CAUC training – Actuation Technology – SB505
Tianjin, [7. -14. September 2016]
issue 01

Teacher: W.Engler

1.1 General Course Introduction (1)

- Engineering first year :
  - The objective was to consolidate the scientific basics in engineering and give first scientific basements in aeronautics.
- Engineering second year :
  - The objective was to develop and strengthen aeronautical general skills enabling the students to have a comprehensive understanding of Civil Aviation before in deep studies through each specialty.
- We are entering now the third year with the Fifth semester. The main target of this semester is to enlarge the students knowledge in system engineering and there related applications

1.1 General Course Introduction (2)

- The Course will provide to the students with comprehensive knowledge in **systems engineering** and **applications** dedicated to
  - aircraft,
  - Aircraft systems (mostly but not only) related to air traffic control
  - air - ground integration.
- The major topics covered during this semester will be:
  - aircraft and related systems knowledge with focus on avionics,
  - communication, navigation and surveillance systems
  - air-ground collaborative applications.
  - certification,
  - aircraft operations,
- The training is multidisciplinary and involves major companies of the aeronautical sector.

1.1 General Course Introduction (3)

- **What is the target of all your studies?**
- The aim of the course is to create people **capable to manage the development , certification and maintenance of air traffic related systems** at
  - aircraft level and
  - ground level
  - interface between the two
- Therefore the content of the 5th semester will be:
  - general aircraft design
  - The aircraft systems related to all air traffic functions (Flight, Flight management and Guidance, Navigation, Surveillance, Communication,)
  - The Aircraft operation
  - Ground based air traffic control systems.

Detail dates to be updated

1.1 Class 2016, Fifth semester Program (4)

2016 data to be issued

SE 51 – Industrial Management Courses is common to all options

1.1 General Course Introduction (5)

- With this program the full perimeter of the Air traffic systems is covered under consideration of the multidisciplinary structure of ATC
  - Introduction to the aircraft and aircraft system design will be provided in the first session using the **Aircraft actuation systems** as an example with focus on the mechanical part (W.Engler)
  - Further knowledge on the Aircraft Control and the integration of the related Electric and Electronic systems to the aircraft will be provided in the second session were the focus is on **Flight management and guidance** (V. de Laborderie)
  - The **session Avionics Technology** will familiarize you with the design of avionic components (like aircraft computers) under consideration of the aircraft environment. (P.G. Noel)
  - The regulatory environment and multiple airworthiness guidance will be explained in the session **Avionics System regulations**.

1.1 General Course Introduction (6)

- **The Industrial Management module** (SE5 2), will help students (all options excepted ATM) to plan and manage a corporation's development, research or production strategies. The set of courses includes the New Technology management, Quality management, Safety Management system, and Logistics & Supply chain management. (M. Vedrenne)
- The **Navigation System session** will address the Global Navigation Satellite System and cover the international regulations , the currently operating systems and the there future evolutions. (A. Rougé, P, Thévenon)

- During the **Aeronautical Communication Systems** course you will be familiarized with all ground and air base communication means (C. Guerber)

1.1 General Course Introduction (7)

- The **Aircraft Operations session** lectures about the aircraft performance. Also the related aircraft limitations will be explained (B. Messinese)
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- During the **Air Traffic Management c**ourse explanation will be provided on Aircraft and Ground basic procedures including items like RVSM, ATFM and FUA
- The present and future functions of the all Air and ground based **Surveillance Systems** will be reviewed in the related section (M, Frayard, M. Soler)
- The **Air-Ground Collaborative Applications** provides the students with a practical view on the use and the importance of the present and future Air/Ground communication and surveillance technology. (S. Boisse, J.M. Louis)

General Course Introduction (8)

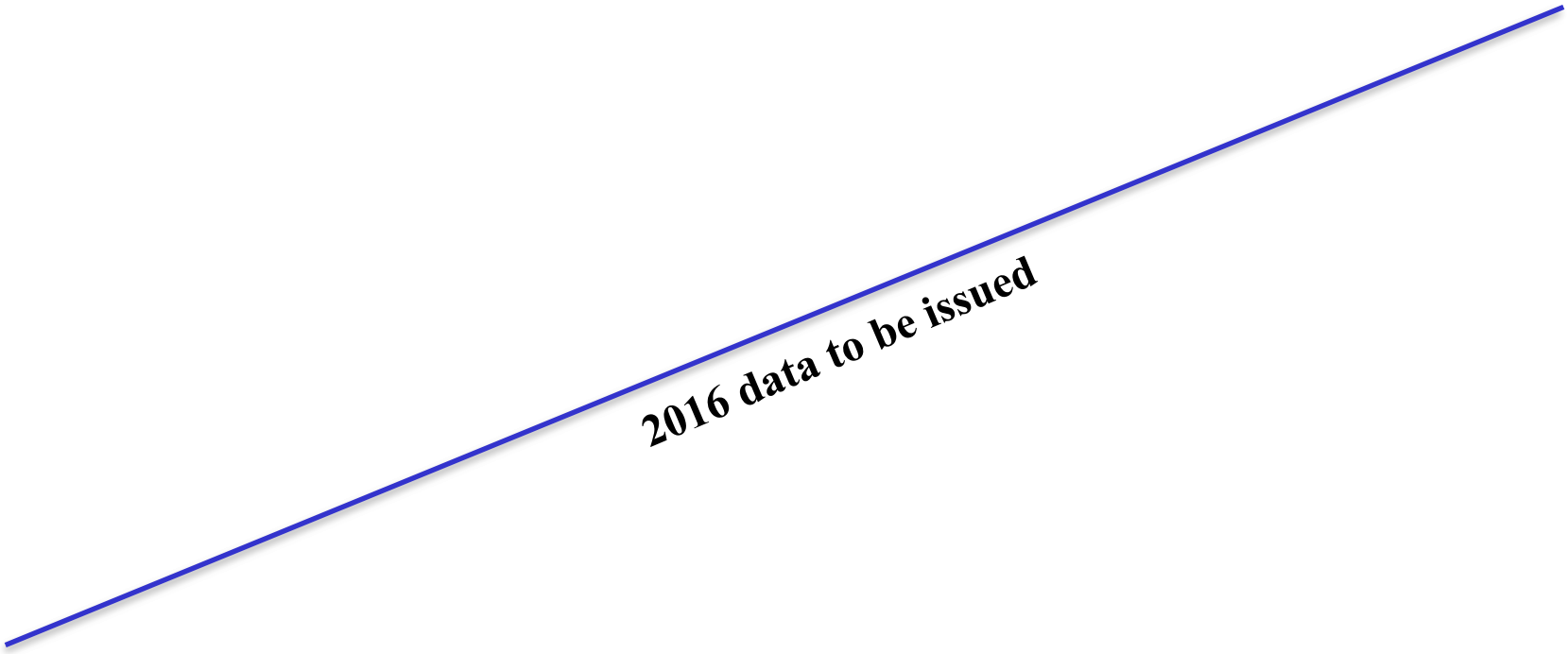
- Due to the multidisciplinary approach of this course some subjects of general nature will potentially be addressed more than one time. Naturally these will be subjects of certain importance, please consider that a repetition could help to understand the full context on the subject.

- Good luck for the 5th semester in the coming month

1.2 Familiarization Students/ Teacher (1)

- Introduction of your Teacher for this week (Wolfgang Engler)
  - Retired Aviation Engineer, Senior Consultant and Guest Professor (part time)
    - Spend my Business life (more than 40 years) in Aviation , most of the Time in Aircraft Engineering (design office) at several functions.
    - Starting as engineer in 1969 in a Airbus a pre successor company (VFW) design office, and ending the carrier at 2012 as A320 family Chief Engineer in Airbus. In Airbus, the chief engineer is technically responsible for the design if the Aircraft
    - The steps in between were: Participating at the design of VFW614, A300,A310,A320, A330/340, A380, A400M
    - For a period of 5 years (2004-2009): Head of Airbus Certification (Airbus A380 certified in 2006)
    - Deep Involvement in European/China cooperation Programs
- Introduction Students

1.2 The students (2)



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1-2 Introduction of the Aircraft Actuation session (1)

- The objective of this module is to familiarise the **students with a major part of the design of Aircraft systems involved in the actuation** of the different items moving on the aircraft. The Major part will deal **with the actuation of Aircraft control surfaces and the High high lift devices** but also touch briefly others like gears, doors and reversers
- The lecture will start with a general introduction of Aircraft **Areodynamics, Aircraft Flight mechanics and Control followed** by a more detailed explanation of **several methods to arrange the flight control surfaces, the high lift devices and all** other items, which “moves” at an aircraft.

1-2 Introduction of the Actuation session (2)

- It follows by a presentation of the different methods to actuate movables ranging **from mechanical actuation, hydro mechanical actuation, electrical actuation** and to any combination of the different ways to move elements at an Aircraft. This will include the presentation of the related **cockpit controls**. Furthermore **Aircraft systems which provide the actuation power** (mechanically, hydraulically, electrically) will be presented
- For each of these moving systems, the architectures and the different ways to design will be reviewed under consideration of the major design criteria. The major **design requirements** (Functional, Airworthiness, maintenance..) will be briefly explained with a short view to the safety process applied for the design

1.2 Introduction of the Actuation session (3)

- Regarding the **Technical standard presented** during the session it is considered that
- The Air traffic system (and also the future evolution of it) must be able to manage **the current Aircraft fleets**. The majority of this are aircraft with todays technical standard, Therefore the technical content of the actuation session will be mainly address the design of the existing aircraft and will not primary focus on the latest technology evolution.
- Due to the restricted time **the technical deeps is adapted** to the time available during the course
- This is considered as sufficient because as future managers of Air traffic you need **first to understand the principals** before going deeper in a further loop of specialization.

Agenda (1/3)

- **Module 1- Introduction** **(Day 1)**
  - 1-1 General Course Introduction (Day 1 Morning 1)
  - 1-2 Introduction of the Actuation session

- **Module 2 – Introduction to Aircraft Aerodynamics, stability and control** **(Day 1)**
  - 2-1 Aircraft Aerodynamics (Day 1 Morning 2,3,4)
  - 2-2 Aircraft Stability and Control (Day 1 Afternoon 1,2,3,4)

- **Module 3 - A/C Aircraft configuration for flight controls and high lift** **(Day 2)**
  - 3-1 Aircraft Anatomy
  - Arrangement of flight control surfaces and high lift devices (Day 2 Morning 1)
  - 3-2 Cockpit Controls (Day 2 Morning 2)

Agenda (2/3)

- **Module 6 – Aircraft Control systems Architectures** **(Day 2)**
  - 6-1 Hydro Mechanical Systems (Day 2 Morning 3,4) (Day 2 Afternoon 1)
- **Module 5 – Aircraft power systems** **(Day 2)**
  - 5-1 Hydraulic power systems (Day 2 Afternoon 2,3,4)
- **Module 6 – Aircraft Control systems Architectures** **(Day 3)**
  - 5-2 Electric power systems (Day 3 Morning1,2)
  - 6-2 Fly by wire systems (Day 3, Morning ,3,4)
  - 6-4 A320 Final assembly line Visit (Day 3, Afternoon 1,2,3,4)

Agenda (3/3)

- **Module 6 – Aircraft Control systems Architectures (Cont)** **(DAY 4)**
  - 6-2 Fly by wire systems (Cont.) (Day 4, Morning 1,2)
- **Module 7 – High lift Systems** **(Day 4, cont. Day 5)**
  - 6-3 Fly by wire systems new generation (Day 4, Morning 3,4)
  - 7-1 High lift systems architecture (Day 4 Afternoon 1,2)
  - 7-2 High lift systems actuation (Day 4, Afternoon 3,4)
  - 7-3 Other aircraft actuation systems (Day 5 , Morning 1,2)
  - 7-4 Future of actuation (Day 5, Morning 3,4
- **Module 4 Design requirements and Safety process** **(DAY5 afternoon)**
  - 4-1 Requirements (Day 5 Afternoon 1)
  - 4-2 Safety process (Day5, Afternoon 2)
- **Module 8 –Wrap-Up , Exercise and Exam Session** **(Day 5, Day 6)**
  - 9-1 Wrap-Up (Day 5, Afternoon 3,4
  - 9-2 Exam (Day 6, Morning 1,2)
  - Summary/conclusion (Day 6, Morning 3)

1.2 Introduction of the Actuation session (4)

- End of introduction lecture,
- Thank You! Merci!
- Any question, Proposal ?