

ORDER

8000.32

NATIONAL TRAINING PLAN FOR
AEROSPACE ENGINEERS, FLIGHT TEST PILOTS,
AND PROGRAM SUPPORT SPECIALISTS



JULY 29, 1986

**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

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FOREWORD

This order provides information and procedures on training available to aerospace engineers, flight test pilots, and associated program support specialists engaged in aircraft certification activities. It is intended to serve as a formal guide to facilitate the employee-supervisor effort to prepare, on a voluntary basis, an Individual Development Plan (IDP) for the employee. The IDP focuses on the need of the employee for improving technical and project management skills, developing employee potential, broadening experience and versatility on behalf of the organization, and when appropriate, facilitating and documenting progression to more complex assignments and more responsible positions.

This order describes a training profile for each specialty function identifying training courses that are essential for personnel assuming a position in the functional specialty. In addition to these essential training courses, it identifies agency and out-of-agency training sources, training courses which satisfy general training needs, and provides for a periodic review of agency training courses to assure currency and quality. This order establishes a focal point and surveillance functions in each directorate and in Washington to monitor and periodically review the effectiveness of the program.


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Director of Airworthiness
(Acting)

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CHAPTER 1. GENERAL

1. PURPOSE. This order establishes a national training plan for aerospace engineers, flight test pilots, and associated program support specialists engaged in aircraft certification activity. This order should be used as a formal guide to improve technical and program/project management skills. It serves as a management tool to fully develop employee potential, broaden experience and versatility on behalf of the organization, and when appropriate, facilitate progression to more complex assignments and more responsible positions.
2. DISTRIBUTION. This order is distributed to the branch level in the Office of Program and Regulation Management, the Office of Personnel and Technical Training, and the Office of Airworthiness; to the branch level in the Aircraft Certification Divisions; to the Aviation Standards Branch at the FAA Academy; to the branch level at the Aviation Standards National Field Office; Aircraft Certification Offices (ACO) and all regional Human Resource Management Divisions; to Director levels in the Offices of Employee and Labor Relations, Organizational Effectiveness, and Human Resources Planning and Evaluation.
3. BACKGROUND.
 - a. The Aircraft Engineering Division, (AWS-100) established a project to develop a national training plan. A team composed of members representing each Aircraft Certification Directorate, the FAA Academy, and Washington Headquarters was selected to develop the training plan. This national plan should facilitate the establishment of individual development plans between the employee and his/her supervisor, establish training priorities, and assist in budgetary planning for training.
 - b. The increasing requirements for certification of aircraft utilizing new technology concepts in design and construction make it essential that the knowledges and skills of aircraft certification engineers and flight test pilots be developed and maintained to a high level of proficiency. This requires training in state-of-the-art technical developments, job functions, project management, human relations, and other general training.
4. RESPONSIBILITIES.
 - a. First-line supervisors should advise employees of available training to improve employee functional effectiveness and foster career goals. With the supervisor's assistance the employee may elect to develop an employee individual training and development plan meeting the individual's training needs. The individual should assume prime responsibility for pursuing career development. Employee career counseling and planning should be accomplished for each employee at least annually. New employees should be given special attention to expedite their functional effectiveness.

b. Office managers should monitor individual training progressions.

c. Human Resource Development (training) elements should provide available resources to assist Aircraft Certification Divisions and Aircraft Engineering Division to establish the plan for individual employee development and training plans using this report as a guide (see APPENDIX 1), in accordance with operational program plans, program priorities, staffing and budget.

d. An individual should be appointed in each aircraft certification directorate and in the Aircraft Engineering Division (AWS-100) in Washington, to monitor the training and to see to it that the overall training objectives are met, that training information is disseminated to all affected offices in a timely manner, and to maintain a liaison with the human resource development (training) organization. These individuals should meet at appropriate intervals, as determined by AWS-100, to review the training plan, to determine if the training objectives are being met, and they are responsible for proposing adjustments and revisions to accommodate changing needs and improvements.

e. PRIVACY ACT. All FAA officials and employees having agency responsibility for collecting, maintaining, using, or disseminating systems of records which contain individual identifiable information are responsible for complying with the provisions of Order 1350.22, Protecting Privacy of Information About Individuals.

5.-19. RESERVED.

CHAPTER 2. JOB FUNCTIONS

20. GENERAL. The following is a list of job functions covering aircraft certification assignments for airframe, system and equipment, propulsion, flight test, and program support specialty areas.

21. ALL SPECIALTY AREAS.

a. Study, explain, and apply Federal Aviation Regulations (FAR's) related to aircraft, aircraft engine and propeller certification.

b. Plan certification projects, including determination of substantiation needed, to show compliance.

c. Conduct certification projects, including evaluation and approval or disapproval of design data submitted, to establish compliance.

d. Conduct structural and flight test activities, including analysis of test methods proposed to show compliance, witnessing tests, and evaluating results against certification requirements.

e. Determine that no feature or characteristic would make the aircraft unsafe for the category in which certification is requested.

f. Recommend type certification approval.

g. Participate in accident/incident investigation and review of service difficulty reports to determine if corrective actions are necessary.

h. Participate in rulemaking and policy development activities.

22. AIRFRAME.

a. Airframe engineers are concerned with the total aircraft structure including:

- (1) Fuselage
- (2) Booms
- (3) Cowls
- (4) Nacelles
- (5) Fairings
- (6) Empennage
- (7) Fixed and rotary wings
- (8) Landing and flotation gear
- (9) Flight control systems (aileron, elevator, rudder, etc.)
- (10) Flaps and other high lift and special airframe devices

b. Airframe engineers are responsible for determining compliance with regulations pertaining to:

- (1) Flight loads
- (2) Ground loads

- (3) All other internal and external loads applied to the airframe
- (4) Structural dynamics
- (5) Flutter and vibration
- (6) Structural fatigue
- (7) Materials and processes
- (8) Structural substantiation procedures
- (9) Allowable stresses
- (10) Structural limitations
- (11) Aircraft crashworthiness

23. SYSTEM AND EQUIPMENT.

a. System and equipment engineers are concerned with all aspects of an aircraft's:

- (1) System and equipment
- (2) Crashworthiness
- (3) Passenger accommodation
- (4) Safety provisions
- (5) Emergency equipment

b. System and equipment engineers are responsible for determining compliance with regulations pertaining to the design, construction, testing, functioning, and reliability of systems and equipment including:

- (1) Electrical (generation, distribution, and control systems)
- (2) Avionics (automatic flight control, navigation, and communication systems)
- (3) Instruments (airspeed, altitude, heading, attitude, and flight director systems)
- (4) Mechanical (hydraulic, pneumatic, and pressurization systems)
- (5) Environmental (air conditioning and oxygen systems)
- (6) Crashworthiness (emergency exits, rafts, seats, and belts)
- (7) Miscellaneous (display, annunciation, lighting, computer, lightning protection, wheels, tires, brakes, and anti-skid systems)

24. PROPULSION.

a. Propulsion engineers are concerned with all aspects of those aircraft systems affecting its propulsion (engines and propellers) and auxiliary power generating devices both as separate products and as installed in specific aircraft.

b. Propulsion engineers are responsible for determining compliance with regulations pertaining to the design, construction, testing, functioning, reliability, and performance of aircraft propulsion systems and components including:

- (1) Engines
- (2) Engine installation
- (3) Propellers
- (4) Propeller installation

- (5) Governor systems
- (6) Power transmission systems
- (7) Rotor drive systems
- (8) Auxiliary power units (APU's)
- (9) Fuel burning heaters
- (10) Fuel and oil systems
- (11) Power management systems
- (12) Accessories installed on the engine including:
 - (a) Electrical generators
 - (b) Hydraulic pumps
 - (c) Bleed air systems
 - (d) Thrust reversers
 - (e) Powerplant fire protection systems
 - (f) Powerplant ice protection systems
 - (g) Powerplant performance analysis
 - (h) Engine instrumentation
 - (i) Engine power management systems
 - (j) Lightning protection (as it affects propulsion systems)

25. FLIGHT TEST.

a. Flight test pilots and engineers are responsible for determining that aircraft designs comply with regulations and established procedures pertinent to:

- (1) Aircraft operating limitations
- (2) Operating procedures (emergency, abnormal, and normal)
- (3) Flight characteristics
- (4) Performance
- (5) System and equipment operation
- (6) Function and reliability
- (7) Pilot - aircraft - environment compatibility

b. Flight test pilots and engineers fly the aircraft through a series of tests at critical configurations, speeds, attitudes and altitudes to show compliance with applicable requirements.

26. PROGRAM SUPPORT.

a. Program support specialists are responsible for advising, assisting, and consulting with management, technical specialists, and other organizational elements in programming and budget/administrative operations of assigned programs, which include planning, developing, analyzing, preparing, controlling, and overall management.

b. Assigned programs are:

- (1) Airworthiness Directives
- (2) National Resource Specialists
- (3) Designated Representatives
- (4) Technical Standard Orders

(5) Activities involving:

- (a) National Transportation Safety Board
- (b) Freedom of Information Act
- (c) International Issues
- (d) Research and Development
- (e) Advisory Circulars/Directives
- (f) Training programs
- (g) Regulations

c. Program support specialists assist engineers in:

- (1) Program evaluation, work progress, preparation of reports, and establishing/assuring a smooth flow of technical project activities
- (2) Regulatory/nonregulatory processes and associated support documents
- (3) Procedural guidelines and personnel, management, organizational, and program policies
- (4) Appeals processes
- (5) Public hearing/meetings
- (6) Management information and briefing material

27.-29. RESERVED.

CHAPTER 3. INDIVIDUAL DEVELOPMENT PLAN

30. GENERAL. An Individual Development Plan (IDP) is a systematic method used in planning for training to develop specific knowledge and skills. It provides an opportunity for both the employee and supervisor to set objectives which define the goals of the employee in consonance with the objectives of the organization. IDPs are made available to the employee on a voluntary basis to be used as a tool for planning training and related developmental experiences. The primary purpose of an IDP is to assist employees in setting reasonable goals, assess their strengths, and direct them where they can best contribute their knowledge, skills, and abilities to the organization.

31. ROLE OF SUPERVISOR.

a. The supervisor should carefully review the short and long range goals of the organization. Defining these goals to the employee will enable both the employee and supervisor to identify developmental needs that will benefit both the organization and the employee. As appropriate, the employee's performance in his/her present job should be assessed (i.e., technical competence, managerial ability, etc.). The employee's present knowledge and skills and areas in which improvement is needed should be carefully examined to determine the types of training and developmental experiences he/she should receive.

b. The supervisor should also provide information on the availability of training and developmental experiences to meet broad developmental objectives. Some possible opportunities for developmental experiences could be:

- (1) On-the-job training task force assignments or details;
- (2) Agency and Out-of-Agency training courses;
- (3) Selective participation and attendance at workshops, symposiums and other technical meetings;
- (4) Opportunities for membership or liaison to industry-government sponsored technical committees.

c. Supervisors should assist and advise employees who desire to participate in self-developmental activities. Such activities might include formal training courses which will prepare the employee to perform anticipated future job assignments. These activities should be identified and discussed with the employee during the IDP planning interview. Care should be taken to provide fair training opportunities and developmental experiences to all employees under the supervisor's jurisdiction consistent with the functional structure of the supervisor's work unit, work load, and available resources.

32. ROLE OF EMPLOYEE.

a. The employee should define short and long term career goals, plans and development needs to his/her supervisor. In planning for an IDP, it is important for employees to consider personal expectations and relate them to the goals of the organization. Employees should also identify areas in which knowledge or skills could be acquired to improve their present job performance

and to prepare them for future job assignments. Information sources such as performance appraisals should be used in identifying those areas in which improvement is needed. The employee should also prepare a list of self-developmental activities which would broaden knowledge and skills.

b. This preparation should assist the individual in his/her discussion with the supervisor and in the construction of the Individual Development Plan, with the individual assuming prime responsibility for pursuing career development.

33. IDP PLANNING INTERVIEW (EMPLOYEE/SUPERVISOR DISCUSSION).

a. This discussion is important because it gives both the employee and supervisor an opportunity to jointly discuss the needs and goals of the organization and employee. The discussion also gives the employee a chance to express his/her interests and goals and how they relate to the organization's present and future needs.

b. After the employee and organizational goals are identified, broad developmental objectives can be discussed. These objectives are defined in terms of the employee's developmental needs. The supervisor and employee should initiate a specific action (i.e., request training courses, on-the-job training, special projects) and schedule completion within a specified period of time. This discussion should also cover how the work experience or formal training should lead to improved job performance and how the employee and the organization will benefit from this developmental plan.

c. The developmental objectives and assignments should then be recorded on an IDP form to be signed and dated by the employee and supervisor, and reviewed by the second level supervisor/manager.

d. It is emphasized that the employee/supervisor discussion is NOT a performance appraisal and should be informal.

34. IDP FORM. A sample IDP Form, including the instructions to complete the IDP Form is contained in APPENDIX 1.

35.-39. RESERVED.

CHAPTER 4. TRAINING PROFILE

40. GENERAL. Adherence to the training profile is recommended to achieve optimum results. Courses should be scheduled to meet the needs of the agency and the individual. Previous experience and training should be credited toward the individual training profile to avoid repetition.

a. The information in APPENDIX 3, Training Subjects provide only general guidelines and are not necessarily consistent with the agency's definitions and descriptions of "Categories of Training" established in FAA Order 3000.6B, Training Handbook. Additional subjects areas, of more or less stringent category definition for specific courses, may be applicable. Supervisors may upgrade or downgrade these categories for particular subject areas that commensurate with the needs of the employee and/or the requirements of the position. Satisfactory completion of training or the lack thereof shall not be, in itself, the sole basis for personnel action (e.g., promotion, reassignment, adverse action, etc.), because equivalent or more appropriate criteria (e.g., job performance evaluation) are dominant to satisfy the objectives associated with training categories for flight test pilots and aerospace engineers engaged in aircraft certification activities. It should be recognized that APPENDIX 3 does not actually list training courses. It lists subject areas applicable to essential training related to the job function responsibilities of the incumbent employee.

b. The training profile identifies subject areas that are essential for all Aerospace Engineers and Flight Test Pilots. In addition, it identifies those subject areas/courses that may be critical for specific job specialties. This will not preclude first level supervisors, with justification, from identifying any additional courses that he/she feels are highly desirable to accomplish an individual's job functions. Mandatory training cannot be waived for the Certification Engineering Indoctrination Course No. 21604.

41. MANDATORY GENERAL. Course No. 21604, Certification Engineering Indoctrination, is mandatory for all Aerospace Engineers and Flight Test Pilots. This course should be taken within the first year of employment in the Aircraft Certification organization.

42. ESSENTIAL - SPECIALTY AREAS. Essential training subject areas which may be applicable to specific specialty areas are listed as follows and are also summarized in APPENDIX 3, Training Subjects.

a. Airframe - Structures.

- (1) Aircraft Basic Loads
- (2) Aircraft Vibrations

b. Airframe - Crashworthiness.

- (1) Impact Dynamics
- (2) Occupant Protection and Survivability
- (3) Flammability, Smoke and Toxicity

c. Systems - Avionics/Electrical.

- (1) Reliability, Probability and Safety Analysis
- (2) System Safety and Hazard Analysis
- (3) Software Verification and Validation

d. Systems - Mechanical.

- (1) Reliability, Probability and Safety Analysis
- (2) System Safety and Hazard Analysis
- (3) Control Systems Design and Analysis

e. Propulsion - Engine. Reciprocating and Turbine Engine Principlesf. Propulsion - Installation. Reciprocating and Turbine Engine Principlesg. Flight Test Engineer.

- (1) Aircraft Performance
- (2) Flight Test Principles and Practices
- (3) Aircraft Anti-Ice/De-ice Systems
- (4) Human Factors in Cockpit Standardization
- (5) Turbine Engine Principles
- (6) Physiological Compliance with (Orders 8110.4) and (4040.9)

h. Flight Test Pilot.

- (1) Pilot Proficiency (Order 3000.17)
- (2) Physiological Training (Orders 8100.4) and (4040.9)
- (3) Flight Test Principles and Practices
- (4) Human Factors in Cockpit Standardization

i. Program Support Specialists. No Mandatory Training

43. MANDATORY/JOB REQUIRED/HIGHLY DESIRABLE/PERFORMANCE IMPROVEMENT/CAREER DEVELOPMENT. The subject areas and categories which may be applicable for specific specialty areas are summarized in APPENDIX 3.

44.-49 RESERVED.

CHAPTER 5. TRAINING AND CAREER DEVELOPMENT

50. TRAINING CATALOGS. The FAA Catalog of Training Courses should be consulted for training course selection covering the subject areas listed in APPENDIX 3. Likewise, the Out-of-Agency Training Course Catalog for Engineers and Flight Test Personnel identifies out-of-agency training that may be of value. It also includes courses on new state-of-the-art techniques. A copy of the latter catalog is available from the Airworthiness Section of the FAA Academy, AAC-952, Telephone: FTS-749-4533.

51. WORKSHOPS, SEMINARS AND TECHNICAL COMMITTEES. Selective attendance and participation at these technical meetings should be considered to supplement, individual training needs and developmental experiences, and to foster career progression. Workshops emphasizing specialized training developed and/or conducted by National Resource Specialists (NRS) are available to meet specific training needs.

52. PERIODIC REVIEW OF TRAINING COURSES. The purpose of establishing an aerospace engineer, test pilot, and program support specialist training review plan is to ensure that the FAA Academy-sponsored training for these personnel is current and of high quality, and generally follows and meets the requirements of FAA Order 3000.6B, Training Handbook.

a. The review should cover the following areas:

- (1) Currency of material being presented.
- (2) Accuracy of material being presented.
- (3) Relevance of the course material to the related job functions/duties
- (4) Criticality of the training.

b. The responsibility for accomplishing the review lies with the Technical Training Division (APT-300). However, to effectively conduct the review, the support of the Aircraft Engineering Division (AWS-100), Aircraft Certification Directorates, and the FAA Academy is required.

c. The review should be conducted in accordance with the guidelines presented in FAA Order 3000.6B, Training. The team leader for the group should be a representative from the Technical Training Division (APT-300). The team will review the course documentation and critique sheets for all of the courses sponsored by the FAA Academy, Resident, and Out-of-Agency training. The team will prepare a report based on their review. This report should identify the deficiencies (if any) in the courses and make recommendations on how to improve their quality and insure relevance of information taught. The report should be forwarded to AWS-100, AAC-900, and APT-1 for review, approval, and implementation.

53. OUT-OF-AGENCY TRAINING COURSE CATALOG AND THE ESTABLISHMENT OF NEW TRAINING REQUIREMENTS. The following procedures should be used to assure that the out-of-agency training course catalog is current so that maximum utilization of available training is achieved and new training requirements are identified in an accurate and timely manner.

a. The Airworthiness Section, Aviation Standards Branch of the FAA Academy, AAC-952, will be responsible for the currency of the Out-of-Agency Training Course Catalog for Engineers and Flight Test Pilots, identifying new training courses available at academic institutions and other training sources, and dissemination of Out-of-Agency Training Course Catalog revisions to all affected offices in a timely manner.

b. The procedure for planning and developing FAA Academy conducted or arranged training is contained in Order 3000.6B, Training Handbook. Specifically, it provides guidance for the preparation and submission of a training proposal to be submitted to the Technical Training Division, APT-300. It should be emphasized that any interested person can submit a training proposal, through channels, to the Office of Airworthiness for evaluation and action.

54. STUDENT END-OF-COURSE EVALUATION. A Training Course Evaluation form such as shown in APPENDIX 2, should be completed by each student after completion of any training course other than those conducted or contracted by the FAA Academy. Copies of the form should be forwarded to the student's immediate supervisor, regional Human Resource Development (training) element, and the Academy Aviation Standards Branch, Airworthiness Section(AAC-952). The Academy will review each student's evaluation and forward comments/recommendations to the training organization and/or FAA Certification Directorate appointed individual as appropriate.

55.-59. RESERVED.

APPENDIX 1 INSTRUCTIONS FOR COMPLETING
INDIVIDUAL DEVELOPMENT PLAN (IDP) FORM

1. PURPOSE.

This IDP form has been designed to help you plan for specific training and experience, to assist that you in achieving your goals, and help you to do a better job.

2. FORMAT FOR THE INDIVIDUAL DEVELOPMENT PLAN

- a. Block 1 thru 5 self-explanatory.
- b. Block 6 Describe the career goals you want to attain within the next year.
- c. Block 7 Describe the career goals you want to attain within the next two to five years.
- d. Block 8 List the knowledges, skills and abilities (KSAs) needed to carry out your goals. Ask yourself "Are there any KSAs that I am weak in or which I lack?" This is the basis of your IDP. Your IDP will outline how you will get the necessary KSAs to enable you to reach your goals.
- e. Block 9 This portion should be discussed between the employee and supervisor. Developmental assignments are assignments in areas which will provide the knowledges and skills necessary for the employee's goals. This maybe accomplished through details, task force assignments, on-the-job training, special projects, rotational assignments, etc.
- f. Block 10 List other self-development activities. This could be self-study, correspondence courses, attendance at conferences, seminars, workshops, symposiums, technical committees, etc. Any other activities that will provide the necessary KSAs to meet the employee's goals.
- g. Block 11 Space provided for any comments or remarks by employee and supervisor.
- h. Block 12 List FAA, interagency, non-government training courses in areas which provide knowledge and skills necessary for employee's goals.
- i. Block 13 This block is used for projected cost of each formal training course.
- j. Block 14 Indicate the date the course should be completed.
- k. Block 15 Indicate the date it was actually completed.

FIGURE 1
APPENDIX 1 INDIVIDUAL DEVELOPMENT PLAN

Employee Name 1	Grade 2	Position Title 3	Organizational Element 4	Name of Supervisor 5
Section I. Career Goals				
Short Range Goals 6			Long-Range Goals 7	

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Appendix 1

FIGURE 1 (CONT'D)
APPENDIX 1 INDIVIDUAL DEVELOPMENT PLAN

Section II. Individual Development Plan (To be completed by Supervisor and Employee)

Develop Objectives (Knowledge, Skills and Abilities needed to reach goal)	8
Developmental Assignments (On-the-job training, details, etc.) Include target date for completion.	10
Other Activities	10

9

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FIGURE 1 (CONT'D)
APPENDIX 1 INDIVIDUAL DEVELOPMENT PLAN

Remarks	Section III. Formal Training and Time Frame for Accomplishing Training			
	Formal Training (e.g., FAA, Interagency, Non-government courses. To be completed by supervisor and employee.)	Projected Cost	Record of Accomplishment Projected Completion	Actual Completion
11	12	13	Date 14	Date 15

Employee's Signature Date

Second Level Supervisor's Signature Date

Supervisor's Signature Date

NOTE: This Individual Development Plan (IDP) is subject to changes depending on availability of funds,

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Appendix 2

SAMPLE APPENDIX 2 TRAINING COURSE EVALUATION FORM

Name and Position Title _____

Routing Symbol _____

Course Title _____

Name and Location of Training Facility _____

Date of Training _____

Please review the items below and circle the most appropriate response with (1) being a very unsatisfactory rating and 5 as being an excellent rating. Your thoughts and comments will be used to advise other Directorate and Agency personnel on the value and appropriateness of this training course.

- | | | | | | |
|---|---|---|---|-----|----|
| 1. How effective was the course in meeting your objectives? Please elaborate in item 9. | 1 | 2 | 3 | 4 | 5 |
| 2. Relationship of course instruction to your job function and training needs. | 1 | 2 | 3 | 4 | 5 |
| 3. Relationship of course material to your job function and training needs. | 1 | 2 | 3 | 4 | 5 |
| 4. The course's effect in improving your effectiveness and/or efficiency. | 1 | 2 | 3 | 4 | 5 |
| 5. How effective was the instructor in teaching and answering questions? | 1 | 2 | 3 | 4 | 5 |
| 6. Would you recommend the course to your colleagues? | 1 | 2 | 3 | 4 | 5 |
| 7. Were training equipment aids used effectively? | | | | YES | NO |
| 8. Was there a balance between theoretical and practical applications? | | | | YES | NO |
| 9. Other comments that you feel would be helpful in assessing the value of the course. (Attach additional pages if necessary) | | | | | |

SAMPLE APPENDIX 2 TRAINING COURSE EVALUATION FORM (CONT'D)

Signature of Student

Date

Copies to: Immediate Supervisor
TFMO

APPENDIX 3 TRAINING SUBJECTS

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY							
		AIRFRAME		SYSTEM		PROPULSION		FLIGHT TEST	PROGRAM SUPPORT
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT SPEC.
1. Material Properties Metals	Math and Statistics Review. Determination of Structural Allowable from Coupon and Subcomponent Testing. Data Reduction Methods using MIL-HNBR 5 Requirements. Coupon and Subcomponent Testing Techniques. Temperature and Environmental Correction Factors.	2	2		3	2	2		
2. Aircraft Loads Assessment									
A. Basic Loads	Basic Aerodynamics. Methods of Loads Analysis. Design Data. Critical Loading Conditions. Airfoil Characteristics. Airplane Balancing. Empennage and Wing Loads. Landing Loads. Inflight Measurements of Loads. Evaluation of Typical Loads Report.	1	3				3	3	
B. Transport and General Aviation Airplanes	Criteria and Requirements. Time History and Maneuver Loads. Discrete Gust. Distributed Loads Flexible Aircraft Gust Loads, Discrete and Continuous. Power Spectral Density Analysis. Wing Load Alleviation System. Effects of Wing Tip End Plates. Effect of Sweep and High Mach Number. Flexible Airplane Dynamic Landing and Taxi Loads. Ground Handling Loads. Inflight Measurements of Loads.	1	3				3	3	

ABBREVIATIONS:

STRUCT. = STRUCTURES AV/ELECT. = AVIONICS/ELECTRICAL INSTL. = INSTALLATION ENGR. = ENGINEER
 C/W = CRASHWORTHINESS MECH. = MECHANICAL ENG. = ENGINE SPEC. = SPECIALIST

*See paragraph 40

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY						
		AIRFRAME		SYSTEM		PROPULSION	FLIGHT TEST	PROGRAM SUPPORT
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR. PILOT SPEC.
2. Aircraft Loads Assessment (Continued) C. Rotorcraft	Rotor Aerodynamics. Momentum and Blade Element Theory. One-G and Maneuver Loads. Gust Loads. High Frequency Vibratory Loads. Effects of Aeroelastic Stability. Engine/Airframe Compatibility. Torsional Stability. Drive System Loads. Landing Gear and Ground Handling Loads. Effect of High Mach Numbers. Flight Loads Survey.	1	3			3	3	
3. Aircraft Vibrations	Review of Mathematics and Physics. Definitions and Terms. Basic Linear and Torsional Frequency Equation. Single and Multi-Degrees of Freedom. Free and Forced Damped Systems. Unbalance and Balancing Equipment. Absorbers and Dampers. Vibration Equipment and Use. Analysis of Continuous and Variable Cross-section Beams. Coupled Modes. Ground Vibration Survey.	1	3			3	2	2

ABBREVIATIONS:

STRUCT. = STRUCTURES

AV/ELECT. = AVIONICS/ELECTRICAL

INSTL. = INSTALLATION

ENGR. = ENGINEER

C/W = CRASHWORTHINESS

MECH. = MECHANICAL

ENG. = ENGINE

SPEC. = SPECIALIST

*See paragraph 40

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Appendix 3

APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY					
		AIRFRAME	SYSTEM	PROPULSION	FLIGHT TEST	PROGRAM SUPPORT	
		STRUCT. C/W	AV/ELECT MECH	ENG. INSTL	ENGR. PILOT	SPEC.	
4. Control Systems Design and Analysis	Manual to Fully Powered and Fully Automatic. Evaluation of Independence, Redundancy, and Typical Failure Sources that Cause Multiply System Failure.	2	2	1	3	3	2
5. Structural Analysis	Finite Element Analysis. Mass Parameter Analysis. Modeling Techniques. NASTRAN. SOM-LA. KRASH. DYCAST. etc.	2	2		3	3	
6. Lightning Protection Systems	Principles of Lightning. Design Practices for Protection. Applicable Regulations and Guidance. Testing and Analysis Methods.	3	2	3	3	3	3
7. Damage Tolerance Assessment	Fracture Mechanics Concepts. Stress Intensity Factor. Residual Strength of Damaged Elements. Surface-Corner-Embedded Flaws. Fastener Flexibility. Energy Release Rate and Pseudo Closed Form Solutions. Critical Crack Length. Crack Arrestors. Crack Growth Assessment. Retardation Models.	2		3	3	3	

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY						
		AIRFRAME	SYSTEM	PROPULSION		FLIGHT TEST	PROGRAM SUPPORT	
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR. PILOT	SPEC.
8. Aircraft Anti-Ice/Deice Systems	Physics for Ice Collection. Technical Report AD-4. Icing Data Statistics for Design Criteria. Protection Methods. AC 20-73. Testing and Analysis Methods with and without Ice Shapes.	3	3	2	2	2	1	2
9. Flutter Analysis and Flight Flutter Testing	Structural Flexibility and Stiffness. Natural Frequencies and Mode Shapes. Excitation Techniques. Ground Vibration Testing. Nature of Flutter. Two and Three Dimensional Incompressible and Com- pressible Flow. Flutter with Two or Three Degrees of Freedom. Aeroelastic Effects. Flutter Testing. Data Acquisition and Instrumentation. Data Reduction.	2						

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

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SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY									
		AIRFRAME	SYSTEM	PROPULSION	FLIGHT TEST	PROGRAM					
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.		
10. Fatigue Evaluation	Definition and Recognition. Theories of Failures. Fatigue Crack Initiation and Propagation. Fatigue Concepts. Interpretation of Fatigue Data. Metallurgical Factors. Detail Design and Manufacturing Considerations. Acoustical Fatigue. Fatigue Numerical Analysis. Fatigue Testing. Life Determination.	2			3	2	2				
11. Aircraft Flight Dynamics	Equations of Motion. Aerodynamic Concepts. Longitudinal-Lateral-Directional Stability Derivatives. Stick Fixed, Stick Force/Speed/Load Factor Gradient. Stick Free. Perturbation Equations. Frequency Response and Feedback Systems. Autopilot Modes. Coupling and Noncoupling Problems. Aeroelastic effects. Performance. Lift/Drag and High Lift Devices. Pressure Distribution.	2	3	3	3	3	3	2	3		

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY									
		AIRFRAME	SYSTEM		PROPULSION		FLIGHT TEST		PROGRAM SUPPORT		
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.	
12. Static and Dynamic Stability and Automatic Flight Control	Equations of Motion. Longitudinal, Lateral, Directional Stability Derivatives. Laplace Transform. Small Perturbation Equations of Motion. Frequency Responses and Mode Plots. Airplane Response to Control and Gust Inputs. Linear Feedback Systems. Synthesis of Stability Augmentation Systems.	3		2	2				2		
13. Computer Technology and Literacy	Survey of Current Computer Operating Systems and System Programs. Computer System Organization and Logic Design. Computer Structure. Artificial Intelligence. Programming. System Usage. Recent Developments in Computers and Programs. Hardware and Software as Applied to Real Time Systems. Language. Computer Aided Design and Manufacturing.	2	2	2	2	2	2	2	2	2	3

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY								
		AIRFRAME	SYSTEM	PROPULSION	FLIGHT TEST	PROGRAM SUPPORT				
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.	
14. Software Verification and Validation	FAA Software Certification Requirements and Guidance.		1	3	3	3	3			
15. Human Factors in Cockpit Standardization	Cockpit Design. Crew Workload Assessment. Visibility. Lighting and Controls.		3			3	1	1		
16. Foreign Certification	Bi-lateral Agreements. ICAO, BCAR and JAR Requirements. Agency Policies. Role of FAA Hq., Accountable and Geographic Directorates. Protocol.	2	2	2	2	2	2	2	2	3

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY					
		AIRFRAME	SYSTEM	PROPULSION	FLIGHT TEST	PROGRAM SUPPORT	
		STRUCT. C/W	AV/ELECT MECH	ENG. INSTL	ENGR. PILOT	SPEC.	
17. Composite Materials	Heterogeneous Materials. Characteristics of Fibers and Matrix Materials. Unidirectional Composites and Structural Laminates. Laminate Theory and Behavior. Interlaminar Stresses. Fracture. Fatigue. Analysis of Structural Elements. Design and Evaluation. Test Methods. Fabrication. Processing. Repair. Design Applications.	2	2	2	3		
18. Noise	Design Techniques. Regulatory Requirements. Evaluation Procedures. Noise Reduction Parameters. Methods of Analysis. Testing Procedures.		3		2	2	
19. Occupant Protection and Survivability	Crashworthiness Design Concepts. Seat Restraint Systems. Human Tolerance, Cabin Delethalization, Evacuation Systems, Cabin Lighting. Post-crash Fires.		3	1			

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY						
		AIRFRAME		SYSTEM		PROPULSION	FLIGHT TEST	PROGRAM SUPPORT
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR. PILOT	SPEC.
20. Impact Dynamics	Acceleration, Velocity, Force and Dynamic Terms. Occupant Envelope. Impact Dynamics Concept. Impulse. Dynamics and Kinematics of Crash. Crash Survivability Terms. Instrumentation. Test and Instrumentation	3	1			2		
21. Fuel Systems and Design	Design Criteria. Crashworthiness Considerations. Ignition Sources. Fire Suppression/Prevention. Frangible Attachments. Self-Sealing Breakaway Couplings.	3	2			3	2	
22. Oxygen and Protective Breathing Systems	System Design, Installation and Maintenance. Methods for Calculating the Flow and Quantity Requirements. Test and Analysis Methods. Industry Specifications.		3			2		

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APPENDIX 3 TRAINING SUBJECTS (CONT'D)

*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY									
		AIRFRAME		SYSTEM		PROPULSION		FLIGHT TEST		PROGRAM SUPPORT	
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSL	ENGR.	PILOT	SPEC.	
23. Fire and Smoke Detection and Fire Extinguishing Systems	In-flight Detection and Extinguishing Systems. Agents. Hand-Held Extinguishers. Cargo Compartment Classification/Evaluation. Smoke Penetration and Venting. Post-Crash Fire Considerations. Test and Analysis Methods.	3	2		2		2				
24. Flammability Smoke and Toxicity	Flammability of Cabin Materials. Heat Release. Flame Spread. Irritant Gases. Protective Breathing Devices. Evacuation of Fire/Smoke.	3	1								
25. Reliability, Probability, and Safety Analysis	Math Review. Concepts and Distributions. Fault and Fault Tree Analysis. Reliability Expectations. Redundancy and Tolerance Analysis. Test and Service Data Assessment. Testing, Qualification and Manufacturing Assessment. System Safety and Hazard Assessment.	2	3	1	1	2	2	2	3	4	

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*Category: 1. Mandatory 2. Job Required 3. Highly Desirable 4. Performance Improvement 5. Career Development

SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY				
		AIRFRAME	SYSTEM	PROPULSION	FLIGHT TEST	PROGRAM SUPPORT
		STRUCT. C/W	AV/ELECT	MECH	ENG. INSTL	ENGR. PILOT SPEC.
26. Nondestructive Testing	Radiography. Ultrasonic. Eddy Current. Magnetic Particle. Liquid Penetrant. Holography. Infrared.	3		3	3	3
27. Control System Theory	Basic Control System Theory. Stability in "S" Time Domain - Linear and Nonlinear Systems.		2			
28. Drive System Dynamics	Torsional and Whirl Mode Analysis. Gear Teeth Excitation Frequency vs Turbine Blade Natural Frequency. Torsional Stability. Hookes Joints.	3		2	2	
29. Transmission Systems	Gears. Bearings. Shafting. Seals. Lubrication. Cooling. Oil Pumps/ Filters. Case Design.			3	2	
30. Air Induction Systems	Design Techniques. Inlet Distortion, Icing Considerations. Inlet Losses. Stalls and Surge Characteristics. Environmental Considerations.			3	2	2

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SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY							
		AIRFRAME	SYSTEM		PROPULSION		FLIGHT TEST	PROGRAM SUPPORT	
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR. PILOT	SPEC.	
31. Turbine Engine Principles	Turbine Engine Fundamentals. Components. Compressible Flow. Turbo Jet. Turbo Fan. Turbo Shaft. Performance. Dynamics.	4				1	1	1	2
32. Landing Gear Systems	Landing Gear Ext./Retraction System. Tires. Wheels. Brakes. Anti-Skid. Auto Brakes. Steering. Failure Effects. Testing and Analysis Methods.	3			2			2	2
33. Flight Test Principles and Practices	Basic Standardization and Recurrent Training in Performance and Flying Qualities. Flight Test Procedures. Data Collection and Reduction. Stability and Control, Stalls, Take-Off and Landings, etc. Engine Cooling. State-of-the-Art Technology. Flight Advisory Systems. Fly-By-Wire. Digital Navigation. Flight Directors. Wing Load Alleviation.	3	3	3	3	3	3	1	1

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SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY						
		AIRFRAME	SYSTEM		PROPULSION		FLIGHT TEST	PROGRAM SUPPORT
		STRUCT. C/W	AV/ELECT	MECH	ENG.	INSTL.	ENGR. PILOT	SPEC.
34. Physiological Compliance with 8110.4 and 4040.9. Training							1	1
35. Environmental Systems	Air Conditioning. Bleed Air Cooling. Ozone. Pressurization. Ventilation. Purpose and Function of Systems. Failure Effects. Testing and Analysis Methods.	2		2		3	3	
36. Pilot Proficiency	Order 3000.17. Initial Checkouts. Annual Recurrency. Instrument Refresher.							1
37. Aircraft Accident Investigation/Prevention	Statutes and Regulations. FAA and NTSB Forms. Reports. Technical Investigation Techniques. Crash Sequence. Autopsy. Biochemical. Pilot History.	3	3	3	3	3		4
38. Fuel Management Systems	Vapor/Liquid Ratios (Hot Fuel). Pressure Pumps. Filters. Fuel Line. Pressure Loss Analysis. Hydromechanical Fuel Control. Electronic Fuel Control. Governors. Failure Modes.					2	2	2

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SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY								
		AIRFRAME	SYSTEM		PROPULSION		FLIGHT TEST		PROGRAM	
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.
39. Reciprocating Engine Principles	Components. Performance, Dynamics.	4				1	1	2		
40. Design, Manufacturing, Operation, and Continued Airworthiness	Principles of Design, Manufacturing and Operation of Aircraft. Normal and Abnormal Operation of Systems. Flight Controls. Navigation. Electrical. Hydraulic and Pneumatic. Fuel. Landing Gear. Airplane Performance and Flight Characteristics. Quality Assurance. Maintenance and Servicing of Aircraft.	3	3	3	3	3	3	3		4
41. Structural Bonding	Matrix Materials. Mechanical Properties. Metallurgical Considerations. Fabrication. Elastic-Plastic Behavior. Fracture and Crack Growth. Plasticity and Fatigue. Design Considerations. Environmental Effects.	2						2		
42. Technical Writing Communication	Brevity and Clarity. Correct and Precise Data Presentation. Elimination of Redundancy. Completed Staff Work. Staff Studies.	3	3	3	3	3	3	3	3	3

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SUBJECT AREAS	DESCRIPTION	APPLICABLE CATEGORY									
		AIRFRAME		SYSTEM		PROPULSION		FLIGHT TEST		PROGRAM SUPPORT	
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.	
43. Project/ Program Management	Organizational Skills. Goal Setting. Management Theory and Practice. Vertical and Lateral Communication. Accountability.	3	3	3	3	3	3	3	3	3	3
44. Staff Work and Skills Techniques	Technical and Administrative Problem Solving. Communication. Preparation and Presentation of Proposals and Recommendations. Information Resource Management.	3	3	3	3	3	3	3	3	3	3
45. Human Relations Skills	Counseling Technique. Interpersonal Behavior Problem Solving. Employee Development. Group Behavior. Interactive Skills in Communication and Attitude.	3	3	3	3	3	3	3	3	3	3
46. Rulemaking and Policy Develop- ment	Development of ANPRM, NPRM, AD's, GENOIS, Orders, AC's, Handbooks, etc.	3	3	3	3	3	3	3	3	3	3

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		AIRFRAME		SYSTEM		PROPULSION	FLIGHT TEST		PROGRAM SUPPORT	
		STRUCT.	C/W	AV/ELECT	MECH	ENG.	INSTL	ENGR.	PILOT	SPEC.
47. Certification Procedures	Indoctrination Training for all Certification Engineering and Test Pilot Disciplines. Airframe, Propulsion, Systems, and Flight Test	1	1	1	1	1	1	1	1	4
48. Contemporary Avionic Systems	Digital Radar, INS, RNAV, FMS, EFIS, Digital Autopilot/Auto-throttle technology Autoland systems, etc.			2		3	3	2	2	
49. Office Orientation (for new employees)	FAA office organization. Time and attendance. Pay. POV and govt cars. Travel and transportation expense vouchers. Telephone. Agency directives. Job assignments, standards, security, and performance rating. Training. Emergency readiness. etc.	2	2	2	2	2	2	2	2	2

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