

Collaborative Innovation Project - PIC

(2016-2017)

Ecole Centrale de Pékin



AIRFRANCE



上海飞机设计研究院
Shanghai Aircraft Design And Research Institute



SIEMENS
Ingenuity for life


Schlumberger

中电科泰雷兹航空电子有限公司
THALES CETC AVIONICS Co., Ltd







Project List

- PIC01: AIRFRANCE - Build a revenue forecasting model for an airline.
- PIC02: AVIC - Test bench design for measuring some key characteristics of hydraulic piston pump moving pairs
- PIC03: COMAC - Civil aircraft noise study
- PIC04: COMAC - Electric and electronic equipment thermal environment study
- PIC05: ESI - Active human body models
- PIC06: SAFRAN - Outlook of metal 3D printing industry in China
- PIC07: SIEMENS - Parallel computation research and application in FEA method
- PIC08: SCHLUMBERGER - Drilling program visualization
- PIC09: SCHLUMBERGER - Maxwell metrics-based bug prediction model
- PIC10: THALES - Operational data gathering, breaking the connectivity barriers
- PIC11: UXSINO - Exploration and practice of platform construction for smart contracts based on blockchain technology
- PIC12: WFC - Regenerative Cities are "Sponge Cities": issues, policies, and practice


Discipline /Field Economy / Business Administration	Project number <i>PIC01</i>
Project title Build a revenue forecasting model for an airline	
Project description <p>Airline industry is an ultra-competitive environment, extremely sensitive to laws of demand and offer. To a certain extent, passenger traffic can be compared to fluids (passenger) going through pipes (airlines network) where brands or schedule play a friction role.</p> <p>Project would be to analyze Air France commercial results in China and try to build a predictive tool.</p> <p>We suggest a 3 step approach:</p> <ul style="list-style-type: none"> – Provide a model estimating overall traffic demand using external and public data (GDP growth, stock market, Chinese Tourism data...). – Integrate offer evolution (including competition) and establish correlation with Air France revenue results – Build a forecast model to predict Air France results in near future <p>To help students in their tasks, Air France will share actual revenue results, industry sales, industry capacity evolution.</p> <p>To simplify analysis, it will be restricted to traffic between Europe and China (excl beyonds like Africa or Americas) sold on Chinese market.</p> <p>To liaise with students, Air France will appoint two coordinators for this project, a data analyst and the sales director.</p>	
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<p style="text-align: center;">Company</p> <p>Name (English): Air France Name (Chinese, if possible): Address: Room 1601, South Building, China Overseas Plaza No 8, Guanghua Dongli , Chaoyang District, Beijing 100020 website: www.airfrance.fr</p>	


Discipline /Field Mechanics/Fluid transmission and control Hydraulic component design and simulation Measurement and control	Project number PIC02
Project title Test bench design for measuring some key characteristics of hydraulic piston pump moving pairs 液压柱塞泵关键运动副油膜特性测试平台设计	
Project description <p>Long lifetime and high reliability of hydraulic pump utilized in aircraft is important and MUST. The leakage resulted from the wear of moving pairs of the pump, and the fatigue of the moving components, are two key factors causing the failure. Monitoring the key characteristics of three moving pairs of hydraulic pump, is helpful for deeply understanding the evolution process of wear and fatigue. To complement the monitoring, test bench is necessary.</p> <p>This project aim at designing a test bench, which could be used to measure the film thickness, temperature distribution, pressure distribution, etc. And moreover, the bench could be used to do the duration ability test, and evaluate the lifetime of pump.</p> <p>Knowledge on mechanics, hydraulics, electronics, measurement and control, sensor are necessary.</p> <p>航空液压泵要求具有较高的可靠性和较长的寿命。液压泵三对主要运动副（柱塞-转子副、转子-配流盘副、滑靴-斜盘副）以及轴尾端面密封处的泄漏，以及所有运动部件的疲劳，是导致液压泵到寿的两个关键因素。对这些运动副的关键特性（油膜厚度、温度分布、压力分布）进行监控，有助于掌握磨损和疲劳失效演化的过程。为实现对这些特性的监控，需要研制专用试验平台。</p> <p>本项目目标是设计此试验平台，用于测量运动副的油膜厚度、温度分布、压力分布等。另外，此试验平台还可以用于液压泵耐久性测试，以及评价液压泵的寿命。</p> <p>需要机械、液压、电子、测试控制、传感器等相关学科基础知识。</p>	
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Company Name (English): Aviation Industry Corporation of China Name (Chinese, if possible):中航工业南京金城机电液压工程中心 Address: 南京市江宁区水阁路 33 号 Website: http://www.avic.com.cn/	Company LOGO 

Discipline /Field AVIATION	Project number <i>PIC03</i>
Project title Civil Aircraft Noise Study	
Project description <p>With the civil aviation development, aircraft manufacturers have to pay more and more attention on the comfortailty, in which noise is particularly important because noise is one of parameters of passenger's intuitive feeling. How to estimate and reduce the noise level has become a necessary task of aircraft design.</p> <p>This project includes the three following aspects:</p> <ol style="list-style-type: none"> 1, Based on literature research and modeling, study the main noise calculation methods, including but not limited to the possible aircraft noise sources (COACH will give guidance), their mechanism, their transmission, natural attenuation, regeneration and superposition, and with the infos above, estimate the noise level and main frequency range. 2, Based on literature research, analyze the main and latest modeling and simulation methods and technologies; 3, Based on literature research, summarize the main and latest noise test methods and technologies (including in the lab and in the flight); 4, Based on 1 and 2, achieve more than one complete example of noise prediction in the aircraft cabin with assumed situation (COACH will give guidance). <p>Proposed research methods:</p> <p>1, literature search 2, modeling and simulation 3, calculation</p>	
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Company Name (English): COMAC-SADRI Name (Chinese, if possible): 中国商用飞机有限责任公司上海飞机设计研究院 Address: 上海市浦东新区金科路 5188 号 Website: http://sadri.comac.cc/	Company LOGO  

Discipline /Field AVIATION	Project number <i>PIC04</i>
Project title Electric and Electronic Equipment Thermal Environment Study	
Project description <p>With the civil aviation development, aircraft manufacturers have to pay more and more attention on the economy, in which the heat/cold energy management is particularly important. That means how to make the cold/heat energy distribute in the optimal path to optimize aircraft economy. As the foundation, aircraft thermal load, especially the one of Electric and Electronic (shorted as 2E) equipment has to be firstly studied.</p> <p>This project includes the three following aspects:</p> <ol style="list-style-type: none"> 1, Based on literature research and calculation, determine the total 2E equipment electric power consumption and heat load of different types of aircraft, and explore the relationship between power consumption/heat load and the passenger number of aircraft, weight and other possible parameters; 2, Based on literature research (especially on the aircraft and suppliers infos) and statistic calculation, achieve 2E equipment statistics, which should include electronic equipment, belonging which system (COACH will give classification and relative guidance), function (COACH will give a list of categories and relative guidance), power consumption, heat load, their proportion; on the basis of the completion of 2E equipment thermal load and power consumption, the relationship between the proportion and function should be studied statistically; 3, Based on literature research and translation, achieve the knowledge of thermal environment section of ARINC600, including but not limited to the thermal environment requirement, cooling method etc. COACH will give the necessary guidance and translation demand as a way to help team to complete basic requirements knowledge preparation. <p>Proposed research methods: 1, literature search 2, statistics 3, calculation</p>	
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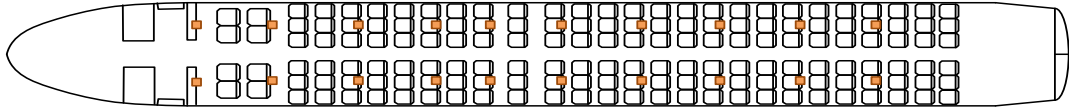

Discipline/Field Automation/Computer-Aided Engineering	Project number <i>PIC05</i>
Project title Active human body models	
Project description <p>So far, mainly passive models of the human body have been used for evaluation of vehicle safety. However, with the emergence of active safety systems (such as automatic braking), the use of active models of the human body becomes an attractive option: with such models, it is possible to simulate the movement of occupants during braking or evasive maneuvers, and take into account the actual position of an occupant during a crash. It is also becoming possible to predict, for average severity of accidents, the influence of muscle tone on the kinematics of the occupant and thus his/her injuries.</p> <p>ESI has various 3D finite element human body models and simplified 'OD' modeling tools for mechanical systems control based on the Modelica language. The proposed project is to establish bases for joint use of these two types of models, i.e. integrating a control model into a human finite element model. Bibliography; software installation; training on a dummy passive model; implementation an example of control for a simple movement.</p>	
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Discipline /Field Marketing	Project number <i>PIC06</i>
Project title Outlook of metal 3D printing industry in China	
Project description History of metal 3D printing in China, Technology (patent) developed in China 3D printing machines in China <ul style="list-style-type: none"> Chinese 3D printing machine manufacturers (companies, research institutes, universities etc.) Sales agency for foreign 3D printing machines Metal 3D printing machines for aeronautics 3D printing powder in China <ul style="list-style-type: none"> Chinese 3D printing powder manufacturers Sales agency for foreign 3D printing powder Metal 3D printing materials for aeronautics Manufacture methods of 3D printing powder 3D printing manufacturing in China <ul style="list-style-type: none"> Post technical operations on 3D printing parts (thermal treatment, machining etc.) Test providers of 3D printing parts Providers of chemical test of powder Standards in China and oversea <ul style="list-style-type: none"> Standards for 3D printing method (manufacture process etc.) Standards for 3D printing parts validation (process test, quality control, measurement instruments etc.) Standards for 3D printing powder Technologies feasible for aeronautical 3D printing (SLM, SLA, EBM), Conference, events and exhibitions of 3D printing in China, Projects financed by Chinese government	
Project Coach Name: Vincent Alberola & Jiang Wenchao Title: Engineer Email: vincent.alberola@safrangroup.com wenchao.jiang@safrangroup.cn Tel: 1860 192 8891	Scientific Referent Name: TANG Hongzhe Title: Dr. Associate Professor Position: Email: tanghongzhe@buaa.edu.cn Tel:
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Discipline /Field Numerical Computation/Simulation	Project number <i>PIC07</i>
Project title Parallel computation research and application in FEA method	
Project description Develop parallel FEA program to achieve fast computation for complicated physical problems. <ol style="list-style-type: none"> 1. Define a use case of complicate physical problem 2. Develop parallel FEA program to solve the use case 3. Compare the efficiency of this program with commercial software 4. Propose idea to improve parallel FEA program 	
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Discipline /Field Complex Data Visualization	Project number PIC08
Project title Drilling Program Visualization	
Project description <p>Tai Ji platform is a mission-specific engineering, designing and planning software platform that efficiently supports the distributed, collaborative implementation of the multi-Segment/multi-Discipline concurrent workflows while also supporting the individual Segment workflows. The digital drilling program is one of the most important deliverables from Tai Ji which covers almost all the drilling processes, with the integration of various the engineering contexts in Tai Ji into a single collaborative package. It is a challenge for modelling and visualizing the drilling program.</p> <p>From the data modelling prospective, the big drilling domain context of drilling program can be separated into different bounded contexts. In this way, the objects can be easily represented and linked with each contexts using multiple dimensions to see the drilling domain “world” and set up the ontology of a whole final drilling program. The dimensions are: 1) physical well structure, 2) engineering designs, 3) operational designs of activity plan, 4) risk etc.</p> <p>The project is focusing on visualizing the current Tai Ji digital drilling program in an interactive way of “multi-dimensional cube” using web technologies, the user can drag the “cube” in a different angle of the drilling program, and zoom in to see the details. But we encourage the student to have more imaginations and innovations to visualize it beyond our thinking.</p> <div>  </div>	
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Discipline /Field Software Quality Assurance, Risk Analysis, Data Analytics	Project number PIC09
Project title Maxwell Metrics-based bug prediction model	
Project description <p>Maxwell is a large legacy software platform that is used as a real-time acquisition system in hundreds of Schlumberger field locations throughout the world.</p> <p>The different environments, applications, and users of Maxwell software in the field leads to an infinite possibility of combinations to be tested. Due to this, regression testing scope determination must be done using a risk-based strategy, considering the changes to the code.</p> <p>Currently Maxwell collects several metrics for code quality which are used qualitatively to determine a risky code change. The metrics include, among others: code churn, file complexity, bug density, test coverage, etc. In order to improve the predictability of a leaked defect and to improve our test scope determination, we need to improve our analysis of the code changes to more accurately identify risk.</p> <p>This project consists of taking advantage of the Maxwell software code metrics to determine the risk of a code change. Data collection and analysis (analytics) based on previous leaked defects will need to be done. An ideal output is a quantitative model to be used for test scope determination, including a variable importance plot for the various Maxwell code metrics.</p>	
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Discipline /Field Engineering, Technology, Network, Distributed architecture, Mechanical	Project number <i>PIC10</i>
Project title Wireless Solution for Overhead Retract System	
Project description <p>This project is to undertake a study of the Overhead Retract System interconnected with wireless Ethernet in the airborne environment. As an example shown in the figure below, the overhead retract monitors (yellow blocks) are installed under the baggage bin panel about every 3 rows on the left hand side and right hand side of the aisle.</p>  <p>This project is intended to replace the wired Ethernet links between all the retract displays with IEEE 802.11 technologies. Wireless devices will be built in the retract displays, and no standalone wireless access points will be used. It also aims to provide WiFi services to the passenger devices so that the passengers can access the entertainment services provided by the overhead retract system.</p> <p>The project is to study:</p> <ol style="list-style-type: none"> 1. How to establish retract-to-retract and retract-to-PED (passenger electronic devices) wireless links 2. How to deliver synchronized multimedia streams to all retract displays 3. WiFi signal coverage and channel allocation 4. Per passenger bandwidth / throughput 	
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Discipline /Field Security technology, Distributed Database Technology, Virtual Machine Technology.	Project number <i>PIC11</i>
Project title Exploration and Practice of Platform Construction for Smart Contracts Based on Blockchain Technology （基于区块链技术的智能合约平台建设的探索与实践）	
Project description <p>A blockchain is a distributed database that maintains a continuously-growing list of records called blocks secured from tampering and revision. Each blockchain consists of blocks that hold batches of valid transactions, and includes the hash of the prior block in the blockchain, linking the two. The linked blocks form a chain. The blockchain is a technology that underlies bitcoin conceived in 2008 and first implemented in 2009, where it serves as the public ledger for all transactions. As of 2014, "Blockchain 2.0" was a term used in the distributed blockchain database field. In 2016, the central securities depository of the Russian Federation (NSD) announced a pilot project based on blockchain technology. Various regulatory bodies in the music industry have started testing models that use blockchain technology for royalty collection and management of copyrights around the world.</p> <p>This project aims to develop a method to construct a decentralized platform based on blockchain. Here, blockchain plays a role of database. Smart contracts are considered as apps （智能合约本质上是建立在区块链这个数据库上的应用程序） that run above the database exactly as programmed without any possibility of downtime, censorship, fraud or third party interference （智能合约的优点在于不会因故障当机，不需要审查机制，不存在信息欺诈的可能性，不需要第三方见证）. These apps run on a custom built blockchain, an enormously powerful shared global infrastructure that can move value around and represent the ownership of property （智能合约可以实现资产的交易和资产的归属权认定）. This enables developers to create markets, store registries of debts or promises （记录债权或期权）, move funds in accordance with instructions given long in the past (like a will or a futures contract) （基金的远期管理） and many other things that have not been invented yet, all without a middle man or counterparty risk （这些功能都是在没有可信第三方的前提下实现的）.</p>	
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Company Name (English): UXSINO Name (Chinese, if possible): 北京优炫软件股份有限公司 Address: 北京市海淀区知春路 6 号锦秋国际大厦 B 座 7 层 Website: http://www.uxsino.com/	Company LOGO 

Discipline /Field	Project number
Sustainable city development	<i>PIC12</i>
Project title Regenerative Cities are "Sponge Cities": Issues, Policies, Practice	
Project description <p>Participants in this project will work with the Regenerative Cities Program of the WFC China office, under the Climate, Energy and Cities Commission of the World Future Council, to develop international understanding and dialogue on the topic of Sponge Cities — how sustainable cities can become more resilient in their management of water resources, particularly with respect to flooding.</p> <p>In September 2015, the PRC government launched the development of 16 model “sponge cities”—a more ecologically-friendly alternative to the concrete-laden rapid development that has come to characterize China's cities in recent decades. These projects will require infrastructure retrofits of existing cities all over China, ranging from Xixian New Area in the north, with about 500,000 people, to Chongqing in the south, with a population of 10 million.</p> <p>Project participants will identify, develop and research investigations into specific Sponge City challenges faced in China, and compare and contrast with relevant examples of international cities that are facing similar challenges. The project shall take a fresh look at what solutions and approaches are working, and why, and shall seek to build international dialogue and perspective to promote more rapid uptake of effective Sponge City development. The inquiry shall explore innovations as well as tried-and-true approaches being taken at the national and local levels, and may examine supportive policy contexts, engineering and technological advances, public-private partnership models, or "blue" finance, etc., Inquiry approach and parameters shall be defined as a part of the students project scope.</p> <p>It is our hope that findings resulting from this China-International exploration of the topic may be presented during G20 proceedings in 2017, to be hosted in Hamburg, Germany, where WFC is headquartered and currently expects to present on our China-EU work.</p> <p>ABOUT WFC CHINA</p> <p>One of the main initiatives of the China office of WFC is the launch of the The Future of Cities Forum, this year in partnership with the Tianjin Eco-City Forum, Oct 21-23, 2016. PIC project students and ECPK advisor(s) may attend both fora; students can also be deployed as volunteers in support of the event.</p> <p>WFC China are currently working with the UN and relevant China research and policy institutions on relating UN Habitat III and Sustainable Development Goals to domestic policy goals and initiatives; and is an official partner of the China-ASEAN Environmental Cooperation Center, under the MOEP. We have joint MOUs with the China Urban Research Center of Beijing Jiaotong University, the UNEP SUC program for long-term strategic cooperation, and also work with CITYNET, as well as the Tianjin-Binhai local government. In July of 2016, WFC China signed an MOU with the National Development and Reform Commission (NDRC) to cooperate the development of a Yuncheng City, Shandong Province Sponge City pilot — the MOU was signed at the High-Level Conference on China-EU Urbanization Partnership, and was witnessed by Prime Minister Li Keqiang and EU President Jean-Claude Juncker.</p>	

ABOUT WFC REGENERATIVE CITIES

A new model of urbanisation powered by Renewable Energy and defined by a restorative and mutually beneficial relationship between cities and their hinterland is urgently needed. We therefore identify transferrable success factors that enable cities to go beyond sustainability and become regenerative. A regenerative city enhances rather than undermines the ecosystems on which it depends.

While modern cities function in a linear manner in which resources are used and wasted, regenerative cities are based on circular resource flows and generate the resources it consumes. In order to realize this vision, we analyse case studies from across the globe and set regional focuses for the advocacy work. For example, the WFC office in Beijing specifically identifies policy solutions for transforming Chinese cities into Regenerative Cities.

- We focus on how cities can mimic nature's circular metabolism.
- We identify exemplary policies to implement the vision of a regenerative city.
- We promote dialogue and exchange of transferable success factors across cities worldwide.

For more information about our work, please see <https://www.worldfuturecouncil.org/climate-energy-and-cities>

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<p style="text-align: center;">Company</p> <p>Name (English): World Future Council, China Office Name (Chinese, if possible): 世界未来委员会 Address: Office 81, #4 Gongtibeilu, Chaoyang, Beijing, 100027 北京市朝阳区工体北路4号81号楼 邮编 100027 Website: https://www.worldfuturecouncil.org</p>	<p style="text-align: center;">Company LOGO</p> 