

August 19, 2011

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Dear Professor Jafari:

On behalf of the staff of IGI Global, I would like to take this opportunity to express our many thanks for your excellent work as editor of IGI's newest publication, *Technology Engineering and Management in Aviation: Advancements and Discoveries*.

As the editor of this exciting new book, you have firsthand knowledge of its value as a research and reference tool. I have enclosed two complimentary copies of this book for your personal use. Furthermore, as a token of our appreciation, we would like to offer you an exclusive 50% discount for obtaining additional copies of this book. Please use the enclosed "Exclusive Discount Offer" form to place your order. Alternatively, you can use the discount code "IGI50" at the IGI Global bookstore ([www.igi-global.com](http://www.igi-global.com)) to purchase a copy of this book or any other IGI Global title at a 50% discount.

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# Technology Engineering and Management in Aviation

Advancements and Discoveries



**Evon Abu-Taieh, Asim El Sheikh & Mostafa Jafari**

# Technology Engineering and Management in Aviation: Advancements and Discoveries

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This chapter was drafted based on the Special Report that was prepared by the Intergovernmental Panel on Climate Change (IPCC) following a request from the International Civil Aviation Organization (ICAO) and the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (IPCC, 1999). In this context, the state of understanding of the relevant science of the atmosphere, aviation technology, and socio-economic issues associated with mitigation options is assessed and reported for both subsonic and supersonic fleets. The potential effects that aviation has had in the past and may have in the future on both stratospheric ozone depletion and global climate change are covered; environmental impacts of aviation at the local scale, however, are not addressed.

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*Marc A. Rosen, University of Ontario Institute of Technology, Canada*

Aviation-related emissions and their impacts are comprehensively discussed in this chapter. Previous studies are described in section two, and their relevance is discussed throughout the chapter. In section three, five common emissions species with contrail formation are described along with qualitative and quantitative results from important investigations. Relationships between aviation emissions and fuel usage are also illustrated. In the mitigation strategies section, emission abatement methods are investigated, focusing on three main areas: technology, flight procedures, and alternative fuels. Both theoretical and practical methods with the potential to decrease emissions are discussed. In the legislation section, the status of emissions regulations is discussed, and emissions charges applied by airports are identified. Examples are provided throughout the chapter to illustrate the points addressed. To complement the main body of the chapter, much detailed information related to aircraft emissions compiled from various sources are provided in the appendix.

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Effective Human Factors Engineering (HFE) has provided the aerospace industry with design considerations that promote aviation safety in the development of complex aircraft systems, as well as the operators and maintainers that utilize those systems. HFE is an integral aspect within the systems engineering process. Measuring the effectiveness of Human Systems Integration (HSI) in the research & development stage is critical for the design of new and modified systems. This chapter focuses on how providing effective HFE design solutions enhances product design and system safety. Providing the customer with safe and reliable products augments mission capabilities throughout the product lifecycle.

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The purpose of this chapter is to describe important aspects of how to manage human factors in the development of fighter aircraft, by presenting prominent features of the domain, corresponding design concepts to cope with what is special, and guidance in the approach to managing human factors in the development of fighter aircraft. The chapter includes a description of the domain of fighter aircraft development, followed by a section on how to design for what is special about a fighter pilot, a fighter aircraft, and the flight environment. Examples of design concepts from the domain, such as HOTAS and Basic-T are discussed in light of domain specific demands. Later, human factor considerations, such as evaluation of human factors and usable systems, are discussed together with how to manage human factors in development.

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<i>Miles Austin, Velcon Filters, LLC, USA</i>	

This chapter discusses the historical approaches to monitoring aviation fuel quality, and the current industry movement towards continuous monitoring electronic measurement systems. The application of mature technology from other industries is reviewed and found to be inadequate. A new type of sensing system designed specifically for the needs of aviation fuel quality is introduced, showing advanced user features and proven to be far more accurate than any other method current available. This article also discusses a typical problem in real world applications where a combination of contaminant is encountered, and how only the new type of sensing system can properly measure the contamination to aviation fuel quality specifications.

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*Salih N. Akour, Sultan Qaboos University, Oman*

*Mohammad Al-Husban, Civil Aviation Regulatory Commission, Jordan*

*Musa O. Abdalla, The University of Jordan, Jordan*

Reducing stress and weight of structures are most important to structural designers. Most engineering structures are an assembly of different parts. On most of these structures, parts are assembled by bolts, rivets, et cetera. This riveted and bolted structure is highly used in aerospace industry. These holes that are drilled for bolts and rivets work as stress raisers. Defense hole theory deals with introducing auxiliary holes beside the main hole to reduce the stress concentration by smoothing the stress trajectories in the vicinity of the main hole. These holes are introduced in the areas of low stresses that appear near the main circular hole. Defense hole system under uniaxial loading is investigated. The optimum defense hole system parameters for a circular hole in an infinite laminated composite plate are unveiled. This study is conducted using finite element method by utilizing commercial software package. The optimum design of the defense hole system is reached by utilizing the redesign optimization technique and univariate search optimization technique. The finite element model is verified experimentally using RGB-Photoelasticity and by reproducing some well known cases that are available in the literature. Digital Image Processing is utilized to analyze the photoelastic images. Stress concentrations associated with circular holes in pure Uniaxial-loaded laminates can be reduced by up to 24.64%. This significant reduction is made possible by introducing elliptical auxiliary holes along the principal stress direction. The best reduction is achieved when four elliptical defense holes are introduced in the vicinity of the main hole. The effect of the fiber orientation, as well as the stiffness of both the fiber and the matrix are investigated.

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*Salih N. Akour, Sultan Qaboos University, Oman*

*Mohammad Al-Husban, Civil Aviation Regulatory Commission, Jordan*

*Jamal F. Nayfeh, Prince Mohammad Bin Fahd University, Kingdom of Saudi Arabia*

Stress reduction and increasing the load to weight ratio are two of the main goals of designers. Fiber reinforced composite materials are preferred by aerospace industry because of their high load to weight carrying capacity. Many parts of aircraft structures are assembled by bolts and rivets. These holes that are drilled for bolts and rivets work as stress raisers. Reducing the stress in the vicinity of these holes is a need. Defense hole theory deals with introducing auxiliary holes beside the main hole to reduce the stress concentration by smoothing the stress trajectories in the vicinity of the main hole. These holes are introduced in the areas of low stresses that appear near the main circular hole. Defense hole system under hybrid (shear and tension) loading is investigated. The optimum defense hole system parameters for a circular hole in an infinite laminated composite plate are unveiled. The study has been conducted using finite element method by utilizing commercial software package. The finite element model is verified experimentally using RGB-Photoelasticity. Digital Image Processing is utilized to analyze the photoelastic images.

## Chapter 8

### Design and Optimization of Defense Hole System for Shear Loaded Laminates ..... 161

*Mohammad Al-Husban, Civil Aviation Regulatory Commission, Jordan*

*Salih N. Akour, Sultan Qaboos University, Oman*

*Jamal F. Nayfeh, Prince Mohammad Bin Fahd University, Kingdom of Saudi Arabia*

Stress concentration associated with circular holes in hybrid loading (i.e., tension-compression ratios of 0.25, 0.50, and 0.75) achieved maximum reduction of 31.7%. This reduction is obtained by introducing elliptical defense holes along the principal stress direction. Finite element analysis is used to optimize the size and location for defense hole system. The effect of the stacking sequence, the fiber orientation, and the stiffness of both the fiber and the matrix are investigated.

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### Effect of Core Thickness on Load Carrying Capacity of Sandwich Panel Behavior

### Beyond Yield Limit ..... 171

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*Jamal F. Nayfeh, Prince Mohammad Bin Fahd University, Kingdom of Saudi Arabia*

Reducing stress and weight of structures are most important to structural designers. Most engineering structures are an assembly of different parts. On most of these structures, parts are assembled by bolts, rivets, et cetera; this riveted and bolted structure is highly used in aerospace industry. Defense hole theory deals with introducing auxiliary holes beside the main hole to reduce the stress concentration by smoothing the stress trajectories in the vicinity of the main hole. These holes are introduced in the areas of low stresses that appear near the main circular hole. Defense hole system under shear loading is investigated. The optimum defense hole system parameters for a circular hole in an infinite laminated composite plate are unveiled. This study is conducted using finite element method by utilizing commercial software package. The finite element model is verified experimentally using RGB-Photoelasticity. Digital Image Processing is utilized to analyze the photoelastic images. Stress concentrations associated with circular holes in pure biaxial shear-loaded laminates can be reduced by up to 20.56%. This significant reduction is made possible by introducing elliptical auxiliary holes along the principal stress direction. The effect of the stacking sequence, the fiber orientation, and the stiffness of both the fiber and the matrix are investigated.

## Chapter 10

### Next Generation Surveillance Technology for Airport and ATC Operations ..... 182

*Werner Langhans, ERA a.s., Czech Republic*

*Tim Quilter, ERA a.s., Czech Republic*

Even during the economic crisis, air traffic demand has continued to increase in certain areas of the world, such as the Middle East. Other regions are on their way to recover to pre-crisis traffic demands and will shortly be back to previous growth rates. Airport operators and air traffic control service providers face the challenge to handle this traffic in an expeditious, environmentally friendly, and safe way without generating delays. Conventional ATC concepts in many parts of the world need to be augmented with next generation surveillance technology, in order to keep pace with the required level of safety in

those regions. Conventional technologies, such as primary radar and secondary radar, are not able to deliver the required cost-performance ratios for these increasing demands and need to be replaced by multilateration and ADS-B surveillance techniques. This chapter outlines the recent achievements in worldwide operational deployments in the fields of ADS-B and multilateration for airport and air traffic control applications and discusses the integration into larger aviation system applications.

## Chapter 11

The Evaluation of Wireless Communication Devices: To Improve In-Flight Security

Onboard Commercial Aircraft ..... 190

*Lori J. Brown, Western Michigan University, USA*

*Liang Dong, Western Michigan University, USA*

*Anthony G. Cerullo III, Western Michigan University, USA*

Today, wireless technology forms the communications backbone of many industries—including aviation, transportation, government, and defense. Security breaches since 9/11 have confirmed the need for a discreet wireless communications device onboard commercial aircraft. Real time, discreet communication devices are needed to improve communication between the pilots, flight attendants, and air marshals—a concept that is essential in today's age of terrorism. Flight attendants and Federal Air Marshalls (FAMs) need to be able to alert the flight deck discreetly of such dangers, and thereby pre-warn the pilots of possible attempts to enter the flightdeck or security breaches in the cabin. This chapter will study the effectiveness of discreet, secure, hands-free, wireless communications methods for enhancing coordination during security incidents among cabin crewmembers, between the cabin and flight compartment, ground support personnel, and report these findings. It will identify breakthrough technologies to mitigate the likelihood of individual radical and/or violent behavior, resulting in catastrophic airline casualties, and it will also improve communications and overall safety in-flight.

## Chapter 12

Terrorist Attacks: A Safety Management System Training Tool for Airport and

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*William B. Rankin, University of Central Missouri, USA*

This chapter examines how airport and airline managers could review their incident and command plans to enhance security counter-measures for terrorist attacks through the use of a well constructed plan-do-check-act (PDCA) tool, in the context of a Safety Management System (SMS), and incorporating a structured field survey into their emergency incident plan and command plan reviews. Thus, through the examination of actual emergency incident plan and command plan survey, airport managers are given the opportunity to work issues through the trials and tribulations of refining their incident and command plans on a recurring basis. It is suggested that a PDCA tool be implemented as a SMS model for the enhancement of these plans in the airline environment.

## Chapter 13

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*Jaime García Sáez, Ingeniería y Economía del Transporte (INECO), Spain*

EPlanAirport is a Web-based tool that allows running complex studies based on airport systems. The primary goal of the tool is helping to the airport stakeholders and policy makers in the decision-support processes. Nowadays, there is a lack of tools and systems that may help the targeted users in such a process. Otherwise, this tool could guide them in the current global scenario. So, ePlanAirport fills this gap detected allowing a non-expert user in complex tools to fulfill successfully his mission. For that purpose, a relevant set of data got in a simple and fast way via Web will be available, and they will help in the planning of airport infrastructures and operations. For instance, the planner will know how a change in an operational procedure or a change in the fleet characteristics or a change in the current infrastructure of the airport will impact on key performance indicators such as capacity, delay, or environment.

#### **Chapter 14**

- Improved Airport Enterprise Service Bus with Self-Healing Architecture (IAESB-SH)..... 223  
*Issam Al Hadid, Isra University, Jordan*

This chapter introduces the different aviation and airport Information Technology systems. Also, this chapter provides architecture based on the Service Oriented Architecture (SOA) that improves the information accessibility and sharing across the different airport departments, integrating the existing legacy systems with other applications, and improving and maximizing the system's reliability, adaptability, robustness, and availability using the self-healing agent and virtual Web service connector to guarantee the quality of service (QoS).

#### **Chapter 15**

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*Ronald John Lofaro, Embry-Riddle Aeronautical University Worldwide, USA*  
*Kevin M. Smith, United Airlines (ret.), & USN (ret.), USA*

This chapter will focus on the role of pilot/flightcrew training and performance evaluation in the identification and management of risk, especially while aloft and in changing conditions. The chapter will integrate different- but we posit interrelated, topic areas: First, a decision-making paradigm for flight crew's use in the operational environment. Second, training and performance evaluation in flight simulators (FS), as well as the design and development of FS scenarios to test decision performance. Third, Relevant Federal Aviation regulations (FAR's) and approved programs in current pilot/flightcrew training. Fourth, accident investigations; the role and use-value of accident investigation data in flying safety. Finally, the authors will present recommendations for the next steps in the development and use of new and emerging technologies for maximum pilot/flight crew decision performance and safety. This will be done via a collaborative ground-air, automated system and is what we propose to achieve our goal, increasing safety of flight.

#### **Chapter 16**

- Augmentation Systems: The Use of Global Positioning System (GPS) in Aviation ..... 283  
*Mohammad S. Sharawi, King Fahd University of Petroleum and Minerals, Saudi Arabia*

The global positioning satellite system (GPS) has been utilized for commercial use after the year 2000. Since then, GPS receivers have been integrated for accurate positing of ground as well as space ve-

hicles. Almost all aircrafts nowadays rely on GPS based system for their take off, landing, and en-route navigation. Relying on GPS alone does not provide the meter level accuracy needed to guarantee safe operation of aircrafts. Thus several augmentation systems have been deployed worldwide to enhance the accuracy of the GPS system. Several augmentation systems that serve local as well as wide coverage areas are discussed in this chapter, specifically the LAAS system, the WAAS system as well as the EGNOS system. The architecture as well the performance metrics for each of these augmentation systems are presented and discussed.

## Chapter 17

Applying the Certification's Standards to the Simulation Study Steps..... 294

*Issam Al Hadid, Isra University, Jordan*

This chapter presents the certification standards applied with the simulation study steps, in addition to the Confidence Grid which is used to assess the quality (Reliability and Accuracy) of the data and the process of the simulation study step which will be the base for the validation and verification.

## Chapter 18

Evaluating the Performance of Active Queue Management Using Discrete-Time

Analytical Model ..... 308

*Jafar Ababneh, The Arab Academy for Banking & Financial Sciences, Jordan*

*Fadi Thabtah, Philadelphia University, Jordan*

*Hussein Abdel-Jaber, University of World Islamic Sciences, Jordan*

*Wael Hadi, Philadelphia University, Jordan*

*Emran Badarneh, The Arab Academy for Banking & Financial Sciences, Jordan*

Congestion in networks is considered a serious problem; in order to manage and control this phenomena in early stages before it occurs, a derivation of a new discrete-time queuing network analytical model based on dynamic random early drop (DRED) algorithm is derived to present analytical expressions to calculate three performance measures: average queue length ( $Q_{avg,j}$ ), packet-loss rate ( $P_{loss,j}$ ), and packet dropping probability ( $pd(j)$ ). Many scenarios can be implemented to analyze the effectiveness and flexibility of the model. We compare between the three queue nodes of the proposed model using the derived performance measures to identify which queue node provides better performance. Results show that queue node one provides highest  $Q_{avg,j}$ ,  $P_{loss,j}$ , and ( $pd(j)$ ) than queue nodes two and three, since it has the highest priority than other nodes. All the above results of performance measure are obtained only based on the queuing network setting parameters.

## Chapter 19

Knowledge: An Information Systems' Practical Perspective ..... 325

*Shadi Ettantawi, The Arab Academy for Banking & Financial Sciences, Jordan*

*Asim El-Sheikh, The Arab Academy for Banking & Financial Sciences, Jordan*

A number of disciplines have approached the concept of knowledge. None of the existing definitions of knowledge can be generalized to other disciplines, and most importantly, none of such attempts fit the requirements of information systems (IS). This chapter suggests to perceive knowledge from the point of view of IS, as an attempt to answer IS requirements better. The proposed vision of knowledge is based on Information Systems' layers.

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<i>Nicoletta Sala, Università della Svizzera Italiana, Switzerland</i>	

Virtual Reality (VR) is a technology which has various application fields (from video games to psychiatry). It is indispensable in critical simulation, for instance in military training, in surgical operation simulation, in creation of environments which could set off phobias (in psychiatry), or in realization of virtual prototypes, for instance in industrial design. The aim of this chapter is to present how the VR also finds excellent application fields in architecture and in engineering, for instance, in the teaching of the basic concepts, in techniques of graphic rebuilding for the building restoration, in realization of virtual visits inside buildings, and in urban generative processes simulated by computer. Another use of the virtual reality is in the introduction of a new kind of architecture: Virtual Architecture, strongly connected to the Information and Communication Technology (ITC), to the Internet, and in the virtual prototyping in engineering.

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<i>Hussein Al-Bahadili, The Arab Academy for Banking and Financial Sciences, Jordan</i>	
<i>Haitham Y. Adarbah, Gulf College, Sultanate of Oman</i>	

Many analytical models have been developed to evaluate the performance of the transport control protocol (TCP) in wireless networks. This chapter presents a description, derivation, implementation, and comparison of two well-known analytical models, namely, the PFTK and PLLDC models. The first one is a relatively simple model for predicting the performance of the TCP protocol, while the second model is a comprehensive and realistic analytical model. The two models are based on the TCP Reno flavor, as it is one of the more popular implementations on the Internet. These two models were implemented in a user-friendly TCP performance evaluation package (TCP-PEP). The TCP-PEP was used to investigate the effect of packet-loss and long delay cycles on the TCP performance measured in terms of sending rate, throughput, and utilization factor. The results obtained from the PFTK and PLLDC models were compared with those obtained from equivalent simulations carried-out on the widely used NS-2 network simulator. The PLLDC model provides more accurate results (closer to the NS-2 results) than the PFTK model.

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## Preface

As computer and Information Systems technology advances, industries such as aviation stand to benefit from the overwhelming new advances in hardware, software, and best practices. *Technology Engineering and Management in Aviation: Advancements and Discoveries* details the essential new developments in technology and management in the aviation industry. Specific and important advances in navigation, air traffic control, and environmental impact all make their way into this volume, which also focuses on management policies keeping up with new technology. This volume is a vital reference for practitioners, managers, students, and all those interested in the field of aviation.

*Technology Engineering and Management in Aviation: Advancements and Discoveries* is composed of 21 chapters written by highly qualified scholars discussing a wide range of topics spanning from aviation environmental crises to technological solution in the aviation industry. The first two chapters discuss aviation and environment; the first chapter is written by Mostafa Jafari, a lead author of IPCC, Nobel Peace Prize Winner for 2007; the second chapter is written by Enis T. Turgut & Marc A. Rosen.

The third and fourth chapters came from scholars affiliated with Boeing Company and Saab Aero-nautics both major airline manufacturers to discuss the topic of *Human Factors*. The third chapter covers *Enhancing Product Safety through Effective Human Factors Engineering Design Solutions* and the fourth discusses *Managing Human Factors in the Development of Fighter Aircraft*.

Chapters five through nine discuss airplane hardware design. The fifth chapter is written by scholars affiliated with *Velcon Filters*, discussing *State-Of-The-Art Real-Time Jet Fuel Quality Measurement*. Chapter six discusses *Design and Optimization of Defense Hole System for Uniaxially Loaded Laminates*. Chapter seven suggests *Design and Optimization of Defense Hole System for Hybrid Loaded Laminates*. Next, chapter eight propose *Design and Optimization of Defense Hole System for Shear Loaded Laminates*. Chapter nine discusses *Effect of Core Thickness on Load Carrying Capacity of Sandwich Panel Behavior Beyond Yield Limit*.

Chapters ten to twelve cover the safety and security issues in aviation. Chapter ten, *Next Generation Surveillance Technology for Airport and ATC Operations*, outlines the recent achievements in worldwide operational deployments in the fields of ADS-B and multilateration for airport and air traffic control applications and discusses the integration into larger aviation system applications. Furthermore, chapter eleven relates the study of *The Evaluation of Wireless Communication Devices: To Improve In-Flight Security Onboard Commercial Aircraft*. The chapter studies the effectiveness of discreet, secure, hands-free, wireless communications methods for enhancing coordination during security incidents among cabin crewmembers, between the cabin and flight compartment, ground support personnel, and reporting these findings. Chapter twelve, *Terrorist Attacks: A Safety Management System Training Tool for Airport and Airline Managers*, examines how airport and airline managers could review their incident

and command plans to enhance security counter-measures for terrorist attacks through the use of a well constructed plan-do-check-act (PDCA) tool, in the context of a Safety Management System (SMS), and incorporating a structured field survey into their emergency incident plan and command plan reviews.

Chapters thirteen to sixteen suggest computerized solution to existing aviation problems.

Chapter thirteen is titled *EPlanAirport: A Web-based tool to user-friendly decision-support systems for airport stakeholders and policy-makers*. EPlanAirport is a Web-based tool that allows running complex studies based on airport systems.

Chapter fourteen, *Airport Enterprise Service Bus with Self-Healing Architecture (AESB-SH)*, introduces the different aviation and airport Information Technology systems. Also, it provides architecture based on the Service Oriented Architecture (SOA) that improves the information accessibility and sharing across the different airport departments, integrates the existing legacy systems with other applications, and improves and maximizes the system's reliability, adaptability, robustness, and availability using the Self-Healing Agent and Virtual Web Service Connector to guarantee the Quality of Service (QoS).

Chapter fifteen, *Integrating Decision-Making Methodology, Flight Simulation and Computerized Systems to Advance Civil Aviation Safety*, focuses on the role of pilot/flightcrew training and performance evaluation in the identification and management of risk, especially while aloft and in changing conditions.

Chapter sixteen is titled: *Augmentation Systems: Use of Global Positioning System (GPS) in Aviation*. Several augmentation systems that serve local as well as wide coverage areas are discussed in this chapter, specifically the LAAS system, the WAAS system, as well as the EGNOS system. The architecture, as well the performance metrics for each of these augmentation systems, are presented and discussed.

Chapter seventeen through twenty one offer solutions to embedded problems in the IT world. The chapters discuss: simulation, networks congestion, Knowledge management, Virtual reality, and network analytical models.

Chapter seventeen, *Applying the Certification's Standards to the Simulation Study Steps*, presents the certification standards applied with the simulation study steps. In addition to the Confidence Grid which is used to assess the quality (reliability and accuracy) of the data and the process of the simulation study step which will be the base for the validation and verification.

Chapter eighteen is titled: *Derivation A Discrete-time Analytical Model Based on Dynamic Random Early Drop Algorithm*. Congestion in networks considered a serious problem, and in order to manage and control this phenomena in early stages before it occurs, a derivation of a new discrete-time queuing network analytical model based on dynamic random early drop (DRED) algorithm is derived to present analytical expressions to calculate three performance measures.

Chapter nineteen covers *Knowledge: an Information Systems Practical Perspective*. This chapter suggests to perceive knowledge from the point of view of IS, as an attempt to answer IS requirements better.

Chapter twenty is titled: *Virtual Reality in Architecture, Engineering and Beyond*. The aim of this chapter is to present how the VR also finds excellent application fields in architecture and in engineering. Examples include: in the teaching of the basic concepts, in techniques of graphic rebuilding for the building restoration, in realization of virtual visits inside buildings, and in urban generative processes simulated by computer.

Chapter twenty one is called: *Effects of Packet-Loss and Long Delay Cycles on the Performance of the TCP Protocol in Wireless Networks*. This chapter presents a description, derivation, implementation, and comparison of two well-known analytical models, namely, the PFTK and PLLDC models. The two models are based on the TCP Reno flavor as it is one of the more popular implementation on the Internet. These two models were implemented in a user-friendly TCP performance evaluation package (TCP-

PEP). The TCP-PEP was used to investigate the effect of packet-loss and long delay cycles on the TCP performance measured in terms of sending rate, throughput, and utilization factor. The results obtained from the PFTK and PLLDC models were compared with those obtained from equivalent simulations carried-out on the widely used NS-2 network simulator. The PLLDC model provides more accurate results (closer to the NS-2 results) than the PFTK model.

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# Chapter 1

## Aviation Industry and Environment Crisis: A Perspective of Impacts on the Human, Urban and Natural Environments

**Mostafa Jafari**

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### ABSTRACT

*This chapter was prepared based upon an invitation made by the Conference organizers, to be presented by the author as opening keynote speaker to highlight "Aviation Industry and Environment Crisis" and focus on the impacts on the human, urban and natural environments. The importance and various dimensions of the issue have been reported by the IPCC following a request from the ICAO and the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer in 1999.*

### INTRODUCTION AND BACKGROUND

This paper was drafted based on the Special Report that was prepared by the Intergovernmental Panel on Climate Change (IPCC) following a request from the International Civil Aviation Organization (ICAO) and the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (IPCC,

1999). In this context, the state of understanding of the relevant science of the atmosphere, aviation technology, and socio-economic issues associated with mitigation options is assessed and reported for both subsonic and supersonic fleets. The potential effects that aviation has had in the past and may have in the future on both stratospheric ozone depletion and global climate change are covered; environmental impacts of aviation at the local scale, however, are not addressed.

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## About the Contributors

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**Mostafa Jafari** was born in year 1956 in Tehran, Iran. He started in school in year 1962 and obtained Natural Diploma in 1974 (Tehran, after 12 years). He finished his first degree (B.Sc.) in Forest and Range, graduated in 1978 (Iran), and finished his Ph.D. in Plant Science (Ecology) in 1990 (UK). His Post doctorate research was in Plant Ecophysiology Methodology in 1997 (Japan). He is member of scientific board since 1990. His interest is in plant ecology, forestry, and climate change, and giving lectures in Universities on Ecophysiology, Ecology, Range Rehabilitation, Plant Geography. He is an advisor of several post graduate students in different universities. He enjoy from Membership to the different Professional Organizations. He was Director (President) of Research Institute of Forest and Rangelands, I.R. Iran, from 1992 to Nov. 1997 (With 600 staff including 250 scientific researcher and 900 research projects, publishing about 200 books in this period). He was Director of First Vice President Office of WMO, from August 2004 to 2009. He is Head of TP Secretariat of Low Forest Cover Countries (LFCCs, International Intergovernmental Organization). Since, March 2003, he is also International Affair Advisor to the Deputy Minister and Head of IRIMO since August 2004. He published 69 articles, 8 books, and 2 university textbooks. He is Managing Director of National Research Project on Climate Change in RIFR entitled: "Investigation on Climate Change Effects on Forest Ecosystems in Hyrcanian forests with Emphasize of Wood Dendrology Studies."

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**Hussein Abdel-Jaber** graduated and was awarded a BSc in Computer Sciences and Computer Information Systems from the Philadelphia University, Jordan in 2003. Moreover, Dr. Hussein Abdel-Jaber received his MSc in mobile computing from University of Bradford, U.K. in 2004 and from the same university he received his PhD, with research on congestion control of networks and network performance engineering. In 2009, he joined The World Islamic Sciences and Education (WISE) University as a head of the departments of computer Information Systems and network systems in the school of Information Technology. His research interests are in congestion control of networks (i.e. internet), queueing networks analysis using discrete-time queues or continuous-time queues, networks performance engineering, fuzzy logic control, and data mining. He has several research papers in the previous research interest's retrieval, and software engineering.

**Haitham Y. Adarbah** is a Lecturer at the Department of Computer Science, Faculty of Computing Studies, Gulf College, Muscat, Sultanate of Oman since 2008. He received his M.Sc degree in Computer Science from Amman Arab University for Graduate Studies, Amman, Jordan in 2008. His thesis title is: Modeling and Analysis of TCP Reno with Packet-Loss and Long Delay Cycles in Wireless Networks. His current research interests are studying the performance of TCP protocol in wired and wireless networks, developing efficient dynamic routing protocols for mobile ad hoc networks, wireless networks management and security, and ad hoc networks modeling and simulation. In addition, he is interested in data compression, signal processing, and distributed system architecture.

**Salih N Akour** is an Associate Professor of Mechanical Engineering at Sultan Qaboos University (SQU) since September 2008. He is on leave from the Mechanical Engineering Department at the Faculty of Engineering and Technology in the University of Jordan. He received his Ph.D. in Mechanical Systems from University of Central Florida (UCF) in 2000. Dr. Akour is a member of Phi Kappa Phi Honor Society and Jordan Engineering Association. Dr. Akour's current fields of research include design optimization, computer aided design/computer aided manufacturing/finite element analysis, rapid prototyping, rapid manufacturing and reverse engineering, 3-D biomedical modeling, structural dynamics, and composite materials and structures technology. He has published 16 journal papers and many conference proceedings papers. He has graduated 3 Ph.D. Students. Dr. Akour serves on a number of national professional committees. Dr. Akour is a reviewer of a number of international technical journals. He is a Consultant to some national industries: Seabird Aviation Jordan, Jordan Aerospace Industries, PREFAB (Prefabricated Buildings, Jordan), and also to some international industries in US through UCF- Lockheed Martin Missiles and Fire Control, US Filters, Siemens Westinghouse Power Corporation /Florida.

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