

Guidelines for Aircraft Maintenance Training

104

Revision 2022.1



Airlines for America
We Connect the World

Airlines for America
1275 Pennsylvania Avenue, NW - Suite 1300
Washington, DC 20004-1707
USA

<http://www.airlines.org/>

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<u>Location</u>	<u>Description of Change</u>
	Extensive revision including grammar and wording revisions for clarity, updated figures, tables and respective numbers, added acronyms, added additional content that includes Appendices E, F, G, H and I.

Chapter 1. Introduction

1-1. General

Maintenance and maintenance training requirements have become increasingly complex as new technology aircraft and support equipment have emerged. At the same time, training methodologies and technology have also evolved.

Specification 104 now provides guidelines for the development of training programs for the various job function/skill mixes resident in air carrier maintenance organizations. It is intended to provide communication and a common understanding among the various interested parties concerning aviation maintenance training and its related training materials.

Interested parties include, but are not limited to, Original Equipment Manufacturers (OEM), operators, Maintenance Repair Organizations (MRO), airport ground operators, third-party maintenance training providers, and regulatory approved schools.

1-2. Training Program Components

The goal of a well-designed training program/course is to provide measurable assurance that employees gain the proper knowledge, skills, and attitudes (KSAs) for efficient and safe work. Organizations can have a variety of programs that vary in their complexity. In this specification, the term organization refers to an air carrier, maintenance repair organization, or other facilities that support aviation manufacturing, maintenance, engineering, or aviation maintenance schools.

An effective training program should contain the following components:

- Training Needs Analysis (TNA)
- Training Design, Development, Implementation, and Evaluation Process
- Training Completion Documentation
- Training Program Quality Assurance Process

Each component will be addressed within this specification, providing guidelines and suggestions for creating a unique and effective training program for the organization.

1-3. Instructional System Design

The ADDIE (Analyze, Design, Develop, Implement and Evaluate) model is one of numerous instructional system design (ISD) methodologies and will be used as the foundation for the layout of this specification. It is a formal systematic process for the analysis, design, development, implementation, and evaluation of a training program/course.

Other models may be used depending on the course developer's experience and the organization's needs. However, all models have a form of these five steps within them, but maybe named differently. See Figure 1 for a flowchart of the ADDIE program.

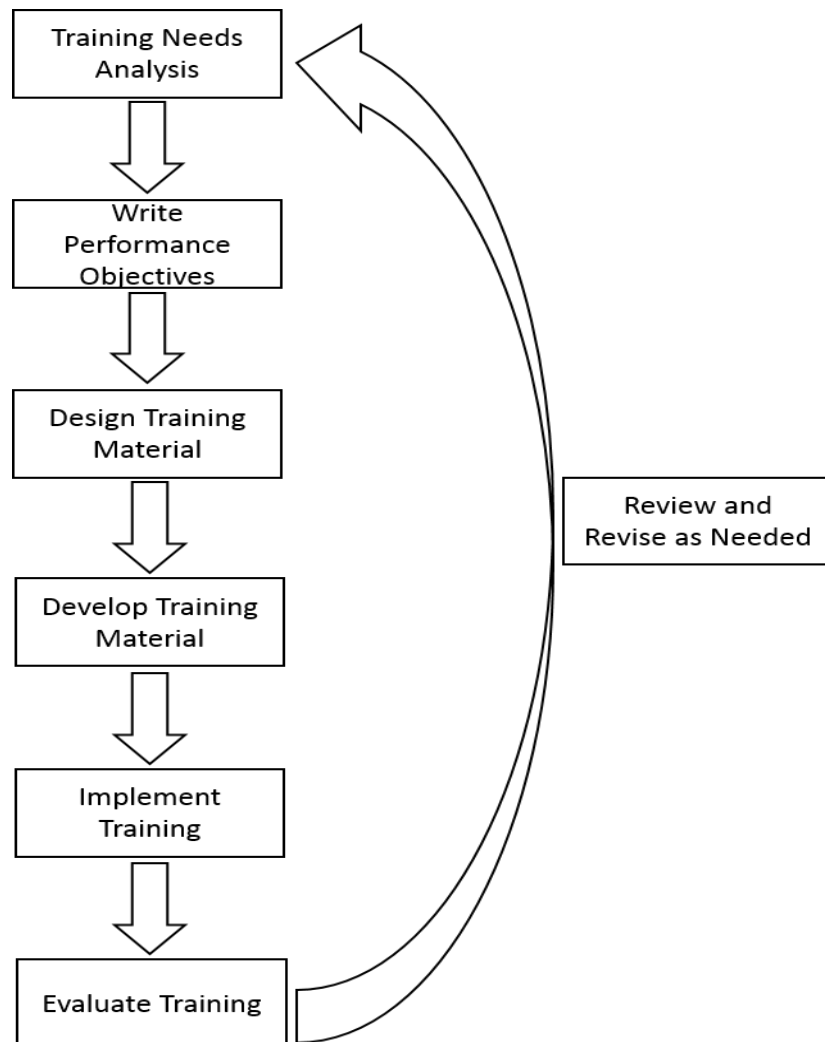


Figure 1: Task-Oriented Course Development Flowchart

A systems approach is an organized method that begins by analyzing the needs of the employee and their requirements to perform the job in the operational environment. Refer to Chapter 2 for a detailed discussion on training needs analysis.

These needs are turned into objectives and serve as design specifications for the development of a training program/course. Refer to Chapter 3 for a detailed discussion on course design and development.

Aviation maintenance organizations are required by regulations to document training programs as well as the employee's individual training. For example, air carriers can refer to

14 CFR §121.375 and 135.433 for specific requirements. Refer to Chapter 4 for a detailed discussion on training completion documentation.

Finally, it is important to determine the effectiveness of the training through the stages of the life of a course using various methods of evaluation. Organizations should have a process for evaluation and continuous improvement of its training programs. Refer to Chapter 5 for a detailed discussion on evaluation and training program quality assurance.

Chapter 2. Training Needs Analysis

The systems approach to instructional design begins by identifying the needs of the organization and the employees' requirements to perform the job in the operational environment. These needs are classified and then defined as measurable goals that determine the employee's Knowledge, Skills, and Attitudes (KSA). These needs are turned into objectives and serve as design specifications for the development of a training program/course.

The analysis phase is sometimes omitted due to the need or perceived need for immediate training. However, if the course design is rushed without sufficient analysis the training project may be inefficient, inaccurate, incomplete, or unnecessary. It is understood that an organization might not have the time to complete a lengthy analysis, but some analysis should be done to make sure the training program will be a success. Past experience, manufacturer's guidelines, and other data have an impact of the appropriate level of initial needs analysis.

There are many resources available to assist the developer in completing an analysis, see Appendix A for a short list. The terms "analysis" and "assessment" are often confused, however for clarity in this document "analysis" will be used to mean the gathering of information to determine overall training needs, while "assessment" in all its forms, will mean the testing used to determine an employee's achievement/proficiency on a given subject. The organization should have defined processes for objectively identifying its overall training requirements and assessing each individual and/or team's capabilities and training needs.

An organization should conduct two different training needs analyses (TNA) to assist in determining training requirements. The first is an analysis of the organization as a whole to determine its overall training requirements. The second TNA is aimed at individual workers to determine specific training requirements. Each organization's TNA process will be different and based on the organization's operation, size, employee hiring, job assignment. Training practices should be documented.

2-1. Organization Training Needs Analysis

The organization's TNA process should define the policies and procedures the organization will use to assess its overall employee training needs, the outcome of which constitutes the basis for developing the training program. Based on the outcome of its TNA, the organization should determine the type and extent of training needed for the company and for individual employees and should develop and/or revise its training courses accordingly.

The organization should have a process to analyze each job function, tasks for each job position, and identify the knowledge and skill sets required to successfully fill those positions successfully. Each organization should have TNA procedures applicable to its particular operation. However, when conducting its analysis, the organization should consider—

- Input from matter experts;
- Current employee hiring criteria;
- Skills, experience, education, qualifications, and training level of new and current employees;
- Data from voluntary reporting systems and internal evaluations dealing with training matters;
- Data from Safety Management System (SMS) information to include reactive, proactive, and predictive information;
- Research information from training and aviation conferences about new training methods or relevant content; and
- Effects of introducing new regulations, procedures, equipment, or recordkeeping requirements on the content of the training program.

After the organization completes its analysis, it should have a process to document the training required for each job position or task. Each organization may approach this documentation differently, but the ultimate outcome should be a document outlining the training requirements by category. For example, an organization may define training based on—

- Job positions or functions,
- Job tasks,
- Aircraft worked on,
- Recommendations from the manufacturer, or
- A combination of the above.

The organization's TNA documentation should include a list of the specific training courses required for a specific position, function, task, or aircraft worked on; when that training should take place; and any minimum qualifications for performing that function or task. The analysis documentation is usually broken down by initial, recurrent, and specialized training requirements.

Figures 2 through 5 provide examples of TNA documentation. Each organization should document its training needs in a format suitable for its operation. The exact format is up to the organization, provided all types of training and required subjects are covered.

2-2. Job Task Analysis

A job task analysis (JTA) is one way to complete an organization's TNA. It can be used to identify critical knowledge, skills and attitudes for individuals and teams. These tasks, with their required knowledge, skills, and attitudes, are used to determine the objectives of the course/lesson. Refer to Chapter 3 for more information on course objectives.

Mechanic/Inspector		
To Sign	Training Required	Experience Required
Airworthiness release	Maintenance initial training applicable to aircraft type; OJT	90 days of aircraft type experience or 1 year experience on air carrier, transport category jet aircraft
Job procedure cards	General familiarization course for aircraft type	90 days of aircraft type experience or 1 year experience on air carrier, transport category jet aircraft
Servicing	OJT familiarization course for aircraft type	90 days of aircraft type experience or 1 year experience on air carrier, transport category jet aircraft
Personnel Assigned to B-737		
Task	Minimum Training Required	Course
Receipt and dispatch	Pushback procedures B-737 familiarization OJT	No. 123 No. 347
Sign maintenance checks	B-737 initial	No. 476
CAT II/III Autoland	B-737 initial or recurrent B-737 OJT B-737 CAT II/III initial/recurrent B-737 CAT OJT	No. 123 No. 173 No. 456 No. 217

Figure 2: Training Analysis by Job Position or Function (737 Example)

Line Maintenance B-737 <i>Initial Qualification</i> • General Familiarization • Avionics Systems • Policies and Procedures • System Review • Flight Deck Proficiency <i>Requalification – Every 2 year</i> • Policies and Procedures • System Review • Flight Deck Proficiency
Engine Start/Run Up/Taxi • Policies and Procedures • Ground Handling Engines Operation • Safe Aircraft Movement • Qualification
Engine RII (Engine Shop Personnel Only) <i>Initial Qualification</i> • Engine General Familiarization • Required Inspection Items <i>Requalification- Every 2 years</i> • Required Inspection Items

Figure 3: Training Analysis Documentation by Job Task (737 Example)

Mechanic General

Work Scope

- Qualified to perform maintenance, preventive maintenance, alterations, inspections, and repairs in accordance with approved data on any fleet type aircraft under the supervision of a fleet-type qualified mechanic

Requirements

- Maintenance Orientation Course
- GMM Familiarization Course
- General Safety Course
- Federal Regulations Course
- Human Factors in Maintenance Course

Certifications

- FAA mechanic certificate with airframe and/or powerplant ratings

B-737 Mechanic

Work Scope

- Qualified to perform B-737 aircraft maintenance, preventive maintenance, alterations, inspections, and repairs in accordance with approved data. Work limited to FAA mechanic certificate rating. Qualified to sign approval for RTS.

Requirements

- Mechanic General Qualification
- B-737 Aircraft Familiarization Course

Certifications

- FAA mechanic certificate with airframe and/or powerplant ratings

Figure 4: Training Analysis Documentation by Aircraft

Line Mechanic Training Requirements

Within the first 15 days of employment

- Paperwork Policies and Procedures
- Maintenance Basic Safety Awareness
- Computer Systems

Annual required after first year

- Maintenance Basic Safety Recurrent

Within 2 years of employment

- Aircraft-Specific Systems

Every 3 years after the first year of employment

- Paperwork, Policies, and Procedures

Within 15 days of assignment to ABC station

- Station Ramp Safety Procedures

Annual for ABC station specific personnel only

- Deicing/Anti-Icing

Figure 5: Training Analysis Documentation by Job Description and Timeframe

2-3. Gap Analysis

A gap analysis is used to determine the discrepancies between the current employee's skills, knowledge, and attitudes and the required skills, knowledge, and attitudes, e.g., determining what they know and what they need to know.

Once the organization assesses the employee's capabilities, it can identify employee-specific training needs. Several methods can be used for post-training testing/assessment. See the section 5-4 Assessment.

When conducting an analysis of an individual's KSAs, the organization's process should be as objective as possible and structured to produce consistent results. The organization should have procedures to ensure the individual conducting the analysis is qualified to conduct the analysis and interpret the results. It may be necessary for the organization to use more than one method to assess an individual's KSAs adequately.

The organization should have procedures to accept prior experience, training, or education to establish an individual's capability. For example, an organization may accept graduation certificates from a Part 147 school and/or an airframe and powerplant certificate as acceptable evidence of a basic knowledge and skill level in a particular area. An organization could also have procedures for accepting certificates of previous training by manufacturers, organizations, associations, or repair stations, or military records. The organization should have procedures on how to document this analysis in an individual's training records.

Chapter 3. Training Design, Development, and Implementation Process

This chapter will provide an overview of the design, development and implementation stages of the ADDIE model.

The design phase focuses on writing the course objectives, determining student assessments, class activities, content, lesson planning and delivery methods.

See Appendix A for additional resources.

3-1. Design

Now that the training needs have been determined, the design phase can begin. Several questions the developer should consider may include, but is not limited to, are:

- In what order should the content be organized (grouped or sequenced)?
- In what ways should the ideas be presented to the students?
- How will the course be delivered? Instructor-led, computer/web-based (synchronous or asynchronous), blended, job aids, or paper-based self-study? Refer to Section 3-1-4 Identify Training Delivery Method.
- What instructional methods will be used to present the material? Instructor-centered (Demonstration, Direct Instruction, Lecture or Lecture with Discussions) or Student-centered (Case Studies, Cooperative Learning, Discussion, Discussion Boards (online), Discovery Learning, Graphic Organizers, Journals/Blogs, Role-Play, Problem-Based Learning and Inquiry Learning or Simulations)?
- What activities or exercises will best assist the student to retain/transfer the material to the working environment?
- What type of student evaluations/assessments should be used to measure student success?
- What will be the completion standards?
- What prerequisite knowledge does the student need, if any?
- What are the time requirements for the course itself or for development?

During the design phase, an instructional design document should be created. This document answers the questions above. It should be reviewed by the requestor of the training for approval before the development phase begins. This document should address, but is not limited to, the following goals:

- Solidify the purpose of the training;
- Define the audience/student; and
- List media that will be used (printed text, printed visuals, display boards, audio, video, film, computer software, internet, etc.)

If training is being developed through a third-party vendor, this vendor will provide an instructional design document.

3-1-1. Define Objectives / Outcomes

Objectives are the core of any course. They should be well written using the Smart, Measurable, Attainable, Relevant and Time Bound (SMART) techniques. When available, example objectives have been provided to assist ISDs in developing course content.

This specification uses a category maintenance levels concept for development of maintenance training programs that is now recognized world-wide. This concept helps ensure that training is specified, developed, evaluated, and generally targeted to the appropriate target population. It also ensures that the training objectives are matched to the competency levels of the job/task requirements.

This system enhances student acceptance of the training and likely increases retention of job-specific knowledge, skill, and ability. Safety and human factors related to the subjects should be discussed throughout the courses.

3-1-2. Levels of Training

Aircraft maintenance training has traditionally been divided into levels. The levels identify associated job-related tasks only and are not designed to be pre-requisites of one another. The three levels are described below. Sample objectives for each level of aircraft maintenance training are provide in Appendix E.

NOTE: ATA Specification 104 maintenance training levels should NOT be confused with knowledge levels as outlined in some regulations, i.e., EASA Part 66. These maintenance levels can be taught to various knowledge levels depending on the needs of the organization.

If new technologies are applied to new aircraft or equipment, the organization will specify what basic knowledge is considered a prerequisite to enter a course. Students should be proficient in reading, writing, and speaking the English language.

Level I - General Aircraft Familiarization

Training targeted to personnel who are not directly performing maintenance on the aircraft or associated components. Level I training provides a brief overview of the airframe, systems, and powerplant as outlined in the Systems Description Section of the Aircraft Maintenance Manual.

Level IIA - Thru/Transit Service Maintenance

Training targeted to personnel familiar with commercial transport aircraft and digital electronic equipment. Level IIA provides a description of a systems' functions, controls, indications, component location, interfaces, operations, tests, tooling, and safety precautions related to thru/transit servicing, maintenance activities, and the necessary practical training.

Thru/Transit Service Maintenance activities are comprised of:

- Unscheduled maintenance tasks linked to MEL/CDL go/no-go items.
- Scheduled maintenance tasks associated with daily, weekly, and preflight activities.

Level IIB - Base/MRO Maintenance

Training targeted to personnel familiar with commercial transport aircraft and digital electronic equipment. Level IIB provides a description of the systems' functions, controls, indications, component location, interfaces, operations, tests, tooling, and safety precautions related to routine/non-routine hangar maintenance activities, and the necessary practical training.

Level III - Line/Base/MRO Maintenance Training

Training targeted to personnel familiar with commercial transport aircraft, digital electronic equipment, and have the knowledge and experience required to maintain turbine-powered aircraft. Level III provides a detailed description of system operation, component location, removal/installation, and BITE to include Onboard Maintenance Systems (OMS) and troubleshooting procedures to maintenance manual level.

3-1-3. Specialized and Component Maintenance Training**Specialized Training**

Target audience is defined by the subject matter. Personnel must meet prerequisites established by the training provider (i.e., Air Carrier Operators, OEMs and MROs). Specialized training provides detailed theoretical and practical course objectives and/or topics. Refer to Appendix F for a listing of established specialized training courses. These courses were chosen because they are standard topics provided to most maintenance organizations. When a course is designed using this specification, it will allow maintenance organizations the ability to accept that training as transferable, in the same manner that aircraft maintenance training taught to this specification has been accepted as transferable.

Specialized training courses provide detailed descriptions, in-depth troubleshooting, adjustment, test procedures for specific systems, and in-depth use of wiring diagrams and schematics. Specialized training may also address additional specialized training as determined by Air Carrier Operators, OEMs or MROs.

Component Maintenance Training

Target audience is defined by the subject matter. Personnel must meet prerequisites established by the vendor. Component maintenance training provides specialized maintenance/overhaul training conducted by airframe, engine, or avionics manufacturers and/or their suppliers and/or air carriers to a component maintenance manual level. For more information on component maintenance training, including general and specific theoretical and practical course objectives and/or topics, refer to Appendix I.

3-1-4. Identify Training Delivery Method

The organization should apply standard procedures to select the appropriate training method for each course. Each organization's training program may include some or all of the following training delivery methods, as applicable to a particular course or organization's operations.

Formal Classroom Instruction

Training can be structured as a formal course delivered by an instructor in a classroom setting. The value of this delivery method depends on the objectives, subject matter of the training, and the effectiveness of the trainer. The interaction between students and between students and a knowledgeable instructor, is very important for certain types of information to be transferred. Consequently, classroom instruction is important.

This type of training, which is typical in a formal school environment, depends heavily on the quality of the instructor. However, it may be cost-effective for the organization because it can be delivered to a large number of students simultaneously.

Classroom instruction is also efficient when the training is a one-time only deliverable to a small number of students. The cost of developing training aids and other advanced technologies may not be appropriate for such applications.

Instructor-led training, whether in-person or virtual, should take into consideration adult learning theory and apply various levels of active and interactive learning.

Practical Training

Practical training is the demonstration of applied learning objectives using a "hands-on" approach. This approach is instructor-guided and can be demonstrated with the actual aircraft, tooling, synthetic training devices, or simulation necessary to exhibit the ability to competently perform a task. Practical training allows the learners to perform maintenance-related tasks in a safe-controlled environment.

On-the-Job Training

On-the-Job (OJT) is a learning process where the trainee observes the accomplishment of a task and then accomplishes the same task under that trainer's supervision. It is a very effective

method of training for subject matter and tasks that are difficult to understand if described, but relatively easy to understand while observing and completing the actual task.

The drawback of OJT is that it is resource intensive to standardize the training process and results. OJT depends heavily on the capability of the instructor. Typically, someone experienced in the subject matter being taught gives OJT but who may have minimal instructional experience in training. Even with a very capable instructor, the organization should ensure any OJT is well structured to ensure all the key elements of the training are included and treated the same way from one instructional period to another. It is paramount that maintenance production personnel who are skilled and current in the task provide OJT. See Appendix A for resources on structured OJT.

OJT usually is the most appropriate training method when—

- The trainees already have prerequisite knowledge and skills and do not need detailed explanations or lengthy discussions.
- The target skill or knowledge can only be taught or is best learned in an actual work environment.
- The work environment cannot be reasonably simulated or replicated in the classroom or with computer-based training (CBT) devices.
- The training process very closely matches the actual tasks that would be performed.
- The training matches the organization's needs and constraints in terms of scheduling, costs, and human resources.
- There are documented course outlines, measures of effectiveness, and training records.
- There may be a regulatory requirement for specific aircraft type training.

eLearning

ELearning is the employment of electronic media and platforms to deploy course content either inside or outside of the traditional classroom. ELearning may be accomplished at different locations at times convenient for each employee. This type of training is usually managed and administered using a learning management system (LMS).

To ensure the effectiveness of this type of training, the organization should evaluate the information provided against its particular needs. ELearning today, if well designed, can support competency or performance-based content. Content can include pre-recorded or even live lectures, videos, as well as interactive elements such as activities, games, assessments, and simulations.

Simulated Training Devices

Simulation has become an important method to deliver training ranging from initial familiarization to advanced operations and free-play troubleshooting. Modern desktop simulations provide extensive maintenance-oriented capability that formerly was possible only with sophisticated and expensive flight simulators.

Augmented Reality

The technology of Augmented Reality (AR) superimposes images that are computer-generated over user's real-world view. A head-up display (HUD) is an example of Augmented Reality.

Virtual Reality

Virtual Reality is a computer simulation of a real or imaginary world or scenario, where the user interacts with simulated objects or living things in real time. Sophisticated virtual reality systems place sensors on the user's body to sense movements that are then interpreted by the system as movements in the simulated world. Binocular goggles are sometimes used to simulate the appearance of objects in three dimensions.

Blended Learning

Blended Learning is typically structured so that 30%-70% of the instruction is comprised of content other than traditional face-to-face methods.

Distance Learning

Distance learning applies to situations where the instructor and the employees are not in the same location. It can take the form of mail-based correspondence courses using written, videotaped, or CBT materials; videoconferencing; teleconferencing, or a combination of both – sometimes called “virtual” classrooms; or internet-based/web-based instruction that allows employees to interact with an instructor or with courseware similar to CBT. The advantages of this training method are that the courses can be tailored to a specific organization’s need and an instructor can respond to individual questions. One of the disadvantages is that the communications can be misinterpreted due to technical difficulties or other communication barriers between employee and instructor.

Embedded Training

Some equipment, particularly those using software for testing or to perform a maintenance function, have training embedded into the process. Incorporating a tutorial or help menu are simple examples of how a software program can provide instruction as the user performs a specific task. Embedded training is most useful when—

- The employee already knows the underlying technical information related to the basic task and needs only to learn the details of the procedure;

- The procedure is straightforward and can be easily understood with a written explanation;
- The media and method in which training is embedded are part of the task or equipment to be learned; and

Other Methods

Other methods include self-study, case study, and seminars. These methods of training or acquiring knowledge may be appropriate provided the information gained applies to the job function and skills required to perform the work capably.

3-1-5. Identify Training Sources

Organizations should have procedures to select the source for providing the particular training course that will satisfy its training requirements. Sources may include an internal training organization for in-house design and development using its own personnel or contract with an outside vendor. Common maintenance training vendors and a brief description of their services follow.

Regardless of the source of the training, the organization remains responsible for the administration, adequacy, and currency of its training program requirements and for maintaining the training records.

Original Equipment Manufacturers

Original Equipment Manufacturers (OEM) may deliver technical information regarding maintenance or alteration on its articles by formal classroom instruction, practical training, OJT, distance learning, embedded technology, or computer/web-based training material. OEM instructors may come to an organization to conduct training on-site or deliver the information during seminars, sessions, or extended study at other locations.

If an organization selects an OEM course, the organization should ensure its employees have the prerequisite training and/or experience for the course to be most effective. In addition, the organization should verify that the area of study, course objective(s), material, and any instructors assigned by the OEM meet the organization's standards.

Independent Training Organizations

Independent training organizations may be affiliated with an OEM or a MRO. They usually have access to equipment, documentation, and technical expertise. Since these organizations are dedicated to training design, development, and delivery they often offer a complete set of ADDIE records and associated documentation and regulatory approval. Like OEMs, these organizations usually offer training solutions that are matched to customer requirements including applicable regulatory requirements.

Aviation Maintenance Technician Schools

An Aviation Maintenance Technician (AMT) school approved by the local regulatory agency (such as EASA, FAA, Transport Canada, etc.) can be an effective source of training for organizations, particularly for basic knowledge and skills. An organization may need to supplement the training with information unique to the organization's operations and equipment. Some schools offer advanced aircraft type-specific training.

Repair Stations

Repair stations may provide specific organization employees with specialized training by contract. They often are best situated to have live aircraft for practical training.

Government Agencies

Government agencies provide training on Occupational Safety and Health Administration (OSHA) regulations, Environmental Protection Agency (EPA) regulations, and hazardous materials recognition and handling. They also may be a source of training related to maintenance human factors and general safety subjects.

Trade Associations

Entities that represent certain segments of the aviation or business community offer training classes on technical and regulatory subjects. Again, the organization must ensure the individual attending the training completed the course and acquired the necessary knowledge required by the particular organization's operations and that the course meets the organization's requirements.

Other sources

There are a variety of other training sources, including independent seminars, product demonstrations, web-based instructions, and videos. Organizations should view all sources of information as potential training sources. The organization's training program should have a method of incorporating training opportunities to ensure each employee is capable of performing his or her assigned task.

3-2. Identify Instructional Activities

When designing training, instructional activities need to be considered. Will the course be more instructor-centered or student-centered? The list below provides typical samples of course activities that can be incorporated into a course.

Activities need to be aligned with the course objectives and support transfer of learning from the classroom to the job.

- Instructor-Centered
 - Demonstration
 - Lecture or Lecture with Discussions
- Student-Centered
 - Case Studies,
 - Cooperative Learning,
 - Discussion/Discussion Boards,
 - Discovery Learning,
 - Graphic Organizers,
 - Journals/Blogs,
 - Role-Play,
 - Problem-Based Learning and Inquiry Learning or
 - Simulations

3-3. eLearning Guidelines

This section provides guidelines to assist in designing, developing, and applying electronic-based learning (eLearning) materials produced for maintenance technical training of aircraft, engines, and components. They are intended to describe the customer's expectations of aircraft, engine, and component manufacturer provided eLearning materials.

ELearning materials, content and graphics should be consistent with guidelines for the Systems Description Section (SDS) of the Aircraft Maintenance Manual. This does not mean they must be identical, but that the learner must readily recognize them as the same objects presented in the SDS.

The information in these guidelines provide a common base of understanding between aircraft manufacturers, vendors, and air carriers when they discuss the preparation, use, and delivery of training courseware. This document may also help training personnel express concepts and requirements to non-training personnel such as procurement officers, legal, and purchasing departments.

The technological capabilities of integrated media development and delivery systems are changing more rapidly than we can change specifications. Other new training technology and approaches to learning continue to be developed and may not be addressed within this section of the specification. Therefore, these guidelines describe functional requirements as opposed to technical requirements.

The Guideline for eLearning Materials addresses:

- Applications of eLearning materials - a description of the various ways digitally delivered learning materials can be used.
- Functionality of eLearning materials - a description of learner controls, types of computer/web-based learning materials, etc.
- Hardware and Software Considerations - a description of hardware and software considerations to assure optimum use of courseware on existing and future authoring and delivery platforms.
- User interface considerations for learner controls and icons.
- Computer Managed Instruction (CMI), including a description of CMI and its use.

These topics relate to eLearning materials such as simulations, part-task trainers, Augmented and Virtual Reality (VR), etc. Refer to Figure 6. For definitions refer to Appendix D.

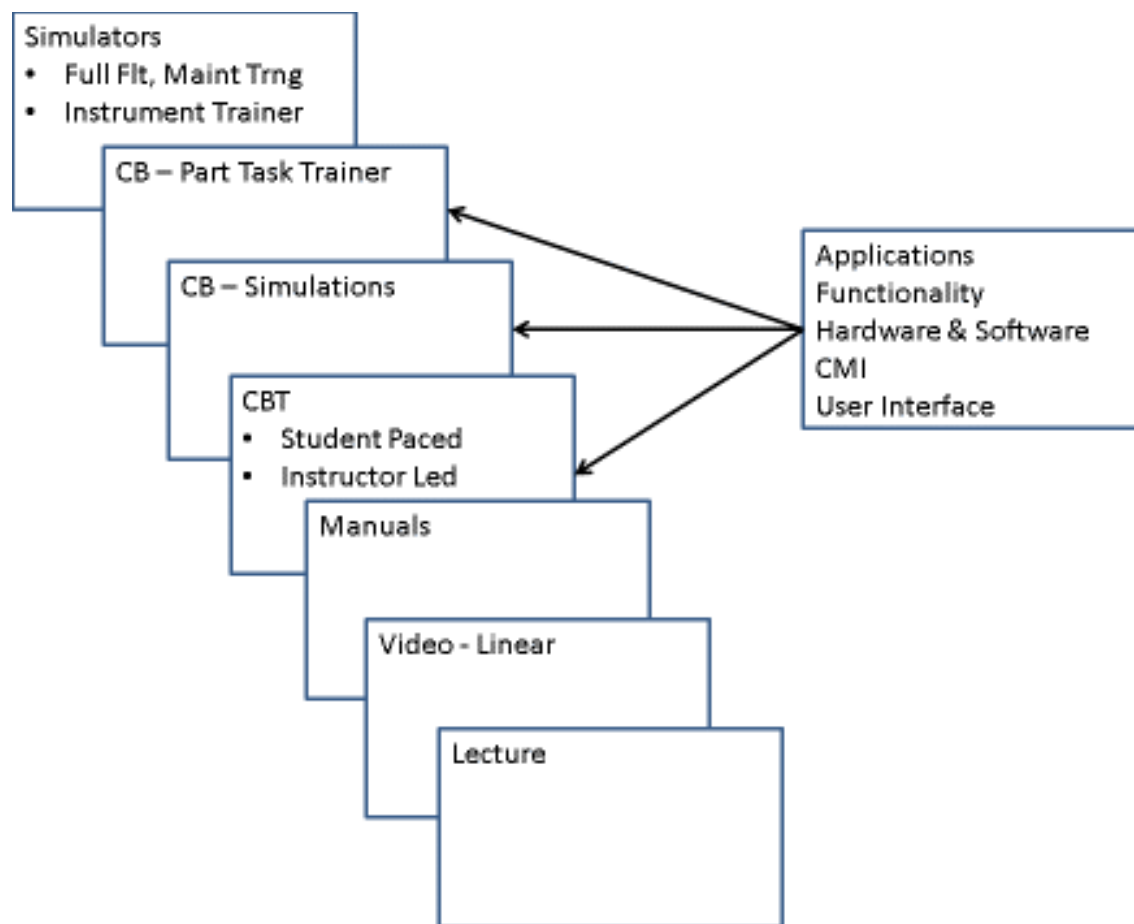


Figure 6: Spectrum of Learning Materials

3-3-1. Applications of eLearning Materials

eLearning methods provide capabilities not available in traditional classrooms and provide dynamic presentation and control of graphics and animations. There are several general categories of eLearning platforms; Web-Based Training, Distance Learning, Fixed Training Devices, E-Platforms, E-Manuals, Blended Training, etc.

The goal of using eLearning technology must be to enhance knowledge/skill transfer rather than demonstrate technological possibilities. The effectiveness for each learner is the key goal for products.

eLearning courseware may be the appropriate medium when students must practice performance of a procedure/skill, when an aircraft simulation best serves the instruction, and use of an interactive screen display provides better information transfer. To assure effectiveness, the courseware must optimize the use of learner interaction for classroom, small group, and individualized instruction.

Table 1 below illustrates how specific types of eLearning materials might be applied.

Table 1: Application of eLearning Materials

eLearning Materials	Application
Computer-Based Simulations	Includes computerized representation of interactive aircraft control panels, displays, schematics, etc.
Desktop Trainers / Fixed Based Trainers	Similar to computer-based simulation but focused on a specific system or task and may include the use of real or simulated equipment. These are often computer-controlled devices to simulate specific hardware operations of an aircraft. This is useful when a specific environment is required or the feel of using the device is critical to task performance.
Computer/Web-Based Training (CBT)	The traditional view of student-paced CBT/WBT is a computer-controlled, structured, learning experience where the student interacts with a computer program that leads the student through a series of activities to a specific goal.
Blended and/or Webinar	Instructor-led CBT can be a lesson as above without the structure where the instructor controls the activity of the lesson, or it may be the use of a lesson where the instructor leads the class through its operation.

This section deals with evolving technology and provides guidance for training development. When determining training delivery methods, it is very likely some form of electronic system will be used. Additional concepts include, but are not limited to, and are defined in the Appendix D.