for working on the air cushion. With its help, research into the possibility of chassis on air cushion using for the aircraft was held. Some inventor's certificates support the newness of results. Various projects of ecological vehicle for the transportation of large dimension freights in the impassability of roads, wing-in-ground effect craft and devices on the air cushion for various purposes were developed.

## **The Airframe Elasticity Effect on the Flight Characteristics of Aircraft**

Head: Vladimir Shestakov Hab.D., Prof.

Members: Valeris Karauch. Ph.D; P. Kolontais magistrant; V. Ignatane magistrant.

### ***Topics of Research and Main Results***

-Static deformation effect on the orientation changing of various airframes parts relatively to the approach flow.

- Effect of dynamic deformation of airframe on the flight characteristics.

The calculation methods of the modified derived aerodynamic forces and moments, considering the local variation of the angle of attack because of the elastic deformation of wing, fuselage and tail assembly and the elasticity calculation in case of stability and control characteristics determination, are developed. The calculation methods of airframe deformation for the calculation of the dynamic stability characteristics in the conditions of atmosphere turbulence effect are developed. The methods of determination of the airframe elasticity effect on the flight safety and comfort are offered.

## **Effect of Unfavorable Exterior Conditions on the Flight Characteristics and Flight Safety of Aircraft in Civil Aviation**

Head: Vladimir Shestakov Dr.Hab.Sc..Ing., Professor

Members: Boleslav Rachko, mag.; Larisa Zagrebina, mag.; Zanet Borovko, mag.;  
Patris Balosa, doktorant; Ekaterina Jaroslavceva, doktorant

### ***Topics of Research and Main Results***

- Atmosphere turbulence effect on the flight characteristics, flight safety and comfort.

- Wind shear zones detection, dynamics of aircraft motion in the wind shear zone.

Atmosphere turbulence models and calculation methods of probability criterion of flight safety in the wind shear zone are developed.

The methods of dynamics of flight modelling in conditions of wind shear for the parametrical studies with profile variation of wind shear, using of the automated means of aircraft control and others, are developed. Some inventor's certificates support the newness of results.

## **Prevention Of Aviation Incident**

Head: Vladimir Shestakov Dr.Hab.Sc..Ing., Professor

Members: Boleslav Rachko mag. Ph., Jevgenij Burdun, Osvald Dreimanis

### ***Topics of Research and Main Results***

Casual-factorial analysis of working dangers of the "Crew-Aircraft-Aircraft Maintenance Depot-ATC". The expert inspection of the aviation enterprises for the application of the automated information systems and their effectively for the prevention of the aviation incidents and accident.

The results of this work were used for the development of subsystems "Bezopasnost-2 and -3" and the multilevel automated system MASU "Bezopasnost" and can be used for the development of the analogous systems and for the evaluation of the flight safety level.

## The New Suspensions for a Vehicle

Head: Vladimir Sharapov, Dr.Sc.Ing., Professor

### *Topics of Research and Main Results*

The new class of the Suspensions is based on the new method of the sprung mass oscillation damping and as well as on the new method of the stabilization of the dynamic forces acting through the suspension to the sprung body of the Vehicle.

Method of the sprung mass oscillation damping will make it possible to create the new damping device without the aforesaid main shock absorber contradiction.

This damping method solves the main contradiction of the hydraulic shock absorber. So, the possibility to decrease the oscillation amplitude at the frequency range from 0 to the infinity is becoming real. The energy supply from an additional source is not needed for this method.

The theoretical fundamentals of the new damping method are described in [1,2] and the constructive suspension schemes are expounded in monograph [1] and in the Invention descriptions [5,8].

The above-mentioned damping method without an ordinary hydraulic shock absorber can improve the ride smoothness by itself. But joint employment of this method with the new stabilisation method of the dynamic forces acting through the suspension to the sprung body can raise the ride smoothness of a Vehicle to the new high-quality level.

The publications [1, 5-8] are dedicated to the technical realization of the optimal control in the Vehicle active suspension.

The real physical analog of the single-axial transportation mean with the active suspension has been made by the author of this method. The laboratory tests of this analogy have demonstrated the good convergence of the theoretical and experimental results.

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## Mathematical modelling and fundamental properties calculation of disordered condensed media

Head: Yuri. N. Shunin , Dr.Hab.Sc. (Phys&Math), Professor

Members: O. Dumbrajs ; Professor, Dr., PhD, K. Hamroon; LR MS, V. Kosarev ; LR BS  
K. Budilov; LRBS, D. Gryaznov; LR BS, V. Bulatecky ; LR BS, S. Piskunov;  
LR MS O. Sičov; LR MS, A. Finogenov; LR MS

Comprehensive modelling of fundamental properties of the disordered solids is based on the solution of a number of physical problems such as statistical parameters of atomic structure, electronic structure calculations, phonon spectra calculation, a construction of potentials, total energy calculations of cluster fragments etc. The developed cluster approach for numerical investigations of disordered solids, based on the multiple scattering theory, cluster conception and effective medium model, has given the known results on the electronic structure of amorphous semiconductors. The main goal of this work is the theoretical and numerical investigation of disordered semiconductors. A particular attention is paid to such factors as an electronic density of states, a phonon density of states, a total energy, a conductivity, a thermal conductivity etc.. Extreme excitations induced by swift heavy ions passages open different channels of energy scattering and transport in a matter. According with the developed model of correlated track excitations it is possible to analyse numerically and simulate various specific elementary excitations, calculate also *in situ* processes. A special attention is directed on properties of solid state surface. From the practical point of view the main goal of the work is the creation of new perspective materials and the prediction of their physical and chemical properties.

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## 3. Journals and Publications

### 3.1. TTI research journals in co-operation with international partners



#### Journal of Transportation World Wide

ISSN 1093-8826

*Host organization:*

University of Nebraska at Omaha (USA)

*Co-Sponsor Organisations:*

NASA Kansas Space Grant Consortium (USA)

NASA Nebraska Space Grant Consortium (USA)

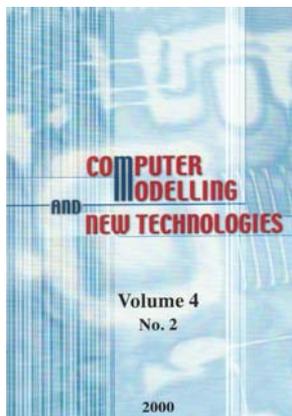
Transport and Telecommunication Institute (Latvia)

World Aerospace Education Organization

Editor: Brent Bowen, Aviation Institute, UNO

Co-Editor: Igor Kabashkin, Transport and Telecommunication Institute, Latvia

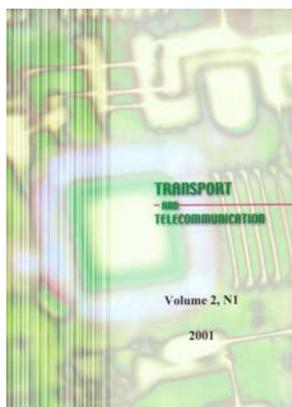
### 3.2. TTI Research Journals



- Computer Modelling and New Technologies - ISSN 1407-4591
- Computer Modelling and New Technologies (on-line) - ISSN 1407-5814

Editor: Igor Kabashkin Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia

Co-Editor: Yuri. N. Shunin. Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia



- Transport and Telecommunication - ISSN 1407-6160
- Transport and Telecommunication (on-line) - ISSN 1407-6179

Editor: Igor Kabashkin Dr.Hab.Sc., Transport and Telecommunication Institute, Latvia

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