

ODSJEK PROMET

ZAVOD ZA ZRAČNI PROMET

Laboratorij za modeliranje i simulacije u zračnom
prometu / upravljanje zračnim prometom



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DIVISION OF TRANSPORT

DEPARTMENT OF AIR TRANSPORT



Laboratory for Modelling and Simulation in
Aviation / Air Traffic Management



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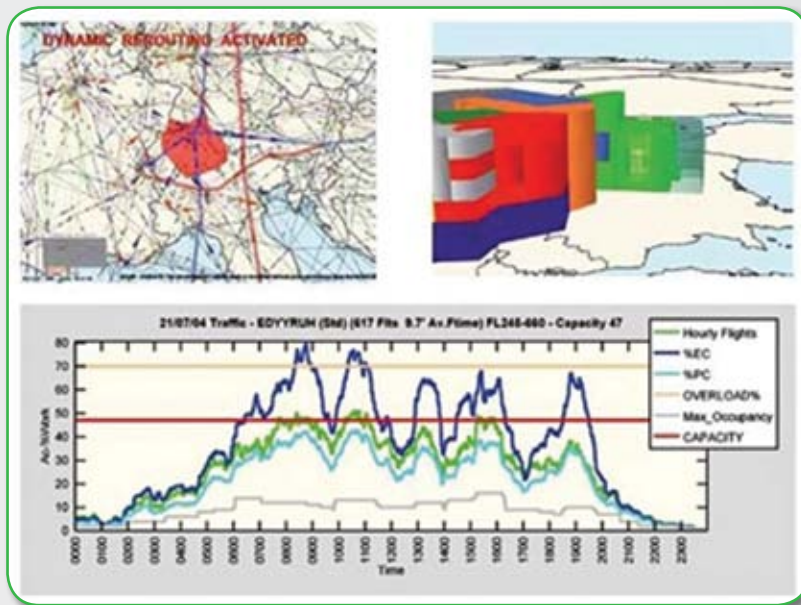


Naziv opreme / Equipment name

Program za modeliranje i simulaciju zračnog prostora
System for traffic Assignment and Analysis at a
Macroscopic level (SAAM)

Proizvođač / Manufacturer

EUROCONTROL, Brussels, Belgium



Namjena i opis / Purpose and description

U svrhu modeliranja i simulacija zračnog prostora koristi se simulacijski program System for traffic Assignment and Analysis at a Macroscopic level (SAAM). Program SAAM koristi se za preliminarna istraživanja, testiranja i analizu različitih mogućnosti te za razvoj scenarija koji se mogu prenijeti u simulacije u brzom vremenu (Fast Time Simulation) te u simulacije u stvarnom vremenu (Real Time Simulation) Programom SAAM između ostalog vrši se kreacija/promjena/dizajn rutne mreže i volumena zračnog prostora (3D), generiranje prometne potražnje (4D trajektorije leta zrakoplova) i apliciranje iste na strukture zračnog prostora, optimizacija prometne potražnje ovisno o funkciji cilja (pronalazak najkraćeg puta i/ili najjeftinijeg puta između parova gradova), analiza trajektorija leta prema zadanim parametrima, npr. prema točki odlaska, točki dolaska, segmentu, sektorima, tipu zrakoplova, itd.

System for traffic Assignment and Analysis at a Macroscopic level (SAAM) is used for the purpose of simulations and airspace modelling. SAAM software is used for preliminary testing, analysis of different solutions and development of scenarios that can be exported into the Fast Time and Real Time Simulation tools. With SAAM tool among others following actions are performed creation/change/design of route network and 3D volume of airspace, generation of traffic demand (4D flight trajectory) and assigning of traffic demand on airspace structures, optimization of traffic demand, analysis of flight trajectories, etc.

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Naziv opreme / Equipment name

Program za procjenu i vizualizaciju kapaciteta kontrole zračnog prometa
Network Estimation Visualization of ACC Capacity (NEVAC)

Proizvođač / Manufacturer

EUROCONTROL, Brussels, Belgium

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Namjena i opis / Purpose and description

Program Network Estimation Visualization of ACC Capacity (NEVAC) služi za: izračun osnovnog kapaciteta ACC-a, generiranje buduće prometne potražnje, optimizaciju sektorskih konfiguracija i shema otvaranja sektora balansirajući radne sate kontrolora zračnog prometa sa prekoračenjem kapaciteta i povezanim kašnjenjem, analizu reorganizacije zračnog prostora upotrebom virtualnog ACC-a, vizualizaciju prometne potražnje, zagušenja i analize kompleksnosti zračnog prometa, itd.

U sklopu aktivnosti laboratorija softverski paket Network Estimation Visualization of ACC Capacity (NEVAC) koristiti se za analizu povijesnog kapaciteta ACC-a u svrhu determiniranja dogovorene granice za sljedeću godinu, te evaluaciju dostizanja kapaciteta od strane pružatelja usluga u zračnoj plovidbi.

Network Estimation Visualization of ACC Capacity (NEVAC) software is used for calculation of baseline ACC capacity, generation of future air traffic demand, optimization of sector configurations and sector opening schemes, analysis of the airspace reorganization, visualization of the air traffic demand and airspace capacity, etc. Within the laboratory Network Estimation Visualization of ACC Capacity (NEVAC) is used for the analysis of the historic ACC capacity and future air traffic demand, evaluation of opening schemes, sector configurations, capacity enhancements, and other activities.







Naziv opreme / Equipment name

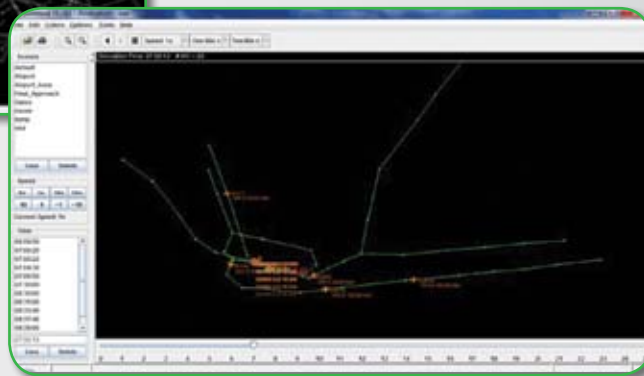
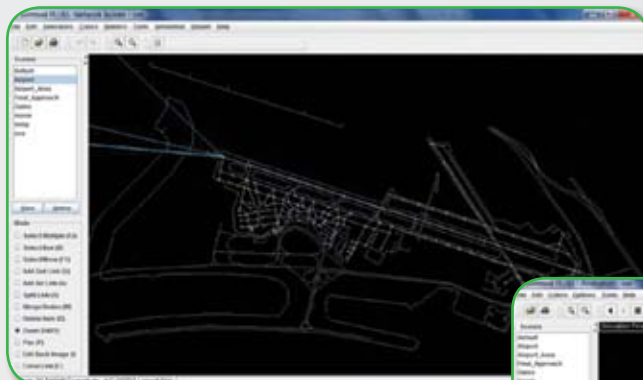
Program za planiranje aerodromskog sustava
SIMMOD PLUS
Airport and Airspace Simulation Model
SIMMOD PLUS

Proizvođač / Manufacturer

ATAC Corporation, Santa Clara, California, USA

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Namjena i opis / Purpose and description

Simulacijski programski paket SIMMOD PLUS koristi se za provođenje složene simulacijske analize na temelju definiranih korisničkih parametara. SIMMOD omogućuje fleksibilnost kod planiranja aerodromskog sustava te razvoj različitih scenarija koji se vjerno mogu prikazati u simulacijskom programskom paketu. Simulacijski programski paket SIMMOD_PLUS u sklopu aktivnosti laboratorija koristiti se za istraživanje i analizu aerodromskog sustava.

SIMMOD PLUS simulation software package is used for complex simulation analysis based on user-defined parameters. SIMMOD provides the flexibility in airport system planning and development of different scenarios that can be realistically displayed in simulation software package. Simulation software package SIMMOD_PLUS within the activities of laboratory is used for research and analysis of the airport system.







Naziv opreme / Equipment name

Kamera Garmin VIRB Elite
Camera Garmin VIRB Elite

Proizvođač / Manufacturer

Garmin, Kansas, USA



Namjena i opis / Purpose and description

Garmin VIRB Elite je kamera za snimanje HD 1080p video snimaka, koja kombinira napredno HD video snimanje i dodatne inovativne funkcije poput GPS prijemnika, senzora akcelerometra i WIFI povezivanje radi dodatnih podataka pri montaži i pregledu video snimaka. 1,4-inčni Chroma™ zaslon je optimiziran za korištenje u zahtjevnim uvjetima te omogućuje lako zadavanje postavki, podešavanje kuta snimanja i pregled snimke.

Dimenzije

- Dimenzije uređaja (HxWxD): 32 mm x 53 mm x 111 mm
- Dimenzije zaslona: 1.4" (205 x 148)

Video

- Image senzor: 16 MP, 1/2.3" CMOS
- Datoteka: .mp4
- 1080p HD video: 1920 x 1080; 30 fps
- 960p HD video: 1280 x 960; 30, 60 fps
- 720p HD video: 1280 x 720; 30, 60 fps
- WVGA (slow motion): 854 x 480; 120, 60 fps
- Rezolucija slike: 16 MP (4664*3496); 12 MP (4664*2632); 8 MP (3264*2448) Photo burst: 6/s

Audio

- Ugrađeni mikrofoni: Da
- Vanjski mikrofoni: Opcija USB to 3.5 mm stereo mic adapter

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Povezivanje

- Bluetooth®: Ne
- ANT+™ kompatibilan: Da (remote)
- Sučelje: USB 2.0
- HDMI izlaz: micro HDMI
- Wi-Fi: 802.11 bgn

Ostalo

- GPS: Da
- Memorija: microSD™ kartica (do 64 GB); kartica nije uključena
- Brzinomjer: Da
- Visomjer: Da
- Vodootpornost: IPX7 (1 m/30 min)
- Stabilizacija slike: Da (digitalna)
- Korekcija izobličenja leće: Da

Garmin VIRB Elite camera records 1080p HD videos, which combines advanced HD video recording and additional innovative features such as GPS receivers, accelerometer and WIFI connection. 1.4-inch Chrome™ screen is optimized for use in demanding conditions, adjust the angle of shooting and viewing images.

Dimension

- Device dimension (HxWxD): 32 mm x 53 mm x 111 mm
- Screen dimension: 1.4" (205 x 148)

Video

- Image sensor: 16 MP, 1/2.3" CMOS
- File: .mp4
- 1080p HD video: 1920 × 1080; 30 fps
- 960p HD video: 1280 × 960; 30, 60 fps
- 720p HD video: 1280 × 720; 30, 60 fps
- WVGA (slow motion): 854 × 480; 120, 60 fps
- Picture resolution: 16 MP (4664*3496); 12 MP (4664*2632); 8 MP (3264*2448) Photo burst: 6/s

Audio

- Embedded Microphone: Yes
- External microphone: Option USB to 3.5 mm stereo mic adapter

Connection

- Bluetooth®: No
- ANT+™ compatible: Yes (remote)
- Interface: USB 2.0
- HDMI: micro HDMI
- Wi-Fi: 802.11 bgn

Other

- GPS: Yes
- Memory: micro SD™ card (do 64 GB); card not included
- Speedometer: Yes
- Altimeter: Yes
- Waterproof: IPX7 (1 m/30 min)
- Picture stabilization: Yes (digital)
- Correcting lens distortion: Yes





Naziv opreme / Equipment name

Program za modeliranje i simulacije aerodromskog sustava CAST – aircraft

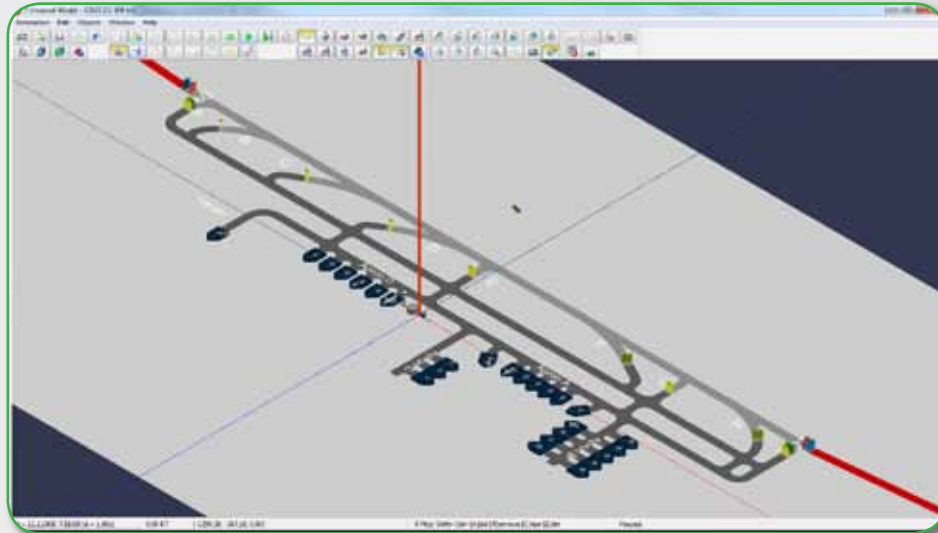
The program for the modelling and simulation of airport systems CAST - aircraft

Proizvođač / Manufacturer

Airport Research Center GmbH, Aachen, Germany

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Namjena i opis / Purpose and description

CAST programski alat sastoji se od tri modula: CAST – aircraft, CAST – terminal, CAST – vehicle. CAST – aircraft namijenjen je za modeliranje i simulaciju prometa zrakoplova na aerodromu i u njegovoj terminalnoj zoni zajedno sa svim relevantnim komponentama poput infrastrukturnih elemenata, operativnih procedura i restrikcija... CAST – aircraft omogućuje testiranje i evaluaciju novih operativnih koncepata i modela.

CAST – aircraft podržava izvođenje sljedećih zadataka vezanih za aerodromski sustav i infrastrukturu:

- Planiranje infrastrukture
- Planiranje i korištenje resursa
- Planiranje i simulacija operativnih procedura
- Identifikaciju i analizu uskih grla
- Verifikaciju operativnih procedura
- Optimizaciju zrakoplovnih operacija
- Analizu kapaciteta
- Analizu kašnjenja zrakoplova prema zadanim parametrima
- Grafički i analitički prikaz dobivenih rezultata

Osnovna svrha CAST – aircraft programskog alata je omogućiti kvalitetan i realan prikaz aerodromskog sustava i procesa. CAST – aircraft moguće je koristiti kao samostalan modul ili zajedno sa ostalim CAST modulima.



CAST software tool consists of three modules: CAST-aircraft, CAST-terminal, CAST-vehicle. CAST Aircraft simulates the aircraft traffic at and around an airport while considering all relevant components like infrastructure, rules, restrictions and operational strategies. With CAST Aircraft, new concepts and strategies can be rapidly evaluated in scalable levels of detail, for example to identify bottlenecks, plan resources or assess a system's capacity.

CAST - aircraft supports the following tasks related to the airport system:

- infrastructure planning
- planning and use of resources
- planning and simulation of operating procedures
- identification and analysis of bottlenecks
- operational procedures verification
- aircraft operations optimization
- capacity analysis
- delays analysis by default parameters
- graphical and analytical presentation of the results

The main goal of using CAST Aircraft is to provide a realistic view of aircraft operations, speed up the decision making process and to guarantee smooth, safe and punctual operations. CAST Aircraft is based on state-of-the-art multi-agent technology and can be used stand-alone or as an integral part of the CAST product family.





Naziv opreme / Equipment name

Program za modeliranje i simulaciju kretanja zrakoplova po manevarskoj površini i stajanci aerodroma
PATHPLANNER AIRSIDE

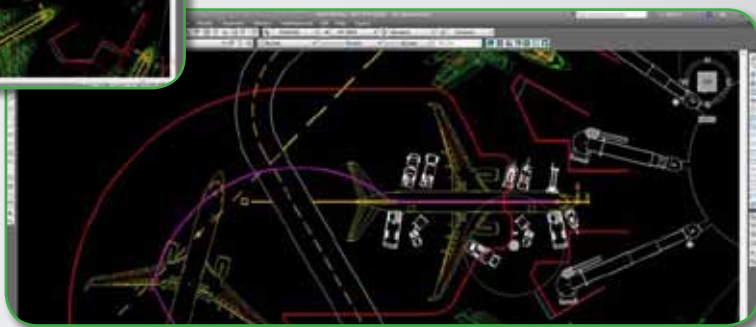
The program for the modelling and simulation of aircraft movement on aerodrome airside
PATHPLANNER AIRSIDE

Proizvođač / Manufacturer

Simtra AeroTech AB, Mölndal, Sweden

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Namjena i opis / Purpose and description

Pathplanner Airside je programski alat baziran na AutoCAD platformi koji omogućuje planiranje, dizajniranje i analizu površina na zračnoj strani aerodroma. Pathplanner Airside predstavlja idealan alat za analizu kretanja zrakoplova i ostalih vozila i opreme na stajanci i voznim stazama aerodroma. Nadalje alat omogućuje analizu kretanja uključujući pojedine elemente poput: raspona krila zrakoplova, putanje kretanja kotača zrakoplova, sigurnosnih razmaka... Alat je pogodan za planiranje budućih površina za vozne staze, stajanke, pozicija za parkiranje zrakoplova. Pathplanner Airside sadrži bazu od preko 500 komercijalnih i vojnih zrakoplova zajedno sa svim specifikacijama te preko 1300 varijanti putničkih zračnih mostova.

PathPlanner Airside is a software tool based on the AutoCAD platform, which allows the planning, design and analysis of airport's airside surfaces. PathPlanner Airside represents a perfect tool for simulating airplane movements on aprons or taxiways, designing complex gates and assessing stand clearances, analysing jet blast impacts and more, the PathPlanner Airside Series allows engineers to efficiently and accurately undertake all aspects of airside planning.

The tool is suitable for the future planning of taxiway, apron, and aircraft parking positions. Pathplanner Airside contains a database of over 500 commercial and military aircraft together with all specifications and more than 1300 variants of passenger air bridges.



