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Proceedings of the 11th Conference on Presentation of Projects

2 1993–2013 years
CZECH TECHNICAL UNIVERSITY IN PRAGUE
FACULTY OF TRANSPORTATION SCIENCES

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PROCEEDINGS OF THE 11th CONFERENCE ON PRESENTATION OF PROJECTS

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Project-oriented study at the Czech Technical University in Prague Faculty of Transportation Sciences

Academic programme at the Faculty of Transportation Sciences (FTS) provides its students not only with the theoretical knowledge – indispensable for the future experts, but importantly also focuses on application of this knowledge into practical life. Students are exposed to this approach from the very beginning of their studies, ensuring the interface between theory and praxis. Project-oriented study provides the future graduates with an opportunity to take part in solving practical tasks already during the course of their studies. This prepares them for the challenges they will encounter in their professional lives.

Graduates with prior exposure to practical aspects of the field are better positioned to succeed on the job market. The ability to solve project-related tasks is an invaluable experience not only for managerial positions, but also for careers in the public or private sector. Work on a project gives students opportunity to acquire habits of team work, sense of responsibility for own work, as well as an appreciation of the fact that their work contributes to the overall output of the entire team. Ideally, students should work on long-term projects commissioned by external entities and in cooperation with doctoral students, academic and scientific staff.

At the FTS, project-oriented study takes a form of specialized courses for all full-time students in the bachelor or master programmes, with the exception of future professional pilots and majors in Technology of Aviation Maintenance.

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ACCEPTABLE FORMS OF TRANSPORTATION IN THE CITY

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

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1. Introduction

All regions face similar challenges in delivering sustainable transport solutions to meet their current and future mobility requirements. Transport authorities are aware of the real needs specific to their regions, but they often find it difficult to identify detailed information on target solution that would provide direct anstangible and positive outcomes.

2. The activities of the project and the need of solving given issue

2.1. Outlineing of solving problems

In the twentieth century has the face of towns significantly changed by the emergence and rapid development of growing automobile traffic. In the second half of the 20th century a wrong ideological stream was unanimously promoted by politics and transport engineers. It had one goal, to satisfy the growing needs of motorized transportation. The demand for the transport network capacity has been solved trough ongoing building of new roads for motor traffic without using analyzes and considerations for sustainable development of transportation.

Oversized width of traffic lanes, absence of elements to facilitate crossings and orientation of disabled persons, narrow sidewalks or even an absence of sidewalks at all, the connected high rate of accidents, noise and exhaust emissions were and still are one of the main causes of resident's dissatisfaction not only in the Czech Republic. Residents require humanization, especially by using traffic calming.

Reviewer of the paper: Ing. Jana Jirků

Urban communications are important public spaces of all towns and villages. Despite the upper mentioned emphasis transport function, the street space don't serve purely only to transport. It shapes the character of the town and also provides the right connection of buildings and not least it has also a social function. Therefore, today's Europe-wide trend is focused on the equal satisfaction of all functions of street's space. The main goals, which today's society is trying to achieve in the field of transport, can be summarized in the following points:

- Removing the superiority of automobile traffic and reducing its areal claims.
- Removing the communication barrier effect.
- Creating better conditions for pedestrians, cyclists and public transport.
- Improving safety of motorized and non-motorized transport.
- Improving environment.
- Reducing traffic intensities.

The needs for traffic calming and regulation are also supported by following facts:

- Accident statistics show that traffic accidents are one of the most common causes of death. Police investigated in total 17,795 traffic accidents only in the capital city of Prague in 2012.
- Development of traffic exceeds the possibilities of providing sufficient capacity. There is a question, whether the providing of sufficient road capacity and keeping up with the developing traffic intensity, is in the real power of cities. In addition, many surveys show that providing of new infrastructure generates traffic more often.
- Road transportation is one of the main sources of environmental degradation.

2.2. Activities of the project

The above-mentioned issues are the main solved by students of project "Acceptable forms of transportation in the city". This project is one of the oldest at the faculty. The first students had a chance to join the project already in 1995. Since then, the project has annually attracted considerable interest of the students and so it is up to nowadays.

Students have an opportunity to participate in surveys and project seminars (see Chapter 4), that are held by the faculty and they dedicate to their bachelor and master works. Students receive work assignment after consultation with some of the project leaders in the first weeks after joining the project. So students have enough time to deal with their works.

Students can choose topics themselves according to their own preferences from a wide range of real-world problems. Own initiative and suggestions of completely new topics and issues are also welcome. Because the members of project cooperate with many companies with different range of activities in the area of transport, departments of transport or land development, municipalities and municipal authorities, students have a valuable opportunity to work on real transport problems, cooperate with companies from the field and high representatives of the above mentioned institutions. Students gain experience, knowledge and contacts, which they advantageously apply in the selection of a job in both private and commercial sectors already when studying. Copies of successfully defended works are handed over to the companies or institutions. Right suggestions and solutions can be implemented in the future.

Students have an opportunity to choose topic from the following, alternatively also from other areas:

- Studies, designing, cocepts of transport solutions and construction modification of crossways, streets and other urban spaces
- Studies of city roads
- Solutions of bicycle transport in the area
- The safety analysis of specific types of traffic and suggestions for it's increase
- Designing of residential or pedestrian zones
- Recommendations on the organization and regulation of transport
- Proposals for traffic calming
- Arrangements for persons with reduced mobility and orientation
- Designing of public transportation stops
- Urban solutions of urban spaces
- Analysis of alternative transport solutions
- Solutions of stationary traffic
- Assessment of communication networks and traffic forecast

- Transport information systems
- Optimization of urban transport services and suggestions of new connections
- Methods of preference of certain types of transportation
- Integration of transport in urban areas

Consulting of works is done individually after previous agreement with the leader of the work and is adapted to the needs of a particular student. Students dealing with projects for specific companies in the field or for transport institutions also regularly consult the direction of their work with the selected consultant, representative of the company with many years of practical experiences.

As the vast majority of solved problems require detailed knowledge of the current situation and traffic patterns in the area, companies and offices also provide necessary materials for students for a high quality and efficient work processing. These are for example maps, statistics, and results of longtime researches and so on. Students have also possibility to borrow various modern tools and equipment from the laboratory of transport systems (radars, detectors for automatic traffic counting) to ensure adequate data base for its future proposals and solutions. The accuracy of traffic flows estimates is so at a high level in graduates' works.

In the project course, students get acquaint intimately among others with the tools used in professional analysis of the nature of transport in practice. They learn how to work with technical terms and Czech technical standards and how to discuss their findings and proposed arrangements with experts.

3. Successes of the project

With the project "Acceptable forms of transportation in the city" is not connected only long-term but also successful history. Students of this project participate in no small measure on raising prestige of the Faculty of Transportation Sciences thanks to their successes in competitions.

3.1. Successes of students of the project in competitions

In the 9th annual nationwide competition Czech transport constructions / technology / innovation was awarded Ing. Milan Tesař for work with the theme "A study of traffic safety on the new route II/610 in Brandýs nad Labem by the dean of CTU FTS Mr. prof. Dr. Ing. Miroslav Svítek in a separate category. The best diploma thesis in the field of transportation and traffic engineering in 2011. The subject of this diploma thesis was to analyze the traffic in the current route of the road II/610 in Brandýs nad Labem in terms of traffic safety, including a description of wider relations in connection with the previously proposed solutions in the area of Masaryk´s square and the Pražská streets and examination of alternative routing of road II/610. The goal was in the space design of local roads according to CSN 73 6110 (optimal width configuration of the selected streets) with regard to the continuity and safety of traffic, including optimization of parking spaces. Furthermore, an optimal arrangement of the width of the connected roads in the area of concerned crossways and the guarantee of safe movement of pedestrians and completing the situation´s design of constructions arrangement by detailed itinerary of traffic signs.

In 2011 also succeeded Bc. Ondřej Landovský with bachelor thesis "Modification of crossway Božtěšická and Petrovická street in Ústí nad Labem" in competition Graduation work of Ústecký region 2011, where he placed at the third place. The subject of this bachelor thesis was to analyze the current traffic organization in Ústí nad Labem in the link to the crossway of Božtěšická - Petrovická streets with considering of existing traffic problems (sight conditions, confusing situation, inadequate traffic signs). Performing of traffic surveys determined to finding out the utilization rate of the crossway and pedestrian traffic in the area. The goal was in an alternative design of crossway construction with considering of requirements of traffic safety, including verification of sight conditions according to valid standards, optimizing of the location of the stops of public transport and pedestrian crossings within the proposed changes with regard to the safety of non-motorized transport and minimizing of walking distances.

An illustrative extract (see Figure 1) of this bachelor work and a photo from the ceremony (see Figure 2) are placed below.

A year later, Bc. Nela Kolesarová succeeded in the same competition. She placed the first place with the theme "Proposal of traffic calming in Drážďanská street in Ústí nad Labem". The subject of this work was to analyze the current traffic patterns in the Drážďanská street and the surrounding area, passport of current state of traffic signs and to design a new solution, then to assess the safety for pedestrians and cyclists in solving area (between crossways with Janáčkova and Krátká streets) in the longitudinal and transverse directions. The goal of work was

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in to propose an optimization of the width arrangement in the solved area with considering of parking and providing of safe supply of objects from side streets, the application of elements for pedestrian traffic safety, modification of public transportation stops and applications of specific elements to optimize and improve the traffic safety in the solving area.

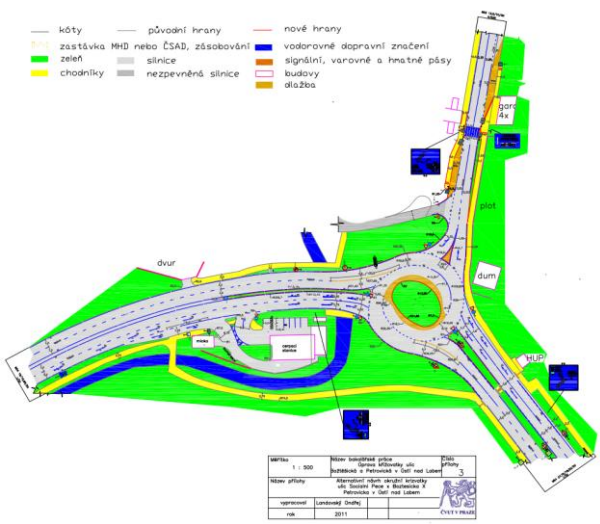

Fig. 1. Sample of awarded thesis of Bc. Ondřej Landovský

Fig. 2. Handing over of award to Bc. Landovský

The following pictures number 3, 4 and 5 are samples of this thesis.

Fig. 3. Sample of work of Bc. Nela Kolesarová

At the 10th anniversary year of the national competition Czech Transport Construction / technology / innovation succeeded Ing. Jiří Hanzl in a separate category for the Best Diploma / Bachelor's thesis in the field of transportation and traffic engineering in 2012, who had dealed with the topic of "Optimizing of cycle routes and cycle paths in Písek".

3.2. Achievements in statistics of Dean's praises

Between 2008 - 2012 49 bachelor theses were successfully defended in this project. Seventeen of these students were awarded by the Dean's praises for the excellent work processing. Statistically, approximately every third student working at the project "Acceptable forms of transportation in the city" is awarded.

From 1999 to 2012, was also processed 63 diploma theses, of which ten deserved the praise.

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4. Participation in grants and projects since 2010 and co-operation with the practice

4.1. Cooperation with transport authorities and companies doing business in the area of transport

As mentioned in the chapter about, students of this project have an opportunity to work in close cooperation with the departments of transport and land development, municipalities and municipal authorities and various companies from the field, from which they receive the necessary information and documents for work processing. So their work can be even realized.

Fig. 4. Sample of thesis of Bc. Nela Kolesarová

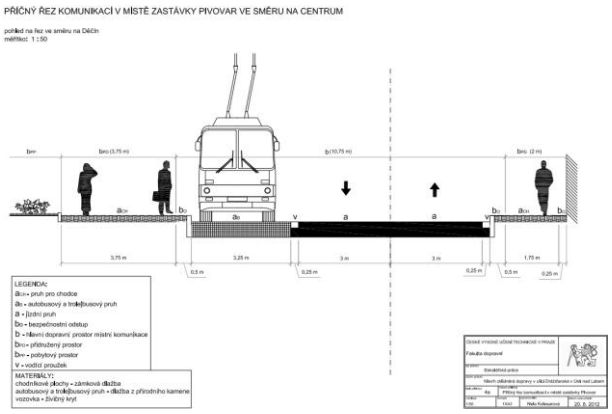

Fig. 5. Sample of thesis of Bc. Nela Kolesarová

Fig. 6. Seminar MEPS year result of 2011 (Náchod)

4.2. Student´s participation in international traffic engineering student project seminar MEPS

Students of the project "Acceptable forms of transportation in the city" have an opportunity to attend an annual international student seminars MEPS (Middle European Project Seminar). The seminar is open to all students of the Czech Technical University in Prague, Technical University of Vienna and Budapest University of Technology and Economics. Representatives of the selected host city together with representatives of various transport-oriented institutions and students choose interesting transport problems in the city. These tasks are usually connected to junctions, traffic organization in the city, parking or the topics are focused on pedestrian cyclists traffic. In recent years, cities focus themselves on information systems and orientation signs in the city. Students from all three universities are divided into groups and work together on possible solutions. At the end of the seminar, students present their solutions to the city representatives. This presentation usually takes place not only in present of representatives of the city, experts in the field of transport and possibly people who are interested in the issues. At this moment, there is currently being prepared student seminars MEPS for year 2014, the host city will be city Tábor.

Two outputs of the seminar (see Figure 6 and 7) are placed below for your information and illustrations.

The highest appreciation of the students' works who participated in solving the problems is future implementation of these proposals in the practice. In this way, representatives of the city of Jihlava in 2011 rewarded students, who worked at a seminar in 2008. There are also very positive press reviews. This fact is evidenced by the following newspaper article and internet article (see Figure 8 and 9).

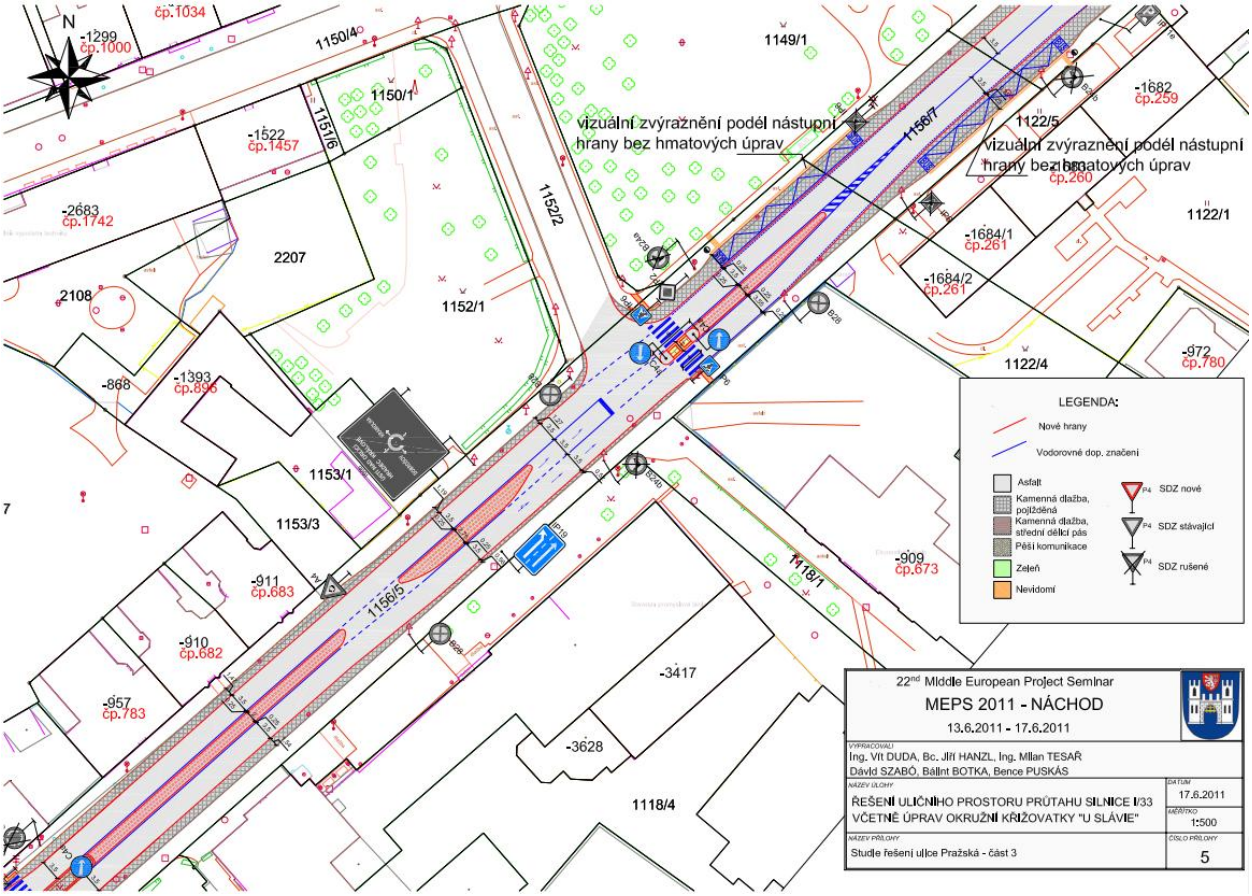

Fig. 7. Seminar MEPS year result of 2011 (Náchod)

5. Best defended bachelor and diploma theses

Among the best theses that have been processed in the project are included the mentioned award theses but at a high level was processed also a number of other works. A list of the ten most successful is located below (see Table 1).

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18.6.2011 Studenti představili svá řešení dopravy v Náchodě

Fotogalerie
Studenti představili svá řešení dopravy

V pátek 17. června proběhla za účasti významných hostů závěrečná prezentace řešení dopravních úloh, které řešili studenti v rámci **Mezinárodního dopravně-inženýrského semináře**. Ten v Náchodě probíhal v prostorách městského divadla po celý uplynulý týden.
Prezentace se zúčastnil senátor ing. Petr Pakosta, hejtman Královéhradeckého kraje Bc. Lubomír Franc, zástupci města Náchoda - starosta Jan Birke, místostarostové Tomáš Šubert a Drahomíra Benešová a zastupitelé, dále zástupci Ministerstva dopravy ČR, SÚS Královéhradeckého kraje i Policie ČR a celá řada dalších významných dopravních expertů.
Studenti navrhli celou řadu velmi zajímavých řešení místní dopravy, která budou inspirací při provádění konkrétních úprav ve městě - např. řešení navigačního dopravního systému, organizace jednotlivých křižovatek nebo dopravy v centru města.
Konkrétní řešení šesti dopravních úloh budou uveřejněna po zpracování na internetových stránkách města Náchoda.

Fig. 8. Internet article in response to the MEPS

Studenti překvapili revolučním řešením dopravy

NÁVRŽENÉ řešení MHD zahrnuje zpřehlednění trolejbusových linek (viz obr.) a redukci linek na A-E, navíc odlišených barvami, dále přečíslování autobusů na 1-6. Trolejbus B by jel z hlavního vlakového nádraží kolem Modrety na náměstí, dále ulicí Benešovou k poliklinice, odtud nově plánovanou spojnicí do Horního Kosova až po Staré Hory. "E" by jelo od poliklinky k Hotelu Jihlava. "A" by od Dopravního podniku jelo na novou zastávku k městskému vlakovému nádraží. Bus č. 4 by vznikl sloučením linek 4 a 7 (tedy z Heroltic až do Popic), "pětka" by pokračovala na Znojemskou. Kvůli přehlednosti by vznikly nové stojany s plánky a také nové názvy zastávek: místo Okružní Tesco, místo Okružní I jen Okružní, místo Romana Havelky I Nákupní centrum. **Repro: archiv Petra Chmely a Blanky Brožové**

Zajímavá dopravní řešení

(Dokončení ze str. 1)
"Některé myšlenky týkající se přechodů – například ostrůvky - směru úpravy související s příjezdem náměstí, jsou použitelné v praxi," uvedl náměstek primátora pro dopravu Josef Kodet (KDU-ČSL).
Podobný názor má i vedoucí odboru dopravy Ján Tinka. "I když některé návrhy jsou finančně náročné, hlásně na bezpečnosti by se nemělo šetřit. Projekty teď půjdou na komisi pro dopravu, budeme se jimi zabývat a eventuelně jejich realizaci doporučovat radě a zastupitelstvu," řekl.
Nelíbil se mu třeba návrh vrátit dopravu do Benešovy ulice, ale naopak ho zaujalo vybudování jedné okružní křižovatky na Brněnské pro odbočku na Kosov i do ZOO, varianta s "objížďkou", který by eliminoval prudký sklon k zoologické zahradě.
"Konkrétní jednotlivá řešení zdvojí na magistrátu, já mohu přiblížit, že pomůžeme," uvedl Karel Havlíček ze Skánského fondu dopravní infrastruktury. Zároveň kritizoval to, že většina žádostí o dotace zrovnoká na špatné dokumentaci, tedy že se v Česku obecně vypracovávají nekvalitní dopravní projekty.

– kruhový objezd po obvodu Masarykova náměstí, ulice Křižová jednosměrná směrem k náměstí a Komenského jednosměrná směrem od náměstí (tedy zrušení dosavadní pěti zón). Auta by po odvodu náměstí ještě zpomalovaly zvýšené přechody pro chodce, jinak by ale ulice byly užší, a tím by vzniklo víc parkovacích míst
– bezpečnější řešení křižovatek Brněnská-Kosovská a Brněnská–sjezd k ZOO (špatné rozhledové podmínky a neusměrněný výjezd řidičů z obou vedlejších ulic):
a) ústí Kosovské ulice zkolmit a rozdělit ostrůvkem,
b) sjezd do ZOO jednosměrný ve směru k parkovišti,
protijedoucí auta by podjížděla pod mostem a napojovala se na Kosovskou,
c) zřídit uprostřed okružní křižovatku s výjezdy do obou vedlejších ulic – k parkovišti u ZOO by vedla buď přímá spojnice s nevýhodným dvě-procentním sklonem, anebo pozvolnější "esíčko", zasahující do svahu nad parkovištěm
– přechody u kina Sokol, naproti Bille u Tesly a na Havlíčkově ulici. Dělené ostrůvkem, zúžená vozovka na jeden pruh i za cenu toho, že auta nebudou moci objíždět stojící vozidlo MHD – tzv. "zátka". Zrušení přechodu nad zastávkou U Modrety
– speciální parkovací dům v Horním Kosově pro 45 míst

Fig. 9. Newspaper article in response to the MEPS

6. Best defended bachelor and diploma theses

Among the best theses that have been processed in the project are included the mentioned award theses but at a high level was processed also a number of other works. A list of the ten most successful is located below (see Table 1).

Table 1. List of the best theses since 2010

Author	Title	Type of thesis	Year of processing
Ing. Jiří Hanzl	Optimization of cycle paths and cycle routes in Písek	diploma	2012
Bc. Pavel Soukup	The study of traffic calming ton the road No. III/0382 in the village of Josefův Důl	bachelor	2012
Bc. Veronika Brabcová	Optimization of space road II/270 in Jablonné in Podještědí	bachelor	2012
Bc. Nela Kolesarová	Proposal of traffic calming in Drážďanská street in Ústí nad Labem	bachelor	2012
Bc. Jan Šilar	The study of calming of selected problém places in Šumperk	bachelor	2011
Ing. Ondřej Landovský	Modifying of crossway of Božtěšická and Petrovická street in Ústí nad Labem	bachelor	2011
Ing. Milan Tesař	A study of traffic safety on the new route II/610 in Brandýs nad Labem	diploma	2011
Ing. Denisa Plánková	Proposal of reconstruction of the roundabout in Bukov in Ústí nad Labem	diploma	2011
Ing. Bc. Jana Košťálová	Solving of traffic safety around elementary school in the city section of Prague - Klánovice	diploma	2010
Ing. Hana Kučerová	Optimizing of traffic flows in the parking lot of personal cars of TPCA´s employees	diploma	2010

7. References

- http://www.cdv.cz
- http://www.fd.cvut.cz/projects/k612x1pf/
- http://www.policie.cz/

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AIR TRAFFIC CONTROL

16121 - DEPARTMENT OF AIR TRANSPORT

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Link to the website of the project: http://www.fd.cvut.cz/projects/k621x1rl/

1. Introduction

Air Traffic Control project is one of the successor projects of project aviation surveillance technology and air traffic control and exists only 2 years. It was needed to divide the original project to two parts more focused on specific issues. The second project is called the CNS / ATM systems. Despite this division, some work in air traffic control and CNS / ATM systems projects overlaps.

2. The activities of the project

Air Traffic Control project is directed to areas of operational procedures analysis that can help to increase airspace capacity, to improve the safety and efficiency of flight operations. These include the development and design of new approach procedures, optimization of airspace sectorization, different concepts of "Free Flight", the analysis of flows and streamlining the exchange of information between all stakeholders that are involved in the process of air traffic control. For effective solutions of the issues are available analysis and simulation tools in the Laboratory of ATM systems at the Department of Air Transport.

2.1. The current focus of the project

Scope of research and development that can hide under the air traffic control project is extremely broad, and it is therefore necessary to distinguish CNS parts which belong under another project. An obstacle, however, is the inseparability of Air Traffic Control and CNS / ATM, so some issues will always be situated in both projects.

Reviewer of the paper: Jiří Šála

Despite this fact, however, is not possible to solve complex ATC and it must be chosen only few areas to work at. Among the most recent are:

- Collaborative Decision Making - Structure, sharing and flow of operational information between all stakeholders in air traffic management to increase the efficiency of air transport. (CDM)
- Performance Based Navigation (PBN) - area navigation and the development of navigational environment. Keeping aircraft in the en route phase of flight and modern navigation systems for approach to land.
- Advanced Safety Nets - Design and optimization tools to increase the safety of airport operations. Conflict detection systems on the movement area and near the airport. Short and medium term conflict detection.
- Airspace Management - sectorization, organization and capacity solutions for airspace. Flexible use of airspace and air traffic flow optimization.
- Simulation – the use of software tools for the design and testing of future technical and operational concepts to increase the efficiency of flight operations.
- The modern concept of the airspace use - Free-flight airspace, the concept of functional blocks, highway in the sky. The concept of SESAR.

2.2. The need for solving the issues

All the above mentioned areas are essential for maintaining the development of aviation in the coming years. Current state of development in the field of air traffic management always reflects the number of aircraft that is necessary to control the airspace. This situation is therefore solved with continuous development of new procedures and technology that is, every few years, replaced by a step change in the form of a comprehensive replacement of ATC systems to air traffic control centers.

Currently, many of aviation stakeholders works on preparation of comprehensive change of the entire air traffic control, called SESAR (Single European Sky ATM Research), with its final applicability in 2018. The whole SESAR affect a large number of players in the aviation, especially air operators, airport operators and air navigation services (ANS) providers. SESAR development was planned well in advance for its successful completion, but the pressure of air operators towards introducing changes to the operations is significant. Therefore, all stakeholders are beginning to seek help even in the research organizations.

3. Achievements of the project

Due to brief history of the project (only two years) there are already interesting successes of air traffic control project. It can in fact rely on the research and development of system components for the ANS station, which are identified by the project managers in advance well before the requirement for their development comes from the business sector.

3.1. Performance-based Navigation

In the project we are dealing with “higher” area navigation application for aviation. The principle of area navigation has been used for over ten years, but the use of all the benefits is still not in sight. Therefore, we focused on this issue, which will begin to outweigh the "classic" RNAV in coming years. We also solve the possibility of redesign approach routes and changes of procedures for air traffic controllers. The benefits of this direction are expected in the following year.

3.2. Application of Free Route Airspace

Three years ago we dealt with the possibility of application of Free Route Airspace to Czech Republic airspace and possibly even for Functional Airspace Block Central Europe. This analysis was carried out in cooperation with Air Navigation Services of the Czech Republic, and from April this year was the first phase, consisting of straight routes through the Czech Republic, introduced into operation. This will be followed by further steps towards the full implementation of Free Route Airspace after the replacement of the entire system of ANS CR.

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Fig. 1 The proposed entry and exit points for the Czech Republic for the introduction of the second phase of Free Route Airspace

3.3. Optimization of Airspace

When dealing with large general aviation aerodromes we got to the stage where the used classes of airspace in Czech Republic need to be changed. In this project area we have done some analysis and identified the need to introduce Class F airspace in CR. Unfortunately, the class itself is insufficient. For this reason, we are currently dealing with the possibility of TIZ (Traffic Information Zone) implementation, which would allow better layout and higher safety of the airspace. Through this research, we also started to communicate and cooperate with the air navigation services provider in Norway, Avinor. We see great benefits in the introduction of TIZ for the Czech Republic.

We focus also on airspace optimization in terms of major air transport and thus the upper airspace. Here can be solved capacity problems both in terms of sectorization changes, and the adding of new routes. The upper airspace cover mainly transit traffic and do not interfere with the areas of complex modeling, such as TMA and standard arrival and departure routes.

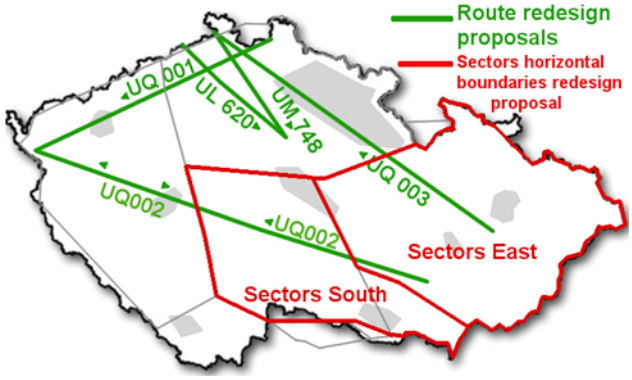

Fig. 2 The proposed redesign of the airspace of the Czech Republic

4. Participation in grants and projects since 2010

Project Air Traffic Control is involved in two grants from the CTU Student grant competition. They are:

- SGS12/165/OHK2/2T/16 - Improvement tools for reinforce small international airport safety and security - in this two-year grant is part of the research devoted to analyzing the use of SBAS approach; for Air traffic Control project in terms of potential airspace management and approach to land at small aerodromes.
- SGS13/090/OHK2/1T/16 - The use of surveillance information to increase safety of AFIS service - the use of multilateration as a source of position information for the AFIS officer.

5. List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Ing. Matěj Nesvadba	Conflict Alerts in A-SMGCS	DP	2013
Ing. Jan Bartuška	Modelling and Simulation of Capacity Adjustments of the Czech Airspace	DP	2012
Bc. Pavel Černý	Pre-Departure Sequence Stability Within CDM	BP	2013
Bc. Lukáš Umlauf	Optimization of airways	BP	2013
Bc. Petr Mazůrek	Software tool for modeling accuracy of MLAT system	BP	2013

6. Cooperation with practice

The project, called Air Traffic Control, alone clearly indicates that the most important partner from the practice is the Air Navigation Services of the Czech Republic. Due to close cooperation established between the Department of Air Transport and Czech ANSP, ANSP representatives in project management (Ing. Jiří Šála) and other representatives of the ANSP (Ing. Aneta Černá, Ing. Jiří Frei), who regularly cooperates in project topics with students, all solved topics are used immediately in practice when completed, or are work at directly at the "order" from the ANSP. This is precisely the case with issues around CDM and Safety Nets. Both of these areas are constantly being developed and improved in this project and students are directly involved in their implementation, or even lead the work to design changes and testing them, with a mere supervision from the ANSP.

We have recently also open cooperation with the Hradec Králové airport, which intends to introduce an instrument approach. Since Hradec Králové airport falls to the category of major aerodromes for general aviation and has the necessary infrastructure, there are no major obstacles on the side of the airport, which would prevent this introduction. The airport operator, however, turned to the Department of Air Transport, and thus indirectly to persons from the Air Traffic Control project for the preparation of background material for this change. Students of the project are currently working on the analysis and the changes required for the introduction of an instrument approach in Hradec Králové airport. Since some of the changes affect the regulations, it was necessary to start cooperation with the Civil Aviation Authority and the Ministry of Transport of the Czech Republic. Then there was also need to establish cooperation with Light Aircraft Association, the Aero Club of CR and the Ministry of Defence to ensure that all stakeholders' interests are taken into account.

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ANALYSIS OF TRAFFIC ACCIDENTS

16122 - DEPARTMENT OF FORENSIC EXPERTS IN TRANSPORTATION

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Link to the project website: http://www.fd.cvut.cz/projects/k616x2d/

1. Introduction

The educational project "Analysis of traffic accidents" led by the Department of Forensic Experts in Transportation started in 2007, shortly after the establishment of the department in 2005. Its aim is to educate students in the field of active and passive safety with a focus on the interaction human - vehicle - transportation infrastructure. Research topics are closely connected with activities of the department itself. Students have during studies chance to get insight into forensic expert activities and learn facts, that are often useful even in their daily life. Overall, the project is taught in an active form, where students have a chance not to learn only, but also to test the theory in practice.

2. The activities of the project

The project deals with the introduction to the solving of traffic accidents and their complex analysis (decision making of road users – subjective parameters, analysis of documented marks and damage – objective parameters, safety of the road and vehicles – prevention of accident situations and material damage).

The project is done in several phases. The beginning of the project consists is based on regular consultations. The main emphasis is put on the selection of the theses topics. Firstly, students prepare presentations and posters on various problems or themes. These are then discussed and evaluated. This enables to remove any potential doubts and verify the suitability of the topic to the student. The main advantage of this approach is that the choice of topic may even come from student initiative. Thus, the student has the opportunity to study a problem that he is really interested in. Furthermore, it is a common practice that students continue further with their topic from bachelor thesis in their master thesis.

Reviewer of the paper: Ing. Zuzana Schejbalová, Ph. D.

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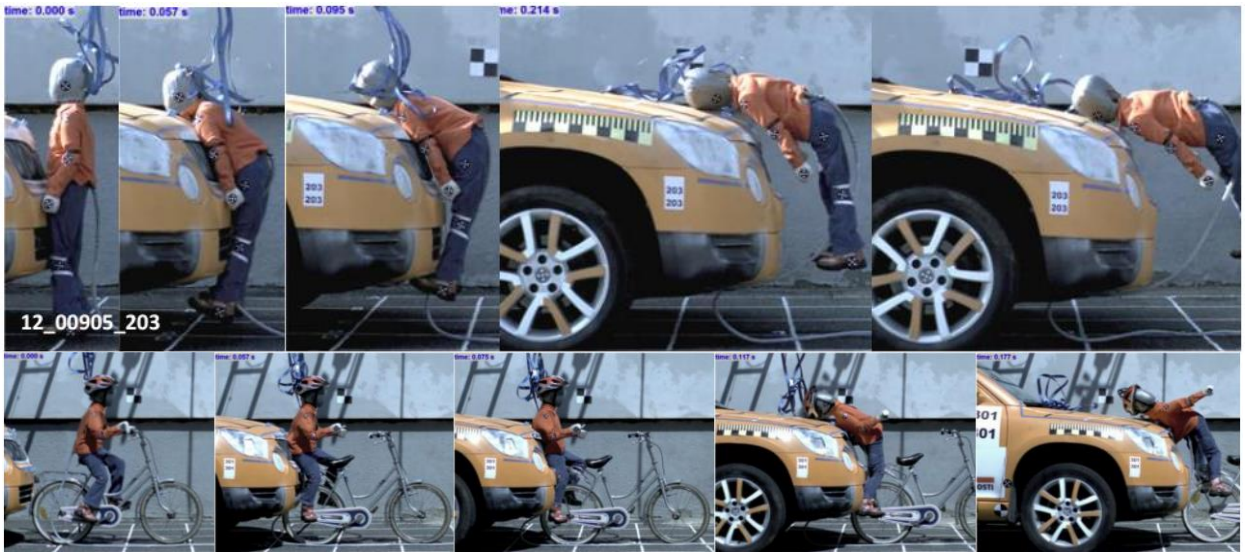
Fig. 1 Project consultation

In the second phase, students have the opportunity to experience excursions and experiments organized by the department. These are used to collect necessary data for theses or expert / research activities of the department. By this the teamwork abilities are developed and improved. Students are provided with an invaluable opportunity to "get in touch" with measuring techniques or methodologies which are essential for any research. In addition, this approach is increasing the attractiveness and reduces the monotony of studying.

2.1. Previous topics of the project

The department together with the project students has performed and excessive tests of dynamic passive safety of a collision with child pedestrians and cyclists with a passenger car (M1 category). Vehicles used within tests were ŠKODA Roomster, ŠKODA Octavia II and ŠKODA Yeti. During tests were monitored contact zones at the front of the vehicle together with potential damage. The damage and deformations were measured by 3D scanning. The child dummy P6 was modified due to the demand on higher number of measuring areas than in the case of the original P6 dummy, which is intended for a child restraints testing. Head, thorax and pelvic resultant acceleration were measured. The left upper leg was equipped with two strain-gauge halfbridges on the femoral skeleton for the contact force measurement. One uniaxial accelerometer was installed in the knee area for the measurement of acceleration in the sagittal direction.



The aim of these tests was not only a detail description of a post-crash pedestrian kinematics and comparison of the primary and the secondary impact seriousness by simulation of accidental situation using full-scale tests, but also served as a data source for advanced mathematical modelling. A secondary, but equally important goal was to provide students with the opportunity to become familiar with preparations of this type of experimental activities, their realization and consequent evaluation. For some students, the topic has become a fundamental in their theses.

Apart from this extensive topic students were dealing with other topics, such as chasses tilting due to intensive braking, testing of vehicle dynamics, vehicle illumination or vehicle identification by different methods. Practical measurements which were necessary took place during project classes. Thus, everyone had chance to learn about the particular topic.

2.2. Ongoing and future topics of the project

At present, the research activities of the department which are closely connected with student theses are mainly focused on several thematic areas: adhesion and adhesion conditions, the use of photogrammetric imaging and motion measurement with use of classical and GNSS technologies.

The first thematic area is focused on detection of the road pavement surface texture and skid resistance. Students are involved in a variety of practical measurements. The skid resistance measurements are mainly done by determination of a friction coefficient. This coefficient is measured with use of British Pendulum Tester or accelerometer, which is mounted in the braking vehicle (decelerometry). The texture of road pavement surface is determined through volumetric patch technique, photogrammetry or 3D scanning. The main goal is to find new ways of road pavement texture and skid resistance determination, especially, with modern technologies like photogrammetry or a non-contact scanning of the surface. Define their accuracy and verify the results with already standardized measuring methods and eventually design methodologies for the measuring procedures.

Fig. 2 Road pavement surface model

Another thematic area that is currently and mainly in near future connected with the project is photogrammetry. Photogrammetry is a measuring method that allows determination of shape, size or position of measured object in the space from one or more images. The primary task of the photogrammetric measurement is to obtain three-dimensional reconstruction of an object in digital form (coordinates and derived geometric parameters). In the project has been photogrammetry already used at determination of the cyclist seating triangle or mapping of the vehicle interior. Currently, a potential application for forensic expert needs is evaluated. Whether it mapping of vehicle deformations after a collision or as an alternative measuring methods for determination of the road pavement parameters.

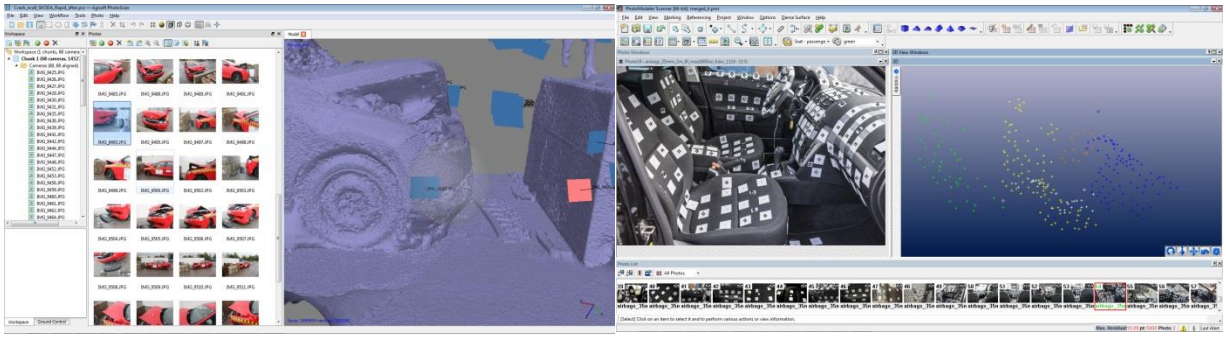


Fig. 3 Examples of photogrammetric evaluation a) post-crash deformations b) target mapping in vehicle interior

The last, but not least, thematic area is the use of modern technologies in transport engineering and forensic expert activities. For the years 2013 and 2014 the department successfully applied with a grant titled "Cyclist Trajectory and Dynamics of Motion (Description and Influencing Factors)". This grant project aims to describe the movement of the cyclist – bicycle system. The tracking of the bicycle position is done with use modern methods and GNSS position recording technologies. In addition to these facilities and procedures are also used conventional measurements with accelerometers or potentiometers.

3. The need for addressing the issue

To the question of whether and why should be addressed the problem researched by the project is a number of answers. The most important one is that this educational project leads to an increase of traffic safety and potentially save lives. Analysis of traffic accidents, as the name suggests, examines the causes, course and consequences of traffic accidents. Students have chance to learn methodologies and learn how to use measuring devices which are developed for this purpose.

Thanks to the focus of the department is possible to work with the most modern and sophisticated equipment, take part at the evaluation or designing of new methods. Therefore everybody can contribute with their efforts to the progress in the field of traffic safety.

4. Project achievements

Among the most significant project achievements are a high proportion of graduates with award-winning thesis (Praise the Dean, Prof. Vlcek awards or CTU Rector Awards). The project is also very successful in various competitions and conferences (e.g. JuFoS 2011 - 2013). Representatives of the project are annually placing among at top places at the Project Conference Presentation of CTU Faculty of transportation sciences.

The project was invited to exhibit at many interesting fairs and exhibitions - International Engineering Fair in Brno, The day of science (at both occasions as a member of CTU stand) or at the Ministry of Transport with presentation of project activities. Furthermore, the master thesis of Ing. Lenka Žaludová "The Headlamp Illuminance in front of a Vehicle" and thesis of Ing. Bc Karel Kocián "Analysis of traffic accidents on the R46 speedway" were published by LAMBERT Academic Publishing.

5. Participation in project grants and supported projects since 2010

In 2011 two the teams were assigned with grant in the Student Grant competition. First team with research project "Research of Safe Distance Feedback Radar Effectiveness" was under the leadership of Ing. Petr Smilek. The second "Traffic accident area survey for simulation and range of vision analysis support" was under the leadership of Ing. Jakub Dvořák. Both were former graduates of the project and are students of doctoral study programme. The remaining participants were students of bachelor's or master's study programmes.

In 2013 was in the same grant competition assigned a grant to the aforementioned project of Ing. Alžběta Lenková "Cyclist Trajectory and Dynamics of Motion (Description and Influencing Factors)". In the processing group are currently students master study programme. For these will this project be a primary theme of their thesis.

Furthermore, several papers and articles were written and published as a part of the educational project. All these publishing activities were supported by the Research Plan of the Ministry of Education MSM6840770043 - Development of methods of design and operation of transport networks from the point of view of their optimization (2007-2013, MSM).

6. List of the best bachelors and masters theses of the project

Table 1 List of the best theses of the project

Author	Title	Type	Year
Ing. Radka Bečicová	Rozhledové poměry na přechodu pro chodce	BT	2011
Ing. Martin Handl	Ochrana chodců při sekundárním nárazu	MT	2011
Ing. Bc. Karel Kocián	Analýza dopravních nehod na rychlostní komunikaci R46	MT	2012
Bc. Luboš Nouzovský	Chování cyklistů v silničním provozu	BT	2012
Ing. Tomáš Rozlivka	Zmanipulované dopravní nehody se zaměřením na analýzu chladnutí motoru	MT	2012
Bc. Zdeněk Svatý	Využití fotogrammetrie ve znalecké praxi	BT	2012
Ing. Petr Smilek	Problematika dodržování bezpečné vzdálenosti mezi vozidly na silnicích	MT	2010
Ing. Lenka Žaludová	Intenzita osvětlení předních světlometů v oblasti před vozem	MT	2012

All theses mentioned in Table 1 were awarded with praise of the Dean. Additionally, theses of Ing. Žaludová and Ing. Rozlivka also won Prof. Ing. Dr. Jaroslav Vlček, DrSc and the thesis of Ing. Petr Smilek was acknowledged by the award of Rector of the Czech Technical University in Prague.

7. Cooperation with application sphere

The Department of Forensic Experts in Transportation closely cooperates with several organisations and this collaboration is also affecting the project themes. Between important partners belongs The Škoda Auto, a.s., Fire Rescue Services of the Czech Republic (FRS) and Road and Motorway Directorate of the Czech Republic.

Already mentioned series of dynamic tests were carried out in cooperation with the Škoda Auto, a. s. and A.L.C.Z., a. s. Students had chance to witness a simulation of traffic accident rescue by FRS Hořovice. At the Ministry of Transport of the Czech Republic (MT) was realised an exhibition of the department together with student works. The most recent active participation of project students was at the first real eCall system test, where they helped with measurements and data evaluation. The test was carried out by the Department of Vehicle Technology in cooperation with MT and FRS.

Fig. 4 The day of science – year 2013

Finally, the possibility of using knowledge and experiences obtained from the participation in the project in practice is rather wide. Students may work as technical specialists in insurance, transportation engineers or designers in state sector (with focus on traffic safety) or as specialists at TÜV, BESIP, Škoda Auto, a. s., etc.

8. Conclusion

The project "Analysis of traffic accidents" has a number of graduates who have gained not only theoretical knowledge in the field of traffic safety, but also practical experiences. Students have the chance to get familiar with modern equipment, technology and methodology. Close cooperation with the application sphere also allows to get important practical skills which are essential for better opportunities in the professional life.

9. References

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Schejbalová, Zuzana et. al. Analýza biomechanické zátěže dětského cyklisty při střetu s osobním vozidlem, ExFoS 2012. Brno: Vysoké učení technické v Brně - Ústav soudního inženýrství, 2012, s. 59-72. ISBN 978-80-214-4412-6.

 ISBN 978-80-01-05416-1

BARRIERS IN TRANSPORTATION

16114 - DEPARTMENT OF APPLIED INFORMATICS IN TRANSPORTATION

Bc. Lucie Čiháková, Bc. Michaela Formanová

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Link to the website of the project: http://bariery.fd.cvut.cz

1. Introduction

There are barriers all around us. These barriers don´t represent for most people any difficulty. Sometimes we don´t realize what can cause insurmountable problems for a handicapped person - too high sidewalks, lack of elevators, small doorway weight, etc.

However, we, for whom these arrangements are not necessary, usually neglect them and don't consider them important. That is also why the project Barriers in transport is important not only in the traffic system, but also it teaches us, that not all people are the same and that there are people among us who have specific needs which we have to devote. Our project is set for both bachelor's and master 's degree study.

2. Project activities

As the project is quite new, the history of it isn't very extensive. It arose in the year 2011, and since then students have got acquainted with the basic terms of this issue. The students were given free hand in aiming their work according to their own preferences and their specifications.

Regularly we have been meeting with our supervisors to discuss the problems which we met while gaining information about problems of impaired people. We have created presentations to learn more about the problems. We have taken part in various exhibitions such as 'Invisible exhibition'. There we could experience what it is like if you cannot see and how to move in the places which are unfamiliar to you.

We have also met Mgr. Victor Dudr, who works for SONS (Union organization of the blind and the purblind). As he himself is blind, he is familiar with these issues and he has been solving problems of the blind and the purblind for a long time. We went with him round the subway station Florenc, which is a very important interchange station of PID (Prague Integrated Transportation System). He showed us problems of the visually impaired here and we discussed possible solutions.

Reviewer of the paper: Ing. Mgr. Michal Jeřábek, Ph.D., Ing. Jan Krřál, Ph.D., Ing. Lucie Krčálová

We have gone to the Prague organization of wheelchair users. We had an opportunity to use wheelchairs in Prague public traffic. We were also lent a device for measuring and so we could research wheelchair access.

Thanks to the project "Barriers in Transport" there have been a lecture of Ing.arch. Petr Lnenicka, who is the expert consultant of the organization SONS. The theme of the lecture was "Creation of conditions for self-dependant and safe use and accessibility of traffic systems by people with restricted abilities of movements and orientation"

Other lectures were given by Ing. Pavel Rocek on the theme "Wheelchair access, right to free life with restrictions" and "Systems and aids for eye handicapped people in traffic"

At present only students of Traffic systems and technology are participating in this project and it means that they concentrate mainly on building adjustment - pavements, communications for pedestrians, passenger terminals, accessibilities of important buildings such as authorities, medical facilities, etc. so that they would be suitable for impaired people.

We would like to invite other students especially of AUT (Automation and informatics) and ITS (intelligent traffic systems) to join us. They could solve problems of information technologies, stating places and navigation systems according to demands of specific demands of impaired people. Nowadays there are enough modern technologies which could be used to ease safe and independent movement of impaired people in streets.

In pursuance of the project we have bought a development device for programming and testing applications of wireless communication between an electronic devices at short distances (NFC). We would like to develop a new traffic system for the impaired people. It would mean new stand with information how to get safely to bus stops or stations. This could be the main task for students of AUT and ITS.

Current students both of bachelor and master studies will proceed with gaining new knowledge of this issue, we will try to contact it with practice so that our proposals could be realized and helpful.

3. The necessity of solving this issue

The project Barriers in transport is dedicated to the subject, which is current and it is given not enough attention. We solve the problems of physically and visually impaired people in daily life. We want the impaired people to live normal life and be able to move freely without the necessity of the help of the others. We concern on the open area and also the space in the means of transport and departure lounge. The term physically and visually impaired people is not limited just to the people on the wheelchair or blind person. This term includes much more, such as the seniors, pregnant women, parents with the baby carriage and the mentally disabled people. In our project we want to cover the problems of all these handicapped people.

We try to draw bigger attention on the problematic of handicapped people. That's because we see lots of problems, which are based on repetition of the same mistakes. We can see all these mistakes and badly realized projects all around us. There is high number of these cases. These mistakes are mostly in the absence of the barrier-free edges, missing of badly implemented adaptation for visually disabled people. In these areas education awareness and interest of the people involved is highly important, which is visible on our already implemented projects.

You can see on the Figure 1 the disinterest of the public in the problematic of the visually impaired people. There are textured paving blocks on this Figure, which helps to the blind and sand-blind people with the orientation and unsupported moving. There is stall built right on this line.

We assume that a similar barriers in moving of visually impaired persons could not be the case if this issue was given more attention. We believe that this can happen only if people who are building the stall do no know, what is the purpose oddly grooved tiles. Compared to photo in Figure1, the problem in Figure 2 caused by lack of interest or ignorance of the engineer or builders. This photo was taken at the Central bus station in Prague (UAN Florenc) and shows the pedestrian crossing, which is very complicated and still not have a single element that would guarantee his wheelchair accessibility.

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Figure 1: Textured paving blocks

Figure 2: Pedestrian crossing – Florenc

However, as noted above persons with reduced mobility include people with intellectual disabilities. In the case of such handicapped persons is very difficult to determine the way in which it would be possible to facilitate their independent movement in the traffic environment. Nevertheless, we believe that there are ways, you just need to pay sufficient attention to solutions that mentally handicapped deserve.

4. Graduate works

Because of the short duration of the project, there are so far just two bachelor thesis. The subject of the first one is Adaptation of Bus Terminals in Prague for People with Visual Impairments. This thesis was defended at the end of September and was evaluated with the grade A. The main focus of this theses was to evaluate adaptation of Prague bus stations from the view of visually impaired people. The result was that none of the chosen stations is right projected. At the end there was chosen one station, which was designed by the author of the thesis according to the barrier- free principle. The detail is shown on the Figure 3.

Figure 3: Bus station blueprints – Florenc

The other thesis is just being finished. The subject of this thesis is Movement of people with reduced mobility in Most. The author's concern is the independent moving of physically impaired people on Most's routes. It is mapping the accessibility of the most important places such as offices or healthy department. It also focuses on the public transport stops adaptation. The result of this thesis is seen on the Figure 4.

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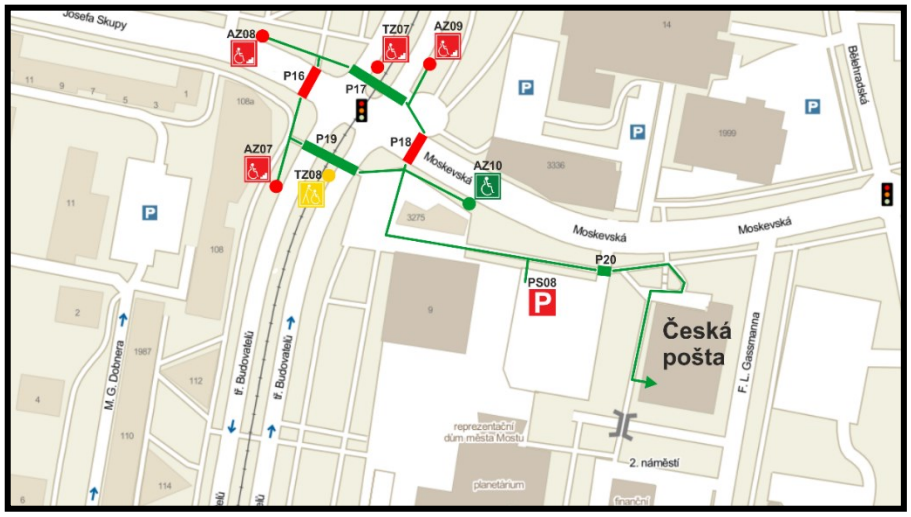

Figure 4: The result of the bachelor thesis

List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Bc. Michaela Formanová	Adaptation of Bus Terminals in Prague for People with Visual Impairments	BP	2013

4.Conclusion

The issue of barrier-free transport is very interesting and there are many unresolved problems and weaknesses. Project Barriers in transport is suitable for everybody, who is interested to get to know something new, work in friendly enviroment. At last but not least this project is for everyone who doesn't want to be only an educated technician, but who would like to help others through his work.

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CNS/ATM SYSTEMS

16121 - DEPARTMENT OF AIR TRANSPORT

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Link to the website of the project: http://www.fd.cvut.cz/projects/k621x1c/

1. Introduction

Project CNS / ATM Systems is one of the successor projects of project aviation surveillance technology and air traffic control and exists only 2 years. The second is Air Traffic Control. This split was caused by the need to specifically define the focus and deviate from the general air traffic. Some work in projects CNS / ATM Systems and Air Traffic Control continues to blend together.

2. The activities of the project

Project CNS / ATM systems is oriented to the technical field of current and future systems, devices, and technologies used in the management and ensuring of air traffic. This is the area of communication (COM), navigation (NAV) and surveillance (SUR) systems, but also the systems used to support ATFM (Air Traffic Flow Management), ATS (Air Traffic Services) and ASM (Airspace Management). In this area it means solving the problems and challenges arising from certain phases of the life cycle of these systems; from capture operational needs, through the definition of the system, design the system, development, production aspects (Factory system integration) integration of the systems to operators infrastructure (On-Site system integration) to the introduction of the system to operation (verification) and the actual operation and maintenance.

The aim of the project is to let students participate in solving specific challenges and tasks in close cooperation with organizations that use these systems as the Air Navigation Services of the Czech Republic, or with companies that develop and manufacture these systems. Students can use ATM systems laboratory built at the Department of Air Transport to support their activities in the project, where they are available analysis and simulation tools.

Reviewer of the paper: Jakub Kraus

2.1. The current focus of the project

The scope of the CNS / ATM systems project is very extensive, as modern solutions and management could not exist without electronic devices of all kinds. Therefore, it is impossible to cover all areas and at present we mainly focus at the following points:

- Development of multilateration method on the "Low-Cost" ADS-B receivers network (Development of low-cost surveillance solution for non-critical applications in aviation.)
- Models to assess the present and future load of the frequency band used by the cooperative systems (1090 MHz RF Band Load Model)
- Systems to ensure integrity IC (Interrogator Code) for Mode S radars in real time.
- Optimization of questioning WAM (Wide Area Multilateration Systems) systems in the Mode S
- Optimizing the use of transmitted ADD (Aircraft Derived Data) to improve the function of ATM systems
- Satellite navigation systems and their use in applications for approach and landing (for example, implementation of GBAS versus ILS)

2.2. The need for solve the issues

All of our current solved areas are an important part of aviation; at the moment dealt with at the research level, because in the following years are expected problems with currently used technology and systems.

The development of air transport continues inevitably and recently research has finally come to the fore, and even managed to “overtake” needs. In the past, all the needed changes were done after they were necessary; therefore, the reactive system was used. This situation, however, was realized by international civil aviation organizations, as well as the national and they started to focus more on the analysis of future operations and the resulting needs of research and development. There are currently two basic development trends affecting the entire aviation; SESAR (Single European Sky ATM Research) in Europe and NextGen in North America. This works style with more allocated time enables to get much longer period for the development of the necessary technology, which get higher quality and can deliver more benefits to the whole aviation.

This longer time period also allows the supervising authorities to provide a comprehensive analysis of new features for aviation and issue certification without the pressure from stakeholders. This in turn leads to an increase in aviation safety.

3. Achievements of the project

Even given the short time of two years of CNS / ATM systems project existence, there can be mentioned some rapid successes, primarily from the perspective of solved areas that are identified by experts estimate number of years before they are "officially" needed in aviation. The advantage obtained by this situation helps in development and building know-how, which is then utilized in cases where aviation companies came to seek help to a project representative or directly to ATM Systems Laboratory. Among these firms can be currently classified mainly Air Navigation Services of the Czech Republic and CS-Soft a.s.

Based on the above mentioned, at present another topic we solved appeared. This topic is development of multilateration method on the "Low-Cost" ADS-B receivers network (in other words, the development of low-cost surveillance solution for non-critical applications in general aviation).

3.1. Testing of multilateration methods on the "Low-Cost" ADS-B receivers network

In summer, the measurement to test the possibility of application multilateration methods based on the use of so-called "low-cost" ADS-B receivers took place. These activities are related to research of new surveillance solution for uncontrolled aerodromes. Specifically, in the context of measurement was used receiver from the British company Aurora Eurotech, loaned by CS-Soft, a. s. To measure aircraft positions was used six of these receivers deployed in Bohemia, in locations Kněževes, Chrudim, Most, Příbram, Nový Vestec and Poniklá. Our method of time synchronization of the receivers has been used and tested. It does not require the use of GPS modules in receivers for accurate time tagging of incoming messages. Given that within the measuring all receiving stations operate in off-line mode, the multilateration calculation was not performed in real time. At present we are working on the evaluation of the measured data and in particular to evaluate the applicability of the method of time synchronization.

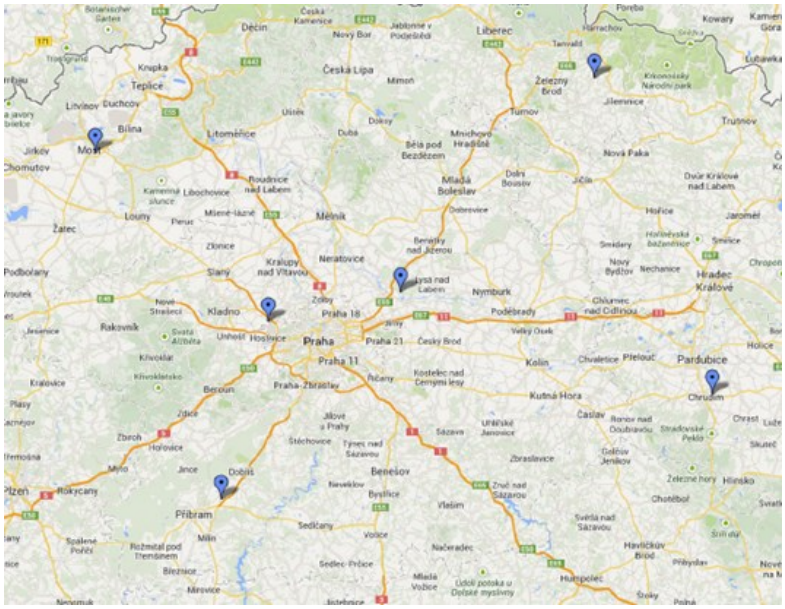

Fig 1 ADS-B receivers' positions

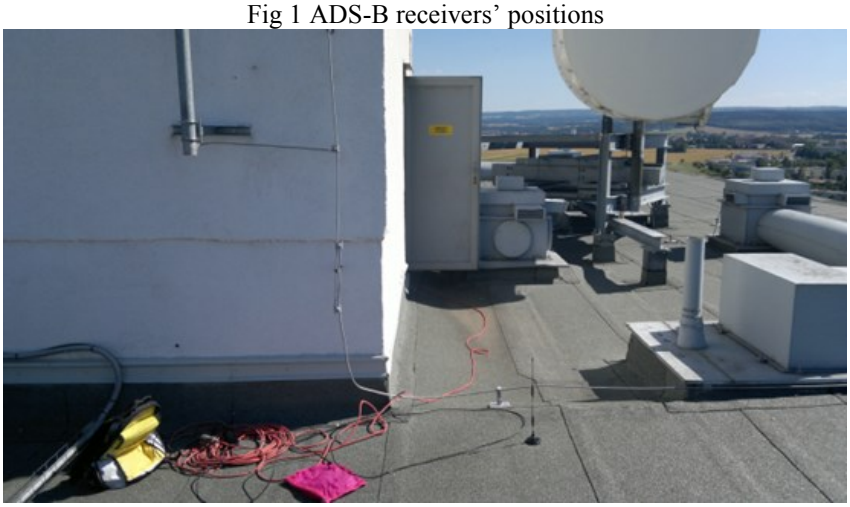

Fig 2 One location of measurement

3.2. The use of SBAS approach for large general aviation aerodromes

Currently finalizes the activities of this project that deals with the evaluation of the use of SBAS to create an instrument approach on major general aviation aerodromes. From this analysis is clear the need to expand the instrument approach to the largest number of aerodromes in the Czech Republic which will subsequently increase the volume of business and general aviation. The analysis also shows the need to increase the use of technologies that have been developed in the recent past and are currently available. We have also identified shortcomings in the legislation that prevents such use.

4. Participation in grants and projects since 2010

Project CNS/ATM Systems is involved in two grants from the CTU Student grant competition. They are:

- SGS12/165/OHK2/2T/16 - Improvement tools for reinforce small international airport safety and security - in this two-year grant is part of the research devoted to analyzing the use of SBAS approach
- SGS13/090/OHK2/1T/16 - The use of surveillance information to increase safety of AFIS service – this entire grant is based on the use of multilateration methods as a source of positional information of aircrafts in the vicinity of the aerodrome (i.e. the use of new CNS technologies)

5. List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Ing. Ondřej Neuman	Optimization of WAN Systém Interrogation in Mode S	DP	2012
Ing. Lukáš Hosnedl	Usage analysis of the Aircraft Derived Data in the ATM systems	DP	2012
Ing. Tomáš Kutenič	Continuous Descend Approach and Point Merge method for TMA Praha	DP	2012
Ing. Tomáš Sankot	Advanced Safety Nets at Ruzyně Airport	DP	2013
Ing. Jana Lingrová	Augmented reality tools for the tower Ruzyně	DP	2013
Bc. Martin Zach	ADS-B and VHF Receivers for Faculty of Transportation Sciences CTU	BP	2013
Bc. Tomáš Lipták	RF 1090 MHz Band Load Model	BP	2013

6. Cooperation with practice

In the project management of CNS / ATM systems are involved representatives of external entities, either directly as a leader (Miloš Strouhal, Ph.D., Travel Service, Ing. Jiří Frei ANS CR), or indirectly as employees of various airlines who have interest in cooperation with research organizations and have issues that must be dealt with.

Due to the representative from the company Travel Service in project management, the people at the project CNS/ATM systems are mostly responsible for all the analyses of the new aircraft equipment of the company, evaluation of the best selection of equipment and even the design of the operational procedures relating to it.

Currently also runs preparations for the project of the use of multilateration to monitor surrounding traffic around aerodromes at Department of Air Transport (DAT) with CS-Soft, a.s. This project aims to design, test and build a prototype of multilateration system for small aerodromes with the fact that the majority of the activities are planned to be performed at DAT, resp. Laboratory of ATM systems.

The Hradec Králové airport is another project concerning the introduction of an instrument approach to runway 34. There is a need for a comprehensive analysis of the feasibility, safety, and suggest the best solution for both the approach procedure and other approach parameters. The project is made in closely cooperation with Air navigation Services of Czech Republic, Civil Aviation Authority and even the Ministry of Transport of the Czech Republic, as our analysis of the use of SBAS approach (see Sec. 3.2, Chap. 4) found obstacles in legislation, which must be removed. Due to the introduction of SBAS solution, as part of the GNSS, we continue to work on this issue in cooperation with the GNSS Centre of Excellence.

At the project we have worked also with the Prague airport, VUT Brno, University of Žilina and we starts to develop cooperation with the Braunschweig airport in Germany and with Jeppesen, a subsidiary of aircraft manufacturer Boeing.

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DESIGN IN TRANSPORTATION

16114 - DEPARTMENT OF APPLIED INFORMATICS IN TRANSPORTATION

Bc. Tomáš Havlík, Bc. Tomáš Hurt, Jakub Jirsa

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Link to the website of the project: http://www.fd.cvut.cz/projects/k614x1d/

The project "design in transport" at faculty of CTU aims to educate students in the field of design. The project was created with the **intention to bridge the gap between traditional education of designers,** who are engaged in designing purely for the **art technically equipped** and graduate education, transport faculty who intends to enter into the design process in cooperation with the designer.

They extend the possibilities of not only the student, but there is such a relatively simple way new combination of education, which can help extend students develop artistic skills from the opposite side of the educational spectrum than normal.

The project is in it's early days focused on general preparation for **creative design studio type**, but gradually crystallized into the present form, **the instruction is completely individual**, both at different speeds and different demands according to their ability and needs of the student. In the future, the project aims for greater consistency with specific by typing in order to bring culture to the design components of the project.

Teaching isn't expected prior and background knowledge of each student begins at ground zero. Proceed using the "step by step" in five levels. These five steps leads to a basic mastery of **visual language design**.

The first step is to master drawings, proportions and way of seeing.

The second step introduces the basic principles of creation and the transition to a creative design approach.

The third step is transferred from the surface into space and deals with the shape.

The fourth step is at the level of mastery of 3D object modeling.

The fifth most difficult **step** is independent creative design in the abstract.

Reviewer of the paper: doc. Ing. Arch. Eva Fantová, CSc.

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Gradation of these five basic steps demonstrates the pyramid teaching in analogy with the pyramid of language development.

Figure 1 Principal of teaching "step by step" in analogy with the development of language

We believe that the project is worthwhile. The newly acquired art knowledge will make it easier to promote technological solutions and vice versa simple technical ideas to deliver creative activity completely different dimension. This also means eliminating unnecessary mistakes Transportation Specialist Group, which is committed by a person with no artistic background.

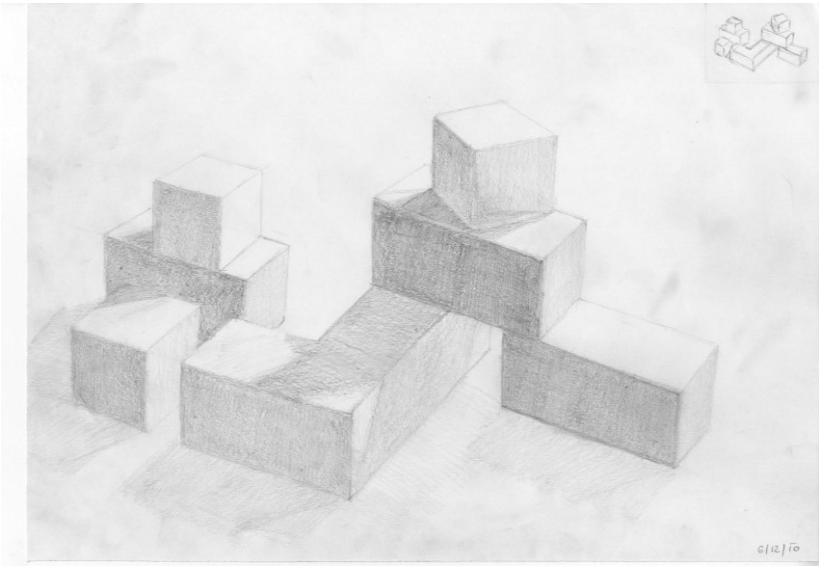

Figure 2 Drawing - the first beginnings

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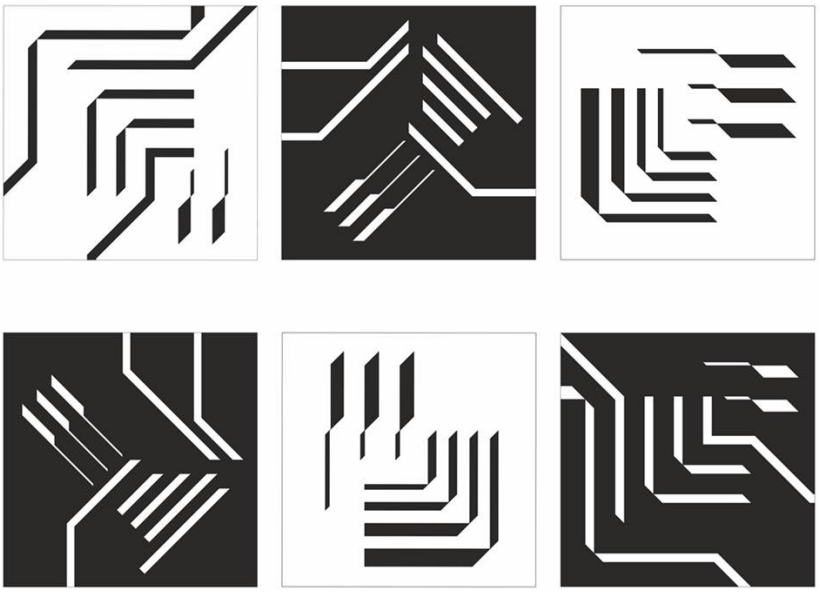

Figure 3 Compositional variation of the line

The first surprise and success of the project has already produced the first of the thesis, that line of common practices to improve freedom of entry. The novelty was also used handmade vivid 3D models that are part of the presentation. The results of dissertations and theses also brought a new perspective on the importance and ingenuity of layout and presentation. This is often extended by a separate additional attachments.

Project hasn't found yet for that atypical nature of the grant application.

List of the best bachelor and master thesis

Author	Title	Type	Year
Bc. Tomáš Havlík	Design innovation of the transport system in terms of visual graphic style	MT	2014
Ing. Barbora Baladová	Design bus stop and street furniture for Taipei	MT	2012
Bc. Tomáš Havlík	The architectural design of the roundabout in Mlada Boleslav	BT	2012
Jakub Žolčák	The redesign of the train for Krkonoše subway	BT	2011
Ing. Jan Petružela	The concept of citycar for taxyservices	MT	2011
Ing. Barbora Baladová	Principles and elements in cube (space of station)	BT	2010
Ing. Petr Doležal	Principles and elements in cube (highlight information - garage)	BT	2010

 ISBN 978-80-01-05416-1

At present, we don't cooperating with major companies operating in the Czech Republic. We assume, however, in the near future, taking into account the fact that students are working on very interesting projects such as the proposal roundabout design logos for Mladoboleslavská infrastructure transportation and many other works (listed in the table above) that this collaboration will soon develop.

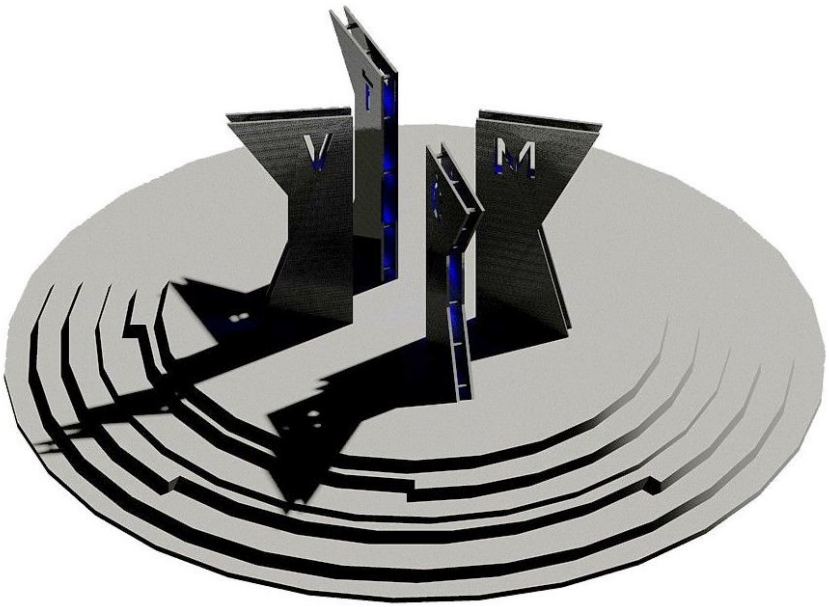

Figure 4 Spatial proposal center of roundabout - Tomas Havlik

For us, another big surprise that we waited under technical university, was a proposal for street furniture Taipei, whose author is now a graduate of the Czech Technical University Ing. Barbora Baladová.

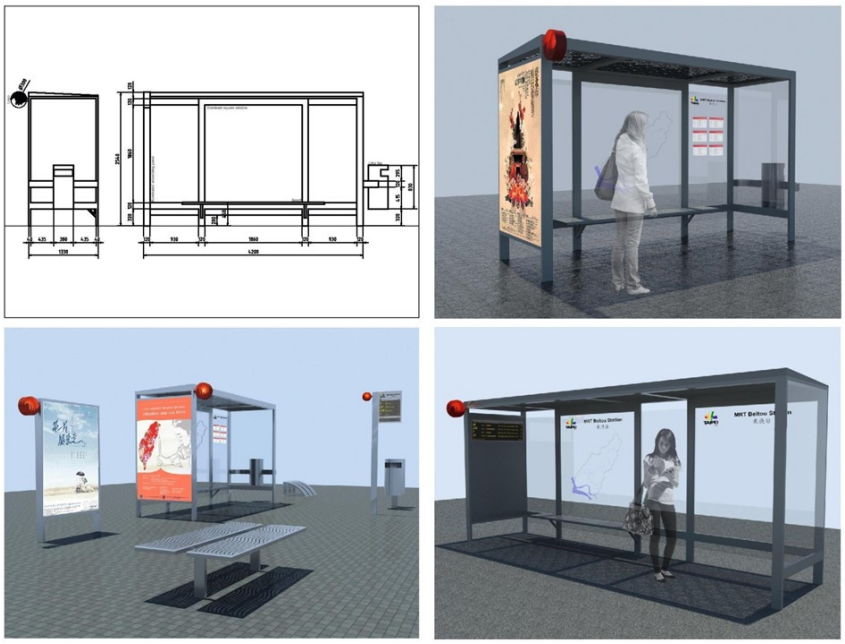

Figure 5 Proposal for Taipei street furniture - Barbora Baladová

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Design concept taxis took our excellent student Jan Petružela.

Figure 6 Draft vehicles for taxi service - Jan Petružela

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DEVELOPMENT OF CYCLING TRANSPORT

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

Bc. Martin Havelka

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- Ing. Jan Šilar (xjsilar@fd.cvut.cz)

Link to the website of the project: http://www.fd.cvut.cz/projects/k612x1rc/

1. Introduction

This project is suitable for students who want to participate in improving conditions for cycling in our state. The main idea is to increase a proportion of cyclists in a regular traffic and offer them the highest level of safety. The network of cycle routes should be able to provide recreational function as well as transport function. We realize that the user's structure of bicycles is very different, so we try to make a suitable infrastructure for everyone. We also want to encourage any proposals to expect the cyclists already in the concepts. In this case the ecological form of transport should become an equivalent component of transportation systems.

2. Why exactly cycling

In the last time the cycling transport has been making such a big progress in a technology and also in an infrastructure. Maybe, due to a current economic situation, still more and more people use economical forms of transport (e.g. in Prague in 2011 intensity of cycling transport increased by 46 % over the previous year). There are also questions about placing bicycles, creating new rest areas or possibilities of taking bicycles by the public transport. This problem is solved by many integrated systems, but there are also special cycle buses and cycle trains which offer some attractive routes (trips) for recreational cyclists. However, the most important are safety aspects, because cyclists and pedestrians are the most vulnerable in the regular traffic. Also people over 18 years don't have to use a helmet. We should ensure the safety for everybody. In 2010 there was some survey in Prague. Most of respondents think that the biggest problem is the safety so they are afraid to use a bicycle in Prague.

Reviewer of the paper: Ing. Jan Šilar

3. Topics of bachelors and masters theses

Certainly the main part of your work will be bachelor or master thesis. In most cases students solve real problems of cities and villages, which are quite often as requests from representatives. Our topics could be divided into traditional and unconventional. Traditional one is e.g. an analysis of a current situation (a place of residence etc.), to create a new network of cycle routes compared with a transportation master plan (if it's available), integration measures etc. On the other side there are unconventional topics such as a study of modern design elements, an automatic loan and a depository for bicycles or to create a bicycle lift in the locality. Usually there is some participation of the traffic surveys at the Department of Transportation Systems and at interesting conferences.

4. Grants and projects

In 2010 was finished a project called "ROCY – Safety of geometry for cycling transport". This project was supported by Ministry of Transport and it was a kind of cooperation between the Transport Research Centre and Faculty of Transportation and Sciences, which was represented by our project. The main topic was how to offer a quality and safety infrastructure as the most important thing for people who think about their bicycle as means of transport.

5. Success of the project

Many of our students got dean's approbation for the excellent elaboration of their bachelor/master thesis. Ing. Lukáš Černý got for his master thesis, he solved the integration of cyclists at crossroads in Letná, the prize of Prof. Ing. Jaroslav Vlček, DrSc. for the best thesis of the faculty in 2010. There are also successful graduates e.g. doc Ing. Josef Kocourek, Ph.D. or por. Ing. Tomáš Padělek who are head of the project at this time. Finally in 2011 our students won the competition "presentation of projects".

6. Cooperation and practicing

Students are usually in contact with representatives because of their thesis and other problems. The output is a new way how it is also possible to solve a conception of cycling transport in the area. These are often created together with some drawings which are very close to real projects. Head of project are very helpful and of course they have plenty of knowledge and experiences. It's also possible to have some consultation with people from organizations that are interested in the transport. Students also work with land use planning documents and other documents and conceptions.

7. Illustrations of student's theses

Let's have a look at the examples of theses, that our students had created, to see what we really do.

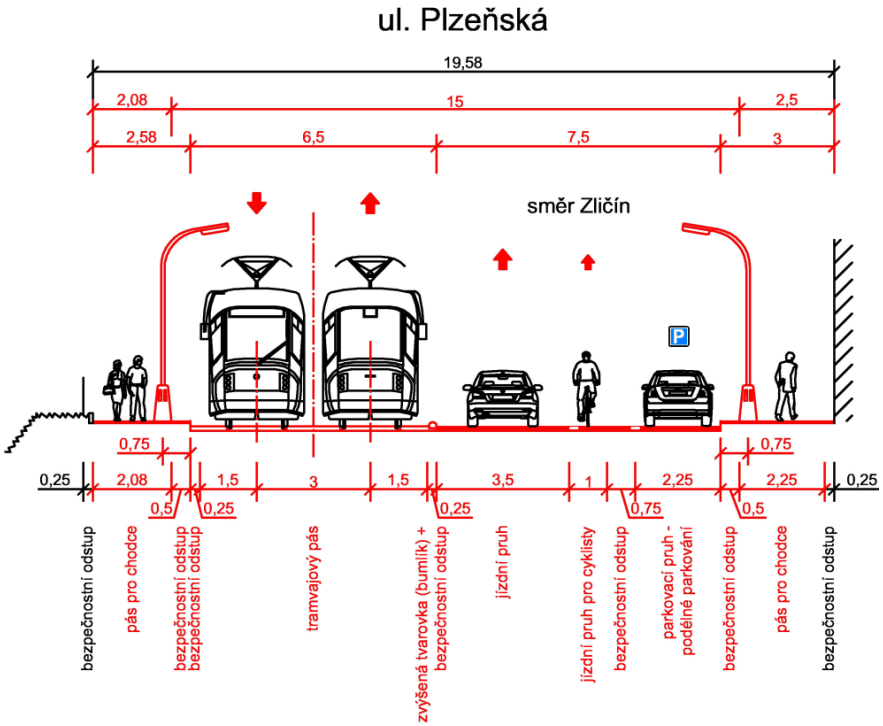

Fig. 1 – Jiří Holer, bachelor thesis: Study of Cycling Transport Propsal in Area of Street Plzeňská and Vrchlického in Praha 5

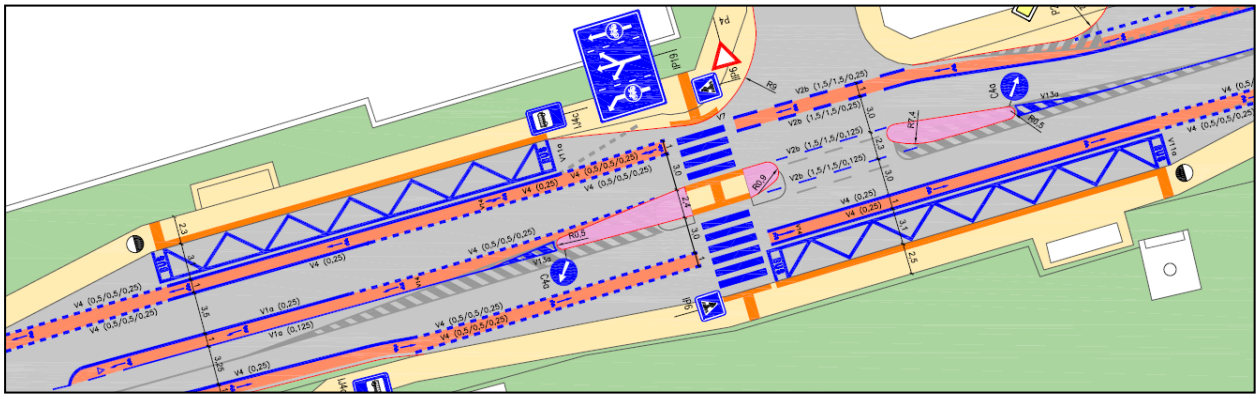

Fig. 2 – Martin Havelka, bachelor thesis: Study of the Traffic Cycle Solution arend Bobsled Track in Prague - Prosek

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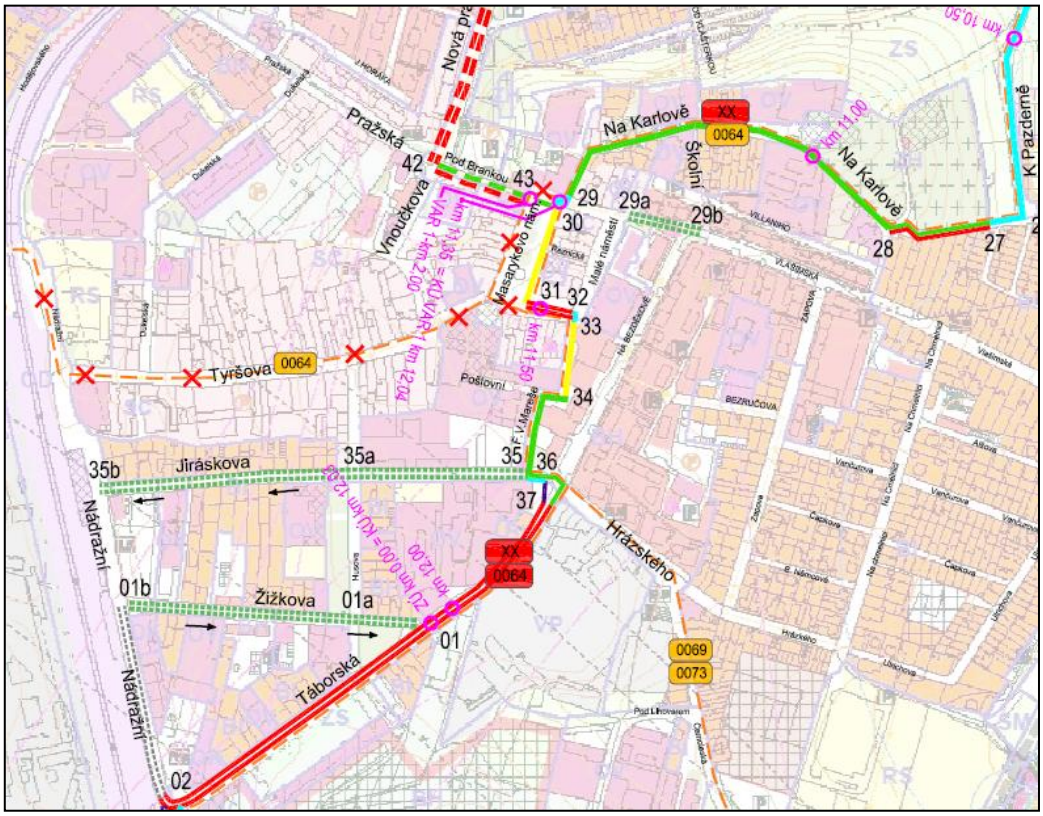

Fig. 3 – Jana Galajdová, bachelor thesis: Study of Cycling Transport Proposal in Petr Bezruč Street in Kladno

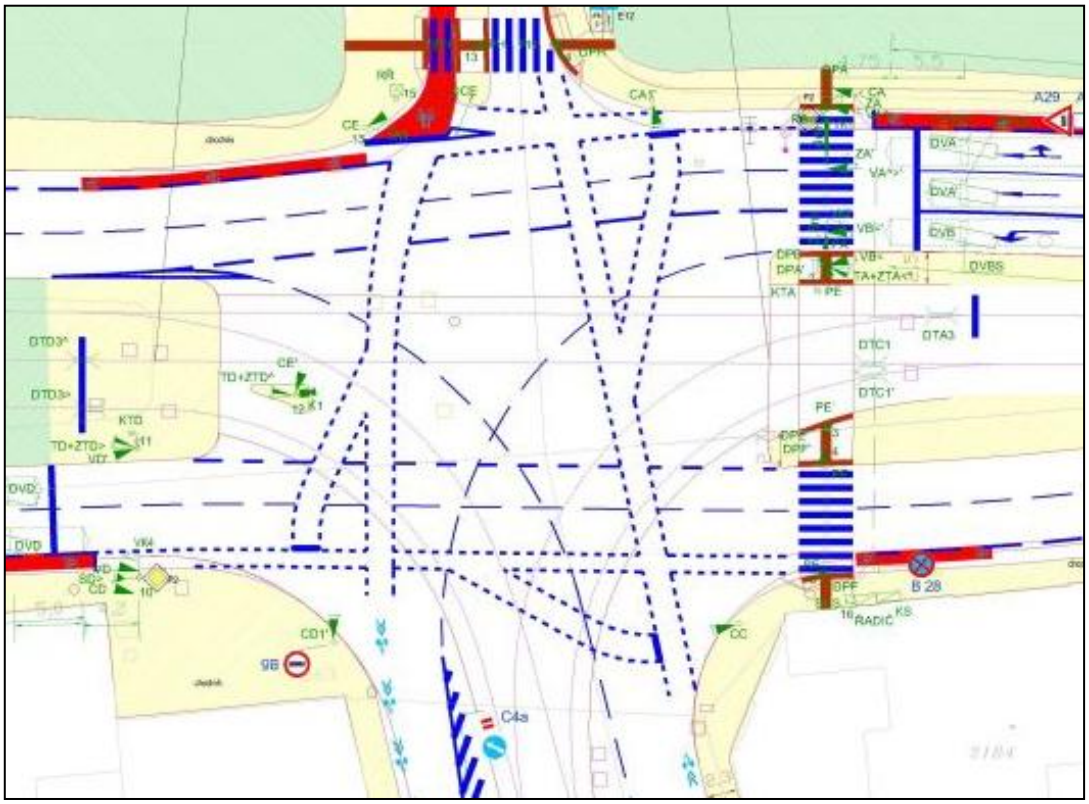

Fig. 4 – Lukáš Černý, master thesis: Integration of Cyclists at Cross-roads of Streets Badeniho and Milady Horákové

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8. As conclusion

We welcome students who have positive attitude towards independent and creative activities. During the semesters you will catch up all principles and possibilities of the current cycle traffic. If you are interested in Department of Transportation Systems, but you are not sure about your vote, then believe that cycling offer a huge field to play and it's open to new initiatives. If you recognize typical "cycle-states" (Netherlands etc.), then it's clear, because we have plenty of work. And finally having a quality infrastructure for cyclists is one of the characters of modern state.

List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Ing. Lukáš Černý	Integration of Cyclists at Cross-roads of Streets Badeniho and Milady Horákové	MT	2010
Ing. Jakub Důra	Study of Cycling Transport Proposal in the Street Dr. Milady Horákové in Liberec	MT	2008
Ing. Zdeněk Fořt	Lay-out of Cycle Tracks Network in Příbram	MT	2010
Ing. Jiří Holer	Study of Non-Motorized Traffic Solutions in the Town Žďár nad Sázavou	MT	2013
Ing. Jana Galajdová	Study of Cycling Transport Proposal in Petr Bezruč Street in Kladno	BT	2010
Ing. Lenka Syrovátková	Study of Cycle Route Jizera in Part from Železný Brod to Semily	MT	2007
Ing. Jiří Holer	Study of Cycling Transport Propsal in Area of Street Plzeňská and Vrchlického in Praha 5	BT	2011
Ing. Lukáš Černý	Study of Cycle Routes in District Prague 8 and its Connection to Subway and Valley of Vltava River	BT	2007
Ing. Zdeněk Fořt	Study of Cycle Route Ohře in Selected Westbound Section of Karlovy Vary	BT	2008

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THE EUROPEAN ATTITUDE TO AIRCRAFTS MAINTENANCE

16121 - DEPARTMENT OF AIR TRANSPORT

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Link to the website of the project: http://www.fd.cvut.cz/projects/k621x2eu

Abstract

The paper presents a part of the project The European Attitude to Aircrafts Maintenance (X2EU). This part is a project which searches potential uses of unmanned aerial vehicles in the aircraft maintenance, meteorological probes, controlling of objects, tracking of transport routes, the Integrated Rescue System, airports working and many others. The project is called *SpyHawk*. There are the history of the project, the current activity and the future activity in this paper present. The tasks which the project had to do this time were to select a suitable unmanned aerial vehicle and to design suitable equipment for it. The basic equipment is the video camera, the thermo vision camera, the autopilot and the transmission system, FPV glasses etc. There are successes of the project, participation in the grants and potential applications for UAV in the paper, too.

Key words

SpyHawk, the project SpyHawk, UAV CTU FTS, the unmanned aerial vehicle CTU FTS, applications of SpyHawk, applications of unmanned aerial vehicle, The European Attitude to Aircrafts Maintenance, X2EU, the grant return of the unmanned aerial vehicle for meteorological probes, the grant unmanned aerial vehicle CTU FTS

Reviewer of the paper: Ing. Martin Novák, Ph.D.

 ISBN 978-80-01-05416-1

1. Introduction

The project European Attitude to Aircrafts Maintenance focuses on contemporary trends in the technical aircraft maintenance, in the preparation of the maintenance staff and in application of technical news and aids into the aircrafts maintenance. Specific parts of the aircraft maintenance on which students are focused in the project are:

- regulations Part-66, Part-145 a Part-147
- design of education of maintenance staff in CZ conditions
- applying European maintenance to small CZ repair shops
- creating draft procedures for providing the maintenance
- Non Destructive Testing
- maintenance of composite parts of aircrafts
- use of a special equipment for the maintenance improvement

As for the last item of the list we can classify the subproject *SpyHawk* which was formed approximately one year ago when the topics for bachelor thesis were chosen. Students of bachelor's degree Slavomír Brázda, Carl Hercik and David Hůlek got with Ing. Martin Novák, Ph.D. an idea to design and to build an unmanned vehicle for the Faculty of Transportation Sciences. The unmanned aerial vehicle is known as UAV, too.

The UAV should not be used only in aircraft maintenance as an aerial vehicle for improvement of the visual control of airframe but in other ways, too. Another ways of using are listed in the following text.

2. Application of the unmanned aerial vehicle

The original intention was to build a tracking aerial vehicle for monitoring transport routes, for the already mentioned aircrafts maintenance and for another use in transportation. These intentions showed as good and it started to become evident how to use the aerial vehicle. The UAV should use in aircrafts the maintenance for faster and easier control of external parts of aircrafts which are not accessible from ground. A technician doing the control could with UAV fly around an aircraft and with the help of the video camera he could easily do the visual control without a ladder or lifting equipment. Benefits for Faculty of Transportation Sciences should be in monitoring the transport situation. UAV should fly over the routes and it should track pedestrians and the vehicular traffic. The advantage is that the aerial vehicle should not interfere the traffic. Another advantage is in its flexibility. Another application can be that UAV should control bridges and other traffic constructions. The controller should stand on the bridge or under the bridge and with UAV could easily visually check the bridge. The aerial vehicle should gauge emissions and should do many other actions connected with the traffic. One of those actions is that UAV can be used on the airport. Primarily the UAV can be used as the mobile video camera for watching the situation at the airport. The places will have to be defined because of a big flight activity. Another application is in security. Functions of UAV will be almost the same as in the first case. The unmanned aerial vehicle could track places at the airport and the video could be posted to the security office. UAV could have a speaker so the security officers could speak to people or it could give them instructions. UAV could be useful for integrated rescue system. Firemen and paramedics could watch accidents from the sky. They could obtain more information about an extent of damage, location of people and objects in the affected location or they could obtain a location and distance from fire to hazardous substance such as fuel. Of course, they can find out all the listed information from ground but with UAV it could be faster, more mobile and automatic. The unmanned aerial vehicle should automatically monitor progress of fire to fuel tanks for example and fireman replaced by UAV could extinguish. Images from UAV could be evaluated by the incident commander. This type of application is not only for integrated rescue system on airport but for all integrated rescue systems. The other CTU faculties wanted to use *SpyHawk* for their projects and measurements. Another application for UAV is checking pipelines, longer conveyor belt, storage towers, high-rise buildings and so on. Automation is an advantage for all mentioned applications. UAV should be able to check objects automatically. UAV should fly along the scheduled way. Only the captured video should be checked. It should be done in real time or of record.

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3. The past, the current activity and the future

After examination of the situation it was decided that the project would be divided into three parts: the construction of unmanned aerial vehicle, the hardware equipment and the software equipment. Based on that, three bachelor theses were sumbitted. They had to theoretically describe and to analyze parts of aerial vehicle and they had to choose the best of them. The main title was the same for all parts “Tracking Unmanned Aerial Vehicle CTU FTS”. The parts differed in subtitles. Slavomír Brázda had his bachelor thesis with a subtitle “Analysis of construction facilities”. He analyzed a suitable aerial vehicle, drive, mechanical parts, stabilization and the power source. Carl Hercik had a subtitle “Unmanned and Transmissions System”. He dealt with a transmission of the video signal from the aerial vehicle to the ground station and with the autopilot. David Hůlek had a subtitle “Analysis of observation facilities”. He analyzed suitable video cameras, thermo vision cameras and FPV glasses in his bachelor thesis. One part of his thesis was to design attachments of both cameras on aerial vehicle. He also designed an attachment for other devices (additional batteries, dosimeter, the device for the emission measurement and so on).

The bachelor thesis should be only theoretical and it should only analyze equipment and it should say which of them the best was. However it did not take long time and the practical realization began. It can be possible mainly due to a further possible application. This application is to return unmanned aerial vehicle for meteorological probes. Meteorological probes launched on meteorological balloon from airport are for one use. They are damaged by landing when they return or they are lost. Unmanned aerial vehicle could be used as a carrier which could take the probe back to a scheduled position after measurement. Returning and landing should be fully automatic. UAV with the probe should pick up on the landing site. The UAV should take video record of condensate lines and should send them to the ground station, too. After charging batteries the probes should be ready for another flight. It was decided to log in with this application into the Students Grant Competition. The Decision proved to be a good choice and after the grant had been assigned it was possible to launch UAV.

It was possible to buy two RC helicopters with money obtained from the Students Grant Competition during last academic year. There were written all bachelor theses in this year. RC helicopters are LA 700 from the Czech company LA Heli and T-REX 500 from the company called Align (Picture 1). Simultaneously the suitable drive and RC radio were chosen. The drive contains electrical engine Kontronik Pyro 700 with 5 000 W/s engine power. The drive contains regulator Kontronik Heli Jive 120+ HV, servo-motors, rotor blades with length of 700 mm from SpinBlades Company and batteries with the capacity of 5 000 mAh and current load of 70C from company called Thunder Power too. Chosen RC radio is Futaba T-12FG.

Picture 1 Helicopters LA 700 (at the back) and T-Rex 500 (forward)

An antenna composed from transmitter and receiving system was chosen for the video transmission from aerial vehicle to the ground station. The transmitter is BosCam TX51W with the transmitting frequency 5.8 GHz and with the transmitting power up to 1 W. The receiving system is called MyFlyDream ATT (Auto Antenna Tracker) (Picture 2). There are two antennas in the receiving system. One of them is an unidirectional antenna for a close distance and a highly directional antenna for a great distance. The directional antenna is turned in direction of the aerial vehicle with the GPS help. The autopilot has been chosen because of a possibility of an automatic flight without any help. The autopilot ensures necessary stability in case of losing of the signal. The autopilot takes over a flight and it holds a helicopter in the place where the signal was lost until the link is restored or it continues in the pre-programmed flight. Everything depends on settings. The autopilot is able to hold a horizontal and vertical position. The navigation and programming of the autopilot during the flight is ensured by the GPS module. Based on autopilot's analysis the APM 2.5 system has been chosen. There are some functions which the autopilot can do in the following text: the stabilization ability, autonomous start/landing, flight to the waypoint, do a task in the waypoint,

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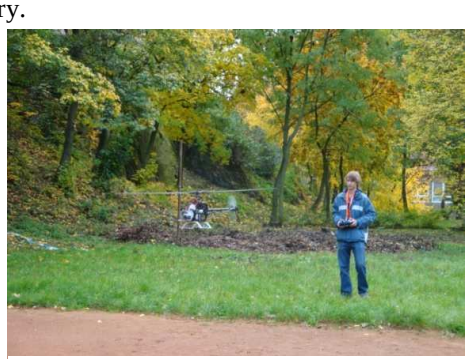
remote programming, broadcasting telemetry, avoidance of the obstacles after installation of additional probes and more. For a safer flight the stabilization HC3-SX has been chosen. The stabilization stabilized the helicopter in one position when the autopilot shuts down.

Picture 2 The receiving system MyFlyDream ATT

The video camera is from MagiCam Company and the version of the camera is ActionPro SD21. The camera ensures the video and audio record. If you look into the bachelor thesis, you will find out that this video camera is not the best for the aerial vehicle. Because of availability and the price the camera ActionPro D21 has been chosen. The FPV (First Person View) glasses era from company FatShark and model of the glasses is Attitude SD. The FPV glasses show video from the aerial vehicle and you have feeling like you are in the aerial vehicle. The Best thermo vision camera for the helicopter is Optris PI200 (Picture 3).

Picture 3 The thermo vision camera Optris PI200

At this time we have two RC helicopters which are fully able to fly manually (Picture 4). The first test flight has been already done. The autopilot and video transmission are set in this time too. We have already tested the video camera on the bigger helicopter. The video camera is fixed on helicopter by movable mounting which allows turning video camera in the same way as the operator's head with FPV glasses (Picture 5). This function is called Head Tracking. The movable mounting is only static now. It is because of the absence of servo-motors which can move with mounting. The servo-motors have not been bought yet. The FPV glasses have been bought neither. We assume that we will use FPV glasses which are owned by the Department of Air Transport. These glasses are iWear VR920 from the company Vuzix. These glasses have the Head Tracking too. But we cannot use it because it needs a special software that must be installed in the computer. iWear glasses are for PC using primary. We would like to use the Heat Tracking, so we must buy Head Tracking module M.I.G. from the company FatShark which is for RC aircrafts primary.



Picture 4 The photography from the first test flight with the helicopter LA 700

Picture 5 The movable mounting with ActionPro SD21 video camera

In the months to come we would like to put into operation the autopilot, the video transmission and FPV glasses with the Head Tracking. After putting into operation all mentioned devices the testing will begin. The testing will be in utilization for the Faculty of Transportation Sciences and like Return Unmanned Aerial Vehicle for Meteorological Probes. Visions of the future are buying thermo vision camera and maybe helicopter with combustion engine. It depends on specific applications of unmanned aerial vehicle.

4. Successes of the project, participation in the grants and possible usag

Because the *SpyHawk* project is relatively young we cannot speak about big successes. Still we can find smaller successes in the previous text. These successes are two helicopters able to fly manually, untested working autopilot, successful test of video recording and first possible application. Namely currently, the negotiations are taking place with municipality of Prague capital city and with conservationists. The negotiations should agree on the use of the project photographing historical buildings. Mapping of buildings should take place in 2014.

As mentioned earlier the project is the part of the grant. The grant´s officinal name is Return Unmanned Aerial Vehicle for Meteorological Probes (number: SGS13/156/OHK2/2T/16). The total amount of money allocated for the grant is 330 000,-Kč.

5. Conclusion

The *SpyHawk* has a big opportunity and it is the way into many practical applications and it enables problem simplification. Practical realization thanks to the grant, planned practical application in photographing historical buildings and untraditional RC controlling with the autopilot help participate on the project interests. The future is completely open for the project and it depends only on how the future opportunities will be exploited.

List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Bc. Slavomír Brázda	Tracking Unmanned Aerial Vehicle CTU FTS – Analysis of construction facilities	BT	2013
Bc. Karel Hercik	Tracking Unmanned Aerial Vehicle CTU FTS – Unmanned and transmission system	BT	2013
Bc. David Hůlek	Tracking Unmanned Aerial Vehicle CTU FTS – Analysis of observation facilities	BT	2013

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MAN AND GLOBAL COMMUNICATIONS

16114 - DEPARTMENT OF APPLIED INFORMATICS IN TRANSPORTATION

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Leaders of project

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Link to the website of the project: http://www.fd.cvut.cz/projects/k614x1g/

1. Introduction

The project focuses on the study of telecommunications technologies, networks and services and their primarily use for process control in real time. The themes are based on the current state of field in the Czech Republic and at the same time the forecasts modern telecommunication systems. The projects are developed both, for mass deployment (for example, mobile networks and IP multimedia networks), as well as specific solutions where required, for example, low quality of service (such as telecommunication solutions the toll system). In the integration of transport systems is crucial the fulfillment of such requirements.

Individual tasks are framed in the context of studies of telematics and telecommunications projects addressing Faculty of Transportation Science under the research of a programs of the government agencies (such as Technology Agency of the Czech Republic or in the past, Permanent prosperity programme of the Ministry of Industry and Trade), as well as in relation to the specific task of industry (such as Škoda Auto).

The aim of leaders is to push his students to work together where possible and formed his bachelor's and master's work with the commercial sector, and thereby work on current, specific, real-world projects with experts in the field.

2. Project activity

2.1. Past activity

In the past, the project focused on the two major projects. The first project was the development of transport-telematics communication module DOTEK and the second project was e-Ident. DOTEK solved the issue of communication for telematics applications. Management of the module unit continuously monitored the selected wireless telecommunication technologies (GSM, WiFi, WiMAX, ...) and evaluated their properties. At the same time DOTEK monitored the communication requirements of

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various telematics applications, including minimum required parameters. The communication telematics applications might have been using the decision algorithm to switch between the available technologies according to application requirements and current technology options, while taking into account the price for using the technology.

The object of project e-Ident was to create an identifier that would uniquely identify the vehicle (the information source of vehicle data). The identifier was used as a non-public information during communication between systems, it provided a clear identification of the vehicle across systems. During communication between systems a universal identifier also transfered the vehicle parameters. These parameters could be changed during the life of the vehicle (the vehicle owner, the vehicle registration number, date of last technical inspection, etc.), however, identifier may have contained the parametres, which could be used for example on electronic toll system, etc.

2.2. Current activity

Currently, the project Man and global communications are specified on a monitoring of moving objects across the airfield (TE-VOGS) and a project Increasing the use of parking capacity on the highway using prediction models.

TE-VOGS is the identification and communication system with function of navigation for airport vehicles, serving primarily to the overall strengthening of the security operations at the airport. The system is designed for a mobile professionals serving the airport resources, supervisors and the staff of air traffic management. The unit is equipped with a map of the airport and allow supervisors to monitor and the control a movement of vehicles (client workstations) on the runway. TE-VOGS allows you to track the vehicle on the navigation screen, the current actual position of the vehicle, other vehicles, rolling aircraft and also allows the transfer of data between the vehicle and the dispatching station, which improves a work of air traffic and increases safety. This system is able to be use for another applications.

Fig. 1. Demonstration of the on-board unit vehicles traveling on the runway

The project Increasing the use of parking capacity on the highway using prediction models focuses on the creating a system that will be based on the input data of the toll system to predict the availability of individual parking spaces on the motorway network. The outputs of the model will be transmitted through appropriate information channels to drivers. Due to the informations, drivers greatly

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facilitate the decision making about the appropriate place for parking and thus system contributes to the overall flow and traffic safety as a whole. One of the outputs of the project is the specification of the method for locating suitable places for the creation of new parking spaces for heavy traffic on highways and roads in the Czech Republic. Method works based on the analysis of historical data from a electronic toll collection.This methodology allows to detect a local maximum in time and place, that makes it easy to detect a places where is likely to be a high incidence of parked vehicles or the fulfillment of parking areas. The output can be 3D histogram showing the time of day, time and place of rest, which shows the number of detected rests in a given place and time interval.

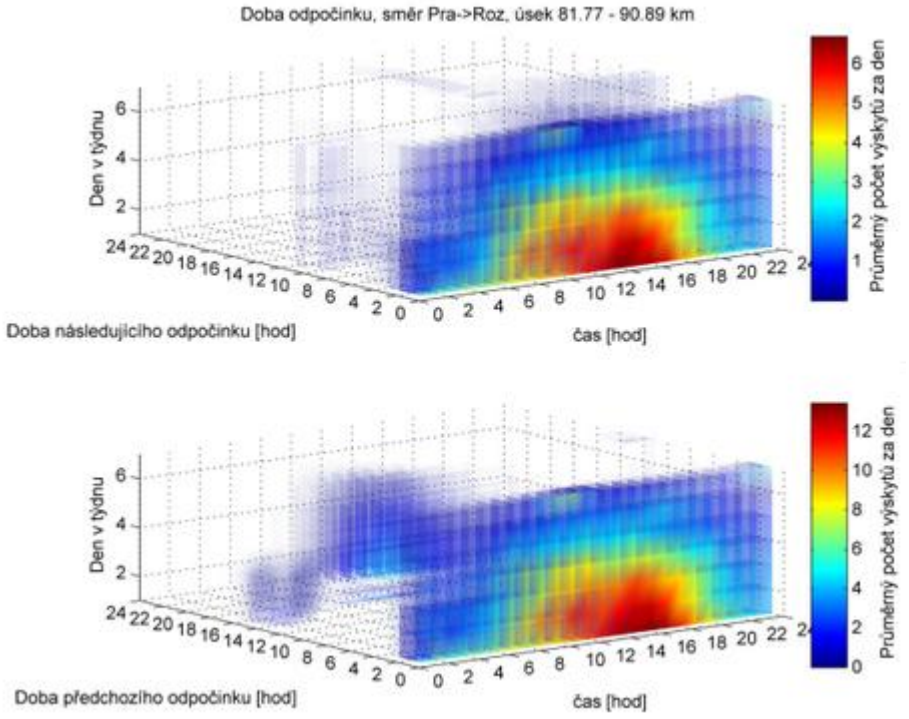

Fig. 2. 3D histogram

2.3. Future activity

In the near future of the project we especially want to deal with the cooperative systems (C2X), the issue of Smart cities and also with the networks of fourth generation (LTE), which are likely to play an important role in both of these.

3. Need for solving the issue

Growing urbanization is one of the trends of our time. It is expected that there will be live another 3 billion people in 2050, 70% of this people will be living in a cities, and these cities will be producing 80% of global emissions and will be consuming 75% of energy. Today, many of the urban infrastructure is on the border of technical competence eg. in relation to safe energy supply, traffic flow and transport services, development and renovation of buildings, healthcare, security, water supply and the waste treatment. These problems eg. in transportation, we can not solve as the endless expansion of roads, but it is time to start with "intelligent" way of solution. Intelligent solution means the appropriate use of data and technologies for more sustainable development. An example may be useful data manipulation

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obtained from traffic detectors. These data you can use for other modern technologies to harmonize traffic flow in cities, significantly decrease emissions, noise, improve urban mobility and enhance a quality of life in cities. Smart transport is one part of smart cities concept, which is our project intends in the future to deal with. One part of European policies (the 2020, Cohesion policy 2014-2020) is also an EU initiative Smart cities, so we can assume full support "smart projects" in future years.

Currently, in the automotive industry occurs the massive development of intelligent transport systems, especially in applications using telecommunications environment for information transmission. Environment of road transport is relatively specific for its complexity and frequency of incidents, which are necessary to properly sort and distribute to each participant of the traffic for that can be crucial, especially for reasons of the safe and efficient travel. But these systems and applications don't serve only to provide information about traffic conditions and incidents, but it can be also use for Entertainment applications (social networks, video, etc.). Therefore there is a very wide range of services. This breadth of use is just one of the arguments why we want to spend time on this issue, because it holds a lot of potential users. Cooperative systems are also largely supported by the EU, so they are already embedded in binding documents as the Action Plan for the implementation of ITS systems. There are currently 2 cooperative systems, electronic toll system, which operates in the Czech Republic since 2007 and automatic emergency call system eCall, which will be mandatory installed in the new vehicles from 2015 in the EU.

4. Achievements of the project

In 2002, team of students from the project Man and global communications won Step Ahead, prestigious competition organized by Czech Telecom. Team members were: Zdeněk Lokaj, Miroslav Kratochvíl, Helena Hutařová a Lukáš Filip. 112 students from various colleges signed up to the competition. The competition took place in a training center of Czech Telecom in Zruč nad Sázavou.

The quality of theses and their evaluation can be also taken for the success of the project, an example may be the nomination of Filip Ekl from 2009 to the dean's award for his bachelor thesis on theme: The decision-making process for the selection of the most appropriate ways of L2/L3 IP redundant access systems.

In addition, our project is a frequent participant in various conferences not only in the Czech Republic, but also internationally. For example, in 2013 it was conference, which was held in Prague, about use of the European navigation system Galileo.

5. Participation in grants and projects from 2010

Man and global communications participated in many of grants projects. Actual figures in one, namely:

Table 1. Overview of grant projects

Project name	Project start year
Increasing the use of parking capacity on the highway using prediction models	2012

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6. List of the best defended bachelor's or master's theses

Project Man and Global Communications has more than ten years of history and during its existence has produced a number of interesting works. We have put a few of them in the following table.

Table 2. List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Ing. Richard Švajdler	Use the convergence of fixed and mobile access networks to provide services of multimedia content	DP	2007
Ing. Zdeněk Lokaj, Ph.D.	Contactless identification of objects in industrial environments	DP	2007
Ing. Martin Šrotýř	Alternative telecommunication solution based on IEEE 802.11 for ITS applications	BP	2007
Ing. Michal Vosátka, Ph.D.	Blocking GSM services in metro stations in crisis situations	DP	2008
Ing. Michal Jiráček	Business model for services of multimedia content	DP	2008
Ing. Filip Ekl	Decision processes in L2/L3 multi-path communications access systems	BP	2009
Ing. Jan Michálek	Parameters of telecommunications services and their guarantee	BP	2010
Ing. Michal Karel	New trends in DSRC technologies for transportation applications	BP	2010
Ing. Renata Riegerová	Time-frequency analysis of the noise of the moving vehicle and its application	DP	2013
Ing. Tomáš Kapic	New telematics solutions for the implementation phase of the project "Prague Airport"	DP	2013

7. Cooperation with practice

As we mentioned earlier in the introduction, the optimum is cooperation of academia and the commercial sector and thus cooperation od students with experts from the field, while solving specific, current projects. In our project, we have already had the honor of working with many prestigious companies.

For Technická správa komunikací hl. m. Prahy we solved the project of usability cooperative systems for the city of Prague. With Škoda Auto a.s. we are still cooperating on cooperative systems, especially on the project of emergency calls, eCall. With company Kapsch Telematic Services, spol. s r.o.

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we participated in the method using data from the toll gates for predicting the availability of parking spaces for heavy transport. On project Monitoring of moving objects over the airfield, we cooperated with company Telematix services a.s., company Techniserv s r.o. and Letiště Praha.

8. Employability of graduates

Graduates of this project often dock in companies, that helped them with their bachelor's and the master's thesis, or they take root in those companies that deal with similar problems like them during their study. As an example, we may appoint Ing. Rostislav Chorvath, who works in O2 or his former colleague Ing. Miroslav Kratochvil, who was in charge of O2 products (eg. O2 TV or SMS in the fixed network), but now works at KBC ICT Global Services. Furthermore, we would like to mention Ing. Lukáš Filip, who works as a strategist at Economia innovation. Finally, we mention one of our leaders, namely Ing. Zdeněk Lokaj, Ph.D., who has worked with companies such as Microsoft, Accenture, Kapsch, etc.

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Integrated periodic timetable in CZ

16117 - Department of Logistics and Management of Transport

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- Ing. Karel Baudyš, Ph.D.

Link to the website of the project: http://takt.fd.cvut.cz/

1. Project activities

Project „Integrated Periodic Timetable in the Czech Republic“ was established in the academic year 2000/2001. Its main mission is to unite students interested in public transport planning and railway or bus traffic timetable construction.

Students and supervisors discuss on regular project meetings current issues of public transportation and share their experiences from studies abroad, interesting conferences and from practice. Besides that, each student individually works on practical tasks based primarily on actual challenges in Czech public transport and presents the outputs to the team. It does not only help to improve presentation skills of each student, but also enables them to get valuable feedback from more experienced team members.

In general terms, there are three main areas for students to explore during the work on the project tasks and topics of their bachelor and master theses:

- proposal of operational concepts for public transport and timetable construction
- microsimulation of railway infrastructure operation
- macroscopic modelling of traffic flows

Furthermore, students have an unique opportunity to use several software tools, namely:

- **FBS (Fahrplanbearbeitungssystem)** – a software tool for creation of timetables using traction efforts of rolling stock for finding train slots on an infrastructure model in the form of editing a graphic timetable. It offers many tailored functionalities for “automatic” creation of driver’s; and customer’s timetable, network interval diagrams, track occupation diagrams in stations, business management calculations of the plan (train mileage, storage balance) etc.
- **OpenTrack** – a software tool designed for microsimulation of railway networks (including light rail, trams and underground systems). It bases on mathematical models of the infrastructure, traction effort of the vehicles and timetable data including connections and waiting times. It has a wide range of applications, e.g. identifying bottlenecks on proposed railway infrastructure including evaluation of solution alternatives, simulation of rail traffic incidents, capacity analysis of railway lines and stations or robustness of proposed timetables to delay scenarios.

Rewievers of the paper: Ing. Karel Baudyš, Ph.D., Ing. Vít Janoš, Ph.D., Ing. Zdeněk Michl

- **PTV Visum** - a software tool for macroscopic modelling and analysis of traffic flows and modal split between public and individual transport. It allows development of advanced transportation system strategies and solutions.

Due to complexity of the mentioned issues and of the software tools being used, the project puts relatively high demands on the students' logical and systematic thinking abilities, patience and also foreign language knowledge. Therefore, when it comes to recruiting new project members, the quality of the students is prefered to their quantity. As we can see from the past study successes of the team members, this strategy has been proved to be fruitful.

Our vision is to retain the interest of new students in our project and to develop the present high level of project activities further both professionally and in terms of personal development of the students and their cooperation.

2. Reasons for engaging in the subject

Transportation planning is a complicated process that requires a high rate of interdisciplinary cooperation and coordination. Regrettably, it has been common czech practice to emphasize the design and construction phases of the transport projects to the detriment of the public transport strategy development. In other words, most of the available finances, time and effort are often being spent on the process of designing and building the transport infrastructure itself whereas the real operational requirements seem to be underestimated. In these cases, the transport (especially railway) infrastructure construction projects could become less effective and economical, than if the investment was realized with respect to the previously prepared proposal of the operational concept (that means timetable) in public transport.

However, when it comes to the quality of the public transport services, passengers usually expect more than effectiveness of the infrastructure investments. To become able to compete with individual transportation, public transport has to offer not only an appropriate level of comfort for a reasonable price, but also availability, accessibility and overall user-friendliness.

Given that, the concept of integrated periodic timetable (IPT) seems to be the perfect solution. It's main idea is to set up a highly interconnected transportation network where the consistent interval of service throughout the whole day (so called "clock-face scheduling") is offered and where periodically repeating transfer possibilities between various lines are guaranteed. For this to happen, following requirements must be fulfilled:

2.1 Unified period (interval) of services

All services included in IPT operate in so called PuT (Public Transport) lines. All PuT lines operate in constant period which is equal to 2^k-multiple of basic period (60 min as a rule), where k is integer.

2.2 Unified symmetry axis

In every PuT line, services from opposite directions meet each other in the same time (symmetry time). This time repeats after half period. Should services of two PuT lines enable mutual connections with equal changing time, these two PuT lines must have equal symmetry time.

In European long-distance railway, symmetry time slightly before the top of the hour is common. This is called zero symmetry axis. In practice, symmetry times in minute 57 to 01 are used. In suburban railway, symmetry time in minutes 00, 15, 30 and 45 are used.

2.3 IPT-nodes

IPT-node is a railway station where services of the same PuT line from opposite directions meet each other (always in symmetry time as mentioned above). If there is a junction station, connections with services from other PuT lines can be ensured (in all directions). The planners of public transport offer endeavour to make IPT-nodes in central stations of big cities or in other significant junctions (in terms of number of changing passengers).

2.4 Arc equation

To keep "rendezvous" in every IPT-node, trains have to depart from each IPT-node shortly after symmetry time and arrive in next IPT-node shortly before symmetry time. From the fact that symmetry time repeats each half period, the arc equation follows

$$t_{T,A\leftrightarrow B} = \frac{n}{2} \cdot t_P$$

where:

$t_{j.A—B}$ is travel time between IPT-nodes A and B

n is natural number

t_T is basic period (interval)

2.5 Cycle equation

As mentioned above, symmetry time repeats each half period. So, for one hour period, if symmetry in minute 00 was chosen, another symmetry time would occur in minute 30. Because "rendezvous" in every IPT-node repeats after period, in some IPT-nodes it occurs always around minute 00 and in another IPT-nodes always around minute 30. To ensure connections within whole network (which is main advantage of IPT), it is necessary to achieve system travel time along every cycle (in the sense of graph theory) equal to integer multiple of the period to achieve arrival to the same symmetry time (either again to minute 00 or again to minute 30). The cycle equation is expressed as follows:

$$\forall(A,m): t_{T,A\rightarrow A,m} = n \cdot t_P$$

where:

A is an IPT-node

tj,A-*A\m is travel time along *m*-th cycle from node *A* into node *A*, including at least 2 another IPT-nodes and dwell time in *A*

m, n are natural numbers

2.6 Attractiveness of IPT

The contribution of IPT for attractiveness of public transport is indisputable. It is proven by practice in Netherlands, Switzerland, and from partial implementation in Germany, the Czech Republic and Hungary. Thus, solutions for freight railway should be sought in the context of IPT.

In Figure 2.3, effect of demand, which was pulled by increasing offer, is represented. Not only the increasing number of trains, but also the advantages of IPT (which was in operation on Swiss railway network for all represented years) influenced the increasing passengers' interest for railway transport.

3. Project achievements

Students have the opportunity to participate in a variety of research activities, including projects for local administration, public transport authorities and private sector. This not only brings them some financial rewards, but it is also a valuable source of experience, information and contacts which they utilize in their bachelor and master theses as well as in practice.

Our graduates rarely experience difficulties finding appropriate jobs - they usually start their careers as traffic engineers working for the Ministry of Transport, public transport authorities (e.g. KIDSOK, OREDO, ROPID), railway and bus operating companies (CD, SZDC, BusLine) or as self-employed persons. However, some of the students continue as postgraduates or academic workers, stay in touch with the project team and try to pass their knowledge and experience on to the next generation of students.

4. Participation in grant competitions and research projects

4.1 Student grant competitions

Sojka M., Baudyš K., Janoš V., Michl Z.: Simulation of the capacity in the IPT nodes, CTU student grant competition, 1.4.-31.12.2011.

The scope of the project was in establishing a methodology of computing the railway capacity in IPT nodes with coexistent passanger and cargo transport including the impact of traffic disturbancies and the ability of the traffic situation to relax, which has significant impact to stability of proposed timetable concepts. Determined methods were tested using the simulation programm OpenTrack.

4.2 Scientific research projects

Between 2007 and 2010, our project team took part in folowing two research projects which falled under the auspieces of the Ministry of Transport:

- Creating a complex model for surveying transport relations in the Czech Republic
- Configuration of IPT-nodes in the railway network of the Czech Republic

5. List of the best bachelor's and master's theses of the project

Table 1. List of the best bachelor's (BT) and master's theses (MT) of the project

Author	Title	Type	Year
Bc. Jan Buzák	**Appraisal of Inter-city Rail Services with two-segment Operation**	**BT**	**2013**
Ing. Václav Macek	**Harmonization the Zone Timetable with Freight Paths in the Prague Agglomeration**	**MT**	**2013**
Ing. Martin Konečný	**Optimization of Transport Services in the Area of District of Jeseník**	**MT**	**2013**
Ing. Milan Kříž	**Mutual relationship between public and individual transport by transport service in an area**	**MT**	**2012**
Bc. Martin Stach	**Developing of Periodic Public Traffic Concept in Region of Český Krumlov**	**BT**	**2012**
Bc. Lukáš Coufal	**Design of public transport system services in border areas**	**BT**	**2012**
Ing. Martin Sojka	**Simulation of Operation Concept on Critical Railway Infrastructure Elements**	**MT**	**2010**

Ing. Ondřej Polák	**Exemplary construction of a train diagram using computer aided simulation**	**MT**	**2005**
Ing. Tomáš Záruba	**Design of Conceptual Layout of Interval-Timetable Junctions in Personal Railway Transport**	**MT**	**2008**
Ing. Michal Drábek	**Concept of Rail Transport Services in Area of Airport Praha Ruzyně**	**MT**	**2007**

6. Cooperation with other universities

Besides the above-mentioned participation in research activities, project members can benefit from a long-term cooperation with several european transport planning institutes, first of all *"Friedrich List" Faculty of Transportation and Traffic Sciences*, Dresden University of Technology, Germany and *Institute for Transport Planning and Systems*, Swiss Federal Institute of Technology, Zurich, Switzerland. The international academic cooperation consists not only of research collaboration, but also of mutual visits, hosted lectures and international student exchange programs (see Table 2 for detailed overview).

Table 2. Student exchange programs with foreign universities

Václav Macek	2011/2012 (1 semester)	TU Dresden (Erasmus)
Milan Kříž	2010/2011 (2 semesters)	TU Dresden (Erasmus)
Martin Sojka	2008/2009 (2 semesters)	TU Dresden (Erasmus)
Tomáš Záruba	2007/2008 (1 semester)	ETH Zurich (Erasmus)
Michal Drábek	2005/2006 (2 semesters)	TU Dresden (Erasmus)
Petr Panský	2005/2006 (2 semesters)	TU Dresden (Erasmus)
Ondřej Polák	2004/2005 (1 semester)	TU Dresden (Erasmus)
Zdeněk Michl	2002/2003 (2 semesters)	TU Dresden (Erasmus)
Jiří Pospíšil	2002/2003 (2 semesters)	TU Dresden (Erasmus)

There is no doubt that the opportunity to experience theory and practice of transport planning in the foreign countries enables our students to break away from the stereotypes of the domestic environment, compare it with alternatives and thus see the well-known domestic problems from an entirely new perspective. Moreover, this helps them to gain necessary confidence to enforce any new ideas and procedures when starting their own careers.

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TRANSPORT-FOOD INTERACTION

16111 - DEPARTMENT OF APPLIED MATHEMATICS

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1. Introduction

Transport–Food Interaction food is an integral part of every day life. The transport of food, unlike transport of other types of goods, fully respects the specific characteristics of different kinds of food. It is a basic element in the food chain. During shipping, we must ensure that the goods has not been spoilt and main taints desired quality.

2. Project & student

The project deals with the transport of food. Students will become familiar with the problems of nutrition policy, issues connected with transport of food and the correct and purposeful application of legislation, particularly that which focuses on health security. Based on the analysis of current states, Ideas for improvement will be proposed in the future.

3. The project activities(past, present, future)

The activities of the project in the past mainly consisted of formulating interests of the project. In the beginning, there was an ambition to encourage students in their studies and familiarize them in an entertaining way with the problems in the field. At present, the main objective of the project is to support members with enough information needed for the creation of their work, which will become the final work on graduation. The project is therefore introduced for bachelor and master degree. This is one of the fundamental advantages, since the topic of undergraduate work can be more carefully elaborated on the Master's program. The project also allows you to divide the research into two parts, so you can explore the topic more deeply and carefully. Currently, the project leader is actively involved in mentoring activities, offering all students to discuss individual problems arising in the study. In the future, the main interest of the project, and an ambition of Ing. Musil and Ing. Kubin is to establish a direct bond between the student and experts of the field, including the issues addressed during

the study and an active connection to the practical problems that are similarly related to common interest, i.e. the interaction of transport - the food. The point of the project is using the real situation from practice in the learning environment. Thus students become used to solving real problems and finding future job.

4. The need for addressing the issue

Food is in its transport from the manufacturer to the hands of customer exposed to many influences that have a significant impact not only on the quality of the food, but also on their safety. The food is primarily affected by chemical, physical and microbiological factors.

In all industries dealing with food, the company is responsible for compliance with the requirements of food law. Carriers also have a great influence on the goods being transported, therefore they have an obligation to avoid harmful foods from circulation. Therefore, the necessary condition for the carrier is to monitor conditions of the transported goods. All necessary materials related to the carriage can be found in the law that concerns food and tobacco products. This issue is to some extent related to veterinary law and partly on plant care law. More can be read in note No.18559/2010-17000 Ministry of Agriculture -General requirements for the system of hazard analysis and determination of critical control points (HACCP) and the conditions for certification. Posted in No. 2/2010Bulletin of the Ministry of Agriculture on page 2with effect from 19th, 2010.

5. Achievements of the project

The proposal to obtain Prof. Ing. Dr.Jaroslav Vlček, DrSc. Award, which is awarded for outstanding works of students in master's degree courses Faculty of Transportation Sciences.

The thesis Analysis of Biofuels Market, the author Ing. Pavla Formanova was nominated in 2013 for a master's degree course in Management and Economics of Transport and Telecommunications for the Prof. Ing. Dr. Jaroslav Vlček, DrSc. Award. The reasons which led the nomination, were as follows. The thesis was exceptional in several aspects, such as detailed theoretical analysis of the data obtained in the literature concerning methods of production and use of biofuels. The relevant data was selected from the Czech Republic, European Union, Spain and international organizations. Different ways of performing the evaluation of data acquired from practice brought a practical benefit of the whole work. The author used knowledge gained in the preparation of the thesis, including language skills learned at ČVUT FD and within the study period in Spain.

The nomination on MVDr. Radoslav Kinsky Award for the best environmental bachelor / master thesis. ENVIOPTIMUM on dating organizes national contest for theses in the field of protection and creation of the environment in collaboration with the Ministry of the Environment of the Czech Republic. This competition has been attended by representatives of colleges and universities across the Czech Republic in the past 17th years. The theses topics concern environment in all points of view, whether technical, science or social science. Over the past 17 years of the competition more than 460 theses were evaluated.

The thesis author Ing. Pavla Formanova called Analysis of the Biofuels Market was designed in 2013 for the Faculty of Transportation Sciences to MVDr. Radoslav Kinsky Award for the best thesis in environmental category of works of engineering.

6. Participation in project grants from 2010

The activities of the project Transport–Food Interaction is not financed through grants.

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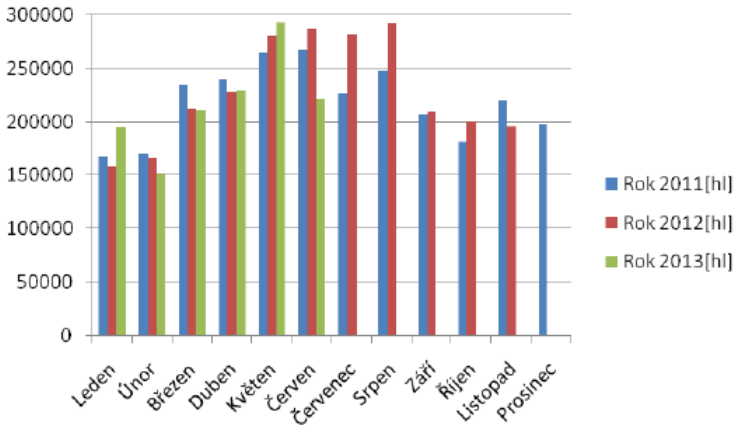
7. Cooperation with practice

Students may choose any topic of thesis; cooperation is therefore established *ad-hoc* with the company involved, whether it is the carrier or manufacturer, depending on the specification of the topic. Students will thus practice collaboration with companies and familiarize themselves with practices connected to their selected topic. Students can conveniently use their past experience gained for example through summer jobs or work in production facilities.

8. Outputs of students working on the project

- Bc. Petra Lenártová: Bachelorthesis: Food Transport

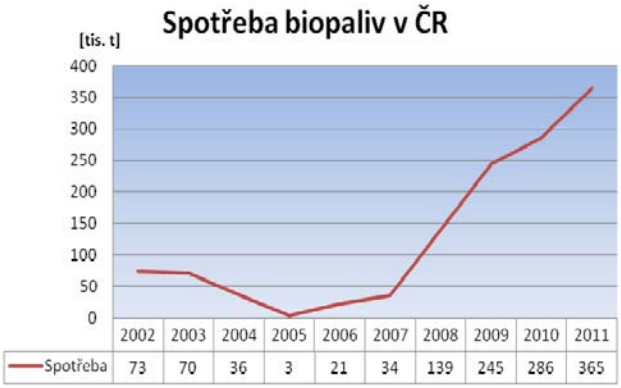
Author's aim was to approach the issue of food transport, specifically beer. The thesis aims to compare the rail transport of beer today and a century ago. In the second part, the author clearly illustrates the trend in imports, exports and total movement of Czech beer breweries. The last part of the thesis compares the transportation process of beer by selected individual means of road and rail transport.



Picture 1 – Volume of beer transported from the Czech Republic to the EU during I/2011 – VI/2013, origin: Bc. Petra Lenártová, BT

- Ing. Pavla Formanová: Diploma thesis: Analysis of Biofuel Market

The main objective of the thesis is to develop an analysis of the current state of the biofuel market focusing primarily on the Czech Republic and Spain. Based on the gained know ledge proper comparison and evaluation on biofuel market was made. The thesis includes research that determines the current status of biofuels used in transportation with a focus on bioethanol and biodiesel.



Picture 2 Consumption of biofuels in the Czech Republic, origin: Ing. Pavla Formanová, DT

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9. List of the best works of the project

The following table contains a list of students, who in 2013 successfully defended their bachelor or master thesis. Unfortunately, the project is relatively new, so a significant expansion of student work cannot be expected.

Table1 – List of theses by project graduates

Author	Title	Type	Year
Ing. Pavla Formanová	Analysis of Biofuel Market	DT	2013
Bc. Petra Lenártová	Food Transport	BT	2013

10. Final Word

The main objective of this article was to briefly inform those interested in the project Transport-Food Interaction. Every student who would be interested to participate in the research allowed by the project is welcomed. Both students and heads of project will happily provide more information about opportunities provided by the project. Contacts can be found on the project website.

 ISBN 978-80-01-05416-1

ITS AND ENVIRONMENT

16120 - DEPARTMENT OF TRANSPORT TELEMATICS

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Link to the website of the project: http://www.fd.cvut.cz/projects/k620X1WS/

1. Introduction

Today's world with no road traffic we can not even imagine for many reasons. Common road vehicles, however, emit a variety of harmful substances such as nitrogen oxides, carbon monoxide, PM or those volatile ones. Vehicular pollutants nitrogen oxides and carbon monoxide are bad for health and carbon dioxide, as one of the greenhouse gases, is currently regarded as the originator of global warming. The growing importance of reducing emissions not only at national, but also regional level, emphasize the real needs of designing balanced environment that is sustainable both for the necessary road traffic and the pedestrians. Especially the welfare of the inhabitants of contaminated areas is followed. An environment that is safe and comfortable for its inhabitants must at the same time be environmentally friendly.

Within dealing with vehicular pollution, it is necessary to understand the existing processes of pollution, be able to identify specific sources of pollution, be able to monitor and predict various factors of pollution. Modelling as a scientific method of describing reality is a suitable method of monitoring vehicular pollutants in the atmosphere. A properly designed model is a very useful tool.

The transport troubles environment not only by pollution, but also by traffic noise. There are also noticeable interferences of transport infrastructure with the natural environment. Since the progress of our civilization goes hand in hand with the development of transport, monitored questions are all-important.

1.1. About project ITS and Environment

A relatively new project ITS and environment is given for students of the newest branch ITS in bachelor degree program and for students of the master's program. The project is currently primarily, but not exclusively, engaged in the use of ITS data for the description and modelling of various environmental parameters (emission load, noise, weather, ...) and their re-use in these systems. The main objectives of the project are the development of tools for

Reviewer of the paper: celé jméno minimálně jednoho vedoucího projektu

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processing real traffic data, mapping and modelling of vehicular pollutions and traffic noise in the Czech Republic. Input real data are gathered mainly from the toll gates or from publicly available sources. The outputs of the developed tools are processed in the form of graphic maps and guidelines for the use and application in GIS. The project runs on the Faculty of Transportation Sciences from the summer semester of the academic year 2011/2012 and to the present moment in its framework has not been defended any thesis yet.

The project is dedicated to all students interested in a complex issue, which is linking more disciplines: transport, meteorology, computer science, mathematical modelling etc.

2. Project's Contents

The students of this project are currently engaged in: developing its own dispersion model of vehicular pollutants in the surrounding area along the highway, a model solution of the real situation of vehicular emission loads in Prague - Spořilov and the study methods to reduce noise pollution from road vehicles.

2.1. Model Solution

To create model situations the project mainly uses microsimulation tools PTV VISSIM and Paramics Quadstone. Fig. 1. shows an example of the Quadstone Paramics software output.

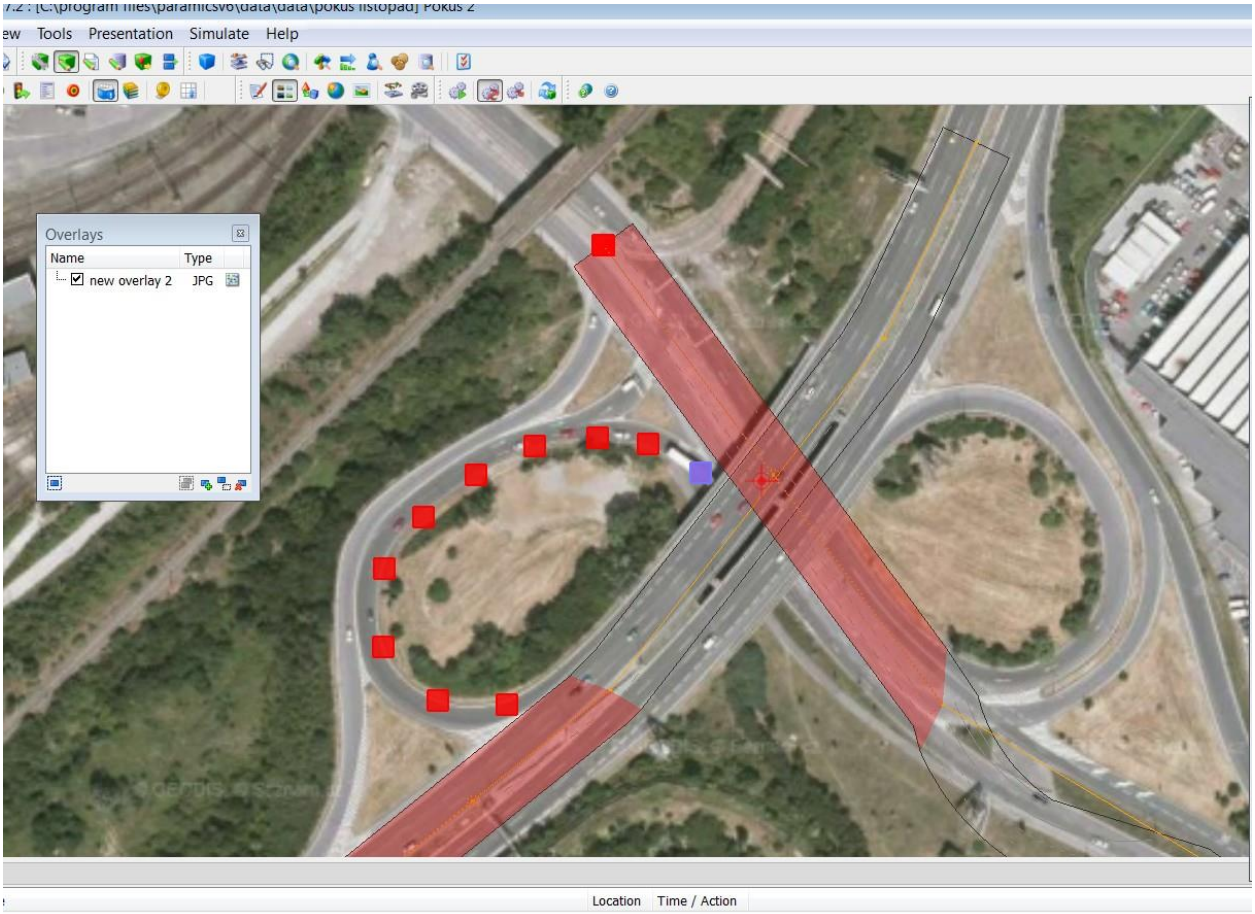

Fig. 1.: An example of the Quadstone Paramics software output

Software Quadstone Paramics using a special module called Monitor is used for accurate modelling of emissions from the exhausts of different vehicle classes.

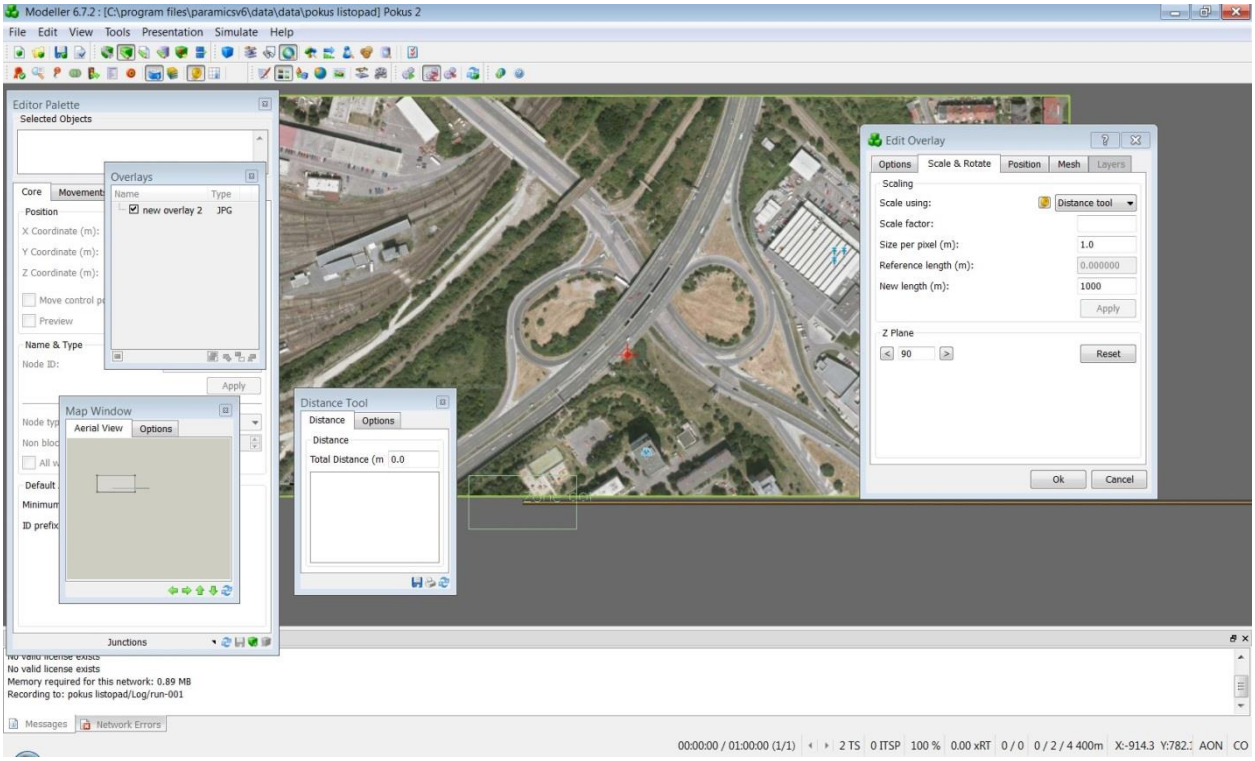

Fig. 2.: Environment of software Quadstone Paramics

The advantage of VISSIM environment is the ability to model multi-modal transport stream, including lights and a heavy duty transport, buses, trams, railroad, cyclists and pedestrians. The most use of VISSIM simulation tool is simulation of the emission load from modeled traffic flow, but in future use in the analysis and simulation of ITS benefits of telematics in traffic management on roads is possible.

3. Cooperation with Practice

The project works closely with the Institute of Computer Science of the ASCR, v. v. i., as well as one of the project leaders is working in the department of nonlinear modelling. Thanks to this cooperation project gets real traffic data, which are not freely available resources, and there is a possibility of cooperation in the development of models that are designed for use in practice.

4. Strengths and Opportunities of Project

The most important advantage of this project is the actuality and reality of solved problems and the possibility of its subsequent application in practice. Cooperation with Institute of Computer Science of the ASCR, v. v. i. offers a wealth of opportunities for cooperation.

Project is led by qualified professionals and great people, who know the environment of the Faculty of Transport Sciences and professional life. In addition, students appreciate the personal approach, willingness and openness to new perspectives on the issue.

Because of the "youth" of this project, there is no threat of rigidity or lack of topics, which the groovy projects can deal with. The project runs in a pleasant dynamically developing intimate environment of the Department of Transport Telematics.

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MODERN APPROACH TO OPERATIONAL SAFETY OF AIR TRANSPORT

16121 - DEPARTMENT OF AIR TRANSPORT

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Abstract

The object of this article is to provide a picture of the project *Modern approach to operational safety of Air Transport*, its history and activities in an interesting way. Among other things, it is also an effort to point out the importance of safety in air transport. The article itself is divided into several chapters, with two tables and two figures. There is also a list of the best theses of the project in the form of one of the tables. In conclusion, the emphasis is on cooperation with practice, both current and future.

Keywords

safety, accident, modern approach, achievements, theses

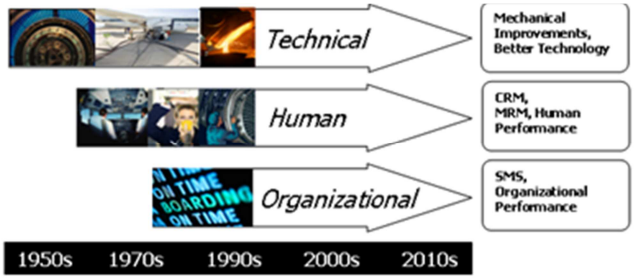
Reviewer of the paper: Ing. Peter Vittek

 ISBN 978-80-01-05416-1

1. Introduction

Investigation of aviation accidents in the early 1950s has been mainly focused on technical errors and deficiencies. When an accident occurred, a team of investigators found the cause, and this has led to technological improvements. Later, thanks to the evolution of thinking about the factors contributing to aviation incidents, the attention shifted from technical to human factors. The focus shifted to pilots, crew and competent people. Instead of technical errors, the objective was to investigate human performance as well as following regulations. At the beginning of the 1990s, attention has been focused on organizational factors. The aim was to create conditions to eliminate the potential for errors from operations. This modern approach is the result of numerous advances in the field of Aviation Safety.

New perception defines the obligations of the organization in relation to the principles of safety management. Hazard identification and control of safety risk management processes are the main processes of safety control. They are also main components of the system approach to ensure the safety of the air transport system. Students of the project are led to the perception of systemic approach and to the study and application of modern methods of operational safety. Using the results in practice will be of great help in improving the safety situation in the Czech aviation.



Zdroj: http://www.faa.gov/about/initiatives/sms/explained/basis/media/evolution_of_safety_thinking.png

Fig. 1. Evolution of thinking about the factors contributing to aviation incidents

2. Project activity

2.1 Past activity

Project *Modern approach to operational safety of Air Transport* was founded in 2009 when we were convinced that the future aviation professionals need quality training in safety and aviation organizations need professionals who will be able to consult the implementation of new organizational and management systems. From the very beginning of the project the main objective was to focus on a new approach to perception of aviation safety, in other words to focus on organizational factors causing the failure of certain processes. The sequence of these at first glance not so serious failures can ultimately have a fatal ending.

2.2 Present activity

At present, the project outputs are tested in cooperation with the Václav Havel Airport Prague and we offer our solutions to all companies that operate in aviation.

2.3 Future activity

As for the future, we are preparing number of projects in which we will focus on scientific issues and practical solutions, grants and projects in our field of expertise. It should be emphasized that the Laboratory of Air Safety under the Department of Air Transport is currently a leader in operational safety. Our research activities and their results have the full support of the Ministry of Transport, Civil Aviation Authority and the most important companies in Czech aviation.

Fig. 2. Laboratory of Air Safety

3. The necessity of addressing the issue

The safety was, is and will always be a primary goal in the air transport. It is also the high level of safety that makes air transport one of the most used ways among human transportation. Sure, there might be some objections that nowadays the probability of accident is low enough and only from time to time we read about aircraft incidents. But our effort is not to find such messages in newspapers at all. We are trying to make the air transport even safer way of travel, where words like „emergency“, „may-day“ or „brace for impact“ do not occur.

Due to these reasons the topic of safety has a great future in the world as well as in the Czech Republic. We insist on improving airport safety processes controls, which would cut-down the number of defects and various problems. Likewise we make an effort to implement safety indicators at the Václav Havel Airport Prague. The result of such implementation would offer straight signalization of potential problems. We hope that all these efforts would help Czech aviation to be ranked within the top according to the level of safety and customer satisfaction.

4. Project achievements

There is a need of reliable colleagues and effective organizing to achieve a good teamwork. Further, there is a need of fair judgment to achieve a good performance and a motivation. The part of our job is to look for and develop gifted students. Therefore, we consider the possibility to financially supporting young ambitious students and creating space for their internships as one of the project achievements.

Year of scholarship	Scholar name
2009	Lukáš Kurtulík
2010 – 2012	Ota Hajzler
2012	Jan Žižka, Miroslav Hladký
2013	Radek Sekyra, Jakub Tomíček, Roman Matyáš, Katarína Szentkeresztiová, Marek Štumper, Jan Franěk

Table 1. Our scholars

Participation in various grants can be also considered as great results. These are closely described in the following chapter.

5. Project participation in grants and projects since 2010

It is important to mention that the project *Modern approach to operational safety of air transport* itself is a part of a bigger unit called MAD Group. This Group includes also other fields, but it is the Safety that is considered to be one of its main topics. MAD Group, which is mostly administered by heads of our project, takes each year part in various grants and projects. The priority is to contribute to higher level of operational safety in the Czech Republic.

- 2011 - 2012 – two-year grant SGS CTU

The main topic was to model processes in order to increase safety and quality of operating activities on airports. While working on this grant, the first team has been formed. The team has continued to deepen its know-how by studying operating safety control systems of high-risk departments.

- 2012 - 2013

Two-year participation in expert's group of European project COPRA dealing with an actual state and fresh trends in Aviation Security EU.

- 2012 - 2013 – two-year grant SGS CTU

The main topic was operating safety control in small aviation companies. The team has gathered new co-workers and has gained first important contacts in Czech and more importantly European aviation industry. Project results were applied in the first company and further we are discussing other implementations.

- 2013 – one-year grant SGS CTU

The third research grant, supported in 2013, is concerned with the operational safety control. It values safety benefits of latest technologies and operating procedures. These are, according to recent legislative and technical progress, starting to be utilized.

- 2013 - 2015 – three-year grant from the Department of Home Affairs of the Czech Republic

This grant aims to improve emergency planning and cooperation in preparation for unforeseen events at Czech Republic airports. Some parts of research tasks are handled by several MAD Group members with the assistance of the Leoš Janáček airport in Ostrava.

6. List of the best bachelors and masters theses of the project

Author	Title	Type	Year
Bc. Jakub Surý	Recommendation for investigation of aviation accidents	BT	2013
Bc. Radek Sekyra	Safety Management System for General Aviation	BT	2012
Bc. Martin Orlita	Application of safety management in conditions of small aircraft operators	BT	2012
Ing. Drahoslav Viktorýn	Risk Assessment in Context of AOC Safety Management	MT	2012
Bc. Jakub Tomíček	Flight crew situational awareness – implementation in SMS instruments	BT	2011
Ing. Albert Mikan	Safety Culture and Modern Approach to Aviation Safety	MT	2011

Table 2. Best theses

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7. Cooperation with practice

7.1 Present cooperation

Václav Havel Airport Prague – Department of operational safety is our main partner at the present time. We are creating a new structure of safety indicators as a result of provided materials. Similar activities are carried out in cooperation with Air Navigation Services of the Czech Republic. Besides, we are also working on a wider concept of SMS for DSA, a.s.

7.2 Future cooperation

We have a tight link with the aeronautic and astronautic Beihang University in Beijing. We hope our effort will someday lead to working on mutual projects with this important partner.

Acknowledgements

One big thank you goes to heads of the project for their embedded confidence, as well as for their helpful advices and support. We are grateful for the opportunity to be part of this project and we hope that our joint work, efforts and achievements will be an inspiration for many other students in the future.

 ISBN 978-80-01-05416-1

PUBLIC TRANSPORT PRIORITIZATION

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

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Link to the website of the project: http://preferencevhd.wz.cz

1. Activities

The project Public transport prioritization deals with preferential measures, hubs, transfer relations, transport planning and determining the advantages and disadvantages of line routing management. The aim is to analyze the current state of the issue and suggest new solutions and improvements.

The members of the project meet both on campus and outside, not only in the Czech Republic but also abroad. Practical examples of already mentioned issues such as line management, interchanges, etc. are discussed on fieldtrips. We gain experience also through collaboration with Prague Public Transport Company and Prague Public Transport Authority (ROPID).

The goal of project is to encourage and guide students to improving public transport. Examining transport services in regions, acquisition of data and information, its analysis and practical suggestions should help provide collision-free, safe and efficient transport services.

2. The importance of dealing with these issues

Public transport is considerably more effective than individual transport. Transport costs per one person in public transport are incomparably lower than in automobile transportation. Mass transport also has less negative influence on environment and people´s health. Public transport prioritization is introduced in cities, because it increases public transport speed and improves service regularity. Travel time determines attractiveness and costs of public transport. If public transport is fast and efficient, it attracts more passengers and less people use individual transport. Because of public transport priority, there are less cars on city roads and there are better living conditions in cities.

Reviewer of the paper: Ing. Blanka Brožová

3. Project achievements

Our project´s biggest pride and achievements are mainly the knowledge and practical skills of our graduates and the high quality of their Bachelor´s and Master´s Theses, many of which were awarded The Dean's Prize. The list of our graduates' best and most successful ones will follow in paragraph five.

Our thematic excursions, either regular short-term walks around Prague or occasional all-day trips to other towns, such as Olomouc or the German city of Dresden, are the most valuable sources of information, skills and inspiration for our project's members and their work.

Among other successes of our project we can definitely mention the development of our members' discussion, argumentation and presentation skills. Frequent meetings and excursions are exactly the right place to improve them. The best proof of this may be our project's position among the best ones in the annual faculty Project Presentation Conference (Konference prezentace projektů) during the last several years and the several times retained victory in Railway Projects Presentation (Prezentace drážních projektů) which is organized every year by the Railway Company of CTU Faculty of Transportation (Drážní společnost při FD ČVUT).

4. Participation in projects and grants since 2010

The students of the project Public Transport Prioritization didn´t take part in any projects or grants in the given time span.

5. List of the 10 best bachelor´s and master´s theses of the project

Author	Title	Type	Year
Ing. Ondřej Vavrda	The Proposal for Transport Mode in the Junction Lazarská	MT	2012
Bc. Jiří Beneš	Tram Traffic along the Streets Vinohradská and Škrétova	BT	2013
Bc. David Holada	The Solution of Public Transport at the Shopping Center "Pivovar" in Děčín	BT	2013
Bc. Ondřej Kališ	PIT implementation possibilities in to Příbram region	BT	2012
Bc. Petr Král	Interchange and public transport priority in Vršovická street in Prague	BT	2012
Bc. Jan Novák	Public transport service in the historical centre of Prague	BT	2012
Bc. Lukáš Tittl	Localization Possibilities of New Railway Stations on Train Routes in Prague	BT	2013
Bc. Jan Turek	Analysis and Optimization of the Integrated Transport System Tábor	BT	2013
Bc. Jan Voříšek	Optimization of "Pražského povstání" Junction and Follow-Up PIT lines	BT	2013
Bc. Karel Zvěřina	Optimization of Bus Service in the Northern Area of Prague	BT	2013

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6. Cooperation with practice

The biggest advantage of studying in the project Public Transport Prioritization) is the opportunity to see the practical traffic situations and solutions which are surrounding us in daily life, whose complexity we might not even realize. Since the project supervisors are employees of The Prague Public Transport Company or ROPID, they can give us plenty of useful advice and pieces of knowledge not only for writing a thesis, but also important in a future job. Herewith a contact of students with the above mentioned public transport companies is made; some of the students can even subsequently find a job in such a company. Prague is a perfect place for gaining experience, since it is an abundant source of both good and bad traffic solutions in full operation. These solutions can be shown on the spot by the project supervisors and subsequently discussed and dealt with.

Figure 1 – Public transport prioritization project's members in Dresden

7. Other curiosities

As a curiosity we can mention a few trips and excursions that are organized within the framework of our project and have enriched not only our knowledge but also transport experience. Usually a tram training ride in Prague tram network is organized annually, which is not only an exclusive occasion, but also an opportunity to acquire new knowledge. We went through bottlenecks of the network, such as Palackého náměstí, Národní třída or I. P. Pavlova, but also newly renovated tracks - Podbaba, Modřany, Řepy, Barrandov. A lot of parts of the network still remain on the list for future. Given that our leaders are experts, who are closely connected with the operation of public transport in Prague, they provide a lot of information. Our project also organizes trips abroad. One year ago our project organized a trip to a very interesting city at least in terms of traffic, to Dresden. We could get acquainted with a very sophisticated integrated transport system, evaluate major transit points, compare the situation with Prague and explore a significant part of the local tram network, including the newly built tracks. Of course, the historical center and the renowned Christmas market were also visited. This year, we remained in the Czech Republic and went to Olomouc. I would say the most interesting part of the excursion was to inspect the new tram track being built to Nové Sady.

The close cooperation with ROPID can also be considered interesting, especially because it enables students to use data from passenger counting and surveys in their theses. One last thing that attracted attention was the possibility to get a tram driving license from the Prague public transport company and several students are now already working as part-time tram drivers. Unfortunately, this isn´t possible anymore.

 ISBN 978-80-01-05416-1

RAILWAY NETWORK OF THE CZECH REPUBLIC AND EUROPE

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

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Link to the website of the project: http://www.fd.cvut.cz/projects/k612x1zs/

Note: The website of the project is temporary placed on http://vrt.fd.cvut.cz, where users are automatically redireted.

1. Project activities

Since establishment of this project an effort is being made to take in railway as a complex system with many fields to concentrate on (such as infrastructure, transport technology, operation or vehicles). The current project – Railway network of the Czech Republic and Europe has been opened since the academic year of 2007/2008 for students of the bachelor's study and since 2010/2011 for students of the master's study. Enrolled students are automatically assigned to DOS/DS – Dopravní systémy a technika (Transport systems and technology) field of study. The project continues in work of the previous one – High-speed railway lines, which enrolled the last students in the academic year of 2006/2007.

Basic division of activities within project according to fields of interest:

- conceptions of expansion of trans-European railway network of high-speed railway lines in the Czech Republic using experience from abroad,
- suggestions of railway line routes optimization in the Czech Republic in order to optimize public transport in and/or between settlements,
- operation principles of different types of railway lines, differences of rail construction and its project parameters,
- study of railway lines in border regions in order to improve over-border connections,
- projects to adapt Czech railway network for contemporary and future traffic demand (in passenger and freight traffic),
- use of sidings for public transportation,
- adjustment of public transport interchange centres to become pleasant places for passengers.

Reviewers of the paper:doc. Ing. Lukáš Týfa, Ph.D., Ing. Tomáš Javořík, Ing. Ondřej Havlena, Ing. Marián Svetlík

This list contains the major project activities but definitely not all of them. Students are not limited by the content of the list, the choice of their research activity depends mostly on their interests and desires.

One of the most important project activities is focused on the final thesis compilation. From the very beginning students are motivated to choose the field of their interest, which they would like to work on. Students are supposed to work out an analysis. On its base (and after discussion) the topic of their final thesis is chosen. Students are also familiarised with special CAD software for railway design. Work on the project is enriched by educational excursions. An attempt is made to gain more practical information throughout cooperation with companies from the railway field.

2. Necessity of research in this field

Formation and development of railway were caused mainly by the industrial revolution, but even in present it remains an important part of the economy. The origin of primitive railway-like systems can be found in European mines in the 16th century. However the cardinal turning point occurred during the turn of the 18th and 19th century in England. In its golden age railway had no company, this has changed radically nowadays. But there is still much that railway can offer and offers. It provides fast and comfortable connections. Also with adequate exploitation of its capacity it - in comparison with other transport systems - achieves very good economical results.

From written above we conclude that systematic support of railway connections especially in the main transport routes has its actual reason. High-speed railway is able to start a new era of travelling mainly by considerable travel time reduction. Based on the experience from countries with working high-speed railway system, it can be presumed, that in some directions trains are able to substitute airplanes, which operation is very energy-demanding. Next field where railway quickly increases in importance is a suburban transport. Fast and big capacity providing suburban railway can noticeably reduce traffic congestions in city centres while offering comparable comfort to the individual automobile transport. In addition to that, it also helps to decrease air pollution in agglomeration areas. The offer of an attractive timetable is very important in attracting new passengers to trains and can change modal split even in directions where road transport traditionally plays the title role. This increment of passengers can often be counted in tens of percentage points in comparison with the situation before change. Hand in hand with this it is important to pay attention to optimization of line running. Most of the railway lines were built by our ancestors for freight transport needs. Therefore these railway lines don't always meet our present needs. Founding of integrated transport systems and arrangement of good transfer junctions can also make railway traffic more attractive to passengers.

The necessity of research is also in freight traffic field. In this field railway plays an important role, but its capacity is not fully used. Transferring some part of road freight transport to railway lines would help to use the available capacity more effectively, and would have a positive effect on environment. Thanks to modern technologies and procedures (such as recuperation) we are also able to decrease energy consumption radically.

3. Project achievements

Since its establishment the project has reached much success. For example the fact, that every year there is bigger demand than the offered capacity, can be considered a big success. However for the purpose of quality preservation it is not planned to increase capacity significantly. After that it wouldn't be possible to keep current standards which rely on individual approach and open discussion.

What is also remarkable is the success of our former student Ing. Jan Baloun. With his Master's thesis "Alternative railway connections Veselí nad Lužnicí – Horní Cerekev" (defended in 24. 5. 2012) he managed to win the "Faculty of transportation sciences Dean's prize" in 10th year of annual competition "Czech traffic construction/technology/innovation" in category "The Best Master's / Bachelor's thesis in transportation and traffic engineering field".

4. Taking part in grants and projects since 2010

Student Bc. Filip Štajner cooperated in project of the ALFA Programme of the Technology Agency of the Czech Republic, Nr. TA01030087 "Influence measures on railway infrastructure to reduce emergence and spread of noise from moving trains". More information about the project can be found on http://vlaky-hluk.fd.cvut.cz/

List of the best Bachelor's and Master's thesis of the project

Author	Title	Type	Year
Bc. Filip Štajner	Optimization of Skochovice - Dobříš Railway Line	BT	2013
Bc. Martin Koudelka	Capacity Increase of Railway Line Mladá Boleslav - Nymburk	BT	2013
Bc. Miroslav Zajíc	Reconstruction of Railway Station Děčín východ dolní nádraží	BT	2013
Bc. Jan Liebl	Reconstruction of Railway Station Děčín východ	BT	2013
Bc. Vladimír Říha	Variant railway connection Šumperk - Jeseník	BT	2012
Ing. Jan Baloun	Attractivity Increase of Railway Connection Jindřichův Hradec – Horní Cerekev	BT	2010
Ing. Martin Farbiak	Reconstruction of Railway Track Výhybňa Slatinka – Výhybňa Pstruša (Slovakia)	MT	2013
Ing. Jan Baloun	Alternative railway connections Veselí nad Lužnicí – Horní Cerekev	MT	2012
Ing. Robert Plocek	Traffic service improvement in region Louny by rail transport	MT	2012

BT – Bachelor's thesis
MT – Master's thesis

5. Cooperation with practice

The head of the project tries to develop contacts with different organization from practice. Direct contact is represented by educational excursions. Among other it includes visits of:

- optimization of railway line Zbiroh - Rokycany (Rokycany, 2010),
- optimization of railway line Benešov u Prahy - Strančice (Světice, 2007),
- DT - Výhybkárna a strojírna, a.s. (Prostějov, 2007),
- National technical museum depository (Čelákovice, 2005)
- Berlin Hbf (2012)

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Pic. 1. Students of the project in Rokycany

Pic. 2. Examination of machines used during modernizations and reconstructions of railway lines

Project also makes attempt to communicate with other academic institutions while resolving specific problems. Project successfully cooperated with the Technical University of Liberec, especially with Prof. Ing. arch. Akad. arch. Jiří Suchomel. His experience was highly appreciated when completing the Bachelor's thesis "Modernisation of Railway Station Ústí nad Orlicí Assessment" by Ing. Robert Plocek.

Students are also familiarized with special software used in practice. They are for example RailCAD or Dynamika, which are later used for work within the project.

6. Another points of interest

There is also inter-project communication going on within the Faculty of transportation sciences with the project Development of freight railway traffic. Thanks to this cooperation Bc. Martin Koudelka was allowed to use special German software FBS (Fahrplanbearbeitungssystem), which serves for creation of train service planning diagrams.

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DESIGNING ROADS AND HIGHWAYS

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

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1. Introduction

Transport is one of the most discussed topics in these days for her safety, the environment, optimization, operating costs, and many other aspects of an. Traffic intensity is increasing globally. This fact is associated rising costs of an infrastructure road. Global increase of traffic intensity between 1990 and 2012 increased several times. This increase is caused by industrial development and the building of new settlements. Construction of new transport infrastructure involves a lot of positive and negative impacts. New transport infrastructure projects can attract investors to the region and enhance the economic development of the region. The rapid development of transport has a major impact on the surrounding countryside and all the animals and plants in the area. Transportation construction changes the level of quality of life and reduce safety for residents who live near the new road. Designing new transport infrastructure is very important for many years to come. In the design must comply with a reasonable ratio between the investor's requirements and interests of the people who live in the area. It is very necessary to preserve all transport links such as connections to shopping centres and industrial zones but also met all the necessary standards.

Reviewer of the paper: Ing. Bc. Dagmar Kočárková, Ph.D.

2. Project activity

Project titled designing roads and highways is managed Department of Transporting Systems. Basic characteristic of the project is to use professional software for designing transportation structures such as roads, cycle paths and intersections. Software which is used in the project is AutoCAD Civil 3D. This software is provided free of charge to students CTU used in the form of a student license. Another important element of the project is to teach students independent access to each type of task. These capabilities then students use to solve their bachelor's and master's theses. Students are encouraged to improve their communication skills throughout the study. Students must be able to solve sub-tasks and communicate with representatives of state authorities, cadastral offices, police departments, design firms and construction companies.

Study at the Faculty of Transportation sciences is arranged as a project-oriented teaching. Project titled designing roads and highways is taught between projects since 2005. In the past, the project focused mainly on work with the software JJJ and its use in designing a modern transport structures. At present, the project also aims to use the latest techniques in design but the main role in the project activities begin to have various excursions and lectures that are linked to current events in the industry tackled by the project. Leaders in the project are The professionals and leaders in their fields which include designing roads and highways, road construction and traffic engineering. Project titled designing roads and highways would like to maintain in the future direction which is issued and who is the greatest possible link students with practical and real problems they should meet in their future practice.

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3. Achievements of the project

As mentioned in the previous chapter, project titled designing roads and highways has built a tradition since 2005. Evidence that the project is very popular among students is the fact that the number of students registered for the project each year is higher than the number of students who can take the project. It is very difficult to say that the success of the project can be considered the greatest, because it would be a subjective evaluation of the corresponding author. For an objective assessment can be considered as a management team. Currently, the project is led by four experienced cantors and one of practitioners who work directly with the project. These cantors their experience opens up new perspectives on the issue of traffic engineering and design activities.

The project titled designing roads and highways each year participate in faculty competition Presentation of projects since 2010. In 2010, the project won second place a year later in the third. In last year's competition is mainly due to a great presentation again placed second. It must be said that in recent years the project presentation was really strong competition, this competition is regularly attended by 25 to 30 projects from across the Faculty of Transportation science.

4. Cooperation with practice

The study of any university, whether technical or humanities is not a guarantee of jobs in the sector. At this time, give companies prefer candidates with proven work experience before graduate without experience. Students can gain work experience in several ways. Students can gain work experience such as voluntary work or work part-time. It often happens that students work outside the scope of that study. Project Leader realize that it is very difficult for students to gain practical experience in companies working in the field. As our project management team is composed largely of specialists who work in practice, their efforts lead students to general work habits of practice. As has been said is an attempt to show the practical experience using a variety of excursions where students have the opportunity to view individual acts or check out. In past years, the project layout some interesting excursions such as the newly built Blanka tunnel complex where students could look up sites that are inaccessible to the public. Other excursions were, for example, the largest dam in the Czech Republic at the dam Orlik, or excursions on the square in Brandýs nad Labem where he conducted a complete reconstruction of the local square.

2014 is planned at least one excursion which will take place at precisely reconstructed highway D1.

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Picture no. 1 - Excursions in Brandys nad Labem

Picture no. 2 - Excursions in the dam Orlik

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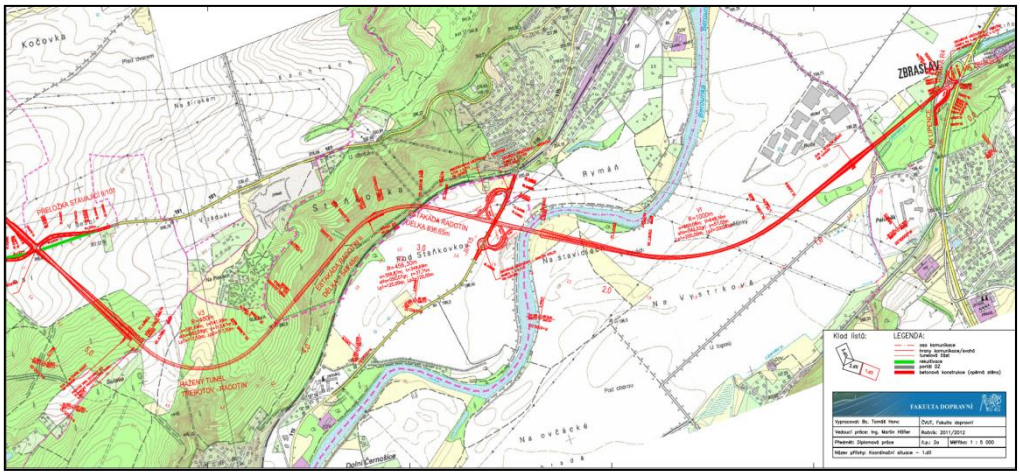
Picture no. 3 - Excursion to the Blanka tunnel complex



Picture no. 4 – The sample of master thesis prepared in AutoCAD Civil 3D software by Ing. Tomáš Honc (successful graduate and associate of the project)

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Chart no. 1 - List of awarded bachelor and master theses since 2012

Author	Thesis´s name	Thesis´s type	Year	Award
Bc. Nejerálová Jana	Assessment the intersection Hradecká and Sportovní street in Přelouč	BT	2013	Passed with Distinction + Dean´s praise
Bc. Gallia Jan	Proposal layout of street U Záběhlického zámku in Praha 10 - Záběhlice	BT	2013	Passed with Distinction + Dean´s praise
Bc. Halama František	Properties of asphalt binders	BT	2013	Passed with Distinction + Dean´s praise
Bc. Vojtěchovský Ondřej	Traffic study connection of town parts Horní nám. and Dolní nám. - Odolena Voda	BT	2012	Passed with Distinction + Dean´s praise
Bc. Skronka Gabriel	Modernising the II and III category road crossings in Roudnice nad Labem	BT	2012	Dean´s praise
Ing. Šatra Petr	Proposal of measure for reconstruction of I/2 and I/12 roads to 2+1 standard	MT	2013	Passed with Distinction + Dean´s praise
Ing. Honc Tomáš	Optimization of technical design of agglomeration circuit in the southwest area of Prague	MT	2012	Passed with Distinction + Dean´s praise
Ing. Severa Jakub	Components for persons with optical handicap at crossections and in street profile	MT	2012	Passed with Distinction + Dean´s praise
Ing. Všechovský Martin	Optimization of technical design of building road III/15529 Nová Plavská	MT	2012	Passed with Distinction

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TRAFFIC MODELS AND TRAFFIC CONTROL

16120 – DEPARTMENT OF CONTROL AND TELEMATICS

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Introduction – who are we and why are we here?

In relation to the present way of life of a civilized society, road traffic is growing every year in the cities of Czech Republic, which has a downside in the congested network. Due to this fact a field of telematics is currently developing and its essential part is traffic management.

Nowadays it is more than necessary to find the optimal method for managing traffic flows in cities, because the time loss of an individual in traffic congestion has more or less a negative impact on the overall economic situation of the state. The methods that are applicable in practice today include simulation tools that are great aid in road design and its control algorithms.

The listed reasons gave birth to the project of Traffic Models and Traffic Control (TMTC). The project was created in 2011 by combining two already existing projects: Traffic Management and Traffic Surveys. This connection is logical, thanks to the continuity of the original and follow-up projects, because when planning the optimum method of traffic management it is always necessary to collect recent traffic flow data, which is done through traffic surveys.

The issue addressed by the project TMTC could therefore be divided into three blocks, which are closely related. Traffic surveys dealing with the use of latest technologies in the collection of traffic-engineering data, traffic simulation to predict future traffic conditions and traffic management. Recently, the project is being supervised by three supervisors and run by 7 master's degree students and 7 bachelor's degree students.

The project is offered to students in two bachelor's degree study fields: Transportation Systems and Technology and Intelligent Transport Systems. For master's degree students it is offered in the same fields.

Activities of the project – what do we do?

Besides the already mentioned division of activities between traffic surveys, traffic simulation and traffic management, the project activities can be broken down into:

- Activities focused on student profiling
- Involvement in research projects and grants
- Involvement in other professional activities of the department

Each of these three important points will be analysed in detail later in this article.

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Project activities focused on student profiling

If a student of the first block of bachelor's degree at the Faculty of Transportation is choosing a project, he will most likely be interested in what he could be working on and what his bachelor's thesis could be about. Most students will also appreciate if their project involvement is applicable in the real world. In this respect students do not need to fear our project, because the project supervisors will be glad to discuss the main fields of interest and offer a current issue that needs solving.

If a student is interested in traffic control and traffic models, his bachelor's thesis could address a traffic lights solution on a particular intersection. Of course it should be such an intersection, where traffic lights would be necessary and helpful for the users. The proposed solution can even be tested by a simulation program. If a student is more interested in algorithms, he could be working on designing and testing of control and simulation algorithms. If a student is interested in traffic surveys, he could be focusing on a particular technology of traffic surveys and then apply it in practise.

Now it would be appropriate to mention what resources and equipment are available for students working on those issues. Within the Department of Control and Telematics there is Laboratory of Traffic Control and Modelling, whose equipment is constantly being expanded. This laboratory is fully available to the TMTC project students.

The laboratory has a number of hardware and software, mainly a traffic controller provided by ELTODO Transport Systems Ltd. The traffic controller is used to test different types of managing different kinds of intersections. There are also several computers as part of the laboratory inventory that are used for project related work. There are simulation modelling programs available, such as VISSIM, AIMSUN and OmniTrans. Thanks to the simulations, students can test the proposed types of control at intersections. It is also possible to use video detection, program the controller software and its testing. Part of the laboratory equipment available for TMTC project students is in Figure 1.

Figure 1 Traffic Control and Modelling Laboratory equipment

In addition to the listed equipment, the laboratory also has a set of detectors of different technologies usable for testing, teaching and measuring data needed for addressing project's issues. These include microwave radar, magnetic detectors, video detection, video camera with license plate recognition, sound meter and weather station. These detectors are already fully available to students, helping them with their theses; the newest detectors will be tested in real traffic soon.

Table 1 contains a summary of the laboratory equipment.

Table 1 Summary of Traffic Control and Modelling laboratory equipment

Software	Hardware	Detectors	Others
PTV VISSIM	SIEMENS traffic controller	pneumatic	IR thermometer
AIMSUN	signal device including pedestrian video detection	magnetic	range-finder
PARAMICS	visual intersection tableau	microwave	measuring wheel
OMNITRANS	PC	video detection	safety vests
LISA+	laptops	combined	Counter application for traffic volume calculations
ATEAS LPR Reader (License Plate Reader)		sound meter	plates, tags,…

It is also worth mentioning that a new and larger room has been allocated for the laboratory this year, therefore allowing further development of the field of traffic models and traffic control, creating better facilities for both staff and students.

For more information about the Laboratory of Traffic Control and Modelling visit the Department of Control and Telematics website: http://www.k620.fd.cvut.cz/department/laboratory/LabTCM

Involvement in research projects and grants

Department of Control and Telematics is a researcher of research projects and grants. In 2012, the Department received funding from CTU development grant to buy traffic detectors, some of which have already been listed in the article. Buying these detectors was preceded by their careful selection, in which the students of the TMTC project were also involved, with every student focusing on a single type of detector. The research consisted of obtaining important information about the detectors' properties and outputs that they provide. If a detector was found useful for the project (and for the whole faculty), students came up with suggestions which of them would be useful and affordable to buy. From the final list of detectors were then selected those who appeared to be most useful in the future.

Subsequently, it was possible to purchase a license for the LISA + program, which allows communication between the software and controller, or a new license for the already mentioned VISSIM simulation software, which also provides the simulation of dynamic signal plans.

The TMTC project was also involved in several research projects of the Department of Control and Telematics. Most important ones are listed in Table 1. TMTC helps with these projects especially in the initial information search phase and subsequent research operations. More information about these research projects can be found on the website of the Department of Control and Telematics.

Link to the Department's projects website: http://www.k620.fd.cvut.cz/research/projects

Table 1 Research projects to which TMTC project contributes

Time period	Project Name	Project Type	Project Supervisor
2010	Directional traffic researches with the use of licence plate recognising software as a source for traffic simulation	CTU Students Grant Competition	Ing. Martin Langr
2011-2013	Green Tunnel	TACR ALFA Programme	Doc. Ing. Tomáš Tichý, Ph. D.
2011-2014	New methods for traffic control in congestions in urban areas	TACR ALFA Programme	Ing. Zuzana Bělinová, Ph. D.
2012-2015	Development of new generation of freeway traffic management and modelling	TACR ALFA Programme	Doc. Ing. Ondřej Přibyl, Ph. D.
2012-2015	Universal intelligent control unit	TACR ALFA Programme	Ing. Zuzana Bělinová, Ph. D.
2012-2018	Transportation systems development centre	TACR Competence Centres Programme	Doc. Ing. Pavel Hrubeš, Ph. D.

Engagement in other professional activities of the Department

Some of the other activities of the Department of Traffic Control and Telematics to which TMTC project contributes to are mainly different kinds of studies.

For example one of our colleagues participated in a study entitled by UAMK, named Options for Traffic Flow and Safety Improvement in the CR. One of the sub-tasks required by this study was obtaining information from the German car clubs to get international experience, so communication with a foreign party was needed. Therefore the project also helps students to develop their communication skills, even in foreign languages. The outcome of this study were recommendations to improve safety and traffic flow, which resulted from information obtained from an individual subjects in the process of restoration of traffic on roads in the Czech Republic and from abroad experiences.

Another solved study investigated the use of video detection on railroad. Next study worth mentioning dealt with the creation of the transport and logistics model of the transport depot in Pilsen. We also participated in a parking systems study.

Importance of the solved issue

The usefulness and necessity of the solved issue comes from the reasons listed above. Here is a summary of the most important reasons why to deal with the issue:

- The degree of motorization in cities continues to grow, so it is necessary to find solutions which would optimize traffic flow in the city, seeking the best type of traffic control.
- Traffic simulation is an ideal tool for testing the proposed solutions, demonstrates their downsides before their implementation, and therefore is worth the cost.
- Traffic surveys are the starting point of any new proposal for road traffic management therefore it is necessary to find those technologies that will provide us with the necessary data.
- The proof of the necessity of this issue can be a number of research projects in which the TMTC project was involved that were assigned by companies from the real world.

List of the best theses written by TMTC project students

The following table contains a list of topics of the best dissertations and theses of this project. As already mentioned in the introduction, the project is relatively new, therefore the number of written theses is limited. However, as you can see from the table, year 2013 was extremely successful when it comes to theses, which can be proved by the fact that the study field of Intelligent Transport Systems was completed by only three students of the whole class and all of them were working on TMTC project.

Table 2 List of the best theses written by TMTC project students

Author	Thesis Title	Type of thesis	Year
Ing. Jan Kapitán	Simulation programme usage for the testing of different types of traffic control in a selected area	Master's	2011
Bc. Ivan Boyarkin	The use of touch technology for traffic surveys	Bachelor's	2013
Bc. Lukáš Garreis	The issue of vehicle license plate recognition	Bachelor's	2013
Bc. Petr Neuwirth	Simulation of traffic lights on road I/50 (Slavkov u Brna)	Bachelor's	2013
Bc. Radim Pacík	Analysis of the use of pneumatic detector Metrocount in the Czech Republic	Bachelor's	2013
Bc. Tomáš Paldus	Contactless payment systems in road transport	Bachelor's	2013
Bc. Jiří Růžička	Design of traffic control of the intersection Na Větrníku - Na Petřinách	Bachelor's	2013

Cooperation with external companies

The TMTC project cooperates with ELTODO, one of the most important Czech electrical companies.

Further cooperation and contact with practice are possible thanks to the cooperation with various companies on grants or additional professional activities.

Final word

This article was designed to briefly introduce the Traffic Models and Traffic Control project and its activities. In case you have any questions about the project, contact the supervisors or students, they will be more than happy to answer all of them. Contacts could be found on the project's website.

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ORGANIZATION AND REGULATION IN URBAN TRANSPORT

16112 - DEPARTMENT OF TRANSPORTATION SYSTEMS

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1. Introduction

A city should be a pleasant place for all residents. There should be a lot of well-tended areas with greenery, traffic-calmed streets, pedestrian zones, etc. This complex goal is a mission of our project.

1.1. Introduction to the project

The project Organization and regulation in urban transport was restored in 2011 at the Department of Transportation Systems K612 due to a high demand for projects that would solve the problems connected to a regulation of traffic in the cities, preference of public transport and pedestrians, traffic calming in the historical centers and organization of urban transport in city centers. This project is actively engaged in the tasks mentioned above and helps students to expand their horizons and to find an appropriate design solution for each issue, which had become very typical for many Czech or foreign cities in recent years. Students can explore these problems during annual international conferences, where they have the opportunity to go. The project "Organization and regulation in urban transport" offers not only an excellent knowledge base in solving transportation problems, but also a practice in communication skills and team work as well. Students will undoubtedly use them while working in their field.

Reviewer of the paper: Ing. Petr Šatra

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2. The activities in the project

2.1. Solved topics

The list of problems the project generally deals with:

- Basic management, control and organization measures
- Development of transport demand - vehicular and pedestrian transport
- Organization of public transport in the city centres
- Public transport services – assessment of public transport lines, optimization of transport services, adaptation of public transport stops
- Preference of public transport, cycling and pedestrian transport
- Selection of a suitable means of transport for different types of areas and different time periods
- Parking control - limited parking zones, organization of parking in the city centres

Practical examples of the points mentioned above are shown on the following figures:

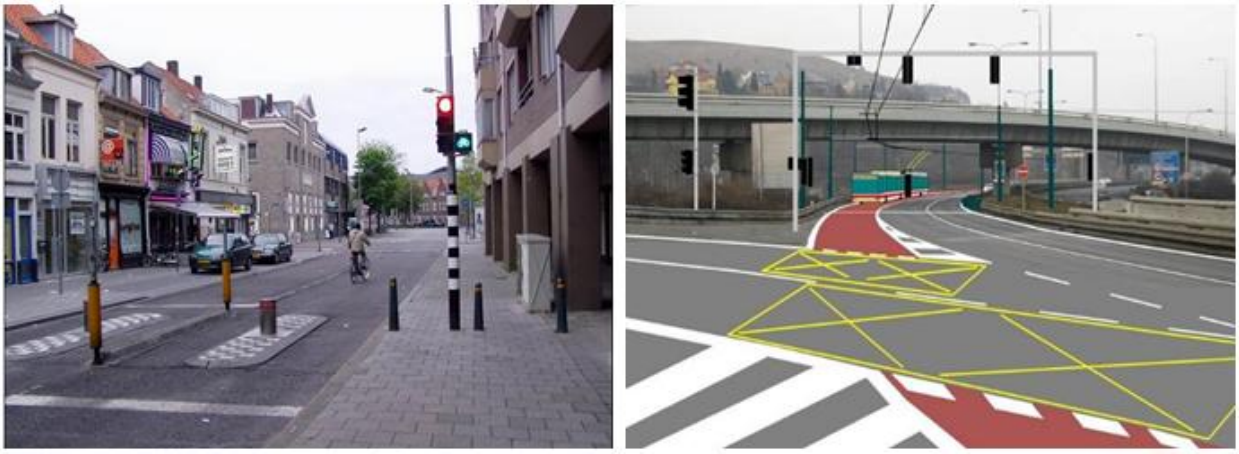

Fig. 1. (a) Traffic calming of residential areas; (b) Public transport preference [1]

2.2. A necessity of solutions in the given issues

With the ever increasing number of motor vehicles, there is a growing need for organization, management and regulation of the traffic flow. Most of the cities have their valuable historical centers which cannot cope with the high intensity of motor vehicles and they are not really adjusted to the amount of tourists and locals in these places. In this case, it is necessary to think about regulation, or at least the proper organization of motor traffic in the city centers. Another pressing issue is the organization of parking spaces. In the most cities, there are not enough parking places, because they are relatively demanding when it comes to the area consumption. This problem can be solved by the parking regulations that might be realized, for example, by means of zones of limited parking. The situation is not going to improve with increasing number of vehicles and therefore it is necessary to consider alternative modes of transport. This can be achieved, for example, by preferences of pedestrians and cyclists, which are undoubtedly the most environmentally friendly transport modes, or by public transport preference, when it comes to the longer distances. The transport network should be optimized in an appropriate way to meet the needs of passengers in a best way, depending on the area size. This also falls into the group of issues solved in this project. It should be also mentioned that pedestrians and cyclists belong among the most vulnerable road users and therefore it is necessary to devote attention to their safe movement. To find some inspiration, it is advisable to travel, keep our eyes open and let’s get inspired by the traffic solutions all around the world, whether these solutions fix the problem or not.

2.3. Achievements of students of the project

The restored project had its first graduates in the last academic year. It is possible to note that they were more than successful. Six of eleven students, who finished their bachelor studies, graduated with honors and one student graduated with distinction. Two of four students who finished their master studies graduated with honors.

The effort of our students was rewarded also by the dean of the faculty. He awarded eight our students during the recent graduation ceremonies for their excellent thesis.

2.4. List of the best bachelor and master theses

There is the list of students awarded by the dean of the faculty for their excellent thesis in the last academic year.

Table 1. List of theses awarded by the dean of the faculty

Author	Title	Type of thesis	Year of processing
Bc. Zuzana Dočekalová	Study of Transport Solution of the Dubina Neighborhood in Ostrava	bachelor	2013
Bc. Jakub Hladík	Study of Measurements on Crossroads in front of the Liberec Railway Station	bachelor	2013
Bc. Petr Jandík	Modification of Junction of Streets Edvarda Beneše and Heyrovského in Pilsen	bachelor	2013
Bc. Lenka Koupilová	Organization and Traffic Calming in the Area Opava – Kateřinky (East)	bachelor	2013
Bc. Marianna Plotnikova	The Prerequisites for Implementation of the Integrated Transport System in Moscow	bachelor	2013
Bc. Markéta Wranová	Evaluation of Impacts of Applied Countdown Systems on Signalized Intersections	bachelor	2013
Ing. Martin Přibyl	Measures on Major Through Roads in Small Municipalities	master	2013
Ing. Ondřej Valošek	Study of Transport Solution of the Through Road I/48 in the City of Frýdek - Místek	master	2013

2.5. Attendance of the students in grants and projects from 2010

Students who have chosen this project have also the possibility to participate in some international conferences where they can try to solve real world problems. One of these conferences is “City and Traffic”. Our students have participated in this seminar since our project was founded. It is a week-long meeting with tradition since 1996. At these meetings, students usually work in groups with other international students who study similar fields to ours and they can thus mutually enrich the valuable experience, knowledge, and different approaches to solving certain tasks. Topics are various - from general urban traffic conceptions, traffic safety measures, to the infrastructure for cyclists and pedestrians. Sometimes, it is possible not only to inspire one another while working on projects, but also make new friendships, and establish new contacts for the future. The advantage of such was proved, for example, last year when getting data from abroad for a bachelor thesis, which brought it to the next level. Last but not least, students also get to practice their language skills. They present their solutions to the representatives of the hosting city and university. They thereby gain also highly valued skill that belongs among the so-called soft skills, which can be very helpful in finding any future employment.

Beside of that, students also participate actively in real world projects which the department K612 is granted to.

2.6. Connection to practice

In our project, we successfully cooperate with the “Nadace Partnerství” and the City of Prague on the project “Safe Routes to Schools”. In addition, students in the project have a chance to try collaboration with companies in the field. Currently, our project offers a list of about 15 companies with different range of activities in the area of transport for which students can apply. Among other institutions, the project also cooperates with Transport Departments or Departments of Regional Development of various municipalities. They often offer the assignments of bachelor or master theses. Having this option, students transform the theoretical knowledge acquired in the school to a practical experience that will help increase their margins over the other graduates while searching

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for the employment. It could happened in some cases that student will find the future employer during the course of studies.

2.7. Curiosities

As both authors of this article study abroad at partner universities, we would like to mention a few traffic solutions, which we consider interesting and which belong to our project by their focus.

2.7.1. Active speed bump „Actibump“

Use of this active speed bump is going to proceed in Plzeň. This device was developed in Sweden in city of Linköping where it is also actively tested at several locations. The speed bumps get active while speeding of individual vehicles. They descend by tens of millimeters; create a drop in the road, which should force drivers to slow down. As it is with the most new devices, there is a problem with the legislative aspect, for example, which will be responsible for an accident occurring on such bump, etc. Generally, we can say that the speed bump probably fulfills its purpose well, but it is necessary to examine all the negative or questionable impacts. Account must be taken to the issues such as how the device will affect other road users and if is it safe for all of them. The financial aspects must be considered as well as the lifetime of the active speed bumps. [2]

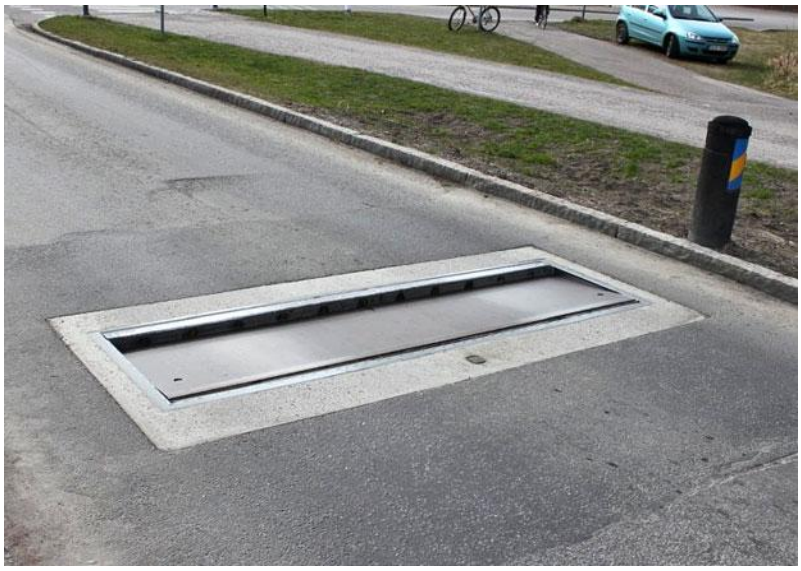

Fig. 2. Active speed bump [2]

2.7.2. Cyclists preference

Other reason why Sweden is interesting, and especially the student city of Linköping, is the almost absolute preference of cyclists. People use their bikes throughout the year and it is no wonder why. Cycle paths are here all over the city, they smoothly continue one after another. They are also very comfortable and even after several kilometers of driving, cyclists might not come to cross the road. When a cyclist comes to an intersection with traffic lights, loops in pavement (Fig. 3b), which enable a dynamic control of an intersection, are able to set green phase for him/her almost immediately. In addition, the drivers here drive in very defensive way and in 99% give priority to cyclists, which make bicycle transport very comfortable. The other reason for high number of cyclists is the very flat terrain in the city.

2.7.3. Visual projection of traffic signs - "Softstop Barrier System"

It is a warning element, which uses a projection of traffic signs on a water wall. It is used in Sydney in nearby of tunnel portals, where oversized trucks used to ignore standard traffic signs of a maximum allowed vehicle height. It is impossible to not notice the "STOP" sign anymore.

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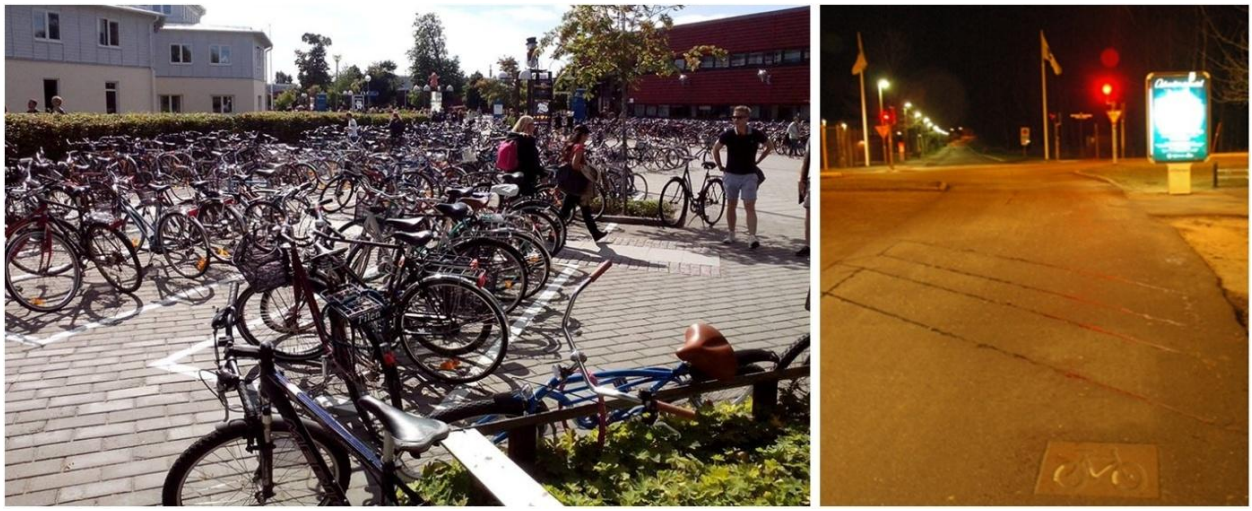

Fig. 3. (a) Cycling traffic - Linköping, Sweden; (b) Cyclist detectors - Linköping, Sweden

Fig. 4. Visual projection of traffic signs - Sydney [4]

3. Conclusion

Contemporary cities are often overloaded with traffic and requirements to their infrastructure are still getting higher. It leads to a necessity of some certain traffic organization according to modern trends of transport planning and design. This field does not stagnate and there is a still development going on. The project "Organization and regulation in urban transport" offers students the theoretical knowledge about current trends in this major and the practical experience that students can undoubtedly use while working in this field.

4. Reference

[1]Ilustrační příklady: Organizace a regulace dopravy ve městech. ČVUT FD. (2012). Retrieved November, 28, 2013, from http://www.fd.cvut.cz/projects/k612xorg/ilustracni-priklady

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 ISBN 978-80-01-05416-1

TRANSATLANTIC COOPERATION IN TRANSPORTATION AND LOGISTIC SYSTEMS

16117 - DEPARTMENT OF LOGISTICS AND MANAGEMENT OF TRANSPORT

Bc. Michal Jizba, Bc. Karel Kůs

Head of the project

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1. Introduction

Project Transatlantic Cooperation in Transportation and Logistics is an integral part of the Master study field Transportation and Logistic Systems (TR), which is a joint effort of the Czech Technical University in Prague, Faculty of Transportation Sciences and The University of Texas at El Paso (UTEP), USA. As well as the study field TR, the project is focused on transatlantic cooperation between EU and US and allows students to work on transportation and logistics related topics that are current on both sides of the Atlantic. After spending their the first year of studies at the Faculty of Transportation Sciences, students are assigned a lecturer from UTEP under whose supervision they finish their topic and thesis during the second year of their studies that takes place in the US. [1] At present, students are working on topics such as transport solutions for big cities (Smart Cities concept), maritime transport, optimization in logistic chains or safety and security of transatlantic logistic chains.

2. Orientation of the project

The range of activities and topics solved in the project Transatlantic Cooperation in Transportation and Logistic Systems is very wide. Because of the number of students involved, each student can rely on having sufficient support and encouragement from project leaders, as well as an opportunity to choose his or her area of interest. In the past, many interesting issues concerning all modes of transport were elaborated. The next part of this paper will focus on selection of some topic that has either been solved in the past or can be further elaborated by future students. Of course, a fresh idea for an interesting topic is appreciated, so this selection is a subject to change according to preferences of students involved in the project.

Reviewer of the paper: doc. Ing. Ladislav Bína, CSc.

2.1. Logistic systems

The European Union and the United States have the largest bilateral trade relationship and enjoy the most integrated economic relationship in the world. [2] This bound naturally brings large flows of goods shipped by both maritime and air transportation in between United States and European Union. World of growing competitors, limited primary resources, ecological issues and problems with economic growth in developed countries brings high demand for finding more efficient methods and solutions for transatlantic logistic chains. This is the main reason why students involved in the project deal with optimization of transatlantic logistics chains.

Besides optimization, students also focus on safety and security of transatlantic logistic chains. Particularly the issue of security has been getting much attention recently - in October 2010 a terrorist plot concerning air cargo and mail transport was foiled. This so called "Yemen incident" involved two explosive devices concealed inside toner cartridges which were mounted in HP laser printers and then sent via air mail. Luckily, the disaster was prevented thanks to a perfect performance of intelligence agencies. [3] However, this plot demonstrated a shift in interest of terrorist organizations which are looking for new ways to achieve their goals. Although a very important part of the global economy, logistic chains are not immune against outer threats. Therefore, new approach and research in this field is required.

Other area students can focus on concerns freight tracking and identification. Due to growing demand of freight transport, higher automation for enhanced safety and security is desirable. For this purpose, modern SMART containers are being developed and introduced. Equipped with Radio Frequency Identification (RFID) and other modern technologies, the SMART containers can revolutionize freight transport and warehousing as we know it. Automated container content monitoring, real-time satellite tracking via GPS and GSM network, monitoring of conditions inside the container (e.g. temperature, acceleration and vibrations, humidity etc.) or seal breach alert are just some of possible functions that can be implemented.

2.2. Intelligent transport systems

Students of the project have also been working in the field of Intelligent Transportation Systems. For example, several students dealt with vehicle toll systems, creating a model of a toll system based on vehicle miles travelled. Other work include creation of a decision making tool for local administrative bodies in both EU and US that should help them decide which instrument for congestion management they should use. In addition, the issue of planning and timing of light signals at crossroads was researched by our students in the past as well. This particular research allowed comparison of both American and Czech approach to the issue.

It is also a common knowledge, that cities and agglomerations around the globe face a rising volume of traffic and externalities connected to it – such as congestions, traffic accidents, pollution, noise or vibrations. Unfortunately, this issue cannot be resolved by conventional approach to transportation sciences – it is thus necessary to develop an integrated conception of intelligent transportation systems. This fresh concept is called the Smart Cities. Currently, some students devote themselves to this concept, focusing on both passenger transport and freight transport.

2.3. Air Transport

Air transport is without doubt one of the most prestigious modes of transport. Needless to say, there are so many interesting subjects to solve - Transatlantic Cooperation in Transportation and Logistic System project presents an opportunity for students to be involved in air transport as well. Notable examples of past work solved in the project is a development of model for forecasting demand in transatlantic air transport using a gravity model - such a fresh approach has never been taken before. In addition, students have been dealing with air transport security in topics such as analysis of checked baggage inspection systems or air cargo security.

3. Attractiveness and desirability of the project

As can be seen in the previous chapter of the paper, the scope of issues solved in the project is very wide. As the heads of our project emphasize, each student has a chance to choose and specify his or her most desired area of

focus. Students are thus able to solve issues they find intriguing and beneficial for their future career or further studies.

The only requirement is that all the solved issues in the project are connected to transportation in both European Union and the United States. Despite the rise of Asian economies, the European Union and the United States remain two largest trading partners in the world. Value of goods shipped between these partners achieved almost € 300 billion in 2012. [2] However, up until recently, there has not been any project at the Faculty of Transportation Sciences focusing on transatlantic movement of people and goods and logistics connected with it.

Thanks to the focus on this general area, students involved in the project Transatlantic Cooperation in Transportation and Logistics are expected to master interdisciplinary skills in the fields of modern transportation and logistics that will allow them to acquire respectable positions in companies worldwide. Moreover, due to the fact that part of the curriculum takes place in US, students should learn how to work as a member of an international team and live in a multicultural environment. [4]

Beside the student's ability to acquire high level of education and skills necessary for their future career or further studies, students of the project are fully capable of representing their alma mater, the Faculty of transportation Sciences of the Czech Technical University. To support this claim, the next chapter of this paper will focus on some notable achievements of students involved in the project.

4. Achievements of students involved in the project

Over the course of the last few years, several students participating in the project have achieved major appreciation of science community. Most notably, project graduate Markéta Vávrová won the Friedrich List Award 2012 by European Platform of Transportation Sciences for her master thesis Development of an Electronic Vehicle Miles Travelled Toll Model. Wining the prestigious Friedrich List Award in the competition of students from the whole European Union indicates outstanding scientific quality of Markéta's thesis which had been solved under the project Transatlantic Cooperation in Transportation and Logistic.

More recently, current students of the project - Tadeáš Umlauf and Radim Večeřa - have participated in the international Solar Decathlon 2013 competition, which is organized by the US Department of Energy. The challenge is to design, build and operate cost-effective, energy-efficient and attractive solar-powered house. [5] It was the first time a team from Czech Republic - composed of students of the Czech Technical University - attended the competition. As a part of the team, Tadeáš and Radim provided the logistic solutions necessary for achieving the competition goal. The Czech team finished 3rd place after the Solar Decathlon 2013 grand finale in Orange County Great Park in California, US. Achieving this result in a fierce competition of 19 teams proved that our students are up to the challenge of representing both Czech Republic and CTU in international competitions.

5. Activities, grants and other projects

As an integral part of the study field Transport and Logistic Systems, the Transatlantic Cooperation in Transportation and Logistic Systems project benefits greatly from collaboration with the UTEP where the project students spend their second year of their master study. This unique opportunity for students cannot be possible without the bilateral EU-USA Atlantis program. It primarily aims to promote understanding between people of the EU and USA and improve the quality of education by development of joint study programs, such as the Transport and Logistic Systems at the Faculty of Transportation Sciences. [6]

Moreover, under the patronage of the Atlantis program, students from UTEP come to Faculty of Transportation Sciences to spend their final year of their master study, during which they participate in our project. In this way, Alejandra Gallegos from UTEP graduated at the CTU last year. Currently, one UTEP student, Luis Hernandez, participates in the project alongside Czech students. Needless to say, students are thus enriched in their social and language skills, not to mention gaining knowledge about a different culture.

In 2012, students involved in the project became involved in the CTU Student Grant Competition with the subject of Air Transport and High-Speed Rail in China, for which they received a CTU grant. The aim of their project was to prepare a sophisticated report on the current state of high-speed rail and air transport in China and their possible synergy. In January 2013, CTU students had an opportunity to familiarize themselves with the results

of this effort during two seminars organized by students involved in the project. Both seminars – Lecture about China and High-speed rail and Air Transport in China – met with enthusiastic response of attending students, CTU staff and experts from business world.

Recently, students of the project participated in the 2nd international scientific conference Air Transport Security 2013. The conference was organized by the Prague Airport and the University of Business in Prague and took place at the Prague Airport on the 19th of November 2013. One of our students, Michal Jizba, contributed to the conference with a paper called Current Approach to Air Cargo Security. Michal's presentation of current development at this area met with interest and acceptance of the attending experts.

6. List of best masters theses

Author	Title	Type	Year
Ing. Markéta Vávrová, M.Sc.	Development of an Electronic Vehicle Miles Travelled Toll Model	DP	2012
Ing. Jiří Tylich, M.Sc.	A Multimodal Freight Collaborative Hub Location and Network Design Problem	DP	2012
Ing. Petr Malina, M.Sc.	Analysis of Isolated Traffic Signal Control Systems	DP	2012
Ing. Nela Blejchařová, M.Sc.	Methodologies for the Analysis of Checked Baggage Inspection Systems	DP	2012
Ing. Tomáš Rendl, M.Sc.	Assessing Regional Impacts of Transportation Policies and Traffic Management Solutions in Large Urban Areas	DP	2013
Ing. Kateřina Střelcová, M.Sc.	Development of Demand Forecasting Model for Transatlantic Air Transportation	DP	2013

7. Cooperation with businesses and institutions, field trips

Of course, theory taught on the academic soil (while necessary, interesting and useful) does not sometimes correspond with the best practices and habits in the business world. Therefore, it is necessary to insure insight into the businesses world, either by organizing various field trips or cooperation with enterprises involved in transportation area.

Notable examples of the project involvement include cooperation with Prague Airport or Czech Airlines. In both 2012 and 2013 excursions to the Prague Airport and Czech Airlines Training Centre were organized. Students had an opportunity to receive valuable information about the airport traffic or training requirements of flight crews. In addition, as mentioned above, students attended the Air Transport Security Conference 2013 organized by Prague Airport and University of Business in Prague.

Currently, cooperation with DB Schenker, one of the leading international providers of integrated logistics solutions, is being negotiated. The meeting of project students with representatives of the company is scheduled for the first half of December - students will be able to receive useful information about transatlantic logistic chains which will be useful for their future work.

In addition, a field trip to Metrans container terminal in Prague is being prepared. Students of the project will thus be able to get acquainted with methods used for container handling and verify theories taught at some of the lectures of their study program.

8. Conclusion

Transatlantic Cooperation in Transportation and Logistic Systems serves as a model example of the best practices of the project-oriented education at the Faculty of Transportation Sciences. As can be seen from the range of solved topics, students are able to choose their most desired area of interest and then solve it in their master theses. Because of this, student of all bachelor field of study can participate in the project and continue with their studies in the Transport and Logistic Systems program.

An integral part of the project-oriented education at the Faculty of Transportation Sciences is cooperation with businesses and institutions - our project is no exception, notable examples can be found in previous text. In addition, thanks to frequent excursions, students can get acquainted with various practices used by companies involved in transport business. This insight can serve to support and verify theories gained during education at our faculty or can even influence future career preferences.

However, the most appreciated aspect of the project and the whole Transport and Logistic Systems study field is the international cooperation with UTEP and the studies in the USA. Besides improving their English language skills, students gain knowledge of differences in approach to transportation sciences in both the US and the EU. In addition, they will be able to gain experience concerning working in an international team or negotiating with members of a different cultural origin.

To conclude, authors of this paper gladly recommend the future students to use the opportunity presented by the project Transatlantic Cooperation in Transport and Logistic Systems and study field TR. They believe that the whole project is a unique experience and will be very beneficial for the future career of students involved.

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[4] *Transport and Logistic Systems: Logistics fuels business*. Praha, 2010. Available at: http://atlantis.fd.cvut.cz/introduction/Atlantis%20Promotion%20Leaflet.pdf

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TRANSPORT OF HAZARDOUS SUBSTANCES

16123 - DEPARTMENT OF SECURITY TECHNOLOGIES AND ENGINEERING

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1. Activities of the project

The project focuses on the transportation of hazardous substances on the roads. Based on the current concept of "integral safety", representing a set of measures and activities to ensure the safe and sustainable development of all essential public protected interests in the territory and in the entire our state, and by help of system approach, real data, data simulated by suitable methods there are determined the critical sites, on which accidents with the presence of hazardous substances come up.

Based on data obtained from the units participating in ensuring the road safety there were identified critical areas. Selected critical points were analysed using the methods of risk engineering, e.g. What – If analysis, and there were created scenarios of impacts of traffic accidents involving the hazardous substances. Based on these data we estimated the potential damage to public assets on investigated section of the transport sector in the variant manner.

Then, there were quantified risks and according to their acceptability for the public there are set up measures and activities for prevention, preparedness, response and recovery, that would avert the occurrence of traffic accidents involving the hazardous substances. According to the results of professional evaluation, current legislation of the Czech Republic (Czech regulations are missing for the transport of hazardous substances) and EU we also prepare the proposal of measures for legislation and management.

2. The need for addressing the given issue

Transport of hazardous substances depends on the industry and economy of the countries, which we have to realize at safety management. Since 1909 the PIARC (World Road organization) has been activated, which now consists of over 140 countries. According to its data the transport of dangerous substances in the EU countries takes 5-8% of the total volume of transport. Association PIARC has recorded traffic accidents on roads involving hazardous substances from 30 years of the last century and since the 70th years it has watching their steep increase,

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Figure 1. In the accidents on the road there are threaten the human lives and health, property and the environment, which are located in the close vicinity of roads.

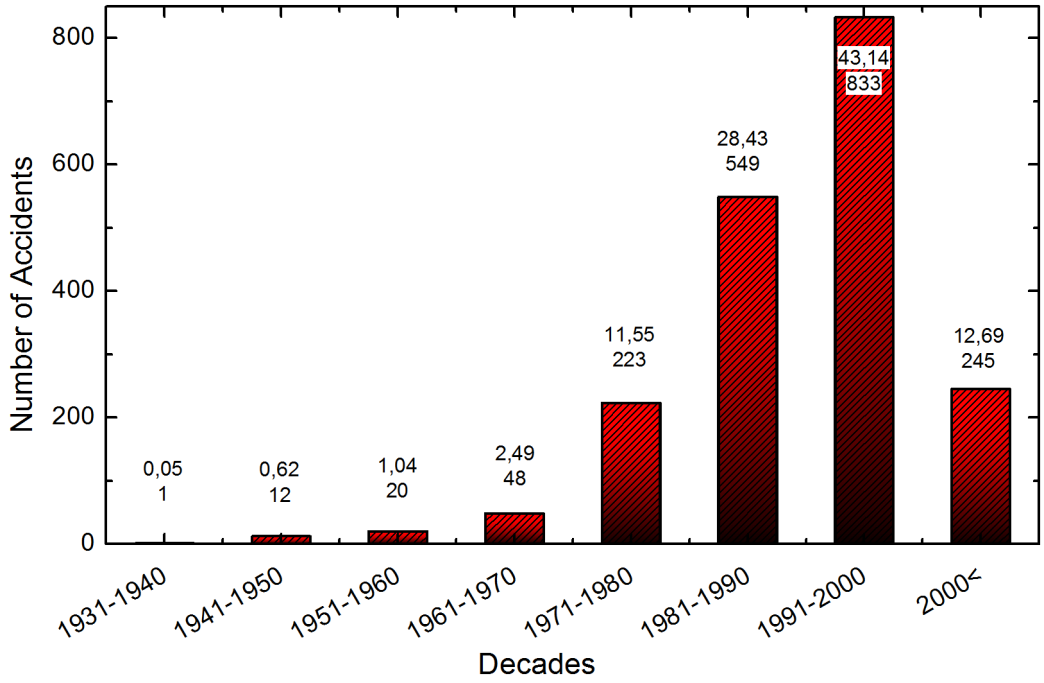

Fig. 1 The number of traffic accidents involving the hazardous substances

Over the Czech Republic there is realised one of the largest freight routes leading from the Asia Minor to Amsterdam, Figure 2. Figure 2 shows loading factor and length of kilometres in the Czech Republic, it is pronounced two main flights, namely from Břeclav or Mikulov to Krásný Les or Rozvadov, both flights lead over the D1 highway from Brno to Northwest. The D1 highway belongs to the busiest roads in our country.

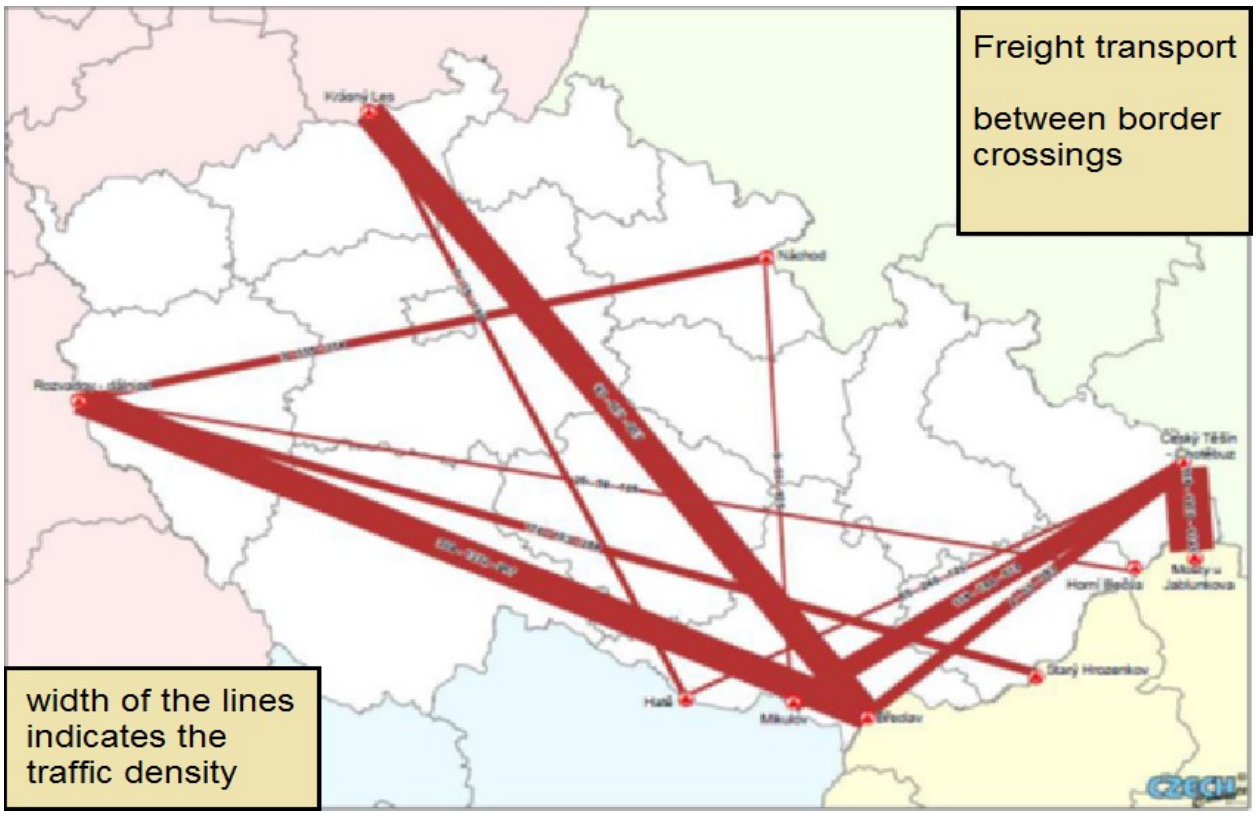

Fig. 2 The density of transit freight traffic between border crossing points in the Czech Republic for the years 2000, 2005 and 2010 (lecture Jirovsky 2012).

The frequency of traffic accidents involving the hazardous substances on the D1 highway in the period 2007 – 2010 is shown in Figure 3; because both mentioned flights lead on it.

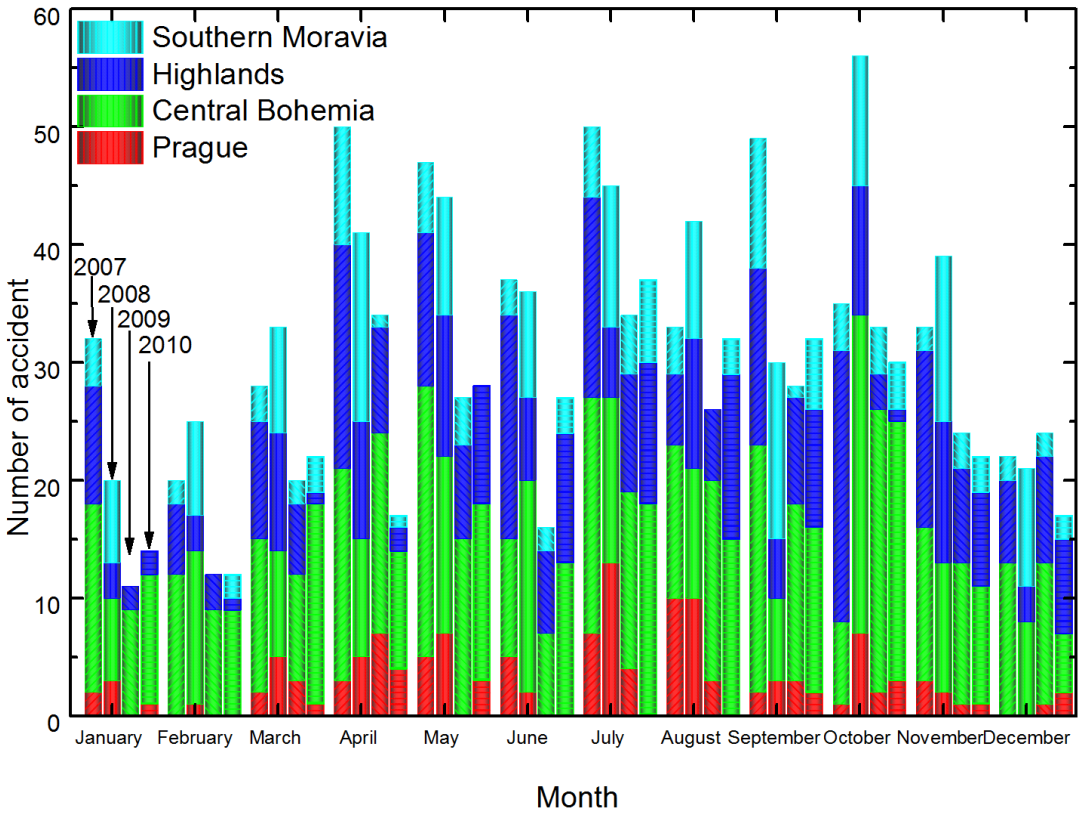

Fig. 3 Overview of accident frequency involving the dangerous substances on D1 highway in 2007-2010.

3. Achievements of the project:

3.1. Articles

D. Procházková, H. Patáková, Z. Procházka, J. Procházka, V. Strymplová: *Dopravní nehody na pozemních komunikacích s přítomností nebezpečných látek.* In: Bezpečnostní management a společnost. ISBN 978-80-7231-928-2. UNOB, Brno 2013, 433-439.

H. Patáková, J. Procházka: Analýza údajů o dopravních nehodách s přítomností nebezpečných látek. In: Požární ochrana 2013, ISBN: 978-80-7385-127-9, ISSN: 1803-1803, VŠB-TU, Ostrava 2013, 193-195.

D. Procházková, V. Strymplová, H. Patáková, Z. Procházka, J. Procházka: Analýza dopravních nehod s přítomností nebezpečných látek na pozemních komunikacích. In: Požární ochrana 2013, ISBN: 978-80-7385-127-9, ISSN: 1803-1803, VŠB-TU, Ostrava 2013, 205-208.

H. Patáková, J. Procházka: *Analysis of data on traffic incidents with presence of hazardous substances.* In: Proceedings of the 11th European Transport Congress. ISBN 978-80-01-05321-8, ČVUT, FD, Praha 2013, pp. 207-212

H. Patáková, J. Procházka: *Analýza dopravní nehody s přítomností nebezpečných látek na křižovatce silnic číslo 7 a 13*. In: Krizový management 2013, Univerzita Pardubice 2013, v tisku

D. Procházková, H. Patáková, J. Procházka, Z. Procházka, V. Strymplová: Dopravní nehody s přítomností nebezpečných látek na pozemních komunikacích

H. Patáková, J. Procházka*: Analýza dopravní nehody s přítomností nebezpečných látek na křižovatce dálnice d1 a silnice I. třídy č. 52.* In: Rizika podnikových procesů. UJEP, Ústní nad Labem 2013, v tisku, publikace sdělení ve sborníku

3.2. Posters

H. Patáková, J. Procházka.: *Analýza údajů o dopravních nehodách s přítomností nebezpečných látek,* Požární ochrana.

H. Patáková, J. Procházka.:*Analysis of Data on Traffic Incidents with Presence of Hazardous Substances,* Proceedings of the 11th European Transport Congress.

4. Participation in project grants and projects from 2010

Grant No. SGS13/158/OHK2/2T/16, Identification and Analysis of Risks on Overland Roads Connected with Transport of Dangerous Substances (leader: doc. RNDr. D. Procházková, DrSc.)

5. List up to 10 best defended bachelor's or master's theses:

Transport of Hazardous Substances, Diploma Thesis – prepared for defence

6. Cooperation with practice

Within the project "Transport of dangerous substances" cooperate with:

1. Police CR, from which we obtain data on accidents on roads throughout our state. Data on specific issues to real problems we obtain through printed or electronic questionnaires from all components of the Integrated Rescue System (IRS), or from the public administration.
2. Association of Chemical Industry of the Czech Republic, where we have presented the results of a risk analysis in certain places - http://www.schp.cz/cs/odborne-akce/details/69-jak-na-bezpenost-a-kvalitu

7. Other points of interest

Within the framework the grant SGS13/158/OHK2/2T/16 we set up a database of traffic accidents involving the dangerous substances in the Czech Republic and by help of methods of system engineering, which work with the risks, we identify and analyse the critical points of roads and judge the potential damages, losses and injuries associated with possible traffic accidents involving the dangerous substances. We are going to appreciate the criticalities of places with regard to protection of human lives and health, and to compare the sites according to the criticality rate so that it might been the groundwork for the prioritization of management targeting to the safe transport.

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ADVANCED MATERIALS

16118 - DEPARTMENT OF MECHANICS AND MATERIALS

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Link to the website of the project: http://www.fd.cvut.cz/projects/k618x1nm/

1. Introduction

Advanced Materials Project is focused on the development of experimental methods for investigation of the mechanical properties of advanced materials, non-destructive testing of structures and usage of mathematical modeling tools. Students acquire knowledge and skills in the field of standard measurement methods, computer assisted measurement and evaluation of data in conjunction with with knowledge of theoretical mechanics. Based on the chosen thesis topic specialisation is improved in a specific experimental or mathematical method with a view to its optimization and utilisation for application.

1.1. History of the project

History of the project began in 2010 when student grants were for the first time awarded by the Grant Agency of CTU in Prague (SGS grants). Among other successful projects heads of the project received support for grant 'Hybrid measurement system of thermo-mechanical parameters of advanced materials and structures in limiting loading states'. Seeing further research possibilities in the field of material engineering the project 'Advanced materials' was then opened in next year for bachelor students. Although only master degree and Ph.D. students are allowed to be SGS team members all students are involved in the research activities as soon as they enter the second study block.

1.2. Current status

The project is currently classified as interdisciplinary project in bachelor and master program. Major part of activities is related to ongoing grant 'Investigation of Microstructure Focused on Material Properties and Behavior of Advanced Materials'. In consistence with goals of this research project students participate in analysis of heterogeneous materials' mechanical behavior with the ultimate objective of finding relations between their internal

Reviewer of the paper: Tomáš Doktor, Daniel Kytýř

structure and physical or mechanical properties. Obtained results are presented by the students at international conferences and published in reviewed (often impacted) journals.

1.3. Orientation of the project

Also in the following years the project will be focused on cooperation with various Czech grant agencies in an effort to support and encourage student research activities with possibility to continue in the Ph.D. program. Work will be concentrated on innovations of experimental methods, development of testing devices (including control software) and tools for automated processing of measured data.

2. State of art

Trend of the replacing of classical (mainly homogeneous) construction materials by advanced materials is associated with a number of challenges in materials research. Despite the significant advantages of modern materials resulting from a comparison of their effective properties to conventional engineering materials it is also necessary to consider the life-cycle cost structures made from such materials. Because of complex internal structure there are high demands on the material damage diagnostics. For this reason there is a focus on the development of complex experimental testing techniques which can investigate all relevant parameters of the system. For estimation of the material properties non-destructive methods such as optical, thermal, acoustic and radiographic methods will be developed. Although nowadays many proprietary measurement systems are available their mutual non-compatibility significantly reduces the possibility of direct comparison of different testing methods and their validation. Therefore using less sophisticated devices the sets of experiments will be performed and the measured data will be evaluated and compared. Another important area is the design of new structures requiring a suitable material model. Macro- and micro-mechanical tests together with a detailed description of the internal structure will allow creating sufficiently accurate homogenized material model suited for the computer aided engineering (CAE) software and computations using the finite element method (FEM).

3. Objectives

Objective of this project is to study mechanical properties and internal structure of advanced constructional materials including effects of material degradation induced by environmental conditions, particularly temperature and ionizing radiation. For this purpose experimental methods and devices are being developed together with applications for data processing and analysis. To obtain complex characteristics of such materials modal analysis, contactless deformation measurements, optical, radiographical, thermographical and defectoscopical methods are utilized.

4. Graduates profile

Graduates of the project are equipped with theoretical apparatus and practical experience in the field of experimental mechanics, measurement and data processing. These skills combined into a solution of complex engineering problems are highly prized by high technology development corporations.

5. Activities

General methodics for achievement of objectives is based on division of tasks according to topics of bachelor and master theses. Requirements are imposed on students in a progressive manner as individual subtasks are accomplished. Methods used for solution of problems can be divided into two groups. Analytical and numerical techniques intensively use mathematical apparatus to characterize relations between morphology, microstructure and overall properties of heterogeneous materials. The second approach utilizes experimental methods such as thermography, modal analysis or hardness mapping that are capable of measurement of various phenomena in complex materials.

5.1. Porosity analysis and homogenization of mechanical properties at the macro-level

Perspective cellular constructional materials based on metal alloys can be considered as multi-phase systems where one phase is the base metal used for production and the second phase is air contained in pores. Similarly to natural

cellular materials (wood, trabecular bone, etc.) it is possible to characterize these so called 'metal foams' as materials with three-level hierarchical microstructure. Micro-level is composed of individual cell walls/struts with their specific deformation response whereas mezo-level involves assessment of stress distribution around pore during deformation and its influence on overall material's characteristics. Material at the macro-level is then studied as complex system containing elements of all other levels. The ultimate goal here is to find the most accurate description of deformation behavior while simultaneously simplify the material model so that it would be possible to use it in engineering process without the need to simulate its porous microstructure. This essentially leads to definition of a new fictive homogeneous material with mechanical characteristics of the original cellular material – so called homogenization procedure [1]. First step of this process is always quantification of porous microstructure based on digital image processing applied on material's microstructure. The most important technique from this category is binary or multi-level segmentation which makes identification of individual phases possible. Evaluation is typically carried out by utilizing mathematical methods of spectral analysis to calculate dimensions of representative volume element and typical pore dimensions. Then analytical or numerical homogenization procedure can be performed to obtain effective mechanical properties. Analytical homogenization is a mathematical method that uses analytical relations for description of stress distribution around single inclusion and extends them to macro-level. Numerical homogenization uses simulation methods (particularly finite element method) to perform virtual experiment using equivalent microstructure generated on the basis of planar or volumetric information about material's macrostructure [2]. If obtained results are experimentally validated, it is then possible to use such material model in the engineering practice.

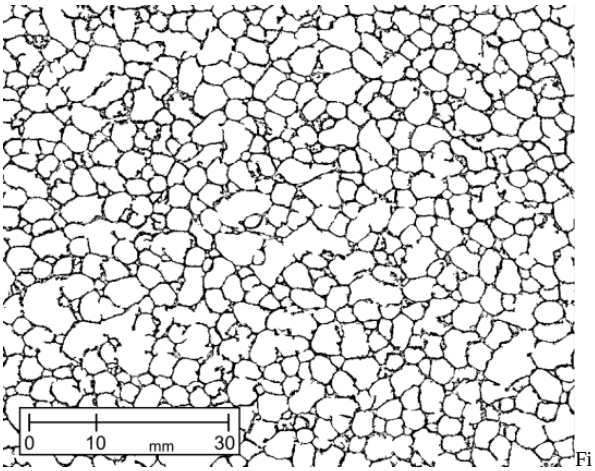

Fig. 1: Binary image of Alporas segmented structure used for homogenization

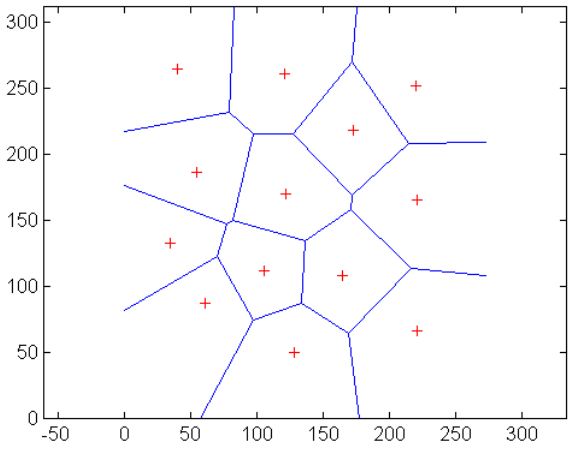

Fig. 2: Example of the structure for numerical homogenization based on Finite Element Method

5.2. Experimental techniques

Micromechanical testing One of the advanced materials investigated in the project are metal foams. These lightweight materials are popular thanks to their insulation (e.g. thermal or acoustic) properties and impact energy absorption capabilities. However there are limitations of their use in structural applications due to insufficient description of the deformation behaviour. To describe the mechanical properties of the metal foam micromechanical testing at the level of isolated cell-wall was utilised. Conjunction with numerical models of the cellular structure brings the possibility to simulate the deformation behaviour of the metal foam at the macroscopic level [3]. The micromechanical tests were performed in three-point bending and cantilever arrangement. The complex cellular structure limits the maximum dimensions to less than few millimetres. To be able to prepare such specimens a complex laboratory procedure is required to achieved the desired shape of the specimen and prevent the thermally and mechanically influenced zones which may falsify the measured results. To the major tasks of this investigation lie in optimisation of a modular micromechanical loading device and development of the control software [4]. Due to a complex irregular shape of the tested specimens the mechanical properties may not be obtained analytically. Hence the investigation utilises numerical simulation of the performed tests and inverse finite element analysis to obtain the elastic-plastic material model. To provide precise volumetric models reconstruction techniques are being developed and optimised to achieve a sufficient accuracy using a limited number of optical projections. The accuracy is then evaluated in comparison with models provided by X-ray computed micro-tomography.

 ISBN 978-80-01-05416-1

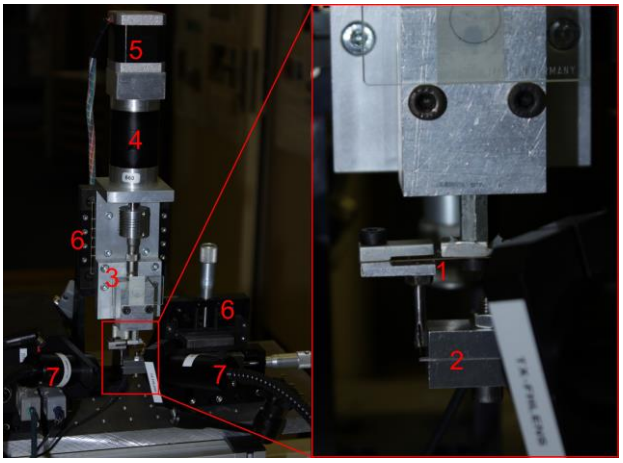

Fig. 3: Load cell (1), clamp (2), precise linear stage (3), harmonic drive (4), stepper motor (5), linear bearing stages (6), illuminators (7)

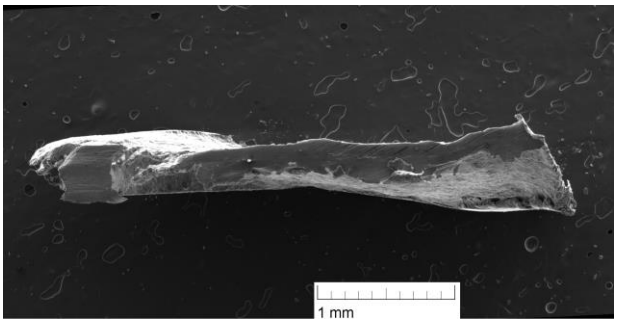

Fig. 4: Example of the specimen prepared from cell-wall obtained by scanning electron microscope

Profilometry This part of the project is focused on damage propagation in laminated composites reinforced by carbon fibres using laser profilometery. The damage may be inflicted during the ground maintenance, by inflight bird strike or during flight in severe meteorological conditions (hail storm) [5]. Initial damage was simulated by drop-weight out-of-plane impact damage. Damage response was analysed from the impacted zones propagation history. Influenced zones area and specimen thickness in the centers of influenced zones were chosen as degradation parameters. Post impact damage propagation induced by cyclic loading was assessed using custom-made computer controlled laser profilometry device [6]. Both upper and lower profiles of the specimen were scanned during interruptions of fatigue test. Global specimen deformation was described by analytically determined centroidal axis curve. Local topography changes were obtained by subtraction of this curve. Surface deformation maps ware created and used for demonstration of damage propagation in the specimen.

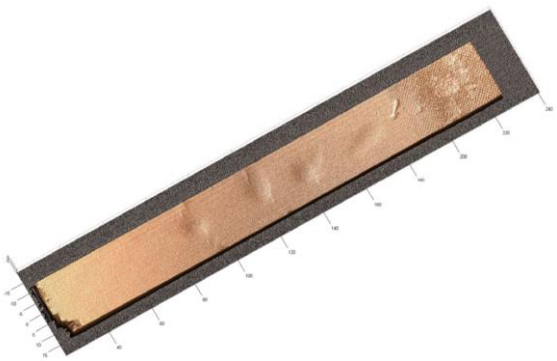

Fig. 5: Impacted surface reconstruction based on profilometry data

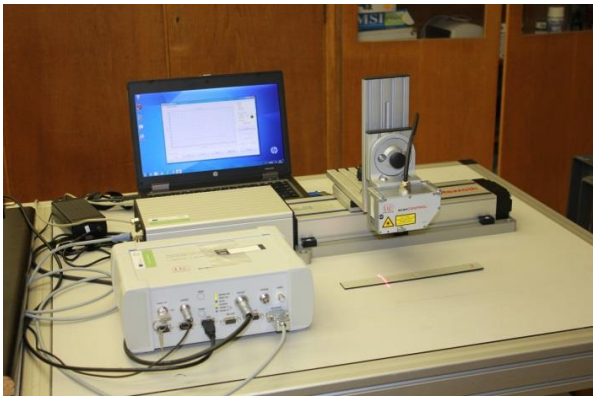

Fig. 6: Custom designed computer controlled profilometry device equipped with ScanControl LLT2600-25 laser scanner

Hardness mapping Development of the hardness map was performed using a semiautomatic diagnostic tool in the Matlab programming environment. Hardness maps were created for two specimens made from pipeline steel. One specimen was in the as delivered state and the second one was annealed. The zone of the plastic deformation was investigated by the microindentation using Vickers tip and nanoindentation using Berkovich tip. Each grid of indents consisted of approximately 150 Vickers microindents covering area of 0.5 mm2. In order to refine and simplify the measurement a modification of the experimental device was designed. Image of the specimen's surface was acquired by the scanning electron microscopy. This image is the input for the semiautomatic diagnostic tool. Using the diagnostic tool we got the hardness values in each point and the hardness map was created [7]. Obtained hardness maps correlate with the theoretical assumptions about behavior of the zone of plastic deformation [8].

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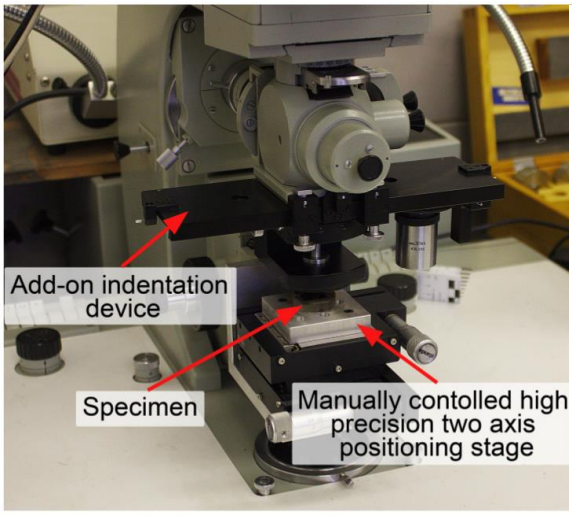

Fig. 7: Modified module for microindentation tests

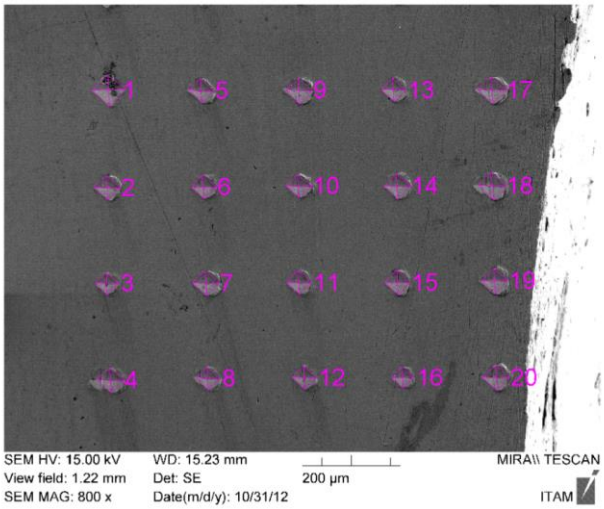

Fig. 8: Evaluated grid of microindents of mechanically influenced zone

6. Achievements and awards

This year the first bachelor (BT) thesis of this project was successfully defended and awarded by Dean's award. Presentation of results at conferences also met with positive feedback and articles submitted to the journals were accepted with only minor revisions. Two participating students in the project are authors or co-authors of three conference papers (Proc), one article in a peer-reviewed journal (Jrec) and one article in a journal indexed in Journal Citation Reports (Jimp). A new experimental device for micromechanical testing is being developed.

Author	Name of work	Type of work	Year
Kytýř, D., Šleichrt, J. *et al.*	Assessment of Post Impact Damage Propagation in Carbon-Fibre Composite under Cyclic Loading (*in press*)	J_{imp}	2014
Valach J, Fenclová, N. *et al.*	Evaluation of Local Plastic Flow in the Vicinity of Indentation by the Means of DIC Applied on SEM Micrographs	J_{rec}	2013
Fenclová, N. *et al*	Biaxial Microindentation Investigation on Plastic Strain Distribution	Proc	2013
Fenclová, N.	Semiautomatic Assessment of Hardness Distribution	BT	2013

7. Collaboration

Topics of the project are based not only on collaboration within the CTU (especially the Faculty of Civil Engineering, Faculty of Mechanical Engineering and the Institute of Experimental and Applied Physics) but also other research institutions (Aerospace Research and Test Establishment and the Institute of Theoretical and Applied Mechanics, AS CR) and industrial companies (e.g. Letov letecká výroba s.r.o.). The cooperation is mainly focused on research of carbon composites and cellular metals.

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7) N. Fenclová, D. Kytýř, J. Valach, T.Doktor, P. Koudelka, *Biaxial Microindentation Investigation on Plastic Strain Distribution*. In: Proceedings of 12thYSESM, 2013

8) V. Landersheim, M. Jöckel, C. Dsoki, T. Bruder, H. Hanselka, *Fatigue strength evaluation of linear flow split profile sections based on hardness distribution*, International Journal of Fatigue, 39(1), 2012

 ISBN 978-80-01-05416-1

Appendix - List of Student Project at the Czech Technical University in Prague Faculty of Transportation Sciences (actual at the date 13th December 2013)

Bachelor study programme

B 3710 – TECHNOLOGY AND TECHNICS OF TRANSPORT AND COMMUNICATIONS

Study field

AUT - Automation and Informatics
DOS - Transportation Systems and Technology
ITS - Intelligent Transport Systems
LED - Air Transport
MED - Management and Economics in Transportation and Telecommunications

Master study programme

N 3710 – TECHNOLOGY AND TECHNICS OF TRANSPORT AND COMMUNICATIONS

Study field

BD - Safety of Transportation Vehicles and Infrastructure
BI - Security of Information and Telecomunication Systems
DS - Transportation Systems and Technology
IS - Intelligent Transport Systems
ID - Engineering Informatics of Transportation and Communication
LO - Logistics, Technology and Management in Transportation
PL - Air Traffic Control and Management
TR - Transportation and Logistic Systems

 ISBN 978-80-01-05416-1

Acceptable Types of Transport in Cities

http://www.fd.cvut.cz/projects/k612x1pf

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

The basic instruments of control, regulation and organization of transport. Solution of transit, external and internal transport. Preference of certain kinds of transport. Modal split. Traffic calming solutions. One-way streets - advantages and disadvantages. Organization of parking.

Active Safety of Vehicles

http://www.fd.cvut.cz/projects/k616x1a

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	DOS, LED
N 3710	DS

Abstract

In general the project is aimed at vehicle design in the field of active safety. It is specialized in vehicle stability and vehicle dynamics behavior. Project is also aimed at design of undercarriage parts of vehicle such as brakes, suspension, damping, tyres and steering. Furthermore there are discussed safety factor which are related to body design such as condition and operation ranges, seating position, views from vehicles, climate inside vehicles etc.
In the frame of the project there are also solved connections of safety elements to transport infrastructure.

 ISBN 978-80-01-05416-1

Active Safety Systems and Vehicle Interaction

16123 - Department of Security Technologies and Engineering

Study programme	Study field
B 3710	DOS

Abstract

The project is focused on the vehicle analysis in the area of primary active safety. It covers the stability analysis and dynamics of vehicles. It considers the vehicle chassis parts such as brakes, tires, suspension and steering. It also includes the security features associated with the car-body, such as operating safety and ergonomics. Principal attention is paid to electronic systems of vehicles. The project also addressed issues of safety features links to transport infrastructure.

Advanced technologies and new social phenomana

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Advanced technology leads to faster movement of information in society, new labor organization and new dependencies. The role of advanced technologies in shaping the society is the subject of this project, including such phenomenons as radicalization of some social groups through social networks, new offenses, etc.

 ISBN 978-80-01-05416-1

Air Traffic Control

http://www.fd.cvut.cz/projects/k621x1rl

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

The project is focused to the field of operational analyses and procedures which could contribute to increase airspace capacity, improve safety and cost-efficiency of air traffic. Students within the project are deal with for example development and design new approach procedures, optimal airspace sectorization, Free Flight concepts, analyses air flows and deal with improvement an affectivity of information interchange among all participants involved in process of Air Traffic Control. In support to their activities students use analyses and simulation tools and applications within ATM laboratory in the department of Air Transport.

Air Transport Logistics

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED

Abstract

The project is focused on the logistics of air transport for passengers and cargo. The use of aircraft in freight transport logistics chains and models and basic parameters of logistic chains cargo air transportation. Requirements for the technical equipment of aircraft used for air cargo and specific technical and business aircraft handling. Controlling Logistics air freight. The harmonization of air transport, road and rail transport. The issue of the impact of air transport on the environment.

Airport security

http://www.fd.cvut.cz/projects/k623x2bl

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Large numbers of people pass through airports as well as enormous volume of goods. This presents potential targets for terrorism and other forms of crime due to the number of people and assets located in a small area. Airport security attempts to prevent potential attackers from bringing weapons or bombs into the airport or decrease a possibility to theft of luggage or cargo. The goal of the project is to investigate current airport security technologies, analyzing the weakness and strenght and evenatually

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Alternative Forms of Debt Financing in the Transportation

http://www.fd.cvut.cz/projects/k617x1af

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

For the purposes of this project there will forms of financing in transportation specified defining the subject in public sector as the final debtor, i.e. the debt payment is made from their budget, they are not, however, a direct participant of the transaction and the counterparty of the financial institution that provides the financing. It concerns financing of the PPP type – Public Private Partnership, claims purchase and such like.

 ISBN 978-80-01-05416-1

Analysis of Traffic Accidents

http://www.fd.cvut.cz/projects/k622x1a

16122 - Department of Forensic Experts in Transportation

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Project deals with introduction to the problems of solving and complex analysis of accident process (decision-making process of traffic participants – subjective parameters, analysis of marks and damage – objective parameters, road and vehicles safety – damage and accident prevention). Within the frame of project students make the one´s acquaintance with principles of data collection and processing and with computerised method used for analysis of accident process.

Application of Control Systems

http://www.fd.cvut.cz/projects/k620x1ar

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	AUT, ITS

Abstract

The goal of the project is to introduce the Rockwell Automation & Allen Bradleys controllers and other of their automation products to students. Within this task are going to be solved particular applications in cooperation with leading companies in the field of traffic.

Assessment of Risks of Pipeline Failure

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The project aim is: to know principles of integral safety management of system; to learn how there are identified the risks for individual protected assets and for the whole set of protected assets and to determine their impacts by the standardized What, If method and the Checklist method. On the basis of detail study of selected product pipeline to identify impacts of outage of important products that after appurtenant quantification are separated by the criticality matrix application to the impacts acceptable, conditionally acceptable and unacceptable (i.e. critical). The aim of project is to determine risks at state at failure of performance of selected product pipelines and to compile security plan of state for ensuring important products.

Automatization and Technical Diagnostic in the Transportation

http://www.fd.cvut.cz/projects/k620x1at

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	AUT
N 3710	ID

Barriers in Transportation

http://bariery.fd.cvut.cz

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

The project focuses on mapping and removal of barriers in transportation. The term "removal of barriers in transportation" is understood in general terms, i.e. not only removal of barriers for persons with reduced mobility and orientation (persons with physical, hearing or visual impairments, mentally challenged, seniors, pregnant women, persons accompanying a child or carrying a stroller, luggage, bicycle, or persons recovering from an injury), but also removal of barriers in application of transportation technologies (paper and pencil are replaced by a tablet in research etc.).
Those interested in computer science and programming have the opportunity to design and create applications for mobile devices which facilitate such orientation when traveling not only to handicapped persons or to streamline traffic survey. For those interested in transport infrastructure can be mapped and propose solutions such as public transport handicapped in the selected location.
The aim of the project is that the students familiarize themselves with problems of barriers in transportation and that they become experts in this area, which in the Czech Republic is still not widely addressed and where exists a shortage of experts.

Biomechanics and Safety of Human in Transportation

http://www.fd.cvut.cz/projects/k618x1b

16118 - Department of Mechanics and Materials

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

To remove the effects of damage of human musculo-skeletal system due to injuries during an traffic accident or illness there are developed new implants and therapy to restore normal activity in the human individual. Biomechanics of the musculo-skeletal system of man. Reconstruction and rehabilitation of damaged elements of the human skeletal system by means of implants and medical procedures. Solving problems is performed biomechanical applications of computational modeling (FEM) and experimental methods. Their common use creates highly efficient hybrid method.

 ISBN 978-80-01-05416-1

Business Economics and Management in Transport

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED

Abstract

The project will focus on the possibilities of application of the principles and practices of management and business economics in the transport sector. Achieving maximum performance and efficiency is reflected in the tarrifs and prices, taking into account the specifics of the market in the different modes of transport.

Calculating the Cost of Transport

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

The project is focused on costing of individual transport modes. In the first phase, students define the detailed structure of individual cost types, in the second phase they create their own concept of a methodology for calculating unit direct and indirect costs, which corresponds technology solved mode. Depending on the complexity of the solution and the ability of the student, the project can be directed to the software industry.

CNS/ATM Systems

http://www.fd.cvut.cz/projects/k621x1c

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

The project deals with technical aspects of current and future systems and technologies used by air traffic service providers. The scope of the area of the interest covers ASM (Airspace Management) ATFM (Air Traffic Flow Management), ATS (Air Traffic Services), COM (Communication), NAV (Navigation) and SUR (Surveillance) systems. Students are motivated to solve and deal with specific issues arise from various stages of the system lifecycle. I.e. for example from capture of needs, definition of the system, system design, development, factory system integration, on-site system Integration, up to putting into service (verification and maintenance). Simultaneously students participate in creating and configuration of analyses and simulation tools and applications within ATM laboratory in the department of Air Transport.

Complex methodology of evaluation of decisive aspects of partial transport modes

http://www.fd.cvut.cz/projects/k617x2km

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

This project is focused on comparison and evaluation of decisive aspects of the road, railway and air transportation in Czech republic in the complex conception: relevant legislation, financial aspects, economical aspects, transport organizational aspects, building and technical aspects, operation and management, transportation organization, services for passengers and carriers, fares, selective procedures in using of the management, marketing and logistics accesses. Road transportation – urban mass transportation, public mass transportation, public route bus transportation, integrated transportation systems, bus terminals and bus stops, entry and parking fees on the bus terminals, transportation service, individual car transportation. Railway transportation – railway terminals, fees, transportation service, transportation net, transportation demand and offer. Air transportation – airports, airport systems, capacity of the airport systems, airport fees, financial management, revenue strategies, grant programs, airport financing, private investment.
Projects goal is creation of complex methodology for evaluation of decisive aspects for particular sorts of the transportation and their reciprocal dependencies in the form of comparison tables or diagrams in software programs.
Results will help as a support for planning of new transportation systems (lines) and for decision making about innovation current transportation systems on the state, district and community level.

Computational Mechanics in Transport

http://www.fd.cvut.cz/projects/k618x1p

16118 - Department of Mechanics and Materials

Study programme	Study field
N 3710	DS, IS

Abstract

Students will become familiar with modern computational methods used for analysis of strain and stress. The project focuses on the numerical analysis of stress and deformation of the vehicle parts, the interaction of vehicles and road and environment and the analysis of the accidents and the development and assessment of safety equipment and regulations. The project also solves the problems of inverse dynamics and fast dynamic processes. The solution of problems uses software systems such as ANSYS end LS DYNA, or MATLAB. These software systems are used in the design, construction and research. The solution complements the use of experimental methods.

Control strategy of vehicle safety systems

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The project is focused on vehicle safety systems in passive and active interactions. Activities are focused on the controlled vehicle security systems with safety target functions. The project output is the design and implementation of technical means increasing the vehicle safety

 ISBN 978-80-01-05416-1

Crimes and Offenses in Transport

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

In connection with the adoption of amendments to the Law on Road Traffic were also some changes in the Criminal Code, the purpose of which is more strict sanctions of undisciplined drivers and thereby increase safety on Czech roads.
In the project, students should focus on specific offenses related to driving motor vehicles (such as driving without a license, driving under the influence of drugs, assault, reckless endangerment, etc.), to compare facts of the case, merits of the penalty, as a comparison of offenses against the safety and a traffic flow on roads, including penalties imposed. The project will include the analysis and comparison of the Czech criminal law with modifications abroad.

Design in Transport

http://www.fd.cvut.cz/projects/k614x1d

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
B 3710	DOS, MED
N 3710	DS, ID

Abstract

Project prepared in co-operation with famous designers from Faculty of Architecture offers to students the possibility to introduce itself into one of the following areas – transport vehicle design, design of spatial relationships (e.g. airport and station design, building of corridors intuitively influencing passengers to go right way etc.), design computing (computer support of creativity and design processes, design of telecommunication and internet-based systems and services, design of user interfaces).

Design of Vehicles

http://www.fd.cvut.cz/projects/k616x1k

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	AUT, DOS
N 3710	DS

Abstract

This project is aimed at vehicle design effectiveness and vehicle operation. It makes use of databases of vehicle operators and producers, analyses technical legislative and its influence on vehicle design and operation. The project target is to establish systematic approach and methodology for taking decision about new ways of vehicle construction at the level of production management and about properties option in case of operators. This subject represents the ground for project stage of vehicle development with respect to the effectiveness in relation to technical legislative, quality regulations, vehicle production and its situation in traffic infrastructure.

Development of Cycling Transport

http://www.fd.cvut.cz/projects/k612x1rc

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Analysis of the current state of cycling transport in the Czech Republic, especially in towns. Integration of cycling transport into the planning documentation. Safety analysis of cycling transport. Integration of cycling and public transport. Integration of cycling transport into a network of urban roads. Studies of the cycling routes in the one-way streets. Traffic and sociological surveys for cycling traffic. Studies of the cycling routes in regions of the Czech Republic.

 ISBN 978-80-01-05416-1

Development of freight railway transport

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	DOS

Abstract

Following logistic requirements for freight railway, the project focuses on integrating them into railway operational and production planning.Thus, it is necerrary to take also efficient usage of rolling stock, staff and railway capacity into consideration. Last but not least, the plan should be coordinated with integrated periodic timetable of passenger railway. Besides Czech freight railway transport, students also get acquainted with innovative solutions proven abroad, which they should creatively implement in Czech environment.

Development of Modern Services of Partial Transport Modes

http://www.fd.cvut.cz/projects/k617x1rm

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Development of Transport Networks Connected to European Networks and Multimodal Logistic Terminals

http://lital.fd.cvut.cz/cz/stprojekty/17X1RE_17X2RE

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

Traffic and freight flow analysis on the main transport corridors in and out of the Czech Republic. Evaluation of the traffic ways capacity on these transport corridors. Analysis of the Czech and connected European railways, highways and waterways transport networks and analysis of the European Air transport network. Identification and forecast of the linking to large industrial and development areas in Czech Republic and Europe. Hub multimodal logistic terminals in the Czech Republic connected to European transport corridors, European multimodal logistic centers and European maritime ports.

Driver Vigilance Monitoring

http://www.fd.cvut.cz/projects/k620x1mp

16120 - Department of Transport Telematics

Study programme	Study field
N 3710	ID, IS

Abstract

Aim of the project is experimental verification of methods for detection decrease of driver's vigilance and warn that there is high possibility of microsleep. One part of project is experimental measurement of trajectories od sleepy drivers with help of car simulator. Second part is a statistical analysis of mesured trajectories and calculation of features of fatigue. In realistic situation on the higway is car trajectory measured with help of webcamera or calculated from driving wheel movements.

Economic and Financial Tools for Optimization of Transport and Communication System

http://www.fd.cvut.cz/projects/k617x1ef

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

Transportation and Communication systems classification and their economic features. Econometric modelling. Models of financing, investors, association of investments, access of strategic partners. Possibilities of use of EU funds.

Electric Vehicle Drives

http://www.fd.cvut.cz/projects/k620x1ae

16120 - Department of Transport Telematics

Study programme	Study field
N 3710	ID

Abstract

Joining the project means work on design of electric vehicle or hybrid electric vehicle drive with respect to traffic requirements of vehicle user. Road, railway or waterway vehicle can be considered here. In case of railway the requirements can be stated by infrastructure operator (character of the track, expected operation, etc.). It is possible to work on reconstruction of current vehicles as well as design of the new ones. Contents of the project build also related energetic calculations.

 ISBN 978-80-01-05416-1

Electromobility

http://www.fd.cvut.cz/projects/k616x1e

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	AUT, MED
N 3710	DS

Abstract

The aim of the project is to measure and evaluate the energy flow in the vehicle, the simulation of the electrovehicle and its driving scenarios. Students can deal with specific requirements on electroinstallation. Consumption management in different driving scenarios. Information flow in vehicle.

Energy aspect of security/safety in transport systems

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The project is focused on the analysis of energy for production and operation of transportation system components with a focus on a comparison of proposed and implemented security/safety solutions. The result is a clear energy directed graphs and conditions, which affects the energy performance of each element of the transport system optimally from the idea to extinction, respectively from obtaining resources to disposal.

European Accession to Aircraft Maintenance

http://www.fd.cvut.cz/projects/k621x2eu

16121 - Department of Air Transport

Study programme	Study field
N 3710	PL

Abstract

Project is oriented on actual European trends in technical aircraft maintenance and in maintenance crew preparation. Charge of the project will focus in fields as follows:

- system of educating aircraft maintenance crew according to Part 66
- education design of crew in Czech condition
- regulation Part -145 and Part 147 specificating maintenance executation
- aplication of European regulation on small Czech repair service
- creation of technique design for maintenance assuration

Students sign in compulsory optional subject designed for PL branch operational orientation.

Evolutionary Techniques in Transportation

http://www.fd.cvut.cz/projects/k614x1et

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
N 3710	ID

Abstract

The goal of the project is to explore possibilities of using genetic algorithms, genetic programming or other evolutionary techniques respectively in the area of solving transportation problems like TSP, location problems, etc. It is possible to explore using evolutionary techniques in problems related to the transportation and telecommunications, especially on the system level (automata and grammar construct, grammar integration etc.). There is also a chance to explore new occasion of GA application in the man-machine interaction area, for example EEG signal analysis.

Firmware as a tool of cyber attack

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Firmware is an integral part of all components of information and communication technologies, it is a highly proprietary software component that provides the basic functions of a device, where full control over the functionality handles the manufacturer. It is usually not available in source code, it is difficult to parse, standardize specifications is unforeseen. Errors in firmware always leads to substantial errors in the functionality of the equipment, often to its complete failure. Detection of potential arbitrary code inclusion into the firmware is extremely difficult, it is also difficult to distinguish intention of the manufacturer from intends of third parties. Failure firmware is very easy to mistakenly substituted for the hardware component failure device (even for experts, it is very difficult to distinguish). Due to the fact that now almost all the devices allow access to the Internet, it can cause arbitrary code in the firmware to be "dormant bomb" waiting to external stimuli . Study of possible firmware its weaknesses and analytical methods for detecting attacks hidden in the firmware is the subject of this project.

Freeways Ltd.

http://www.fd.cvut.cz/projects/k611x1d

16111 - Department of Applied Mathematics

Study programme	Study field
N 3710	DS

Abstract

As you might know from your own experience, traffic congestion is a common problem on freeways in CR as well as abroad. Their eliminating and minimization of their influence is covered in the field freeway management. The objective of this project is to build a center of excellence for the freeway management. It is a field covering a whole range of tasks from different fields, such as data collection, data analysis application of control algorithms, but also automated incident detection, travel time prediction, travel information or reaction of drivers to the travel information. It is clearly a wide research field, in which every student can find own interesting particular research task. Our objective is application of the gained theoretical knowledge to practical goals, which can be used in different real world projects.

 ISBN 978-80-01-05416-1

Handling and Information Systems

http://www.fd.cvut.cz/projects/k620x1ya

16120 - Department of Transport Telematics

Study programme	Study field
N 3710	DS, ID

Abstract

Students on the project will learn about the current state of information and clearance systems which are used not onlu in the PID (Prague Integrated Transport), both in vehicles, at stops, and the Internet, and internal IS used in ROPID, including the development of vehicle tracking in real time. Their own work will include analysis of individual components of the systems and may participate in the ongoing development of ground handling and information systems. The project builds on the already currently running project "Regional Integrated Transport".

Human - machine interaction

http://www.fd.cvut.cz/projects/k616x1i

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	AUT, DOS, MED
N 3710	ID, IS, LO

Abstract

The aim of the project is a development of methodology for better understanding and measurements of the system of HMI, targeted mainly on car drivers. The project involves all levels of such a research starting with experiment design, specification and design of devices needed for quality measurements (research driving simulators as well) ending with final analyses and classifications. It covers problems of simulations, virtual reality, system analyzes, psycho-physiological measurements, mathematical analytical methods, data mining and data classification. Students can practically participate within large spectra of works staring with modeling of 3D testing scenarios up to evaluations and classifications of measured data.

 ISBN 978-80-01-05416-1

Human and Global Communication

http://www.fd.cvut.cz/projects/k614x1g

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
B 3710	AUT
N 3710	ID

Abstract

The project is specialized in study of telecommunication networks and services globalization problems. Individual project topics are based on real conditions of telecommunication market in the Czech Republic, telecommunication structures development prognoses and new services innovation in the Czech Republic consistent with the worldwide trend (IMT 2000 system preparation, multifunctional networks of higher transmission rate, metropolitan information systems and their convergention into the global information system, etc.).

Identification and analysis of impacts of risks of flight operation

16123 - Department of Security Technologies and Engineering

Study programme	Study field
B 3710	LED

Abstract

To know principles of integral safety management of system. To learn how there are identified the risks for individual protected assets and for the whole set of protected assets and to determine their impacts by the standardized What, If method and the Checklist method. On the basis of detail study of process model of flight operation to determine critical items and to identify impacts that after appurtenant quantification are separated by the criticality matrix application to the impacts acceptable, conditionally acceptable and unacceptable (i.e. critical). The aim of project is to determine risks of flight operation and to assess which of them are acceptable, conditionally acceptable and unacceptable.

 ISBN 978-80-01-05416-1

Identification and its Applications in the Transport Sector

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
N 3710	ID

Abstract

The aim of the project is the analysis and suggestions for practical implementation in the use of ID cards and other identifiers. This is a real application designs, preparation of new services and concepts especially using cash payments, access control systems, etc.

Identification of Critical Spots in Transportation

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The research is concentrated to transportation system with specific direction to transportation infrastructure that is one of the main items of critical infrastructure because it ensures the basic utilities that are important for operation of human communities. On the basis of present concept “integral safety” the aim of which is to ensure the safe territory, the safe community, the safe infrastructures, the safe human system including the human society security there will be with use of system approach, real data, data obtained by simulation with help of suitable methods looked up critical spots in selected sections of transportation sector. There will be appreciated their importance for transportation sector, region, state and the EU. The concentration will be to two tasks, namely: vulnerability of critical spots against to disasters with respect the All Hazard Approach and impacts on public assets and assets of followed section of transportation sector; impacts of failure of critical spots in transportation on followed section of transportation system, the whole transportation system, public assets, region, state and the EU. In real cases there will performed the assessment of partial risks, cross-section risks and the integral risk. On its basis there will be identified measures for prevention, measures and activities of response to traffic accidents.

Imaging and Electronic Systems for Intelligent Transportation

http://www.fd.cvut.cz/projects/k611x2ke

16111 - Department of Applied Mathematics

Study programme	Study field
N 3710	ID

Abstract

The concept of Intelligent transportation systems (ITS) was pioneered in the United States and represents the sum of telecommunication and information technologies used in transportation systems. This project addresses a part of the ITS concept. It was launched 5 years ago by our research into pattern recognition algorithms for road sign and registration plate recognition. Currently, our work focuses on implementation of rapid algorithms for image processing and computer vision using graphics cards processors (GPU), the development of software and hardware for laser detector presence of a vehicle on the road, the fusion of video and GPS information for traffic sign inventory purposes or the concept of automatic evaluation of on-board camera recording from public transport vehicles.

Innovation of Transport Routes

http://www.fd.cvut.cz/projects/k618x1ed

16118 - Department of Mechanics and Materials

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

The project is aimed at addressing innovation of design and construction of transport routes, particularly rail tracks mixed conventional rail system. The aim is to reduce costs throughout the service cycle (Life Cycle Costs - LCC) and improve the characteristics of reliability, availability, maintainability and safety (RAMS). The project is to study the problems and work on computational models for analysis of stress state and deformation of parts of the body design of road and rail by means of the finite element method. The project is also focused on optimizing the structure of the transport routes for increasing transmission speed and the axle pressure.

Integrated Periodic Timetable in Czech Republic

http://www.fd.cvut.cz/projects/k617x1mg

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

Implementation and planning of segmented public transport system, based on principle of integrated periodic timetable into the real operational conditions, the real as well as proposed infrastructure. After completing of project the students would be able to project a concept of public transport services in selected region. Theoretical principles of integrated periodic timetable generation, mathematical methods and optimization processes used by integrated periodic timetable generation, project of public transport services concept in region on the available infrastructure, disparities in application of modified and perfect integrated periodic timetable, modification proposal for fulfilling of constraint limits suitable for perfect integrated periodic timetable.

Interaction Traffic - Food

http://jazyky.fd.cvut.cz/projekt - vyuka.htm

16115 - Department of Languages and Humanities

Study programme	Study field
B 3710	MED
N 3710	DS, PL

Abstract

Project is focussed on issues related to food in traffic field. Students will familiarize themselves with nutrition policy issues, food issues in connection with traffic in full extend and with the appropriate and practical application of legislation, particularly focussed on health security issues. According the analysis of the current situation there will be proposed possibilities of improving for the future.

International Transport

http://www.fd.cvut.cz/projects/k613x1mp

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

The project is concerned with the broad problems caused by international exchange of goods and people:

- technical and economic questions, international rules of transportation
- international logistics
- problem of travel services
- Czech Republic and European countries, overseas countries

ITS and Environment

http://www.fd.cvut.cz/projects/k620X1WS

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	ITS

Abstract

The project focuses on research and development of a tool for real traffic data processing, mapping, modeling and estimation of automobile emission load in the Czech Republic. Real input data are gathered primarily from a database of toll gates of the Czech Republic and further processed in the project. Outcomes of the developed tool are processed in the form of graphical maps and focused for the use and application of GIS.

 ISBN 978-80-01-05416-1

Knowledge and Process Systeme in Transportation

http://www.fd.cvut.cz/projects/k614x2pa

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
N 3710	ID

Abstract

The aim of the project is to introdukce process modeling, and procedures for acquiring, storing, manipulating, and presenting the information or knowledge. The students will prepare practical transportation models. The models will be designed for utilizing and maintaining information infrastructure.

Krkonošské Metro - Faculty Railway

http://www.fd.cvut.cz/projects/k620x11

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Joining the project means work on complex solution of personal transportation system in the Czech highest mountains Krkonoše. This means front of all maintenance and modernization of traffic operation on the regional railway route no. 042 Martinice v Krkonoších – Jilemnice – Rokytnice nad Jizerou. The aim is the development and spreading of current infrastructure, automated interlocking systems design or construction of "light" railway vehicle, which should be able to operate also on road communication ("Tram-Train"). Within the project complex solution of transportation is also considered, so that it would be possible to include considered system into integrated transportation system VHoD – Veřejná horská doprava (public mountain transport). Above stated route (railway) should also serve as "faculty railway FTS CTU" like practice laboratory for verification of innovative methods and technologies of CTU under common traffic conditions.

 ISBN 978-80-01-05416-1

Laboratory of Transport Technics

http://www.fd.cvut.cz/projects/k620x1ds

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	ITS
N 3710	ID

Logistics, Information Technology and Economy of Air Transport

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

Air transport (passenger, cargo, irregular, low-cost) is a part of logistics chain, dependent on the use of high-tech information technology and also industry with a worldwide economic importance. The aim of the project is to elaborate on logistic processes of air transport chains, on information technology used in the different stages of the traffic chain, on economic aspects of air transport and relations between logistics, information technology and economic factors of the air transport.

Macroeconomic indicators and transportation system

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED

Abstract

From the beginning of human history is closely linked transport with the performance of the economy. Have our ancient ancestors were aware of the importance of water management and land routes for trade between them, during the Middle Ages a few groups only were transported commodities (especially necessary raw materials and luxury goods). Today is a transport of goods daily consumption a common practice. Therefore, the project will spend exploring the links between transport and its parameters, and the development of national economy on the basis of its macroeconomic indicators. The project will focus on all modes of transport (air, water, road and rail). Possible topics to address as modeling the elasticity of demand in the transport sector, the multiplier effects of construction traffic, trends in air transport (especially from the perspective of the economic performance of airlines, resp. forecasts of air transport).

Management and Strategic Marketing

http://www.fd.cvut.cz/projects/k613x1ra

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

The project will be aimed at solution of crisis situation in bussiness economics, in industrial and logistics, especially on the coordination industrial approaches with strategy marketing as a tools of market research and analysis.

 ISBN 978-80-01-05416-1

Maps and GIS

http://gis.fd.cvut.cz

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	AUT, DOS, ITS
N 3710	ID, IS

Abstract

Application of GIS-technology to system problems of transportation. Analysis and construction of knowledges in GIS, characteristics of development of defined values in time, projection a prediction in environment of GIS (with tools of GIS), applications in tasks for transportation with backing of tools of system engeneering.

Methods of identification and localization

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Methods of identification and localization play an important role in the movement of people and goods. Using the latest technologies such as access systems or storage systems has its limitations and weaknesses. Study of methods for identification and localization of persons and goods is the subject of this project.

Modelling of Economic Risk of Bussiness Projects

http://www.fd.cvut.cz/projects/k617x1mr

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

The project is oriented at the risk decision process algorithmization and its application to business projects in transportation and telecommunications. It concerns the integration of exact methods and expert assessments to quantify the economic risk of these projects.

Modern Approach to Aviation Safety

http://www.fd.cvut.cz/projects/k621x1mf

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

The gradual evolution of safety thinking began during the era of technical factors at the time when the beginnings of aviation were characterized by a high frequency of accidents. Huge extent of technical, technological and infrastructural improvements based on primary approach allowed massive expansion of aviation. In period from 70s - 90s, there was a lot of investment to research of human factor and human performance. It was discovered, that work environment has a big influence to human performance, and its properties can increase as well as decrease quality of work. Nowdays the era of organizational factors brings new pieces of knowledge and endeavours to remove or modify error-including features in the operational context. It defines duties of organization related with safety principles of safety management. Hazard identification and safety risks management are the core processes of safety management and main components of system approach to ensure safety of aviation system. Students of this project will be lead to perception of system approach and aplication of modern safety methods. Use of project outcomes will be great contribution to improvement of Czech aviation operational safety.

Modern Approach to Aviation Security

http://www.fd.cvut.cz/projects/k621x1mc

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

In the field of aviation security it is important to pay more significant attention to more effective system implementation of safety requirements into practice by taking into account predictive and proactive attitudes. Exclusively formal fulfillment of minimal requirements can lead to dangerous an risks in future which would be outside of the sphere and it would not be possible to react on them with adequate measures and procedures. Important part is the implementation of informational technologies for monitoring and controlling operational actions into already used systems in air transport. New and innovative component of this project is use of sensoric networks. This project is designed for students with interest of systems analysing and systematic problems solving of aviation security

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Modern Trends and Development of the Airports

http://www.fd.cvut.cz/projects/k621x1ml

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

- Appreciation net structure international airports appearanceto surrouding Euroregion
- Territorial planning documentation problems for airports
- Consecutive certification international airports according to Annex 14
- Buffer area problems
- Appreciation presumptions for obtaining statute international airports
- Assessment hypothesis in one´s behalf originfresh aerodromes
- SW procesing buffer zones, 3D displayed in the maps
- Facture 3D models buffer zones
- Assessment origin water airports
- Aerodrome environmental aspect

New trends and technologies inside access telecommunications network

http://www.fd.cvut.cz/projects/k614x1n

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
N 3710	ID

Abstract

Nowadays increasing requirements for content diversity and data bulk in transmiting information. The interst in new aplications in the offer telecommunications service develop needs provide ability transmismission and receiving high-speed switched data. Part of the telecommunications networks which provides access for services called by the term „access network“and the demands of new applications, there are increasing demands on technology solutions for the construction of telecommunications networks. The project aims are to analyze the technical environment for providing safe services, new applications and content-intensive next-generation access networks. Project will result in multi-criteria analysis of options, selected using copper, fiber optic transmission and radio access network environment.

New Trends on the Electronic Communications Market

http://www.fd.cvut.cz/projects/k613x1nt

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

This project is focused on the electronic communications market development. The main accent is put on the solution of current issues related to the regulation and its impact on the new markets development, broadband analysis, new services availability in the CR in comparison to foreign countries (especially EU), competition, the present and the future of IP telephony, MVNO. The further topics are digitalization and innovation potentials in this dynamically booming environment.

Operation and Economic of the Air Transport

http://www.fd.cvut.cz/projects/k621x1pe

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

Project is aimed at current European trends in operations a economy o fair transport. Content of project is addressed to following areas:

- Stance and duties of transport in national economy, characteristics of transport modes, duties o fair transport in transport system, organizations and control of civil aviation, national and international organizations, technical aeronautical operations, air transport, agreements and rates used in air transport and special aeronautical works.
- Economical disciplines asset
- Microeconomics basics
- Market segmentation and possibilities to run a business
- Air Carrier economy
- Economical marks in aviation
- Business activity in aviation

Students shall write down subjects designated for branch PL operational alignment.

Optimization tasks in logistic chain

http://www.fd.cvut.cz/projects/k617x1ol

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

Transportation networks form an environment with a wide variety of transportation and logistic problems. This project is focused on research of facility location, vehicle routing, optimization of logistic centres operation, optimization of supply chain logistic and economic point of view (the costs and risk analysis).

 ISBN 978-80-01-05416-1

Passive Safety of Vehicles

http://www.fd.cvut.cz/projects/k616x1pd

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	DOS, LED
N 3710	DS

Abstract

The aim of this project is to describe and analyses construction problems in the field of passive safety, which means mechanisms of injury comprehension, injury criteria formulation and main impact mechanisms formulation with respect to restraint systems. The research is focused on minimizing of traffic accident consequences, injury epidemiology and biomechanics. Restraint systems are considered such as a part of vehicle active systems. For new injury criteria development can be used mathematical software (MADYMO, PAM-CRASH) as well as experimental performance, which compose integrated part of impact biomechanics.

Personal management in Transport and telecommunications

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED

Abstract

The projec t focuses on the importance of human resources management in all its aspects. Attention will be paid to the specifics requirements for transport employees at all levels and it will focus on their search, career training, motivation and leadership, includig communications within the company and outside, especially with customers and partners.

Preference of Public Transport

http://preferencevhd.wz.cz/

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Students deal with issues concerning both direct and indirect public transport priority measures. They design solutions which benefit public transport by improving its speed and efficiency. For example building adjustments (arrangement of transport interchanges, linear priority measures), organizational changes (modification of routes, direction and time coordination of lines, timetable adjustments etc.) or other supportive measures (marketing, economical, ecological). Public transport excursions with descriptions of specific situations are a part of the project.

Prognosis of Technological Development in Transportation and Telecomunication

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED

Abstract

The project deals with new results in forecasting with dedication to transportation, telecomunications, cosmic sonds, and satellites. The project uses classical mathematical and statistical methods. Brittish Telecomunication Timeline, Gartner, and Cisco forecast are also included. Considerations will present new approach to the technological forecasting including new attitudes to logistic technologies.

 ISBN 978-80-01-05416-1

Proposal of Urban and Suburban Rail Transport

http://www.fd.cvut.cz/projects/k612x1rk

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Public Sector Economics and Management

http://www.fd.cvut.cz/projects/k613x1es

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO

Abstract

The project will be aimed at the various connections of transportation as a public sector - relationship of transportation and environment, solution of externalities in transportation, evaluation of public transport projects through the methods CBA, MCA, CEA, the financing of transportation infrastructure, using of telecommunication system.

Quality in Transport, Transportation and Telecommunication

http://www.fd.cvut.cz/projects/k613x1kd

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

The project is oriented on:

- analysis of conditions needed for implementation of European Union rules of model quality in services and production
- evaluation of rules and conditions for assessment of quality in transportation and communication in the Czech Republic and Europe

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Quality Management in Civil Aviation

http://www.fd.cvut.cz/projects/k621x1jk

16121 - Department of Air Transport

Study programme	Study field
B 3710	LED
N 3710	PL

Abstract

The project is focused on current European trends in quality. The contents of the project is directed to the following themes:

- Introduction to ISO 9001 standards
- Claims on quality in civil aviation based on European legislation
- SW for quality available in Czech Republic and its application in civil aviation
- The methodology of building the quality system for air operators and aerodrome
- Quality in relationship to training and maintenance organisations
- Safety in civil aviation
- Serviceability and reliability

Radiation

http://jazyky.fd.cvut.cz/projekt - vyuka.htm

16115 - Department of Languages and Humanities

Study programme	Study field
N 3710	PL

Abstract

At current technical development in transportation more and more devices and apparatuses (PC, mobile phones etc), which operation is connected with occurrence of radiation. Project is focussed on occurrence of radiation, particularly electromagnetic radiation, in transportation. Students gradually form a general survey on occurrence of radiation, which is connected with transportation. Further, they focus on analysis of current situation in transportation, problems of cumulation and combining of radiation sources, exposure and legislation connected with these problems.

Railway Network of Czech Republic and Europe

http://www.fd.cvut.cz/projects/k612x1zs

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Attachment of Czech railway network to Europe. The project is cugaged in transit railways (passanger and cargo traffic), cross – border transport as a factor which leads to economic growth of region. Final thesises are centred on modernisation of railways and on optima providing of transport service in region.

Railway Transport Development in Condition of Czech Republic

http://www.fd.cvut.cz/projects/k612x1rz

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Conception of railway service development in CR and Europe, analysis of foreign literature, summary of current modernisation of railway network in CR, potential of railway service in CR. Feasibility study of railway constructions. Team work on project – railway station and railway design, fundamentals of technological and economical evaluation, design principles.

Reducing the Amount of Traffic Accidents and the Prevention of Conflict Phenomena in Road Transport

16114 - Department of Applied Informatics in Transportation

Study programme	Study field
B 3710	AUT

Regional Integrated Transport

http://www.fd.cvut.cz/projects/k612x1ri

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Risk Assessment at Brownout

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The project aim is: to know principles of integral safety management of system; to learn how there are identified the risks for individual protected assets and for the whole set of protected assets and to determine their impacts by the standardized What, If method and the Checklist method. On the basis of detail study of selected region to identify impacts electric power outage that after appurtenant quantification are separated by the criticality matrix application to the impacts acceptable, conditionally acceptable and unacceptable (i.e. critical), and then to determine which human errors may be causes of selected net failure. The aim of project is to determine risks at selected region at electric power outage and proposal of countermeasures at critical situation defeat.

Roads and Higways Design

http://www.fd.cvut.cz/projects/k612x1ps

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Project Road Design use computers in modern concept projection (CAD). Project use products of AutoCad Civil 3D. Designing of bypasses towns and new building roads. Design structure of pavement.

Safety of airborne transportation

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

On the basis of present concept “integral safety” the aim of which is to ensure the safe territory, the safe community, the safe infrastructures, the safe human system including the human society security there will be for selected specific sections of individual sectors of airborne transportation determined vulnerabilities by both, the public assets and the followed sector assets. Considering the characteristics of selected sections of airborne transportation and the characteristics of disasters, i.e. phenomena that selected sections of airborne transportation and public assets damage, there will be identified risks for both, the followed sector and the public assets, namely including the cross-section risks, with aim to propose measures and activities for qualified risk management by the way it may increase the safety of both, the followed sector and the human system that leads to ensuring the human security. The attention will be paid to safety management system of both, the sector and the territory represented by human system, which are ensured by public administration; legislation; responsibilities; decision support systems; and on principals for management of critical situations that might be led to necessity to use measure “crisis situation declaration” in order that the situation might be put under the control. It also includes security technology used, their verification and evaluation.

 ISBN 978-80-01-05416-1

Safety technologies for vehicle

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

Project is aimed on the control management vehicle, sensors, data processing, data management, applied non-linear control, actuators in connection with the safety requirements for road vehicles. The outputs are the proposals of security technologies in selected areas and vehicle systems.

Sattelite Navigation and Practical Use in the Transportation

http://www.fd.cvut.cz/projects/k620x1d

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	ITS, LED
N 3710	IS, PL

Security of Information and IT Networks

http://www.fd.cvut.cz/projects/k623x2bi

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

The project is focused on security of information generally and specifically on the security of information stored and transmitted in IT networks. The methods and means for information security are searched in hardware as well as in software fields. The goal of the project could be e.g. searching for danger sources on the Internet and its geolocation as well as methods for detection of malicious codes and its removal. In the frame of the project is also possible e.g. to design and than verify device identification etc.

Sensor Networks

http://www.fd.cvut.cz/projects/k623x2ss

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

The development of control and monitoring technologies demands whole spectrum of native information, often collected from large territory (e.g. advanced warning in case of fire, movement of show fields etc.). The sensor networks, where we understand connection of intelligent sensors and network technologies is one of the solutions how to get valuable data for further processing. The goal of specific project could be design or method of use of specific sensor, model of behavior of extensive sensor networks or creation and tests of sensor network for specific application.

Single-purpose Machines and Equipments

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

For special measurement, certification of products and systems and other specific purposes it is often necessary to construct a different tools, special purpose machines or equipment, using a combination of mechanical and electronic elements. During project design students demonstrate their skills in the design of such machines or equipment using CAD/CAM tools, which are available at the faculty (Autocad, Orcad, Inventor, etc.). The project result in the design and technical documentation for the product, including the necessary calculations, simulations or demonstrations. Based on the recommendations of the project manager, students can manufacture equipment in the Laboratory of special projects using electronic design and manufacturing machines or CNC machines. An example of a specific solution can be mini-robots for the gas pedal or steering wheel movement control in standardized tests or evaluation device for monitoring status on the vehicle CAN bus etc

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Space Technologies

http://www.fd.cvut.cz/projects/k621x2kt

16121 - Department of Air Transport

Study programme	Study field
N 3710	PL

Abstract

Space systems (satellites, probes, stations) are extremely complicated piece of art. There is made the heavy effort Europe wide in development and subsystem integration, which is paved not only by excellent project management know-how.
Czech Republic is full member state of European Space Agency (ESA) since 2008. This has opened doors for Czech subjects (industrial companies, academy of science, universities and research & development organizations) to play a role in research, development, and production of space subsystems. Therefore there is natural need for system engineers with suitable knowledge.
System engineers are taxed heavily because the space research meets technical, human and natural science requirements all together.
The project's goals are to familiarize students with managing the development and manufacturing of aerospace components and technologies as well as to prepare them for future professional role in project management and system engineering in such a new multidisciplinary field.

 ISBN 978-80-01-05416-1

Supply Chain Security

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

Provision of Supply Chain Security has been a key logistic issue in the past decades. Strategic security, which can be violated by illegal migration, smuggling, sabotages, military support of dubious organizations and terrorist acts. The interest of manufacturers and trade organizations is the effective optimalization and minimalization of delays caused by additional security provision. The effective optimalization also lies in introducing commonly shared standards against theft during transportation and other logistical operations. Regional governments (EU, U.S., Asia) have created their own tools represented by a portfolio of compulsory and voluntary security programmes and initiatives AEO, C-TPAT, ISPS Code, WCO SAFE, TAPA etc.). The objection of this project is detailed security programs analysis, determination of their security principles, describing coherence among programmes, with emphasis being primarily on regions with strong potential of growth.

Technology for close space

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	DOS, ITS

Abstract

The aim of this project is to develop recent space technologies aimed at close space, including satellite navigation, dedicated telecommunication and telemectric systems, autonomous intelligent systems, energy harvesting, close space resources monitoring, GIS implementation into this area, co-operative and networking systems etc. The project will be linked to ESA-supported cosmic technologies activities, where the Czech republic has been a prospective partner for several years. The targeting of the project requires students with creative thinking and imagination.

 ISBN 978-80-01-05416-1

Telematic Services

http://www.fd.cvut.cz/projects/k620x2bs

16120 - Department of Transport Telematics

Study programme	Study field
N 3710	ID, IS

Abstract

Students in this project participate on design of new applications from the area of transport telematics, that is in the field integrating information and telecommunication technologies with traffic engineering in order to aim better transport systems efficiency, lower travel times, higher safety and security, reduction of environmental impacts, increase of passengers' comfort, etc.

The communication methods for security applications

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Increasing number of sensors, camera systems and other security devices calls for increasing demand on transmission media. The goal of the project is the design or verification of new communication paths and media for security application, eventually verification and testing of existing communication methods fro security applications. The example of the project should be power line network, from the point of view of security well guarded, so this is evident to use such a network for information transfer. Similarly there could be some other type of transmission used in automobiles or product-duckts, where demand on the copper usage is high and required security is enormous. The goal of the project is design, verification or eventually implementation of application using the new method of information transmission in application using this new method of information transfer or to test and evaluate method used from the view of practical security application.

 ISBN 978-80-01-05416-1

The Methods and Means for Recording, Evaluation and Identification of Psychic of Driver

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The goal of the project is to design sensors, methods and procedures which allow to record, to identify or, just in case, to predict psychic status of the driver, engine-driver or other persons responsible for transport means operation.

The Methods and Means for Recording, Evaluation and Prediction of Crisis Situation

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BI

Abstract

Every crisis situation is distinguished by relative quick change of stable state. The goal of the project is to find methods of identification of crisis state, methods for its recording such a way that history of initiation of such a state will be recorded, and relevant procedures of off-line evaluation of such a record. The part of the project should be also models of pass way through critical state, which could provide enough information for reliable prediction of crisis situation.

The Studies on the Integrated Public Passenger Transport Systems

http://www.fd.cvut.cz/projects/k617x1si

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	LO

Abstract

Project focuses on sustainable solution of public transport in agglomerations by means of integration of individual modes of transport into common users environment. The attention is paid on coordination of public transport operation, ticketing, common tariff and carriage condition in a territory and both fiscal and technical restriction of individual motorised transport. The activities within the project include:
- creation and functionality of Integrated Public Transport Systems in the Czech republic
- analysis and description of foreign Public Transport Associations, especially in Germany, Austria and Switzerland

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Tourism and Transport

http://www.fd.cvut.cz/projects/k613x2c

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	DOS, LED, MED
N 3710	LO, PL

Abstract

The aim of the project is to analyse the organisation of transportation in the tourist business and the rendering of transport services from view of its needs. Marketing of tourist business, regular and irregular transportation. Relations between carriers and travel agencies, transport valuables, computer and reservation systems. Economic analysis of transport modes in tourist business and the choice of optimal transportation.

 ISBN 978-80-01-05416-1

Traffic Control in Urban Areas

http://www.fd.cvut.cz/projects/k611x1rd

16111 - Department of Applied Mathematics

Study programme	Study field
N 3710	ID

Abstract

Traffic volume on the roads of big cities is constantly rising. In historical cities, road capacity is lower than the demand and special alterations of the road system are not possible. The only possibility to increase the capacity of the system is through better traffic management algorithms, which respond to the immediate or even predicted traffic conditions. For this purpose different mathematical models of the transport area can be designed. Parameters of such models are identified from the data measured by traffic detectors (typically the intensity and occupancy). Such a model is used for short-time prediction of traffic. This information is used by the control part of the traffic management strategy to control, for example, signals at traffic lights. Role in the project will involve testing and suggestions for improvements to existing transport models and testing the models and control algorithms using AIMSUN micro-simulator.

Traffic Management and Traffic Models

http://www.fd.cvut.cz/projects/k612x2pd

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS

Abstract

Introduction into ITS application, mostly in the cities. Sensors for traffic data collection, video – detection. Traffic flow models. Methods of traffic control, informative display. Practice of regulating in Praha, Brno and Plzeň. Traffic control on highways. Tunnels in towns, ecology and traffic.

Traffic Models and Traffic Control

http://www.fd.cvut.cz/projects/k620x1pd

16120 - Department of Transport Telematics

Study programme	Study field
B 3710	AUT, DOS, ITS
N 3710	DS, ID, IS

Traffic Organisation and Regulation in Towns

http://www.fd.cvut.cz/projects/k612xorg

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Evolution of transport demand. Modal split. Increase of traffic volume. Methods of regulation traffic in cities. Preference for public transport and pedestrian traffic. Traffic calming in historic towns. Monitoring of stationary traffic. Traffic organization in cities.

Traffic Safety and Design Elements for Accident Rate Elimination

http://www.fd.cvut.cz/projects/k612x1bn

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Traffic safety. Accident frequency. Traffic-engineering analysis and statistics of accident. Work with database accident. Traffic studies and monitoring conflictful situation. Safety audit. Project precaution to improve traffic safeness. Elements for traffic calming. Regulation of crossing, project roundabout crossing. Safety of pedestrians.Interest to decrease traffic accidents.

Transatlantic Cooperation in Transportation and Logistics

http://lital.fd.cvut.cz/cz/stprojekty/17X2TC

16117 - Department of Logistics and Management of Transport

Study programme	Study field
N 3710	TR

Abstract

Project is an integral part of the Master study field TR – Transportation and Logistic Systems, which is a joint effort of the Czech Technical University in Prague Faculty of Transportation Sciences and The University of Texas at El Paso, USA. As well as the study field TR, the project is focused on transatlantic cooperation between EU and US and allows students to work on transportation and logistics related topics that are current on the both sides of the Atlantic. The aim is to elaborate the topic into thesis. During the first year of studies at the Faculty of Transportation Sciences students are assigned a lecturer from The University of Texas at El Paso under whose supervision they are going to finish their topic and thesis during the second year of their studies that takes place in the USA. Currently, students are working on topics such as electronic toll, security of civil aviation, European freight rail network expansion or transport solutions for big cities.

Transport and Environment

http://www.fd.cvut.cz/projects/k612x1dz

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

This project mainly focuses on transport impacts on environment. Students study constituent transport impacts and their implications. The noise measuring is part and parcel of work in the project. Among the theme of seminar work and thesis belong the traffic noise, ecoducts and assessing traffic construction.

Transport Energy, Crisis Situations, Security

http://www.fd.cvut.cz/projects/k613x1d

16117 - Department of Logistics and Management of Transport

Study programme	Study field
B 3710	MED
N 3710	LO, PL

Abstract

This project is focused on energy efficiency, pipe line networks, crisis and security situations in transport.

 ISBN 978-80-01-05416-1

Transport Service

http://www.dopravniobsluznost.cz/

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Transportation Engineering and Transport Management

http://www.fd.cvut.cz/projects/k612x1dd

16112 - Department of Transportation Systems

Study programme	Study field
B 3710	DOS
N 3710	DS

Abstract

Traffic model in traffic planning, production of traffic models, simulation and transport management in software PTV VISION. Model traffic demand, model traffic offers.

 ISBN 978-80-01-05416-1

Transportation of hazardous substances

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

The project is directed to transportation of hazardous substances, namely on over ground roads, water and airborne routes. On the basis of present concept “integral safety” the aim of which is to ensure the safe territory, the safe community, the safe infrastructures, the safe human system including the human society security there will be with use of system approach, real data, data obtained by simulation with help of suitable methods determined critical spots of transportation of hazardous substances at individual types of transportation of hazardous substances. There will be processed scenarios of traffic accidents with presence of hazardous substances. On their base there will be estimated possible damages and harms on public assets and on followed section of transportation sector in variants. Then will be determined risks and according to their public acceptability there will be determined measures and activities for prevention, preparedness, response and renovation in domain of traffic accidents with presence of hazardous substances. In accordance with results of professional assessment, appraisal of present legislation of the Czech Republic (there are missing specific Czech legal rules for transportation of hazardous substances) and the EU there will be proposed measures for domain of legislation and management.

Trends in Construction, Work and Service of Transportation Vehicles

http://www.fd.cvut.cz/projects/k616x1v

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	DOS
N 3710	DS

 ISBN 978-80-01-05416-1

Unconventional Materials

http://www.fd.cvut.cz/projects/k618x1nm

16118 - Department of Mechanics and Materials

Study programme	Study field
B 3710	DOS
N 3710	ID

Abstract

The project is focused on development of methods for description of the mechanical behaviour of advanced materials. The relationship between the internal structure and physical and mechanical characteristics is emphasised. The aim of the project is development of experimental procedures, testing devices and software tools for evaluation of measured data. The proposed experimental techniques include destructive materials testing and nondestructive testing of structures, diagnostics and life prediction of materials and parts of the structures.

Vehicle Testing and Legislation

http://www.fd.cvut.cz/projects/k616x1l

16116 - Department of Vehicle Technology

Study programme	Study field
N 3710	DS

Abstract

The project is aimed at national and international legislation in frame of vehicle technical qualification. Students are taught in certification systems and propose types of tests (in developmental stage, functional or compatible). These tests are performed for vehicle properties investigation and for criteria limits based on legislation comparison.

Vehicles fire resistance

16123 - Department of Security Technologies and Engineering

Study programme	Study field
N 3710	BD

Abstract

Institute of Security Technology and Engineering creates in collaboration with the Underground Educational Facility of the Faculty of Civil Engineering – Joseph, the experimental laboratory of the fire resistance of vehicles. The targets of activities are legislation overview, design of experimental equipment and design of experiments. The project deals with fire resistance of vehicles with alternative fuel and propulsion systems, electromobiles and hybrid vehicles

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Vehicles Hygiene

http://www.fd.cvut.cz/projects/k616x1h

16116 - Department of Vehicle Technology

Study programme	Study field
N 3710	DS

Abstract

The project is aimed at emissions and ergonomics of vehicles and their influence on human and nature. The goal of the project is to distinguish and classify traffic emissions, causes (emitters) determination and to propose the way of their elimination with respect to national and international standards in vehicle hygiene (noise, vibration, exhalation). Application of ergonomics on particular projects with respect to sitting and standing condition, handling, operating range.

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Virtual reality in transportation

http://www.fd.cvut.cz/projects/k616x1dm

16116 - Department of Vehicle Technology

Study programme	Study field
B 3710	AUT, DOS
N 3710	DS

Abstract

The project is aimed to give an overview of basic instruments and features of the virtual reality. The obtained skills should be used for a development of virtual simulation devices, data visualization and development and creation of 3D-GIS applications. It covers mainly the topics of modeling and rendering of virtual objects and sceneries, real-time rendering using a modern hardware, creation of spatial sounds, as well as problems of HCI and particular peripheral devices used within the scope of the virtual reality.

- creation of objects in 3D modeling applications (Maya and similar)
- programming for multimedia libraries in C, C++ (OpenGL, OpenAL, DirectX)
- development and use of peripheral devices for the virtual reality

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