

Industry Meeting

Friday, April 17th, 2015 at 7:00am at the Northrop Facilities

Minutes

Members Present: Orville Dothage, Rodney Black, Lupe Delgado, and Maria Clinton.

I. Courses

- a. Course Descriptions
 - i. Mr. Delgado and Mr. Black are going to review the course descriptions in the Program Planning Sheet and the Engineering Manufacturing Position Responsibilities (job duties) and link the Engineering Manufacturing Position Responsibilities to each course description were applicable.
- b. Course Objectives
 - i. On standby pending final draft of course descriptions
- c. Course Outcomes
 - i. On standby pending final draft of course objectives

II. BS Program

- a. Program Outcomes
 - i. Based on feedback from this meeting regarding the overarching responsibilities of the Engineering Manufacturing position, Dr. Clinton is going to draft program outcomes.
- b. Engineer Manufacturing Level 1 and Level 2 (only difference in job duties is years of experience)
 - i. Designs manufacturing processes, procedures and production layouts for assemblies, equipment installation, processing, machining and material handling.
 - ii. Designs arrangement of machines within plant facilities to ensure most efficient and productive layout.
 - iii. Designs sequence of operations and specifies procedures for the fabrication of tools and equipment and other functions that affect product performance.
 - iv. Adapts machine or equipment design to factory and production conditions.
 - v. May incorporate inspection and test requirements into the production plan.
 - vi. Inspects performance of machinery, equipment, and tools to verify their efficiency, and investigates and initiates corrective action of problems and deficiencies to ensure product quality.
 - vii. Develops manufacturing processes that are applicable to statistical process control, and may develop those techniques.
 - viii. Provides guidance to engineering regarding design concepts and specification requirements to best utilize equipment and manufacturing techniques.
 - ix. Ensures processes and procedures are in compliance with regulations

III. Capstone Courses

- a. Capstone Descriptions
 - i. In progress
- b. Capstone Objectives
 - i. On standby pending final draft of Capstone descriptions
- c. Capstone Outcomes
 - i. On standby pending final draft of Capstone objectives

IV. Timeline

- a. Course Development
 - i. Dr. Clinton is going to email a draft timeline and meeting schedule to Northrop BS Program Team.

V. Dacum Session (On standby)

- a. Identifying Industry experts to attend
 - b. Dacum session(s) meeting schedule
- VI. Other
- a. Northrop BS Team requested timeline and electronic copies of the documentation.

BS Program Planning Document
Courses that need to be developed (Total of 14 classes)

Course Name	Credits:	Responsible for Developing
AERO 101, Introduction to Aviation	3.0	
<p>Possible Course Description: This course provides an understanding of the principles and practices critical to the aviation industry. Aviation, operation of heavier-than-air aircraft and related activities. Aviation can be conveniently divided into military aviation, air transport, and general aviation. Military aviation includes all aviation activity by the armed services, such as combat, reconnaissance, and military air transport. Air transport consists mainly of the operation of commercial airlines, which handle both freight and passengers. General aviation consists of agricultural, business, charter, instructional, and pleasure flying; it includes such activities as the operation of air taxis, as well as aerial surveying and mapping.</p> <p>OR Introduction to the Aviation Industry? With a focus aimed more toward Northrop, Lockheed, Boeing, work floor practices?</p> <p><u>No comments for this section at the April 3 2015 and April 17th meetings.</u></p>		
AERO 105, Vintage Aircraft Structures (this course would include areas like assembly & rigging)	3.0	Jack R Halliday & Ty Mettler
<p><u>April 3 2015 meeting:</u></p> <ul style="list-style-type: none"> • <u>Northrop wants to be involved with the development of this course.</u> <p><u>No comments for this section at the April 17th meeting.</u></p>		
Technical Writing for Aviation	3.0	Dr. Susan Lowry & Jack R. Halliday
Industrial/Organizational Behavior	3.0	Dr. Irit Gat & Ty Mettler
Theory of Low Observables	3.0	
<p>Possible Course Description: A program that focuses on the application of electromagnetic field theory, electro-optics and materials science to the reduction of radar, optical and acoustic signatures of weapons systems. Includes instruction in computational electromagnetics, electro-optics, acoustics, guided wave theory, radiation capture, antenna applications in layered environments, material characterization, radar cross-section analysis, sonar signature analysis, non-destructive testing, remote sensing, and applications to specific weapons systems and operational environments.</p> <p><u>No comments for this section at the April 3 2015 and April 17th meetings.</u></p>		
FOE Migration Paths	3.0	
<p>Possible Course Description: The for Foreign Object Elimination Elements of Basic Awareness addresses twelve industry identified basic knowledge areas, activities and functions designed to prevent foreign objects from entering aerospace products. The standards are derived from NAS 412 - Foreign Object Damage / Foreign Object Debris (FOD) Prevention.</p> <p>April 3, 2015 meeting:</p> <ul style="list-style-type: none"> • <u>For this class the addition of Ground Flight Representatives (GFR) and Ground Operations Representative (GOR) (DLAI 8210 Rev. C government document regarding these areas)</u> • <u>Need to include extensive hands-on projects: i.e. boroscope inspections looking for FOD for close-outs, use of flash lights and mirrors, etc. Possible projects could include metal box with compartments, the use of a jet engine contain FOD, and the students identifying all FOD items and their locations.</u> • <u>Possible field trip opportunities to Northrop Grumman and other industry partners.</u> 		

<u>April 17th 2015 meeting:</u>		
<ul style="list-style-type: none"> • <u>DLAI 8210 Rev. C government document focus on Chapter 5 and Chapter 6 (attachments – checklist for training)</u> 		
Safety in Aviation	3.0	
<p>Possible Course Description: This course provides supervisors with aviation safety principles and practices needed to manage the problems associated with aircraft maintenance operations. In addition, it prepares attendees to assume safety responsibilities in their areas of operation. It does not teach aircraft maintenance and assumes the attendee has a maintenance background.</p> <p><u>No comments for this section at the April 3 2015 and April 17th meetings.</u></p>		
Lean Management (Six Sigma and 5S's)	3.0	
<p>Possible Course Description: Understand lean management; focus on greater value to the customer by eliminating waste throughout business processes. Students will gain knowledge and experience in the engineering aspects of designing and the maintenance side of aircraft. As mentioned before, some of the graduates will apply for jobs at major aircraft manufacturers, where the challenge is to fill the gap between the production floor and the engineering department. In addition to manufacturing liaison positions, graduates also get jobs in scheduling, tooling design, and even purchasing. To better prepare the students for these careers, these new courses are designed to teach the students not just to follow instructions, but to give them a set of tools to truly understand the design or improvement process.</p> <p>April 3 2015 meeting:</p> <ul style="list-style-type: none"> • <u>If a standard project is included with this class, students can earn a “green belt” for this class.</u> • <u>Include the following sections for this class: project management, workflow analysis, these subjects will be incorporated into the standard project. In addition this class will be the foundation class for the possible capstone courses.</u> <p>April 17 2015 meeting:</p> <ul style="list-style-type: none"> • Clarification: The term “design” in the above course description refers to shop layout versus engineering designing. 		
Manufacturing Testing & Inspection	3.0	
<p>Reliable bonds are essential to the integrity of aircraft composite structures throughout their service life. Therefore, NDT methods have been developed to assess bonding quality during maintenance.</p> <p>April 3 2015 meeting:</p> <ul style="list-style-type: none"> • <u>To included hands-on with testing equipment related to: rigging, high pressure lines and fittings, seals, electrical testing, gases, fluids, and curing.</u> • <u>MMP – Need to look at incorporating some elements of industry standards into the A&P's Material & Processes section.</u> <p><u>No comments for this section at the April 17th meeting.</u></p>		
AERO, Capstone Project I	2.0	
<p>April 3 2015 meeting:</p> <ul style="list-style-type: none"> • <u>Possible capstone course discussed would be a Lean Management/Project Management Project that would consist of an actual unclassified Northrop, Lockheed, Scaled, etc. project that two to three groups of students would compete for.</u> • <u>There would also be a generic or general project that would be a standby, if Northrop, Lockheed, Scaled,</u> 		

etc. would not be able to provide an unclassified real-life project for the students.

- The capstone course I would be the class where these real-life project will be distributed, and teams would develop proposals for industry/faculty. Workflow analysis and project management.

No comments for this section at the April 17th meeting.

Aviation Logistics Productivity/Affordability

3.0

April 3 2015 meeting:

- Return on Investment (ROI): Do changes fix a problem, do changes reduce cost
- AFAB 210 as a possible pre-requisite for this class.

No comments for this section at the April 17th meeting.

AERO, Capstone Project II

6.0

April 3 2015 meeting:

- Possible capstone course discussed would be a Lean Management/Project Management Project that would consist of an actual unclassified Northrop, Lockheed, Scaled, etc. project that two to three groups of students would compete for.
- There would also be a generic or general project that would be a standby, if Northrop, Lockheed, Scaled, etc. would not be able to provide an unclassified real-life project for the students.
- The capstone course I would be the class where these real-life project will be distributed, and teams would develop proposals for industry/faculty. Workflow analysis and project management.

No comments for this section at the April 17th meeting.

Airframe Manufacturing Tooling Phase I

6.0

This course is designed and intended for advancing knowledge and skills of composite manufacturing, whether in preparation for employment in the advanced composite manufacturing industry, or as engineers or technicians desiring a further understanding of the practical skills involved in producing quality composite structures. The student will have an intermediate level of understanding of composite layup and vacuum bagging techniques for complex shapes, fabrication of potted honeycomb core assemblies, manufacturing composite component parts using production type tooling, and a fundamental understanding of the documentation and record keeping required to support composite manufacturing.

Course Objectives: Quality assurance in manufacturing; planning, in-process inspection, and record keeping systems, Mold preparation; using semi-permanent polymer release systems, Challenges in layup of complex geometries: maintaining ply orientation/symmetry, Vacuum bagging complex shapes for oven and autoclave processing, Introduction to tooling: component specific molds and fixtures, Overview of non-destructive inspection methods.

Shop Projects: Mold preparation: clean, seal, and release molds for service, Cut and machine honeycomb core materials for use in layup, Cut and kit prepreg fabrics and adhesives for panel build, Layup, vacuum bag, and process complex sandwich core panels, Demold and inspect parts using non-destructive methods, Part marking, packaging, and storage of parts used for assembly.

April 17 2015 meeting:

This course to be broken down into 2 separate courses (2 semesters). Prerequisite for this course is AFAB 110. AFAB 110 needs to revise current objective to emphasize GD&T.

Airframe Manufacturing Tooling Phase II

6.0

This course is designed and intended for advancing knowledge of composite manufacturing, whether in

preparation for employment in the advanced composite manufacturing industry, or as engineers or technicians desiring a further understanding of the practical skills involved in producing quality composite structures. The student will have an intermediate level knowledge of machining, trimming and drilling composite components using fixtures, surface preparation methods/secondary bonding of structures, component assembly methods and techniques, as well as a acquire a fundamental knowledge of the resin vacuum infusion manufacturing process.

Course Objectives: Documentation of in-process and post-process operations, Rejection reports, cause and corrective actions, Machining, trimming, and drilling composite components, Surface preparation and adhesive bonding of composites Vs metals, Mechanical fastening methods and techniques, Composite structure assembly methods and procedures, Resin infusion processes such as Vacuum Infusion Process (VIP), Resin Transfer Molding (RTM), Vacuum Assisted Resin Transfer Molding (VARTM), etc., Darcy's law/permeability discussion, Resin ingress vacuum egress plumbing design.

Shop Projects: Trim and drill components for assembly using Trim and Drill Fixtures (TDF), Surface preparation and bond-assembly of components, Installation of bonded nut-plates and inserts, Prepare mold for infusion layup process, Layup preforms, arrange inlet and vacuum plumbing, vacuum bag, and infuse panel, Inspect all panels and assemblies and document findings.

April 17 2015 meeting:

This course to be broken down into 2 separate courses (2 semesters).

April 17th meeting:

T440: Engineer Manufacturing Level 1 & 2

1. Position Summary / Responsibilities
Designs manufacturing processes, procedures and production layouts for assemblies, equipment installation, processing, machining and material handling.
 - a. This part of the job description pertains to shop supporting criteria.
2. Designs arrangement of machines within plant facilities to ensure most efficient and productive layout.
 - a. This part of the job description pertains to placement of shop equipment for work production and efficiency.
3. Designs sequence of operations and specifies procedures for the fabrication of tools and equipment and other functions that affect product performance.
4. Adapts machine or equipment design to factory and production conditions.
5. May incorporate inspection and test requirements into the production plan.
6. Inspects performance of machinery, equipment, and tools to verify their efficiency, and investigates and initiates corrective action of problems and deficiencies to ensure product quality.
7. Develops manufacturing processes that are applicable to statistical process control, and may develop those techniques.
8. Provides guidance to engineering regarding design concepts and specification requirements to best utilize equipment and manufacturing techniques.
9. Ensures processes and procedures are in compliance with regulations.