

# The MIRCE Akademy



Summary of the Professional, Technical,  
Philosophical, Mathematical, Scientific,  
and Business Information provided to the  
Members of the MIRCE Akademy  
during the 2014 calendar year.

**December 2014**

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## **Important dates in 2015, at Woodbury Park, Exeter**

14-16 April,	4 <sup>th</sup> World Congress of Mirce Mechanix
22-25 June,	26 <sup>th</sup> MIRCE International Summer \School
8-10 December	25 <sup>th</sup> MIRCE International Symposium

## Overview by the President



With professional pride I am writing the overview of this summary document related to the information that the MIRCE Akademy has provided to its Members during the last year.

We have tried to cover most areas of professional, technical, philosophical, mathematical, scientific, and business aspects relative to Mirce Mechanics and its applications to system engineering process in one hand and system in-service management on the other.


Material provided has been generated by the Staff and Fellows of the Akademy to whom we are grateful for the time devoted to us and for their professional knowledge and experience shared with the Members.

I do hope that the efforts put in the selection and the preparation of the Membership material are meeting your professional needs and personal curiosity related to the further developments of the Mirce Mechanics as the only scientific discipline that addresses the complex indeterministic, irreversible and interdependent issues of Managing In-service Reliability, Cost and Effectiveness of maintainable systems.

As there is always a room for improvement I would like to invite your comments and suggestions regarding the information to be provided to the Members in 2015 and beyond.

I do hope that you find our activities beneficial and essential for your continuous professional and personal development, which will be manifested through your renewal of the Membership and strong encouragement to colleagues to follow your example.

With thanks and very best wishes for prosperous 2015.

  
Dr Knezevic

# **Written Papers presented to the Members of the Mirce Akademy in 2014**

## **Space Weather as a Mechanism of the Motion in Mirce Mechanics**

J. Knezevic, MIRCE Akademy, Exeter, EX5 1JJ, UK

The main objective of this paper is to draw attention to the Mirce Mechanics approach to reliability and safety of maintainable system, which enables accurate predictions of the motion of functionality through their in-service lives to be made by design engineers. This paper focuses on the scientific understandings of the space weather phenomena as mechanisms of the motion of functionality through the life of systems like power networks, aviation, satellite services, pipelines, digital control systems and similar.

## **Applied Genetic Programming in a Chemical Plant for Reducing Production Costs**

Ariel Katz, Centre for M.I.R.C.E., University of Exeter, U.K.

The Genetic Algorithms (GA) is a model of “machine learning”, Goldberg (1985,1989). Whereas classical optimisation methods often rely on a local gradient search, a genetic algorithm keeps track of the population of potential solutions. It is thus less sensitive to an arbitrary initial guess of the solution, which imparts it with a degree of protection from the local optima trap. The GA is a model of machine learning which derives its behaviour from a metaphor of the processes of evolution in nature. This is done by the creation within a machine of a population of individuals represented by chromosomes, in essence a set of character strings that are analogous to the base - 4 chromosomes that we see in our DNA. The individual in the population then goes through a process of evolution. A genetic algorithm is a trial and error process whose method of producing solutions imitates biological evolution and allows an improvement in the solution. The genetic algorithm has been tested on a variety of problems e.g., a model of an industrial flowability, customer service pH controls system etc.

## **Hospital Logistics**

Mikko R. Salminen, Jyvaskyla Polytechnic, School of Engineering and Technology, Jyvaskyla, Finland

There has been a lot of discussion about hospital logistics. So far there have been no definitions for that area. Also all the articles under this topic have handled only some single elements of hospital logistics without a wider context. This article is made in order to find and define the essence and the scope of hospital logistics. By doing so this article should establish a foundation for further research in the area of hospital and health logistics.

## **Bird Strike as a Mechanism of the Motion in Mirce Mechanics**

Dr J. Knezevic, MIRCE Akademy, Exeter, UK,

Birds represent a serious, but often misunderstood, threat to aircraft. Most bird strikes do not result in any aircraft damage, but some bird strikes have led to serious accidents involving aircraft of every size. According to Bird strike Committee USA, bird and other wildlife strikes to aircraft result in over \$600 million in damage to U.S. civil and military aviation each year. The lives of the crew and passengers are also at risk. Since 1988, over 200 people have been killed worldwide as a result of encounters with birds and other wildlife. Thus, this paper addresses bird strike from Mirce Mechanics point of view, which means that it is considered as a mechanism that generates a functionability event which causes the motion of a system from positive to negative functionability state. The paper provides vital information about the physical properties of most common birds that are required for predictions of their impacts on aircrafts, at the design stages as a scientific method for the evaluation of alternatives.

## **Efficient Learning of Failure Detection, Understanding and Prevention: Case Trial Bike**

Pasi Lehtola and Juha Sipilä, Jyväskylä University of Applied Sciences, Finland

Authors lectured this spring a course titled Supportability Analysis and Design for a group of about 20 second-year engineering students in Jyväskylä University of Applied Sciences. The course aimed at showing how various logistic support analyses help the engineers to improve design, maintenance and support of systems while keeping the life cycle cost at a reasonable level. These analyses included elements of reliability theory; failure identification methods; failure rate calculations; criticality estimations; availability, maintainability and safety issues; reliability centred maintenance topics; level of repair analysis; and cost calculation. To bring the theory into practice we presented a case study.

## **Possible Approach to Reliability Prediction with Strength Degradation Process**

Zeljko Vladimir, LOLA Institute, Kneza Visislava 70a, Belgrade, Yugoslavia

In this paper, the reliability model is analysed. The strength is described as degrading process. The stress is considered as static or Poisson process. Probability of failure is obtained by general stress-strength interference. The reliability, as probability of surviving given time interval, is derived as function of instantaneous probability of failure. Numerical examples are calculated for different (Weibull and normal) distributions of strength and stress, and for static and Poisson load.

## **Mirce Mechanics Analysis of the Flight 1549**

J. Knezevic, MIRCE Akademy, Exeter, EX5 1JJ, UK

The main objective of Mirce Mechanics is the understanding of mechanisms that generate positive and negative functionability events, which cause the motion of a system through corresponding functionability states. Hence, this paper addresses the mechanism of the collision between birds and flying objects, commonly known as a bird strike. This is a typical example of the overstress mechanisms where a huge amount of kinetic energy is generated by the collision of both flying objects. Consequently, the main purpose of this paper is to analyse mechanisms of the motion of the USAir A320 through functionability states caused by the kinetic energy generated by the collision with a flock of Canadian Geese during the flight 1549, on 15th January 2009, in New York. The consequences of the motion on the fuselage and engines are analysed and presented here.

## **Life-Cycle Benefit of Repair**

Adrian Blenkiron, Rolls Royce, Filton, UK

During the concept, design and development phases of a project, the role of the Logistics Support Department is to influence the product design for supportability and originate support systems optimised for life cycle benefit. The support system's task is the management of the effects of product failure. To ensure that the Logistic Support department fulfilling its role it is essential that each aspect of the support system is providing maximum life cycle benefit. This paper investigates the operation of the repair system with regard to life cycle benefit.

## **When “if it ain’t broke, don’t fix it may not be the best policy.**

John Crocker, Science Fellow of the MIRCE Akademy

It is the fate of almost every system made by man to eventually wear out or outlive its usefulness. Most high-value systems are designed to be repairable such that if parts of the system cease to perform their designated function adequately, they can either be returned to a state of functioning or replaced without having to discard the whole system. For these systems, waiting until they fail is seldom the most cost-effective policy. Unfortunately, few failures can be predicted with very much confidence or precision. This paper proposes an opportunistic maintenance policy which attempts to reach a compromise between the conflicting desires to maximise the times between maintenance actions whilst minimising the in-service support costs.

## **System Engineering - Can reality prediction be made as accurate as in Physics?**

Professor Arie Dubi  
Department of Nuclear Engineering  
Ben Gurion University of the Negev, Beer-Sheva, Israel.

System Engineering involves, basically, prediction of the future behavior of systems. One wishes to answer questions such as: What would the reliability, availability and

other performance measures of the system be? How many spare parts, repair teams, Inspections, Maintenance operations of all kinds and other resources be allocated for the system so as to guarantee a required performance level at a minimal cost? etc. The purpose of this paper is to discuss the framework under which such predictions can be made. It will be demonstrated that a general system transport equation exists which governs the system behaviour. The prediction process can be most effectively performed using the Monte Carlo method for the solution of the transport equation.

## **Opportunistic Maintenance in Aircraft using Relevant Condition Parameter based Approach**

Dr Haritha Saranga

Indian Institute of Management Calcutta, P O Box 16757, Alipore (Post)  
Calcutta 700 027, INDIA

Opportunistic maintenance has been an essential part of all systems-maintenance, implicitly if not explicitly. However, as systems become more expensive and complex, the decisions involving opportunistic maintenance activities become more challenging. In this paper, we discuss a few issues that arise while carrying out the opportunistic maintenance, and try to resolve them with the help of a popular optimization technique called Genetic Algorithms. We also present a few results concerning relevant condition parameter based maintenance, as it has a high potential to be an opportunistic maintenance in complex systems. A systematic methodology is designed to enable the maintenance crew in deciding which items to be maintained when an opportunity arose. The cost of premature replacement is compared with the cost of down time, in the optimization process using Genetic Algorithms.

## **No Fault Found and Air Safety**

Christopher J Hockley OBE, CEng MRAeS,

Centre for Through-Life Engineering Services, Cranfield University, Bedford, UK.

There is a view that has been expressed in some organizations that No Fault Found, NFF, is not an air safety issue. Consequently the occurrence of NFF and the rates for a particular fleet do not get the attention that they deserve in these organisations. In this paper it is shown that there is a distinct similarity between maintenance errors that could cause accidents and NFF causes and their impact on air safety. It is concluded that NFF needs a higher profile and the acknowledgement that it certainly is an air safety issue.

# Questions Asked and Answered for the Members of the MIRCE Akademy in 2014

## Question 1

What are the main advantages of building a model of a system, process or activity under consideration?

## Question 2

A European producer is to export a packaging machine to a customer in Brazil. The machine is packaged in a wooden box of the following internal dimensions: length=7.00 m, width=2.75 m and height=3.00 m. Calculate a required number of desiccant units that should be used in order for the machine to arrive to Brazil in a functionable state.

## Question 3

The majority of plastic component failures occur in the mid to long term. Even, in normally tough, ductile plastic materials, failures are invariably brittle in nature and result in a short service life. What are the most common causes of such brittle failures?

## Question 4

What are mechanisms for formation of plastics?

## Question 5

What are Non Destructive Methods for Corrosion Monitoring?

## Question 6

What is corrosion?

## Question 7

What are the processes of heat transfer?

## Question 8

What is Infrared Thermography?

## Question 9

What are the main differences between inspection and examination as condition monitoring activities?



### **Question 10**

For a continuously operating machine, does the increase in the number of spare engines:

1. Increase the number of failures of the gearbox?
2. Have no impact on the number of failures of the gearbox?
3. Decrease the number of failures of the gearbox?

### **Question 11**

What are the differences between linear and dynamic programming?

### **Question 12**

Under what conditions are the two random variables X and Y independent?

# Quotes presented to the Members of the MIRCE Akademy in 2014

## Quote 1

*“However, all scientific statements and laws have one characteristic in common: they are “true or false” (adequate or inadequate). Roughly speaking, our reaction to them is “yes” or “no.” The scientific way of thinking has a further characteristic. The concepts which it uses to build up its coherent systems are not expressing emotions. For the scientist, there is only “being,” but no wishing, no valuing, no good, no evil; no goal. As long as we remain within the realm of science proper, we can never meet with a sentence of the type: “Thou shall not lie.” There is something like a Puritan's restraint in the scientist who seeks truth: he keeps away from everything voluntaristic or emotional.”*

## Quote 2

*"A theory can be proved by experiment; but no path leads from experiment to the birth of a theory."*

## Quote 3

*“There is nothing more frightful than ignorance in action.”*

## Quote 4

*"In my scientific vocation I have found a pleasant shelter, where I was protected from much turbulence that shook the world. Under that roof I have prepared and equipped my scientific workshop, segregated from the wider world but in constant spiritual connection with famous scientists, I have created my scientific area, my indisputable spiritual property. In this workshop I have spent forty years including short breaks writing and publishing my papers."*

## Quote 5

*“A law is more impressive the greater the simplicity of its premises, the more different are the kinds of things it relates, and the more extended its range of applicability. Thermodynamics is the only physical theory of universal content, which I am convinced, that within the framework of applicability of its basic concepts will never be overthrown.”*

## Quote 6

*“To think is easy. To act is hard. However, the hardest thing in the world is to act in accordance with your thinking.”*

### **Quote 7**

*"World hates change, yet it is the only thing that has brought progress."*

### **Quote 8**

*"Having been in my progress so often misled by taking for granted the results of others, I have determined to write as little as possible but what I can attest by my experience."*

### **Quote 9**

*"It is impossible for a man to learn what he thinks he already knows."*

### **Quote 10**

*"All truly wise thoughts have been thought already thousands of times; but to make them truly ours, we must think them over again honestly, till they take root in our personal experience."*

### **Quote 11**

*"Never confuse motion with action."*

### **Quote for January 2014**

*"If you want to live a happy life, tie it to a goal. Not to people or things"*

**Simplified Technical English Questions and Answers Presented to  
the Members of the MIRCE Akademy,  
Prepared by Orlando Chiarello, Honorary Fellow of the Akademy**

**Orlando's Example 1**

Which verb form most occurs in procedures written in STE?

**Orlando's Example 2**

Will STE change the meaning of maintenance procedures?

**Orlando's Example 3**

How can the following sentence be rewritten in order to be compliant with the STE rules? *Paint the unit with a pressure sensitive low temperature curing glass cloth coating varnish.*

**Orlando's Example 4**

Is STE simple to write?

**Orlando's Example 5**

Can Technical Names and Technical Verbs contain vocabulary that is explicitly unapproved in the dictionary?

**Orlando's Example 6**

How were the words for the STE dictionary chosen?

**Orlando's Example 7**

Does the STE dictionary include all the words that are necessary to write technical documentation?

**Orlando's Example 8**

Why passive sentences cannot be used in procedures?

**Orlando's Example 9**

Do conditional clauses always need to precede the main clause?

**Orlando's Example 10**

In Simplified Technical English we can use words that are approved in the controlled dictionary.

What about if a word we would like to use is not listed at all?

### **Orlando's Example 11**

In Simplified Technical English we can use words that are approved in the controlled dictionary, Technical Names and Technical Verbs.

Technical Verbs are not listed in the Dictionary but they are defined in the specification by 4 categories. Which are these categories?

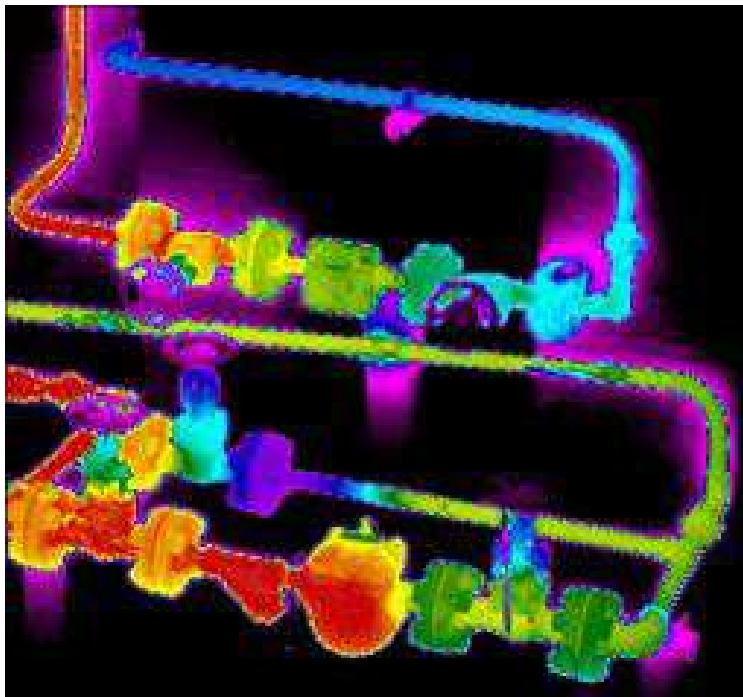
### **Orlando's Example 12**

RULE: 1.5 states that in STE we can use words that are Technical Names.

Technical Names which are not listed in the Dictionary but they are defined in the specification by 19 categories. Which are these categories?

**Austin's Thermography Images presented to the Members of the MIRCE Akademy by Austin Dunne, the Science Fellow of the MIRCE Akademy, Director at Infrared Training Limited ( [www.infraredinstitute.co.uk](http://www.infraredinstitute.co.uk) )**

**Austin's Image 1**



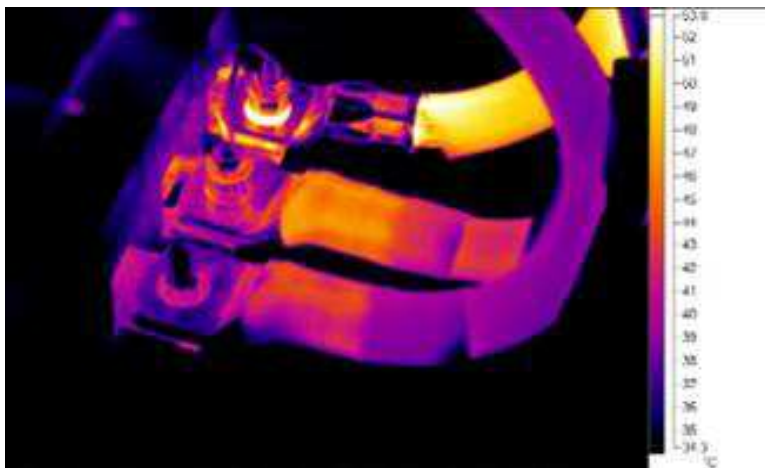
**Austin's Image 2**



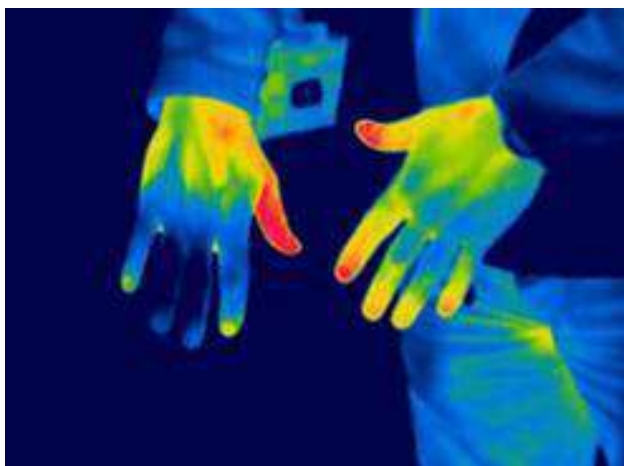
**Austin's Image 3**



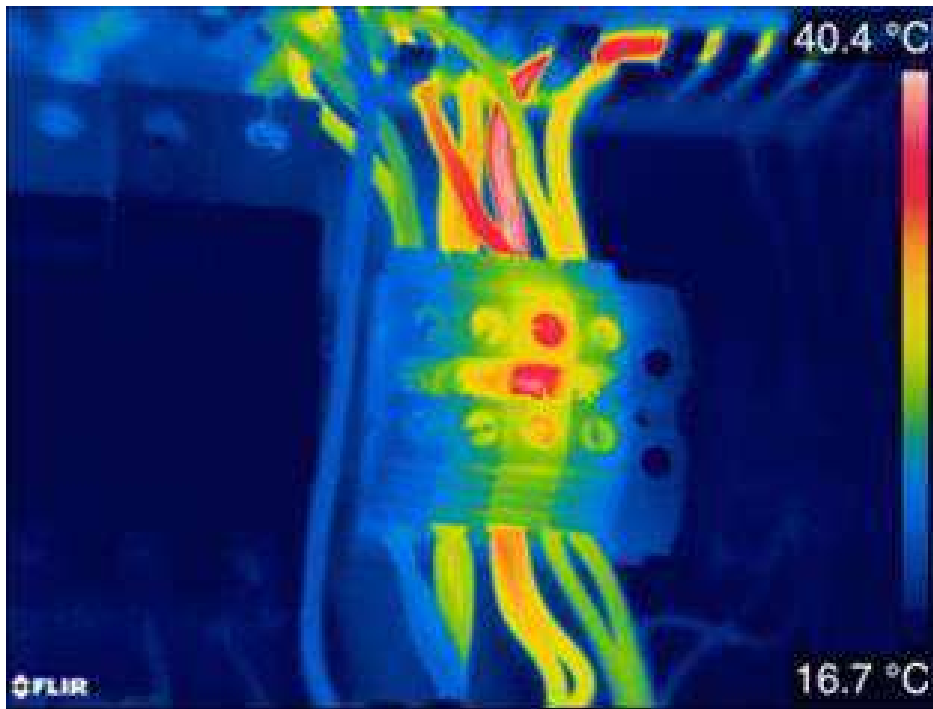
**Austin's Image 4**



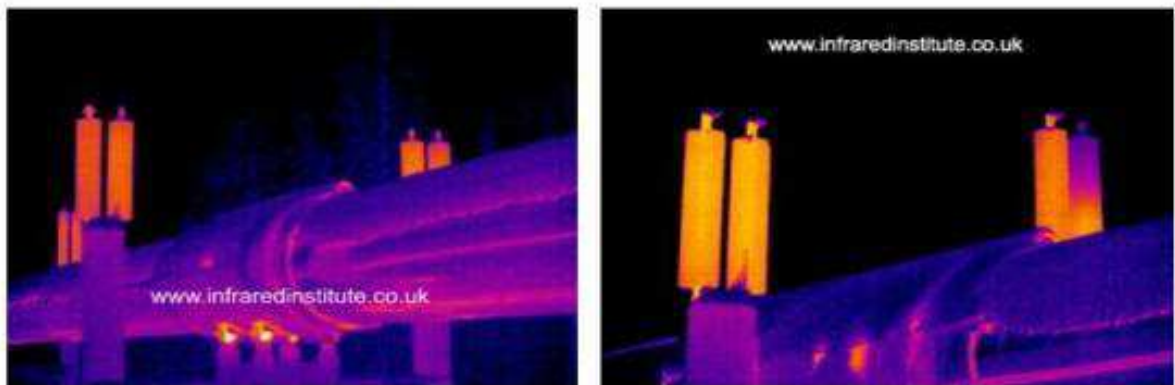
**Austin's Image 5**



**Austin's Image 6**



**Austin's Image 7**

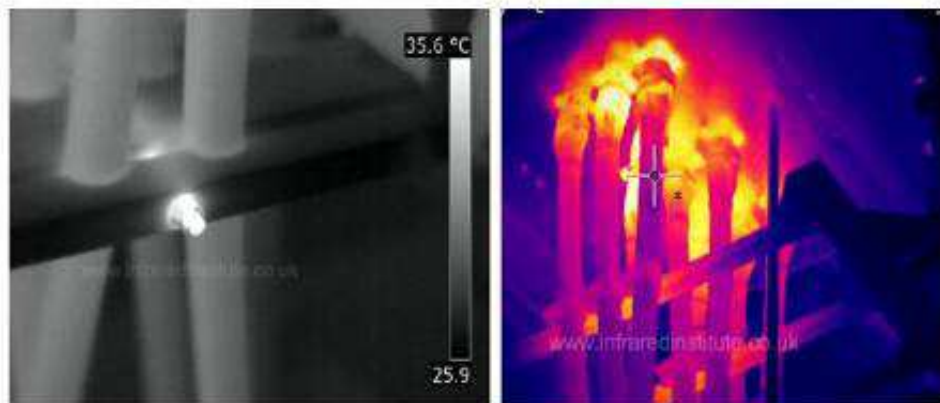




**Austin's Image 8**



**Austin's Image 9**



**Austin's Image 10**



**Austin's Image 11**



## Austin's Image 12



## **Mirce Mechanics related Functionability Events that took place in the world during the second half of 2014**

### **28 December 2014 – AirAsia Airbus A320 crashes in the Java Sea**

QZ8501, a flight operated by Indonesia AirAsia, was en route from Surabaya, Indonesia, to Singapore early in the morning of Dec. 28. The aircraft, an Airbus A320-200, was flying around 120 nm southeast of Belitung Island when the crew requested to climb from Flight Level 320 (32,000 ft.) to FL380 and deviate from its planned track to avoid severe weather. AirNav Indonesia approved the request, at least partially, but is reported to have cleared the aircraft only to FL340 initially to avoid traffic. When air traffic control cleared the aircraft to the new altitude, at 6:14 a.m. local time, QZ8501 did not respond. The aircraft disappeared from radar at 6:18 a.m. Wreckage and bodies found in the Java Sea off the Indonesian part of Borneo on Tuesday have been confirmed by Indonesian authorities to be from the missing Airbus A320, delivered to AirAsia in 2008. It was registered as PK-AXC. There were 155 passengers, two pilots, four flight attendants and one aircraft engineer on board. The captain had accumulated 20,537 flight hours, 6,100 of which were with Air Asia Indonesia on the A320 fleet. The first officer had 2,275 flight hours with the airline.

### **22 December 2014 - First Delivery of Airbus A350**

Eight years and three weeks after the launch of first Airbus A350 is delivered to Qatar Airways. The aircraft, MSN006 will be ferried to Doha on Dec. 23. Qatar Airways plans to fly the A350 to Frankfurt from January 15, 2015. London is to be added soon. As of today, Airbus has a total of 778 orders for the aircraft – 577 for the A350-900, 169 for the A350-1000 and 32 for the -800, which is likely never going to be built in its current form.

### **8 December 2014: Light Jet Crashed near the airport in Washington D.C. Area**

2009 built light jet, Embraer Phenom 100, crashed near an airport in the Washington, D.C area. It has been confirmed that three people on the aircraft as well as three people in a house that burned down as a result of the crash were killed. Eyewitnesses described the aircraft as flying very low with motion that could indicate a stall-like condition. The pilot did not make any distress calls before the accident. Airport officials had been warning other pilots in the traffic pattern of a large amount of bird activity in the vicinity of the runway end.

### **5 December 2014: NASA's Orion Spaceship Completed First Test Flight**

NASA's new Orion spaceship, a capsule built for a trip to Mars, successfully completed its first test flight. The Orion capsule cannot deliver astronauts to Mars on its own. The spacecraft will need to be outfitted with a functional service module and a habitat module in order to make a trip to the Red Planet comfortable for the four astronauts on the journey, officials have said. The Orion space capsule splashdown in the Pacific Ocean at 16.29 GMT) after a 4.5 hour of un-crewed test flight. Orion's key

systems were put to the test during the flight, which launched atop a United Launch Alliance Delta 4 Heavy rocket, from a pad here at Cape Canaveral Air Force Station at 7:05 a.m. EST (1205 GMT).

### **12 November 2014: Human made Craft landed on Comet**

ESA's Rosetta mission has soft-landed its Philae probe on Comet 67P/Churyumov-Gerasimenko, the first time in history that such an extraordinary feat has been achieved. After a tense wait during the seven-hour descent to the surface of a Comet the signal confirming the successful touchdown arrived on Earth at 16:03 GMT (17:03 CET). The confirmation was relayed via the Rosetta orbiter to Earth and picked up simultaneously by ESA's ground station in Malargüe, Argentina and NASA's station in Madrid, Spain. The signal was immediately confirmed at ESA's Space Operations Centre, ESOC, in Darmstadt, and DLR's Lander Control Centre in Cologne, both in Germany.

### **31 October 2014: Virgin Galactic's Accident**

Scaled Composites, Virgin Galactic's partner, conducted a powered test flight of SpaceShipTwo earlier today. During the test, the vehicle suffered a serious anomaly resulting in the loss of the vehicle. The WhiteKnightTwo carrier aircraft landed safely. Local authorities have confirmed that one of the two Scaled Composites pilots died during the accident. The other pilot parachuted to the ground and is being treated at a local hospital.

### **29 October 2014: Orbital Sciences Antares rocket blew up 10 seconds after liftoff**

On its way to deliver a Cygnus cargo spacecraft to the International Space Station (ISS), Orbital Sciences Antares rocket blew up just seconds after liftoff. The mission was to have been the third Orbital resupply flight to the ISS, carrying 5,000 lb. of NASA cargo. The vehicle, the first stage of which is powered by two refurbished AJ-26 rocket engines, suffered a "catastrophic anomaly shortly after liftoff". Attempted launch on 27th October was delayed because of a boat straying into the range safety zone southwest of the launch pad in the Wallops Flight Facility in Virginia, USA.

### **23 October 2014: SpaceX Dragon capsule's return delayed due to heavy seas**

Scheduled return of SpaceX Dragon capsule's from the International Space Station was delayed to heavy seas. The unmanned cargo craft is carrying around 3300 pounds of equipment used for scientific experiments performed in the space. A parachute-assisted splashdown in the Pacific Ocean west of Baja California is expected on 25th October.

### **22 October 2014: 218 minutes of Functionality Actions on the International Space Station**

To maintain the functionability of International Space Station two Russian astronauts successfully performed several functionability tasks. During the first outing they removed a protective cover from a European science experiment that exposes seeds, bacteria spores, fungi, ferns and other samples to the harsh environment of space. The second spacewalk was conducted to disconnect and discard two obsolete antennas that used to guide visiting spacecraft to docking ports. They will remain in orbit for up to a year before, when pulled by the Earth's gravity they will be incinerated in the atmosphere.

### **18 October 2014: Mitsubishi launches the first Regional Jet**

Unlike most other aircraft companies in the world Mitsubishi Heavy Industry rolled their very first passenger aircraft into a hangar where guests had been assembled, at Komak South Nagoya, Japan. It is 92-seat regional jet powered by two Pratt & Whitney PW1200G geared turbofans. The first ground test will start in spring 2015 with a first flight expected to take place in the second half of the next year. Mitsubishi Aircraft plans to complete the certification process in the second quarter of 2017.

### **17 October 2014: Spaceplane X-37B landed after a record-setting 675 days in orbit**

This Boeing built spaceplane, owned and operated by USAF's as a flying technology test bed was launched on a United Launch Alliance rocket Atlas V in December 2012. It orbited the Earth at the height around 200 miles along the path ranged from 43.5 deg. north to 43.5 deg. south.

### **16 October 2014: Solar Power Channel Repair of the International Space Station**

Two NASA astronauts successfully replaced a failed sequential shunt unit on solar power channel that has been shut down since May 8. They spacewalked from the far starboard to the far port side of the station's near 360-foot-long solar power truss. During the repair astronauts encountered several balky bolts, which threatened to slow or interrupt an ambitious list of secondary tasks. Also, they battled the difficulties with a combination of power and hand tools to restore an ISS by an internal short and then clear the path for external reconfigurations next year that will accommodate a pair of docking ports for new Commercial Crew Program spacecraft.

### **24th September 2014: First India's Spacecraft Entered Martian Orbit**

After a 300-day journey covering over 670 million km, the orbiter successfully entered the Martian orbit and is located at about 515 km from its surface. To achieve this the 440 Newton Liquid Apogee Motor (LAM) was fired up for 24 minutes to slow down the Mars Orbiter Mission, MOM spacecraft from 22.1 km per second to 4.4 km per second to get the right trajectory and be captured by the red planet. Because of the Mars-Sun-Earth geometry, the orbit insertion happened while the MOM was in eclipse. At that time the MOM was dependent on the battery for all the power required. The 1350 kg spacecraft's five instruments will now be switched on to

scan and study the atmosphere of Mars for a period of six months and scan its atmosphere for methane gas in search of life-sustaining elements. India became the first nation in Asia to reach the red planet and the first nation ever to achieve it in the first attempt. Russia took 10 attempts, while the U.S. managed success after six. China and Japan are still trying. In fact, only 21 of the 51 missions to Mars have been successful.

### **6th August 2014: Europe's Rosetta Mission First to Rendezvous with Comet**

After 10 years, five months and four days traveling towards our destination, looping around the Sun five times and clocking up 6.4 billion km, Europe's Rosetta mission has arrived at its destination – 67P/Churyumov-Gerasimenko – becoming the first spacecraft in history to rendezvous with a comet. It has made three gravity-assisted flybys of Earth and one of Mars on its way to rendezvous with the comet. This complex trajectory has seen Rosetta pass by the asteroids Steins and Lutetia, obtaining unprecedented views and scientific data on both. Also it is the first space mission to go beyond the main asteroid belt and rely solely on solar cells for power generation, rather than conventional radio-isotope thermal generators. The new technology used on the orbiter's twin solar panels allows the mission to operate more than 800 million km from the Sun, where sunlight levels are only 4% of those on Earth.

Source: <http://aviationweek.com/awin-only/europe-s-rosetta-mission-first-rendezvous-comet>

### **25 July 2014: MD-83 Wreckage Found in Mali**

Near the border of Burkina Faso, the wreckage of Air Algerie Flight 5017 (AH5017) has been found in a "disintegrated state". Contact with the MD-83, operated by Spanish wet-lease company Swiftair on behalf of Air Algerie, was lost on the morning of 24th July, just 50 minutes after take-off from Ouagadougou en route to Algiers, just as air traffic control advised the aircraft to change course due to extreme weather conditions over Africa. There were 117 passengers and 6 crew members on board. Reports suggest that aircraft broke up only upon impact with the ground, rather than in mid-air.

### **17 July 2014: Malaysia Airlines Flight MH17 Shot Down**

A Boeing 777-200ER registered 9M-MRD en route from Amsterdam to Kuala Lumpur, crashed Thursday 30km from the Tamak waypoint, about 50km from the Russia-Ukraine border. There were 283 passengers and 15 crew on board. The flight was operated as a code-sharing service with KLM Royal Dutch Airlines. The aircraft was cruising at 33,000 ft. and at a speed of 476 knots. It left Amsterdam at 1215 and was due to arrive in Kuala Lumpur at 0600 local time on Friday. There are no survivors.

### **15 July 2014: Oil Leak Stopped Test For C Series Engine**

Bombardier's CSeries test flight program has been grounded since 29th May 2014, following what the company called "an engine-related incident" on one of the test aircraft during ground maintenance testing in Mirabel, Montreal. Today, Graham Webb, Pratt & Whitney PW1000G vice president and chief engineer said at Farnborough Air show that the chain of events has been traced to leaking oil seals, which reduced lubrication around bearings in the low pressure turbine, eventually triggering a failure during ground runs on engine number one on CS100 test aircraft FTV-1.

### **14 July 2014: Cause of Fire on Board of F-35A**

Today, at the FARNBOROUGH Air Show, Lt. Gen. Christopher Bogdan, program executive officer for the U.S.-led F-35 program, said that blade rubbing that prompted a fire in an F-35A – leading to a fleet wide grounding July 3 – took place in the third-stage fan of the integrally bladed rotor (IBR) in the low pressure section of the F135 engine,

The three-stage IBR sits behind the front fan in the F135 and compresses the air before passing it into the high-pressure core. Each stage is separated by a stator and rotates within the casing, which is lined with an abradable strip to maintain tight clearances between the blade tips and the inner wall of the compressor casing. This enables small tolerances while reducing pressure loss and some rubbing is acceptable. In this particular engine for AF-27, the blades were rubbing far in excess of the design, creating excessive heat and micro cracking in the blades. The resulting high cycle fatigue failure forced the section to “come apart,” Bogdan says, referring to the fire on June 23 at Eglin.

### **July 2014: Boeing delivers 1500<sup>th</sup> Jumbo Jet**

Today, Boeing celebrates a remarkable milestone by delivering the 1500th Boeing 747. The aircraft handed over to Lufthansa was registered D-ABYP and is the carrier's 14th 747-8 out of an order for 19 aircraft. Lufthansa was also the main driver behind the decision to launch the -8 Intercontinental and is currently its only operator in a scheduled passenger configuration.

### **30 June 2014: Managing Complexity**

Professor George Rzevsky, Science Fellow of the MIRCE Academy, and Petr Skobelev, have published a book on Managing Complexity.

### **23 June 2014: Fire on Board of F-35A**

During the preparation for a training mission of an F-35A a fire was detected in the aft end of the single-engine, stealthy fighter. Emergency responders, at Eglin Air Force Base in Florida, USA, used foam to extinguish the fire. The cost of the damage to the aircraft is likely to be the first F-35 class A mishap, which is an event where an aircraft sustains more than \$2 million in damage or results in a fatality, as the fire is thought to have badly damaged the Pratt & Whitney F135 engine. The event is under investigation.



## **16 June 2014 : Pilot's Error in Gulfstream's Hanscom Crash**

The pilots aboard a corporate jet that crashed on 31st May at Hanscom Field, Boston, killing all seven people on board, may have failed to conduct a pre-flight check and possibly attempted to take off with the plane's lift controls in a locked position, federal investigators have found.

The missing check could be significant, as a primary factor or a distraction, as NTSB investigators also found that the elevator surface position during the taxi and takeoff "was consistent with its position if the gust lock was engaged." The aircraft has a mechanical gust lock system, which locks the ailerons and rudders in the neutral position and the elevator in the down position as a method of protecting the surfaces from wind gusts while the aircraft is parked. The system is also supposed to prevent the throttles from being pushed to takeoff power with the lock engaged. Post-crash, investigators found that the gust lock handle, located on the right side of the control pedestal, was in the forward, or "OFF" position, and the elevator gust lock latch not engaged however.

Skid marks were found on the final 2,300 ft. of runway and overrun area, with the aircraft traveling another 1,850 ft. through grass, hitting approach lighting and localizer equipment before coming to rest in a gully and burning. All seven on board were killed.

Source: The Boston Globe

## **12 June 2014 - Unfavourable Winds Delay Test Flight of NASA's Low-Density Supersonic Demonstrator**

NASA is suspending efforts to test launch a disk shaped craft for the demonstration of technologies intended to greatly increase the payload mass that can be landed on the Martian surface, at the U. S. Navy's Pacific Missile Range Facility, due to "two weeks of uncooperative wind conditions". The announcement followed half a dozen attempts since June 3 to launch the rocket powered Supersonic Inflatable Aerodynamic Decelerator from a high altitude balloon.

NASA team studied wind data in the region from 2012-13 and 2008-09 that suggested early June was favorable for the test flight. However, the weather pattern in the Northern Hemisphere changed this year, leading to a longer winter and unfavorable winds in the region.

The test flight represents a major milestone for the \$200 million, five-year old LDSD initiative managed by NASA's Space Technology Mission Directorate. Current technologies support Martian landings with masses of about one ton. A human mission of the type NASA envisions for the 2030s would require a 40 ton capability.

Source: Aviation Weekly eBulletin

## **10 June 2014 - Smoke in Russian Module of the International Space Station**

Just before 3 p.m., EDT, smoke flowed briefly from the ventilation system of the International Space Station's Russian service module. The ventilation system for the

station's Russian segment was isolated from the U.S. Operating Segment with commands issued by NASA flight controllers. Russian controllers pointed to a heater for the water reclamation system in the Zvezda service module, which includes dining, sleep and work quarters for the station's cosmonauts, as the smoke source. According to NASA the device was deactivated. The station's crew activated a fan and filters to clear the smoke, NASA reported.

Source: Aviation Week eBulletin