

# Maintenance Repair And Overhaul Mro Fundamentals And

This book constitutes the refereed post-proceedings of the 11th IFIP WG 5.1 International Conference on Product Lifecycle Management, PLM 2014, held in Yokohama, Japan, in July 2014. The 51 full papers presented were carefully reviewed and selected from 77 submissions. They are organized in the following topical sections: BIM operations, maintenance, and renovation; BIM concepts and lifecycle management; design and education; naval engineering and shipbuilding; aeronautical and automotive engineering; industry and consumer products; interoperability, integration, configuration, systems engineering; change management and maturity; knowledge engineering; knowledge management; service and manufacturing; and new PLM.

Strategic MRO: A Roadmap for Transforming Assets into Competitive Advantage combines the concepts of enterprise asset management and the associated maintenance, repair, and operating/overhaul (MRO) materials supply chain. It introduces the breakthrough Demand Supply Compression (DSC) methodology, which guides an organization's thinking and doing as it seeks performance improvement. Like Lean, DSC provides a practical path forward by changing a mind frame and the way in which work is performed. Focused on achieving a future perfect and guided by meaningful principles, organizations will learn to apply compression

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strategies to drive out waste, time, and non-value adding activities from their strategic MRO practices. Strategic MRO utilizes case studies from a wide variety of businesses to demonstrate strategic MRO practices and implementation — It can be successfully applied to any business where maximizing return on assets is critical to success. This is much more than a maintenance management or supply chain book because it encompasses both asset management and supply chain practices — Strategic MRO will transform your assets into a strategic advantage.

A-Z fact-packed guide to MRO leadership and training Industry shorthand for maintenance, repair, and overhaul, MRO is the key to air carrier safety and profitability (it could help you see as much as 25% growth over the next 5 years!). Written by Jack Hessburg, the award-winning chief mechanic and developer of the Boeing 777's computerized maintenance system, Air Carrier MRO Handbook fully explains and illustrates MRO in air carrier operations with charts, graphs, forms, tables, data, statistics, and figures -- the most complete and usable collection of MRO data ever assembled. This expert tunes up your knowledge base so you can streamline all phases and facets of operation. This is the resource you need to help your managers, engineers and technicians work within the industry's guidelines and interdependent network to facilitate partnerships, leadership, and profits.

"The purpose of this research is to examine a major commercial airline MRO [maintenance, repair, and overhaul] facility to determine the areas needing

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performance improvement as measured against the criteria of cost, delivery, quality, and reliability. The significance of this research is to suggest a strategic plan, to enable this MRO to achieve and sustain the competitive advantage over other commercial airlines and MRO vendors through an incremental cost-reduction."--Leaves 9-10.

Internet of Things Applications aims to provide a broad overview of various topics of Internet of Things (IoT) from the research, innovation, and development priorities to enabling technologies, nanoelectronics, cyber physical systems, architecture, interoperability, and industrial applications. It is intended to be a standalone book in a series that covers the IoT activities of the Internet of Things European Research Cluster (IERC) from technology to international cooperation and the global "state of play." The book builds on the ideas put forward by the IERC Strategic Research Agenda and presents global views and state-of-the-art results on the challenges the research, development, and deployment of IoT face at the global level. IoT is creating a revolutionary new paradigm with opportunities in every industry, including Health Care, Pharmaceuticals, Food and Beverage, Agriculture, Computer, Electronics Telecommunications, Automotive, Aeronautics, Transportation Energy, and Retail, to apply the massive potential of the IoT to achieving real-world solutions. The beneficiaries will include semiconductor companies, device and product companies, infrastructure software companies, application software companies, consulting companies, and telecommunication and cloud service

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providers. IoT will create new revenues annually for these stakeholders and potentially create substantial market share shakeups due to increased technology competition. The IoT will fuel technology innovation by creating the means for machines to communicate several different types of information with one another. At the same time, it will contribute to the increased value of information created by the number of interconnections among things and the transformation of the processed information into knowledge shared in the Internet of Everything. The success of IoT depends strongly on enabling technology development, market acceptance, and standardization, which provides interoperability, compatibility, reliability, and effective operations on a global scale. The connected devices are part of ecosystems connecting people, processes, data, and things which are communicating in the cloud, using the increased storage and computing power and pushing for standardization of communication and metadata. In this context, product manufacturers have to address security, privacy, safety, and trust through the life cycle of their products, from design to the support processes. The IoT developments address the whole IoT spectrum - from devices at the edge to cloud and datacentres on the backend and everything in between - through ecosystems created by industry, research, and application stakeholders that enable real-world use cases to accelerate the IoT and establish open interoperability standards and common architectures for IoT solutions. Enabling technologies such as nanoelectronics, sensors/actuators, cyber-physical

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systems, intelligent device management, smart gateways, telematics, smart network infrastructure, cloud computing, and software technologies will create new products, services, and interfaces by creating smart environments and smart spaces with applications ranging from Smart Cities, smart transport, buildings, energy, and grid to smart health and life. Technical topics discussed in the book include: \* Introduction \* Internet of Things Strategic Research and Innovation Agenda \* Internet of Things in the industrial context: Time for deployment. \* Integration of heterogeneous smart objects, applications and services \* Evolution from device to semantic and business interoperability \* Software define and virtualization of network resources \* Innovation through interoperability and standardisation when everything is connected anytime at anyplace \* Dynamic context-aware scalable and trust-based IoT Security, Privacy framework \* Federated Cloud service management and the Internet of Things \* Internet of Things Applications

The purpose of this MBA professional report is to supplement the long and short range strategic development efforts of Fleet Readiness Center Southwest (FRCSW) by providing command leadership with an analysis of the current aviation maintenance, repair, and overhaul (MRO) industry to identify potential expansion opportunities for FRCSW. Strategy development is dependent upon a solid, current and complete industrial analysis. An industrial analysis includes, 1) a definition of the industry, 2) a description of external forces acting upon the industry, 3) a description

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of the industry structure and 4) an examination of the key success factors that benchmark the requirements for a firm to stay competitive in the industry. These analyses provide FRCSW with the information required to leverage their core competencies to identify and capitalize on potential opportunities in the industry. This study identifies emerging trends, presents projected forecasts, identifies external forces on both the military aviation MRO industry and FRCSW, and discusses those factors that are key to long term success in the military aviation MRO industry. The conclusions present a number of opportunities for FRCSW to explore in their effort to remain the Navy's premier aviation depot.

Leveraging Information Technology for Optimal Aircraft Maintenance, Repair and Overhaul (MRO) Elsevier

Rockwell Automation's Allen-Bradley division was considering how to deal with the threat posed by national distributors in the maintenance, repair, and overhaul (MRO) business for its industrial automation products. National distributors were consolidating the MRO distribution channel, offering national account customers an integrated multichannel solution for their MRO needs. Allen-Bradley had traditionally served its customers through high-touch, high-value-added local distributors, but this channel was inadequate for the demands of large MRO customers. An effort by Allen-Bradley and other manufacturers to create an industry-wide electronic sourcing consortium called SourceAlliance.com had failed. Now the company

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had to choose between redesigning its traditional channel by creating a virtual network of local distributors, striking an alliance with a national distributor, or withdrawing from the MRO market. It had to contend with difficult channel conflict issues in choosing a channel strategy. To analyze the competitive strategy of a company serving the MRO market.

Maintenance, repair and overhaul (MRO) is a key activity in the lifecycle of an aircraft and its engines. Because of the typically long operational lifetimes expected from these costly assets, MRO is necessary to maintain these systems in a safe and functional condition, so that they can fulfill the operational role that they were designed for. The MRO system can be understood as a complex socio-technical system organized and operated to achieve aircraft availability and operation safety at minimal cost. As a complex socio-technical system, it consists of various layers: The environmental context, organizational structure, management, infrastructure, workers and the technical core. Focusing primarily on infrastructure, management, and manpower, this thesis seeks to identify best practices found within each layer by examining current practices in both commercial and military aircraft engine MRO, as well as surveying potentially useful concepts from related fields to propose how they can be applied to aircraft engine MRO. Among

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the issues presented are outsourcing, transportation, maintenance scheduling, inventory management, organization culture and human factors.

This unique resource covers aircraft maintenance program development and operations from a managerial as well as technical perspective.

Readers will learn how to save money by minimizing aircraft downtime and slashing maintenance and repair costs. \* Plan and control maintenance \*

Coordinate activities of the various work centers \*

Establish an initial maintenance program \* Develop a systems concept of maintenance \* Identify and monitor maintenance problems and trends

The global aviation industry is recovering from a recession that was triggered by the events following the events of 9/11. As airline traffic increases, so does the demand for engine maintenance, repair and overhaul (MRO). MTU is a German-based, globally operating, independent MRO provider and represented in North America through its Canadian subsidiary MTU Maintenance Canada. Since its launch in 1998, the company has been producing negative results and by the end of 2002, at the height of the worst crisis of the airline industry to date, the MTU board decided to change the business model for MTU Maintenance Canada. The company is now operated as a cost centre and "extended workbench" of MTU Maintenance Hannover. This strategy has allowed MTU to

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maintain its presence in North America and to limit the financial risk. However, while this has been a viable strategy during recession recent forecasts for the industry have been positive and a new strategy might be better suited in this change environment. This is the first practical, all-inclusive training and education handbook in the MRO (Maintenance, Repair, Overhaul) field, the most critical and evolving area in the aviation industry. Comprehensively explains and illustrates MRO in air carrier operations, demonstrating how it works--and how MRO managers, executives, engineers and technicians can work within the industry's guidelines and interdependent network to facilitate partnerships, leadership, and profits. Includes charts, graphs, forms, tables, data, statistics, and figures pertaining to air carrier MRO.

Welcome to the proceedings of the 8 International Conference on Pervasive Computing (Pervasive 2010). After Toronto, Sydney and Nara, the conference has now returned to Europe. Pervasive is one of the most important conferences in the area of pervasive and ubiquitous computing. As in the previous year, we had two categories of technical papers: Full Papers and Notes. Pervasive attracted 157 valid submissions, from which the Technical Program Committee (TPC) accepted 24 full papers and one note, resulting in an overall acceptance rate of 16%. The submissions included 628 authors from 27

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countries representing all the continents (except Antarctica). As we can see from these figures, Pervasive is a truly global highly competitive conference. A major conference such as Pervasive requires a rigorous and objective process for selecting papers. This starts with the selection of a high-quality TPC. We were fortunate to be able to draw on the wisdom and experience of our 28 TPC members, from the most prestigious universities and research labs in Europe, North America, and Asia. This committee was aided by the input of no less than 238 external reviewers chosen on the basis of their domain knowledge and relevance to pervasive computing. The papers were selected using a double-blind review, with four peer reviews per paper, a discussion phase among the reviewers, and a discussion of the papers in the TPC meeting, which was held in Palo Alto during December 12-13, 2009. We thank Nokia Research Center for hosting the meeting.

The major objective of this book was to identify issues related to the introduction of new materials and the effects that advanced materials will have on the durability and technical risk of future civil aircraft throughout their service life. The committee investigated the new materials and structural concepts that are likely to be incorporated into next generation commercial aircraft and the factors influencing application decisions. Based on these predictions, the committee attempted to identify the

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design, characterization, monitoring, and maintenance issues that are critical for the introduction of advanced materials and structural concepts into future aircraft.

TRB's Airport Cooperative Research Program (ACRP) Synthesis 79: Funding Industrial Aviation explores how airports fund the infrastructure to support industrial aviation development. For this report, industrial aviation development includes but is not limited to: aircraft maintenance, repair, and overhaul (MRO), specialized aviation services such as paint and interior completion (single service operators, SSOs), aircraft manufacturing and assembly, aircraft fabrication and development, aviation warehousing, cold ports, spaceports, unmanned aerial systems (UAS) platform development.

. . . Eat not up your property among yourselves unjustly except it be a trade amongst you, by mutual consent . . . and help you one another in righteousness and piety. . . (Al-Hadid 4:29; Al-Ma'idah 5:2) There cannot be any doubt that the current financial crisis, which began in the US, has gone global. This realization has fuelled the fire of debate over globalization. Today's globalization is no longer the globalization that Theodore Levitt, a former professor at the Harvard Business School, described in 1983 in his world famous article "The Globalization of Markets. " Although, in old days,

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Levitt and his successors had not seen globalization as an utopian state free of problems, no- days globalization has been reshaped completely. Therefore, in the perception of the editors it is justifi?ed to use the phrase “Globalisation 2. 0” for the range of effects interpenetrating global economic arrangements. Globalisation 1. 0 will never be restored again. Since the subprime crisis made its way to the global arena in the year 2008, companies and managers are confronted with the breathtaking speed of global, regional, and local changes. It is more than a provocation to divide dev- opments into cause and effects. Forecasts in strategic management are no longer valid even for the moment they are published. Uncertainty occupies the driving seats in global, regional, and local oriented companies.

**BOOST PROFITS AND REDUCE COSTS BY EFFICIENTLY DELIVERING SUPERIOR MRO SERVICES** Lean Maintenance Repair and Overhaul describes how MRO organizations can achieve significant improvement in financial performance by applying the Theory of Constraints (TOC) to guide the implementation of Lean manufacturing tools. This Lean/TOC approach facilitates a growth strategy by providing customer value, such as faster turnaround times, that the competition cannot match. Lean/TOC creates the capacity for this growth by eliminating waste. This practical guide shows how

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Lean/TOC also provides the improvement strategy for dealing with the variation that distinguishes MRO from high-volume, repetitive manufacturing. The methodology expands the improvement efforts beyond the manufacturing floor to make the organizational changes needed to facilitate growth and to empower the workforce to be enthusiastic participants in the improvement processes. You will learn how these concepts have been applied to MRO organizations in the commercial and defense sectors. **COMPREHENSIVE COVERAGE**

**INCLUDES:** The MRO business opportunity The goal of Lean and how Lean for MRO is different Achieving sustained growth in the MRO business Managing the MRO process Enabling flow in an MRO environment The Lean MRO toolkit Managing the back-shops Creating a visual culture for the implementation of Lean/TOC

Military supply chains are unique because what is supplied to the end user is routinely returned to the supply chain for maintenance, repair, and overhaul (MRO). Offering a blueprint for transforming military depot workload and processes into those of high-performance commercial facilities, **Enterprise Sustainability: Enhancing the Military's Ability to Perform its Mission** provides a powerful system of concepts and tools for enhancing the ability of the military to perform MRO on its weapon systems. These concepts and tools are applicable to any

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enterprise, military or commercial, that is concerned about sustainability. The text focuses on five abilities that must be considered to achieve efficient, cost-saving operations: Availability of required parts, facilities, tools, and manpower Dependability of the weapon systems Capability of the enterprise to perform the mission Affordability and improving the life cycle cost (LCC) of a system or project Marketability of concepts and motivating decision makers Aging weapons systems, an aging workforce, limited financial resources, new technologies, and an increased military operational tempo demand that the military develop an aggressive transformation plan for its sustainability. This book follows An Architecture for a Lean Transformation, the first in a series dedicated to the sustainment of an enterprise. In this second volume, the authors continue to provide an analysis of, and prescription for, the strategies, principles, and technologies that are necessary to sustain an enterprise like the military and the weapons system it develops and utilizes.

Interest in the phenomenon known as "lean" has grown significantly in recent years. This is the first volume to provide an academically rigorous overview of the field of lean management, introducing the reader to the application of lean in diverse application areas, from the production floor to sales and marketing, from the automobile industry to

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academic institutions. The volume collects contributions from well-known lean experts and up-and-coming scholars from around the world. The chapters provide a detailed description of lean management across the manufacturing enterprise (supply chain, accounting, production, sales, IT etc.), and offer important perspectives for applying lean across different industries (construction, healthcare, logistics). The contributors address challenges and opportunities for future development in each of the lean application areas, concluding most chapters with a short case study to illustrate current best practice. The book is divided into three parts: The Lean Enterprise Lean across Industries A Lean World. This handbook is an excellent resource for business and management students as well as any academics, scholars, practitioners, and consultants interested in the "lean world."

Operation, Maintenance, and Repair of Land-Based Gas Turbines provides a toolkit for practitioners seeking to make techno-economic decisions on life extension of power turbine equipment. The work describes essential degradation modes affecting critical components and proven methods of restoration. Sections discuss key elements of life extensions for aging units and components, together with critical reviews of available methodologies. Coverage includes advanced nondestructive testing methods essential for effective life extension

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programs, including lessons learned from firsthand experience working with multiple machine designs, classes and operating conditions. The final sections cover a body of solutions intended to refocus ORM processes on overcoming the shortfalls caused by volatilities and system restructuring. Reviews best practices for practitioners seeking to make decisions on gas turbine maintenance, repair and operations Analyzes components and major sections in terms of functionality, critical features, residual properties and service caused damages Explains the applicability and limitations of special processes and advanced non-destructive testing methods

After the IPS2 conferences in Cranfield and Linköping in 2009 and 2010 the 3rd CIRP International Conference on Industrial Product Service Systems (IPS2) 2011 takes place in Braunschweig, Germany. IPS2 itself is defined as “an integrated industrial product and service offering that delivers value in use”. The customers expect comprehensive solutions, which are adapted to their individual needs. IPS2 offers the possibility to stand out from competition and for long-term customer loyalty. Particularly in times of economic crisis it becomes apparent which producing companies understand to satisfy the needs and requirements of their customers. Especially in this relatively new domain IPS2 it will be important to keep track of the whole context and to seek cooperation with other

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research fields and disciplines. The 3rd CIRP International Conference on Industrial Product Service Systems (IPS2) 2011 serves as a platform for such collaborations and the discussion of new scientific ideas.

This book provides a state-of-the-art overview of the changes and development of the civil international aircraft/aviation industry. It offers a fully up-to-date account of the international developments and structure in the aircraft and aviation industries from a number of perspectives, which include economic, geographical, political and technological points of view. The aircraft industry is characterized by very complex, high technology products produced in relatively small quantities. The high-technology requirements necessitate a high level of R&D. In no other industry is it more of inter-dependence and cross-fertilisation of advanced technology. Consequently, most of the world's large aircraft companies and technology leaders have been located in Europe and North America. During the last few decades many developing countries have tried to build up an internationally competitive aircraft industry. The authors study a number of important issues including the political economy of the aircraft industry, globalization in this industry, innovation, newly industrializing economies and the aircraft industry. This book also explores regional and large aircraft, transformation of the aviation industry in Central and Eastern Europe, including engines, airlines, airports and airline safety. It will be of great value to students and to researchers seeking information on the aircraft industry

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and its development in different regions.

Aircraft maintenance, repair and overhaul (MRO) requires unique information technology to meet the challenges set by today's aviation industry. How do IT services relate to aircraft MRO, and how may IT be leveraged in the future? *Leveraging Information Technology for Optimal Aircraft Maintenance, Repair and Overhaul (MRO)* responds to these questions, and describes the background of current trends in the industry, where airlines are tending to retain aircraft longer on the one hand, and rapidly introducing new genres of aircraft such as the A380 and B787, on the other. This book provides industry professionals and students of aviation MRO with the necessary principles, approaches and tools to respond effectively and efficiently to the constant development of new technologies, both in general and within the aviation MRO profession. This book is designed as a primer on IT services for aircraft engineering professionals and a handbook for IT professionals servicing this niche industry, highlighting the unique information requirements for aviation MRO and delving into detailed aspects of information needs from within the industry. Provides practical and realistic solutions to real-world problems Presents a global perspective of the industry and its relationship with dynamic information technology Written by a highly knowledgeable and hands on practitioner in this niche field of Aircraft Maintenance This book gathers select contributions from the 32nd International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management

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(COMADEM 2019), held at the University of Huddersfield, UK in September 2019, and jointly organized by the University of Huddersfield and COMADEM International. The aim of the Congress was to promote awareness of the rapidly emerging interdisciplinary areas of condition monitoring and diagnostic engineering management. The contents discuss the latest tools and techniques in the multidisciplinary field of performance monitoring, root cause failure modes analysis, failure diagnosis, prognosis, and proactive management of industrial systems. There is a special focus on digitally enabled asset management and covers several topics such as condition monitoring, maintenance, structural health monitoring, non-destructive testing and other allied areas. Bringing together expert contributions from academia and industry, this book will be a valuable resource for those interested in latest condition monitoring and asset management techniques.

**Aerospace Predictive Maintenance: Fundamental Concepts**, written by longtime practitioner Charles E. Dibsedale based in the UK, considers PdM a subset of Condition Based Maintenance (CBM), and must obey the same underlying rules and pre-requisites that apply to it. Yet, PdM is new because it takes advantage of emerging digital technology in sensing, acquiring data, communicating the data, and processing it. This capability can autonomously analyse the data and send alerts and advice to decision makers, potentially reducing through-life cost and improving safety.

**Aerospace Predictive Maintenance: Fundamental**

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Concepts provides a history of maintenance, and how performance, safety and the environment make direct demands on maintenance to deliver more for less in multiple industries. It also covers Integrated Vehicle Health Management (IVHM) that aims to provide a platformcentric framework for PdM in the mobility domain. The book discusses PdM maturity, offering a context of the transformation of data through information and knowledge. Understanding some of the precepts of knowledge management provides a really useful and powerful perspective on PdM as an information system. On the other hand, Aerospace Predictive Maintenance: Fundamental Concepts also discusses disadvantages of PdM and shows how these may be addressed. One of the fundamental changes PdM implies is a shift from deterministic black-and-white thinking to more nuanced decision making informed by probabilities and uncertainty. Other concerns such as data management, privacy and ownership are tackled as well. Aerospace Predictive Maintenance: Fundamental Concepts covers additional technologies, such as the Industrial Internet of Things (IIOT) that will result in proliferation of cheap, wireless, ultra-low-power sensors, and will transform PdM into a more economical option. The book brings in the future possibilities of nano technology, which can be used for new sensors, micro-robotics for inspections and self-healing/repairing of systems which can be intergrated with PdM.

Introduction to Maintenance, Repair and Overhaul of Aircraft, Engines and Components brings together the basic aspects of a fundamentally important part of the

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aerospace industry, the one that supports the global technical efforts to keep passenger and cargo planes flying reliably and safely. Over time, aircraft components and structural parts are subject to environmental effects, such as corrosion and other types of material deterioration, wear and fatigue. Such parts could fail in service and affect the safe operation of the aircraft if the degradation were not detected and addressed in time. Regular planned maintenance supports the current and future value of the aircraft by minimizing the physical decline of the aircraft and engines throughout its life. Introduction to Maintenance, Repair and Overhaul of Aircraft, Engines and Components was written by the industry veteran, Shevantha K. Weerasekera, an aerospace engineer with 20+ years of aircraft maintenance experience, who currently leads the engineering team of a major technical enterprise in the field.

MRO organizations perform product maintenance, repairs and overhauls as their core business. When a customer sends their product for MRO services it is called an Event. More than any other type of interaction, Events are especially important to the customer and stand out disproportionately in their minds as they judge the quality of your organization. While much has been written about customer service excellence, very little has been written about the unique dynamics and needs of organizations that perform MRO services or the Event Teams that deliver them. In PART I we will discover an enormous opportunity to dramatically improve the customer's experience in the MRO enterprise by

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optimizing the performance of the entire Event Team. In PART II we will learn about the critical role of the Customer Event Manager (CEM) - part of the customer support function and a key member of the Event Team - and how to optimize this customer-facing role to provide world-class service.

"Changing market requirements and increased competition have been driving the economy to shift from production of material goods to integrated product and service offerings, aiming at increased customer value by delivering function availability instead of just the physical product. This trend has led to what is known in the literature as Product-Service Systems(PSSs), and has generated significant research since the turn of the century, aiming at developing design methods and innovative business models that create integrated manufacturers and service providers. Even though one of the first PSSs examples stems from the aviation industry, the focus of this thesis, our literature review indicated that there is a lack of proper structured service design methods for integrated value assessment encompassing all key stakeholders. As a result, service models are not as effective due to uninformed decision making typically based solely on general market trends. Motivated by this challenge, the first contribution of this thesis is a quantitative approach that integrates tactical and operational activities to support the decision-making process during the design and development of aviation PSSs. A combination of Quality Function Deployment and Design-to-Cost techniques is proposed to aid design engineers in determining the relations among value to

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customer, functional requirements, and design variables and cost. The objective is to identify PSS design alternatives that deliver value to customer while respecting cost targets. An aviation software case study is conducted to demonstrate the proposed approach. The second contribution of this thesis is a quantitative method to support design of more collaborative and sustainable PSS business models between airframe Original Equipment Manufacturers (OEMs) and independent aviation Maintenance, Repair, and Overhaul (MRO) enterprises, in order to deliver higher value-added to operators. A mathematical model has been developed to map the main business interactions between OEMs and MROs, establishing the relation between the amount of operational resources invested in the PSS by each stakeholder and the final value delivered to aircraft operators. The typical business relationships have been mapped from a real independent MRO in South America and its stakeholders. Real data have been used in multiple scenarios to demonstrate the effectiveness of the model in assessing the collaboration level of each stakeholder while measuring their financial return as well as the value generated to the aircraft operators." --

The U.S. Air Force is grappling with the challenge of aging fleets and when it might be optimal to replace those fleets. This monograph examines commercial aviation data with the goal of drawing inferences and lessons about aging aircraft that may be relevant to the Air Force. It focuses on "aging effects" - i.e., how

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commercial aircraft maintenance costs change as aircraft grow older. Although commercial aircraft clearly differ from military aircraft, commercial aviation aging-effect estimates might help the Air Force to project how its maintenance costs will change over time and how those costs might evolve for new commercially analogous aircraft not yet in its inventory. This study found that commercial-airline inflation-adjusted total aircraft maintenance costs, per flight hour, rise substantially as aircraft come off the manufacturer's warranty after a few years of operation, and then rise at about a 3.5 percent annual rate for aircraft six to 12 years old, but are nearly unchanged for aircraft 12 to 25 years old. The passenger airline industry in the United States has gone through significant changes since deregulation in 1978. In domestic operations, airlines now have almost total freedom to determine which markets to serve and what airfares to charge. Competitive forces, as well as higher fuel prices and changing travel patterns, have placed the industry under financial pressure, as evidenced by numerous mergers and bankruptcies. To stay competitive and profitable, many airlines have joined alliances. Price competition has forced airlines to contain costs. One of the practices aimed at keeping costs competitive is the outsourcing of aircraft maintenance, repair, and overhaul (MRO), either domestically or to foreign countries. This book focuses on U.S.

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passenger airlines because their outsourcing of maintenance, especially to foreign countries such as China and El Salvador, has generated specific concern among Members of Congress. This book analyzes trends in MRO outsourcing and explains the major factors contributing to them; considers safety consequences, employment effects, and regulatory implications of increased foreign maintenance of U.S. passenger aircraft; provides factors affecting U.S. titanium aircraft component manufacturers' markets; and discusses the manufacturing trends of unmanned aircraft systems. Demonstrating the latest research and analysis in the area of through-life engineering services (TES), this book utilizes case studies and expert analysis from an international array of practitioners and researchers – who together represent multiple manufacturing sectors: aerospace, railway and automotive – to maximize reader insights into the field of through-life engineering services. As part of the EPSRC Centre in Through-life Engineering Services program to support the academic and industrial community, this book presents an overview of non-destructive testing techniques and applications and provides the reader with the information needed to assess degradation and possible automation of through-life engineering service activities . The latest developments in maintenance-repair-overhaul (MRO) are presented

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with emphasis on cleaning technologies, repair and overhaul approaches and planning and digital assistance. The impact of these technologies on sustainable enterprises is also analyzed. This book will help to support the existing TES community and will provide future studies with a strong base from which to analyze and apply technological trends to real world examples.

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