

MODULE –V

APPLICATION OF NEW AND EMERGING TECHNOLOGY IN AVIATION INDUSTRY

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EMERGING TECHNOLOGY IN AVIATION

INTRODUCTION:

- ▶ SIGNIFICANT TECHNOLOGICAL ADVANCES – ICT, AI/ML, ROBOTICS, NANOTECH, QUANTUM COMPUTING ETC
 - ▶ SOCIAL AND ECONOMIC BENEFITS
 - ▶ LEGAL ASPECTS
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FUTURE OF AIR TRAVEL IN AGE OF NEW TECHNOLOGY

- ALTERNATIVE FUELS
- NEW AIRCRAFT TECH
- ALTERNATIVE MODES OF RAPID TRANSPORT – HYPERLOOP ETC

MAJOR DRIVERS OF AVIATION

- SOCIETY
 - ENVIRONMENT
 - POLITICS
 - ECONOMY
 - TECHNOLOGY
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COVID 19 AND ITS EFFECTS ON TECHNOLOGY

- ▶ CHANGE IN WORKING CULTURE – WFH AND PRODUCT DEMAND SHIFT
 - ▶ INCREASED WORK FROM HOME- CYBER SECURITY CONCERNS
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DIGITISATION

- ▶ AFFECTS WHOLE TRAVEL INDUSTRY INCL AVIATION
 - ▶ DIGITAL COMPUTING
 - ▶ INTERNET NETWORKING
 - ▶ CRYPTOGRAPHY
- ▶ ARTIFICIAL INTELLIGENCE
 - ▶ TRANSFORMS CUTOMER EXPERIENCE
 - ▶ BIOMETRICS FOR CHECKING-IN
 - ▶ LEGAL CONSIDERATIONS
- ▶ AIRPORTS TO EMBRACE DIGITISATION AS PER CUSTOMER NEEDS
 - ▶ FIRSTLY, NO AIRPORT IS THE SAME AND ACCORDINGLY, AIRPORTS WILL HAVE DIFFERENT NEEDS AND PRIORITIES WHEN IT COMES TO IMPLEMENTING DIGITAL TECHNOLOGIES
 - ▶ SECONDLY, AIRPORTS ARE AT VARIOUS STAGES WHEN IT COMES TO IMPLEMENTATION. WHILE MOST AIRPORTS ARE TRANSITIONING AWAY FROM AIRPORT 2.0 (SELF-SERVICE AND PROCESS EFFICIENCY) TO AIRPORT 3.0 (USING DIGITAL TO OPTIMIZE FLOW MONITORING AND PASSENGER PROCESSING) THIS MASKS A NUMBER OF DIFFERENCES IN AIRPORTS' UNDERSTANDING, FREEDOM OF ACTION AND OVERALL STRATEGY

IMPACT OF ICT ON AVIATION INDUSTRY

- ▶ 1970S COMPUTERISED RESERVATION SYSTEM
- ▶ 80S GLOBAL DISTRIBUTION SYSTEM
- ▶ 90S INTERNET
- ▶ 20TH CENTURY WORLD WIDE WEB
- ▶ 21ST CENTURY ONWARDS LEAPS AND BOUNDS IN TECHNOLOGY

INCREASING OPERATIONAL EFFICIENCY

CUSTOM SOFTWARE FOR COMPETITIVE ADVANTAGE

CUSTOMER PREFERENCES DRIVEN PROCESS

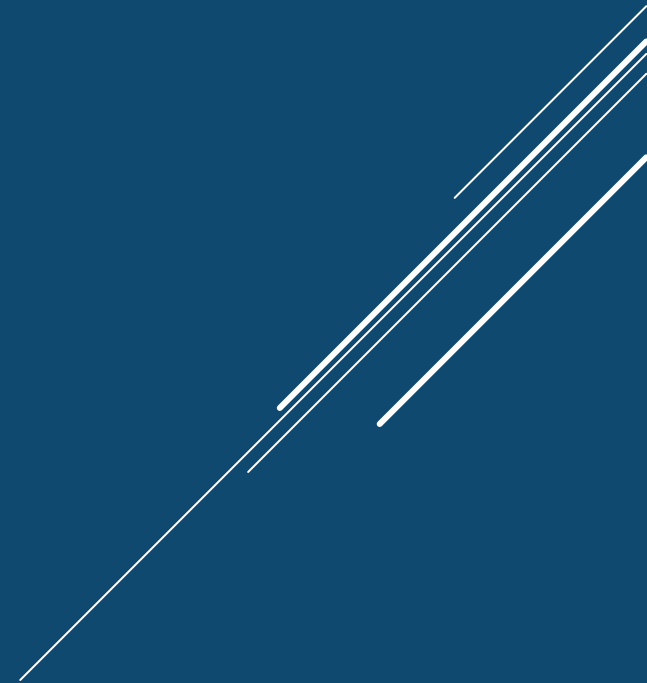
ELECTRONIC DOCUMENTATION

AIRCRAFT PERFORMANCE

CREW MANAGEMENT

FUEL EFFICIENCY

LIVE FLIGHT TRACKING



BIG DATA

RESHAPING BUSINESS

DATA OF AIRCRAFT PERFORMANCE VIS-À-VIS FUEL, LOADING PASSENGERS ETC

E.G., BOEING 787 CREATES HALF A TERABYTE OF DATA ON EVERY FLIGHT. COMBINED WITH WEATHER FORECASTS, CUSTOMER SERVICE DATA, TICKETING INFORMATION, AND AIRPORT COMMUNICATIONS, THIS VAST OCEAN OF DATA OFFERS A WEALTH OF BUSINESS INTELLIGENCE.

KEY BENEFITS OF LEVERGING BIG DATA-

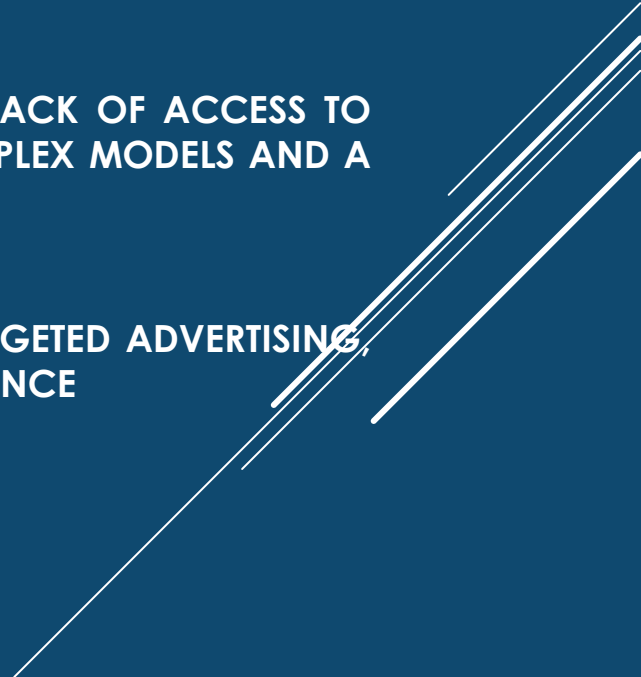
SMARTER MAINTENANCE

SAFER FLIGHTS

EXAMPLES

- Navblue, an Airbus company, offering the N-software, able to produce best-in-class aero data targeting airspace re-design;
- Sky-breath, offered by Open Airlines, promises to exceed 2% on fuel savings thanks to big data analysis
- Honeywell software helps airline flight operations managers to quickly understand fuel consumption trends, identify savings opportunities, monitor progress of savings initiatives and demonstrate results
- ACE offers a more effective fuel management through improvement of daily operations, strategic planning and operational efficiency
- UTC offers enabling improvements in operational efficiency by integrating flight planning, avionics data, flight performance tracking and weather data with real-time updates and notifications
- Flight Scanner, offered by Safety Line, offers to automatically identify the factors associated with hazardous situations based on all flight data

ARTIFICIAL INTELLIGENCE

- ▶ MARKET FOR AI IN AIRLINES IS EXPECTED TO REACH \$2.2BN BY 2025
 - ▶ AI CAN HELP THE AVIATION INDUSTRY WITH MACHINE VISION, MACHINE LEARNING, ROBOTICS, AND NATURAL LANGUAGE PROCESSING
 - ▶ SIGNIFICANT ROLE IN CUTTING COSTS, REDUCING DESIGN CYCLE TIME, SIMULATION, PROTOTYPING, OPTIMIZATION, MAINTENANCE, MANUFACTURING AND UPDATING PRODUCTS AND IS ALL SET TO DRIVE MANY DEVELOPMENTS IN THE AEROSPACE SECTOR
 - ▶ LIMITED ADOPTION OF MACHINE LEARNING IN AVIATION INDUSTRY AND MAIN REASON IS LACK OF ACCESS TO HIGH-QUALITY DATA, INCREASED DEPENDABILITY ON SIMPLE MODELS AS COMPARED TO COMPLEX MODELS AND A LACK OF SKILLED WORKFORCE
 - ▶ AIRLINES USE AI FOR PREDICTIVE ANALYTICS, PATTERN RECOGNITION, AUTO SCHEDULING, TARGETED ADVERTISING, AND CUSTOMER FEEDBACK ANALYSIS SHOWING PROMISING RESULTS FOR BETTER FLIGHT EXPERIENCE
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AI & ML

- ▶ AIRLINES AND AIRPORTS ADOPTING CHATBOTS TO COMMUNICATE WITH PASSENGERS, AND ON THE OTHER TO IMPROVE OPERATIONS
 - ▶ AIRASIA DEVELOPED AND LAUNCHED ITS AIRASIA VIRTUAL ALLSTAR (AVA), A CONTINUOUSLY LEARNING AI-POWERED CHAT PLATFORM
 - ▶ DELTA AIRLINE CLAIMS THAT IT IS APPLYING AI-DRIVEN MACHINE LEARNING PLATFORM TO ANALYSE MILLIONS OF OPERATIONAL DATA POINTS – FROM AIRCRAFT POSITIONS TO FLIGHT CREW RESTRICTIONS TO AIRPORT CONDITIONS – TO CREATE HYPOTHETICAL OUTCOMES THAT HELP MAKE CRITICAL DECISIONS BEFORE, DURING AND AFTER LARGE-SCALE DISRUPTIONS
 - ▶ IDENTIFICATION OF PASSENGERS
 - ▶ CHECK IN
 - ▶ CUSTOMER SERVICE AGENTS
 - ▶ BAGGAGE SCREENING
 - ▶ MAINTENANCE PREDICTION
 - ▶ FUEL EFFICIENCY
 - ▶ ASSISTING CUSTOMERS
 - ▶ GENERATIVE DESIGN
 - ▶ SUPPLY CHAIN MANAGEMENT
 - ▶ QUALITY
- 

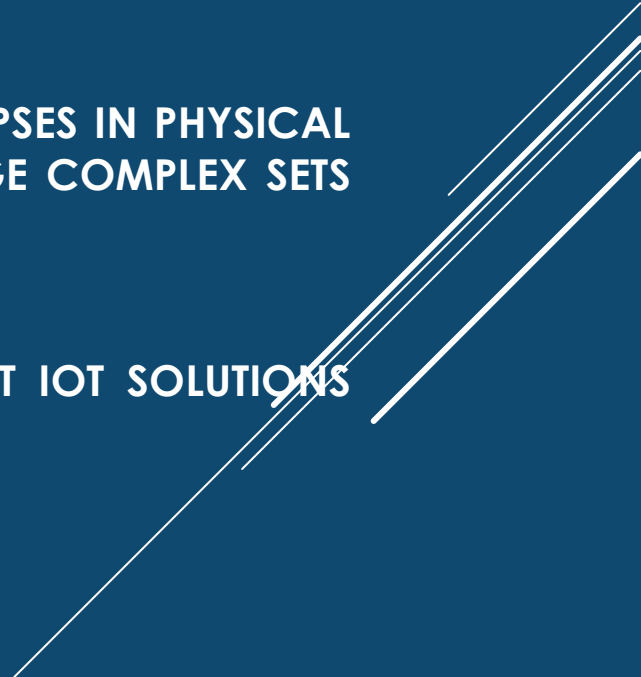
AI & ML

- ▶ TRAINING
- ▶ AI ROBOTIC PILOT
- ▶ FLIGHT ENGINEERS AND PILOTS
- ▶ BOMBER PILOTS
- ▶ GROUND ATTACK PILOTS
- ▶ HELICOPTER PILOTS
- ▶ NEW AND EMERGING TECHNOLOGIES

IOT

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CHALLENGES

- ▶ SECURITY, NAMELY CYBERSECURITY, IS A PRIME CONCERN WHEN ADOPTING IOT
 - ▶ SAFETY- ERRORS IN HARDWARE AND SOFTWARE TECHNOLOGY MAY POSE A SAFETY ISSUE. AS AN EXAMPLE, THINK OF WHAT CAN GO WRONG IF AN IOT SOLUTION MAKES ERRORS IN THE FUEL UPLIFT CALCULATIONS OR FUEL ORDERING PROCESS
 - ▶ CONSERVATIVE NATURE OF THE AVIATION INDUSTRY, POSES A RISK TO THE ADOPTION OF IOT
 - ▶ DISJOINTED IOT INITIATIVES CAN EXTEND TO REGULATORY COMPLIANCE ISSUES, LAPSES IN PHYSICAL SAFETY, CYBER-SECURITY RISKS AND DECREASED CAPABILITIES OF HANDLING LARGE COMPLEX SETS OF DATA.
 - ▶ NO “TURN-KEY” IOT SOLUTIONS. IT’S SAFER AND MORE PRACTICAL TO IMPLEMENT IOT SOLUTIONS GRADUALLY AND OVER TIME
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PROCEDURAL ASPECTS FOR IMPLEMENTATION

- ▶ IDEATION AND STRATEGY - THE BUSINESS STRATEGY SHOULD BE DETERMINING YOUR TARGETS AND AREAS OF IMPROVEMENT, BUT USE IDEATION WORKSHOPS AND ECOSYSTEM CONTACTS TO FIGURE OUT HOW TO ADDRESS THESE AREAS, GOING BEYOND THE NORM AND TRULY INNOVATING
 - ▶ PILOT AND ROADMAP - THE IDEA IS TO “LEARN FAST “AND ITERATE AS YOU GO ALONG, OVERPLAYING IS OFTEN THE DEATH OF INNOVATION
 - ▶ CAPTURE, STORE, AND PROCESS - FOR IOT INITIATIVES TO BE SUCCESSFUL, ONE NEED A WAY TO GET AHOLD OF THE RIGHT DATA, PROCESS IT AND STORE IT - USING EDGE COMMUTING AND CLOUD TECHNOLOGY - AND FINALLY, YOU’LL NEED TO BE ABLE TO ANALYZE IT
 - ▶ SCALE AND DEPLOY - ONCE YOU HAVE PROOF OF CONCEPT, PAY MIND TO PRIVACY RULES, SECURITY AND GLOBAL CAPABILITIES, ALL CRITICAL FACTORS DETERMINING SCALABILITY
 - ▶ OPERATE - MEASURE PERFORMANCE AND OVERALL CONTRIBUTION TO BUSINESS METRICS. NOW IMPROVE, REPEAT AND MEASURE AGAIN.
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BLOCK-CHAIN TECHNOLOGY

POTENTIAL APPLICATIONS:

- SECURE, IMMUTABLE AND DECENTRALIZED FEATURES HELP AEROSPACE COMPANIES REDUCE MAINTENANCE COSTS, INCREASE AIRCRAFT AVAILABILITY, AND MINIMIZE ERRORS IN TRACKING AIRCRAFT PARTS
- WELL-SUITED TO IMPROVE THE PERFORMANCE OF ONE OF THE WORLD'S MOST COMPLEX, GLOBALLY INTERCONNECTED AND SECURITY-DEPENDENT SUPPLY CHAINS, POTENTIAL TO DELIVER PROFOUND BENEFITS FOR THE HUNDREDS OF SUPPLIERS TYPICALLY INVOLVED IN THE MANUFACTURING OF A SINGLE AIRCRAFT. IN LONG TERM CONNECT THE MANY LOOSE ENDS IN THE SUPPLY CHAIN COULD PROVE REVOLUTIONARY. OFFERS WAY TO TRACK AND PROVIDE CONSISTENT AIRCRAFT CONFIGURATION DATA ACROSS THE SUPPLY CHAIN
- PARTS TRACEABILITY. HOLDS THE KEY TO TRANSFORMING MAINTENANCE LOGS AND PARTS TRACEABILITY. HELP ENSURE PARTS PRODUCED ARE LEGITIMATE AND LIVE UP TO NECESSARY AIRWORTHINESS REQUIREMENTS, AND OFFER VIRTUALLY IMMUTABLE RECORD OF EVERY PART ON AN AIRCRAFT, AS WELL AS EVERY TIME IT'S BEEN HANDLED AND BY WHOM. AIRLINES ABLE TO SELL AND PURCHASE PARTS WITH CONFIDENCE THAT DOCUMENTATION IS ACCURATE AND COMPLIANT WITH ALL MAINTENANCE REGULATIONS

BLOCK-CHAIN TECHNOLOGY

POTENTIAL APPLICATIONS:

- SIMPLIFY AND AUTOMATE LOYALTY PROGRAM TRANSACTIONS AND BOOKKEEPING. CREATING A COMMON DIGITAL CURRENCY - CALLED TOKENS, IN THE BLOCK CHAIN - TRAVELLERS CAN GET INSTANT VALUE ON THE SPOT. AIRLINE GET A MUCH CLEARER UNDERSTANDING OF REVENUE FLOWS FROM REWARD PROGRAMS
- INTRODUCING SO-CALLED SMART CONTRACTS. AUTOMATE THE SUPPLY CHAIN TRANSACTIONS, POTENTIALLY REMOVING NEED TO PROCESS INVOICES AND PAYMENTS, AS THE BLOCK CHAIN WOULD OPERATE ON A STANDARDIZED, COMMONLY-AGREED MICROPAYMENT BASIS. SMART CONTRACTS USED TO STANDARDIZE AND AUTOMATE LEASING CONTRACTS OF ENTIRE AIRCRAFT, ANOTHER POPULAR TREND IN THE AVIATION INDUSTRY
- NEW, ELEGANT AND SECURE WAY FOR THE INDUSTRY TO TRACK AND TRACE MYRIAD COMPONENTS WHILE DETERRING COUNTERFEITING AND IMPROVING MAINTENANCE CAPABILITIES. USED IN COMBINATION WITH TECHNOLOGIES LIKE DIGITAL TWINS AND DIGITAL THREADS, BLOCK CHAIN COULD ULTIMATELY BE A GAME-CHANGING INNOVATION FOR THIS SECTOR

OTHER EMERGING TECHNOLOGY

▶ PREDICTIVE ANALYSIS

▶ PRESCRIPTIVE MAINTENANCE

▶ ROBOTICS

- ▶ FRAPORT'S NEW SELF-DRIVING GUIDE ROBOT, CALLED YAPE, FOR LUGGAGE TRANSPORTATION
- ▶ "AIRSTAR" ROBOT AT INCHEON AIRPORT
- ▶ MUNICH AIRPORT'S JOSIE PEPPER
- ▶ BRITISH AIRWAYS' PARTNERSHIP WITH STARTUP COMPANY BOTS AND US TO TEST AI-POWERED AUTONOMOUS ROBOTS AT HEATHROW TERMINAL 5 TO FURTHER ENHANCE PUNCTUALITY FOR PASSENGERS
- ▶ VANDERLANDE'S END-TO-END BAGGAGE LOGISTICS SOLUTION FLEET, DEPLOYED AT ROTTERDAM THE HAGUE AIRPORT, AND TRIALED AT HONG KONG INTERNATIONAL AIRPORT TO FURTHER IMPROVE THE EFFICIENCY OF THE BAGGAGE HANDLING PROCESS
- ▶ DRONE DELIVERY ALSO BECOMING INCREASINGLY POPULAR AND RECENTLY EDMONTON INTERNATIONAL AIRPORT (EIA) ENTERED A NEW STRATEGIC PARTNERSHIP WITH DRONE DELIVERY CANADA (DDC) THAT WILL SEE THE AIRPORT BECOME A HUB FOR DRONE CARGO DELIVERIES IN WESTERN AND NORTHERN CANADA. THIS IS EXPECTED TO BE THE WORLD'S FIRST REGULARLY SCHEDULED DRONE DELIVERY SERVICE FROM AN AIRPORT

OTHER EMERGING TECHNOLOGY

- ▶ AUGMENTED REALITY
 - ▶ ADDITIVE MANUFACTURING
 - ▶ E-COMMERCE
 - ▶ LEAN MANUFACTURING
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IMPEDIMENTS

- ▶ HUMAN RIGHT VIOLATION
 - ▶ PRIVACY VIOLATION – BODY SCANNING
 - ▶ DATA PRIVACY – PASSENGER PROFILING
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CYBER SECURITY RISKS

CYBER CRIMES - AIRPORTS

- ▶ GPS SPOOFING AND JAMMING
- ▶ ATC HACKING
- ▶ SECURITY THREAT TO AIRPORT OPERATING SYSTEMS

AIRLINES

- ▶ ACARS HACKING
 - ▶ THREAT ON BOARD
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CYBER SECURITY RISKS

- ▶ FLIGHT MANGEMENT SYSTEM
 - ▶ REMOTE HIJACKING
 - ▶ DDOS
 - ▶ THROUGH PUBLIC INTERFACE SMART PHONES
 - ▶ AIRLINE MOBILE APPLICATIONS
 - ▶ WEBSITES
 - ▶ GDS/CRS
 - ▶ ONBOARD WIFI
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▶ **BIOMETRICS**

▶ **EVTOL AND AUTONOMOUS TRAVEL**



ENTITIES CURBING CYBER CRIMES

▶ ICAO

▶ IATA

▶ ACI

▶ CERT

“Cybercrime should not become a “new cold war” nor should result in complete social chaos. If these cyber-security threats are not curbed, one has to rethink over the retaining of airports in opting one among the Conventional Airports or E-Airports or the Intelligent Airports.”

LEGAL ISSUES TO NEW TECHNOLOGY

▶ REGULATION, INSURANCE PUBLIC POLICY

- ▶ EU resolution also delves into a broad number of ethical and public policy considerations such as:

- (1) Protecting humans against “manipulation” by robots
- (2) Ensuring equal access to these technologies
- (3) “Avoiding the dissolution of social ties”
- (4) Protecting human liberty and privacy

▶ LEGAL ISSUES

- PRIVACY AND PREDICTIVE ANALYSIS ISSUES
- INTELLECTUAL PROPERTY THEFT
- INTELLECTUAL PROPERTY OWNERSHIP

▶ LIABILITY RISKS

LIABILITY RISKS

- ▶ **INSURANCE COVERAGE**
 - ▶ **UNDERSTANDING THREAT LANDSCAPE**
 - ▶ **GET INVOLVED EARLY**
 - ▶ **FOLLOW AND ATTEMPT TO INFLUENCE REGULATORY ACTION**
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INDIAN AVIATION

- ▶ INDIAN AVIATION MOVING RAPIDLY TOWARDS ICT
 - ▶ PASSENGER SELF SERVICE
 - ▶ CYBER SECURITY
 - ▶ BORDER MANAGEMENT THROUGH BIOMETRICS
 - ▶ AUTOMATED BORDER CONTROL
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THANK YOU

