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Personnel

***INFORMATION FOR DESIGNERS OF INSTRUCTIONAL SYSTEMS -
ISD EXECUTIVE SUMMARY FOR COMMANDERS AND MANAGERS***

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This handbook provides commanders and managers a brief overview of Instructional System Development (ISD) in the Air Force. It acquaints them with the principles and concepts of ISD, and provides internal guidance on procedures and methods for applying ISD. The handbook also stresses the importance of continuous quality improvements in the ISD process.

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Section A Introduction

Education and training are essential

Education and training are essential for the effective operation of the Air Force, but can be expensive and can account for a large portion of the Air Force's annual budget. A major concern for every commander and manager is whether personnel are adequately prepared to do the job.

Instruction is not always the answer

There is a tendency to assume that instruction is the solution for every operational problem. This assumption results in wasted dollars when it's not valid. The tendency is for commanders and managers to request more instruction than needed, or to request instruction for a non-instructional-related problem.

The challenge is to provide adequate instruction for your personnel when they need it.

ISD is the answer

Since 1965, the Air Force has used the Instructional System Development (ISD) process to help commanders and managers resolve the instructional dilemma. ISD is a systematic, flexible, proven process for determining whether instruction is necessary in a given situation, for defining what instruction is needed, and for ensuring development of effective, cost-efficient instruction. Quality Improvement (QI) is constantly emphasized in the ISD Process.

Air Force policy

AFPD 36-22 directs that Air Force instruction be developed using the ISD process. Also, AFMAN 36-2234 provides information on ISD concepts, principles, and procedures, with specific applications of the ISD process spelled out in various volumes of AFH 36-2235 (see Attachment A).

Air Force training doctrine

AFMAN 1-1 states that people are the decisive factor in war. It is imperative that people receive the right education and training at the right time. Education and training should:

- Prepare forces for combat.
- Be as realistic as possible.
- Be conducted for all forms and levels of war.
- Give special attention to training for joint and combined employment.

ISD can help ensure that you meet these objectives.

This handbook

This executive summary is intended for you, the commander or manager. Its purpose is to acquaint you with the essence of the ISD process, to reveal how it can help you, and to explain what you can do to aid the process. This summary will help you realize the importance of what you can contribute to the successful application of the process. Should you want additional information about the process and how to apply it, check the documents listed in Attachment A.

Section B

ISD – What It Is

Introduction

The Air Force ISD process is a conceptual adaptation of the systems engineering process to the problems of developing, implementing, and evaluating instruction. ISD results in alternative solutions to instructional problems which may be more or less cost-efficient, depending on the instructional need and environmental constraints. ISD also clarifies that a systems approach, which involves choosing among alternative solutions, will produce the most effective results.

Goal of ISD

The goal of ISD is to increase the effectiveness and cost-efficiency of education and training, as follows:

- Develop instruction based on job performance requirements.
 - Eliminate irrelevant skills and knowledge instruction from courses.
 - Ensure that graduates acquire the necessary skills, knowledge, and attitudes to do the job.
-

Product of the ISD process

The product of the ISD process is a total quality instructional system that is cost-efficient and produces graduates who can do the job.

The ISD model

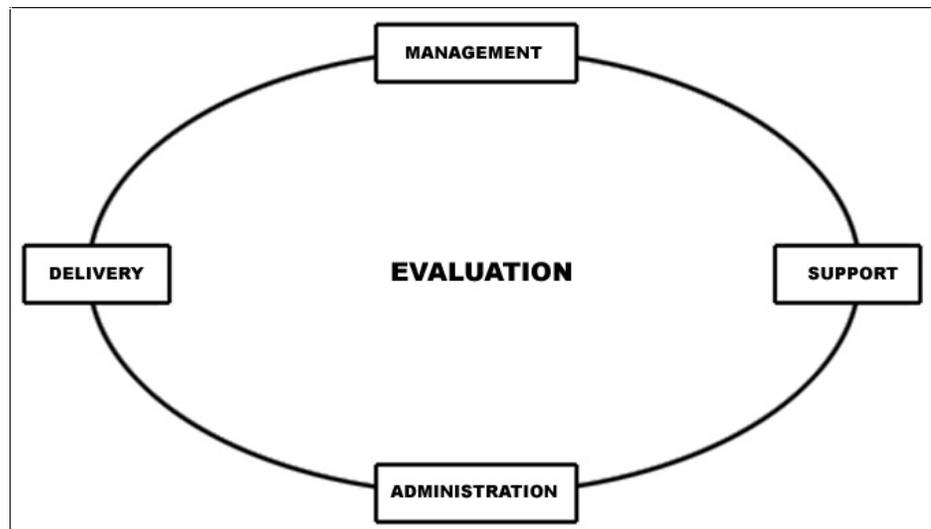
The Air Force ISD model is designed to represent simplicity and flexibility, so that instructional designers with varying levels of expertise can understand the model and use it to develop effective, cost-efficient instructional systems. The model is composed of three distinct, yet interrelated parts. These parts are system functions, ISD phases, and quality improvement. The three parts of the model are depicted in Figures 1 through 3.

System functions

Figure 1 shows the basic top-level system functions of the ISD model, which are instructional system management, support, administration, delivery, and evaluation. Evaluation is shown as the central feedback "network" for the total system.

**System functions
(Continued)**

Figure 1. System Functions.



**System functions
defined**

The system functions of the ISD model are defined as follows:

Management is the function of directing or controlling instructional system development and operations.

Support is the function of maintaining all parts of the system.

Administration is the function of day-to-day processing and record keeping.

Delivery is the function of bringing instruction to students.

Evaluation is the function of gathering feedback data through formative, summative, and operational evaluations to assess system and student performance.

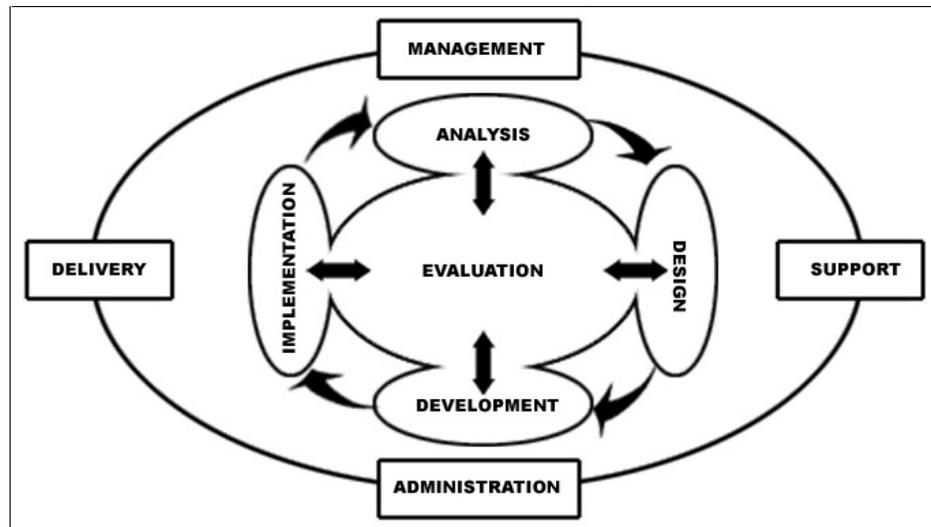
Planning

Although not a specific phase of the ISD process, planning is a key event. Planning the ISD structure and functions includes determining ISD process management and evaluation strategies, and estimating resource requirements and constraints. Planning also includes determining the instructional needs and concepts, and it must take place before developing an instructional system or revising courses. Planning cannot be overemphasized.

ISD phases

Figure 2 graphically depicts the ISD phases embedded within the system functions. As shown, the phases used in the systems approach are analysis, design, development, and implementation, with evaluation activities integrated into each phase of the process.

Figure 2. ISD Phases.



The instructional development process, which the model summarizes, requires instructional designers to:

- **Analyze** and determine what instruction is needed.
 - **Design** instruction to meet the need.
 - **Develop** instructional materials to support system requirements.
- Implement** the instructional system.

Evaluation is a central function that takes place in every phase.

Symbolically, Figure 2 shows that each phase of the model depends on all of the other phases. The phases are described next.

Analysis phase

In courses that tie the content directly to preparing a student to do a job, the instructional designer analyzes the job performance requirements and develops a task list. Remember, job performance requirements may also include skills such as problem solving, leadership, and management. The designer then analyzes the job tasks and compares them with the skills, knowledge, and abilities of the incoming students. The difference between what they already know and can do, and what the job requires them to know and be able to do, determines what instruction is needed. The activities of formative evaluation begin during the analysis phase with process and product evaluations.

Design phase

In the design phase, the instructional designer develops a detailed plan of instruction which includes selecting the instructional methods and media, and determining the instructional strategies. Existing instructional materials are reviewed to determine their applicability to the specific instruction under development. In this phase, the instructional designers also develop objectives and tests, as well as design the instruction. The implementation plan for the instructional system is developed and a training information management system is designed, if required. Formative evaluation activities continue in this phase with process and product evaluations.

**Development phase
(Continued)**

In this phase, both the student and instructor lesson materials are developed. If the media selected in the design phase included items such as videotapes, sound/slides, interactive courseware, and training devices, these are produced. If a training information management system was developed, it is installed in this phase. As a final step in this phase, the implementation plan is updated. Instructional designers also

Development phase validate each unit/module of instruction and its associated materials as they are developed. Validation includes:

- Internal review of the instruction and materials for accuracy (formative evaluation).
- Individual and small-group tryouts (formative evaluation).
- Operational (field) tryouts of the "whole" system (summative evaluation).

Revision of units/modules occurs as they are validated, based on feedback from the formative and summative evaluation activities. The last step in this phase is to finalize all instructional materials.

Implementation phase

After the instructional system has been designed and developed, and the validation activities of formative and summative evaluation have been completed, it is time to actually implement the "whole" system. In this phase, the instructional system is fielded under normal operating conditions. To ensure continuing quality of the fielded system, operational evaluations, including both internal and external evaluations, provide the necessary periodic feedback for the life cycle of the operating system.

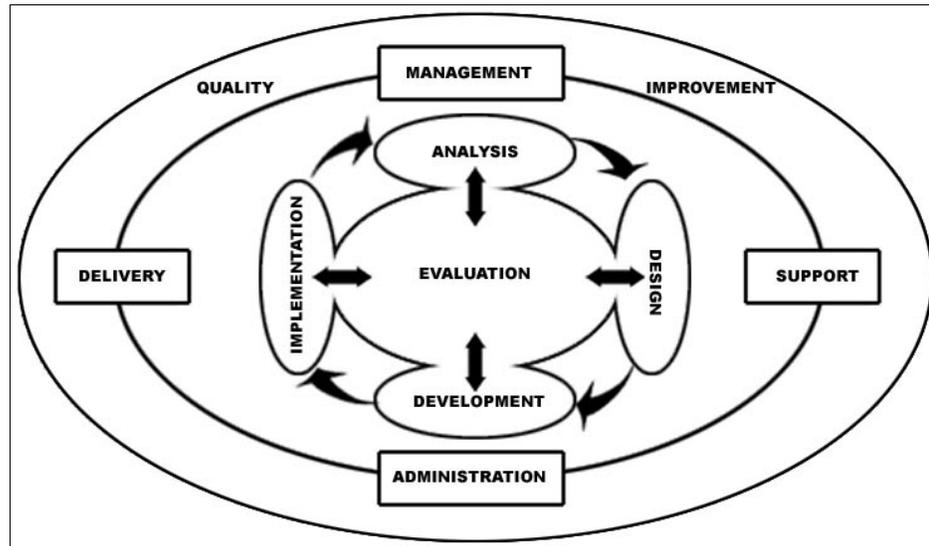
Evaluation

Evaluation is a continuous process beginning during the analysis phase and continuing throughout the life cycle of the instructional system. There are three types of evaluation.

- **Formative Evaluation** includes process and product evaluations conducted during the analysis and design phases. It also includes validation, which is conducted during the development phase and includes individual and small-group tryouts.
 - **Summative Evaluation** includes operational tryouts and is conducted as the last step of validation in the development phase.
 - **Operational Evaluation** includes periodic internal and external evaluation of the operational system during the implementation phase.
-

Total system model Figure 3 completes the Air Force ISD model. It depicts the system functions and ISD phases embedded within the quality improvement process.

Figure 3. Quality Improvement.



System functions An extension of the systems approach places the ISD process within the functional design of a total instructional system. The basic top-level system functions are instructional system management, support, administration, delivery, and evaluation. Evaluation and quality improvement are key parts of the system. Evaluation is the central feedback network for the total system.

Quality improvement defined Quality Improvement (QI) is the continuous, organized creation of beneficial change to the instructional system. The objective of QI is to foster continuous improvements in both the ISD process and the products of the process.

**ISD and quality relationship
(Continued)**

All of the principles of quality are implemented in the ISD process. The ISD process helps ensure total quality in the education and training environment. The relationship between the following key concepts of QI can be easily seen in the process. The relationships between QI and ISD are provided in the following paragraphs.

Know your mission. ISD depends on mission and job analysis for the necessary data to design, develop, and implement instruction. All instruction should be based directly on mission or job requirements. The quality checks in the analysis process help eliminate instruction that is unrelated to the job.

Job analysis uses data from many sources, including mission statements found in regulations or locally developed statements. Analysts or curriculum developers also make use of management engineering reports, occupational survey data, and direct observation to determine the actual job requirements.

As part of the job analysis process, a Training Needs Assessment (TNA) is conducted to determine what the actual performance problem(s) is (are). In some cases, a problem isn't due to a lack of instruction, but to deficiencies within the job structure or environment. The ISD process helps ensure that instruction is not developed for non-instructional problems. Instruction may also be developed as a "preventive" measure—that is, to prevent problems and to meet the informational and educational needs of Air Force personnel.

Customers

Know your customers. The information gained in the mission/job analysis process gives the instructional design team information that defines the customer's expectations.

The customer defines quality. ISD emphasizes criterion-based instruction. The criteria are directly linked to performance requirements in the field. Field representatives identify education and training requirements which instructional providers such as Air Education and Training Command (AETC) or other training

**ISD and quality
relationship
(Continued)**

organizations are then under "contract" to satisfy. All evaluations are focused on the graduate's actual job performance.

Set goals and standards. The goals and standards for an instructional development effort come in many variations. First, the job requirements and the impact of the performance deficiency determine the timing required for the development process and the conduct of the instructional program. Second, the content of the instruction is determined by the person's need to do the job. The design team must directly translate the cues, conditions, and performance standards of the job directly into the instructional program.

Focus on customers. As mentioned earlier, the gaining unit or work center needs determine instructional requirements. By continuing to trace the relationship between the job requirements and the person's need to do the job, a continual focus on the actual field requirement is maintained. In addition, the ISD process requires that the capabilities, aptitudes, and attitudes of the target audience be considered.

Manage by fact. Each phase of the ISD process requires constant evaluation against the job requirements identified earlier in the process. In addition, a myriad of tools have been developed to ensure that design and development decisions are made with supporting data. For example, a number of media selection tools are being used which provide managers information that matches training media with the instructional requirements. These matches are based on learning theories and development cost factors (money and time). ISD is designed to guide the design team to awareness of factors affecting their decisions.

Team Players

Foster teamwork. An instructional program can't be designed and developed in a vacuum. In order to develop effective instruction, the design team must be in constant touch with the work center and evaluation offices. This ensures that the instruction matches the performance requirements of the job.

ISD and quality relationship

Empower your people. ISD is a problem solving, decision making model. Since ISD is flexible and since there are any number of ways to solve a given instructional problem, a design team can be allowed freedom and given authority to design, develop, and implement instruction that meets job performance requirements.

Final Product

Integrate quality in all phases. Evaluation is continuous quality checking. This is true during each phase of the ISD process, from analysis to evaluation. Built-in checks in each phase ensure the quality of the ISD process and instructional products with emphasis on the graduate's performance.

Evaluate quality constantly. The ISD process is a cyclical, ongoing process of continuous improvement. As curriculum developers progress through the different phases of ISD, the process and products of each phase are constantly evaluated against the instructional requirements and principles of learning. The results of the evaluations determine which phase of ISD to enter next. Constant evaluation identifies changes in instructional requirements due to updates in equipment and personnel, which results in new ISD efforts to provide the best possible instruction to Air Force personnel.

Basis of process improvement (Continued)

The basis of process improvement is Quality Air Force (QAF). QAF is a management philosophy and a methodology that work together to produce continuous process improvements. It is based on the following ten principles.

- All work is a process.
 - Processes receive work from suppliers, add value, and deliver output to customers.
-

Basis of process improvement

- Anyone from whom a process receives work is a supplier.
- Anyone to whom a process delivers output is a customer.
- Customers have needs and expectations.
- Customers will define and measure quality in terms of those needs and expectations.
- Quality is meeting customer needs and expectations.
- Improving process quality increases productivity.
- Processes can be identified, understood, measured, and improved.
- The people who operate the processes know best how to improve them.

Procedure for process improvement

In order to ensure process improvements, you will need to use a systematic method to identify and correct the causes of the problems. The six steps of process improvement are outlined in the following table.

Step	Activity
1	Define the process and determine the main problem areas.
2	Analyze the problems and identify the causes of each.
3	Identify and evaluate possible changes to the process.
4	Implement the changes and monitor the process.
5	Institutionalize the changes.
6	Repeat for continuous improvements.

Ways to implement the procedure

There are many different ways to implement the basic procedure mentioned above. Two of the ways are:

- "Chart it, check it, change it"
- Shewhart Cycle (plan-do-check-act)

Each of these techniques uses the six basic steps mentioned above.

Chart It, Check It, Change It

What it is

"Chart it, check it, change it" is a simple phrase that summarizes one of the ways to implement the procedure. It is a systematic approach to continuous improvement. This approach has three principal steps, as shown below and in Figure 4.

Step	What You Do
1. Chart it	<ul style="list-style-type: none"> - Describe the process. - Gather data.
2. Check it	<ul style="list-style-type: none"> - Analyze the data. - Evaluate the process. - Identify opportunities.
3. Change it	<ul style="list-style-type: none"> - Improve the process. - Institutionalize the change.

How to use it (Continued)

Chart It

- Using a process flowchart, describe the process to be improved.
- Gather data on the process and its products.

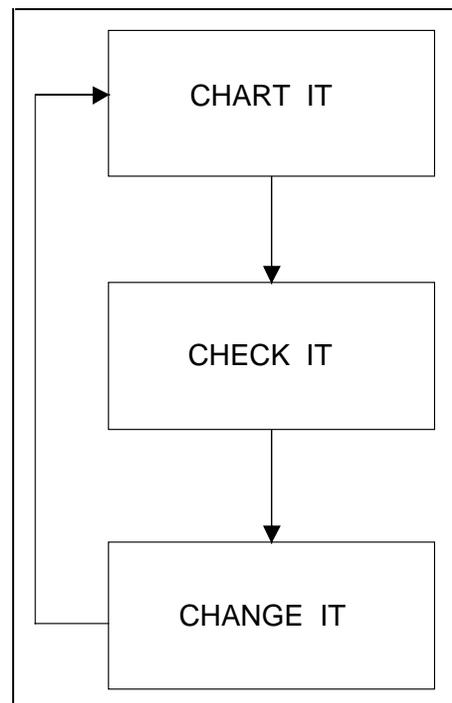
Check It

- Analyze the data to isolate the problems and opportunities.
- Evaluate the process to identify alternative approaches.
- Identify opportunities (i.e., useful changes) from the alternatives.

Change It

- Improve the process by implementing changes identified as opportunities.

Figure 4. Chart it, Check it, Change it.



How to use it

Change It

- Institutionalizing the changes through training, standardization, and other means. Then, use another process (or use this same one again) to make further improvements.

Shewhart Cycle

What it is

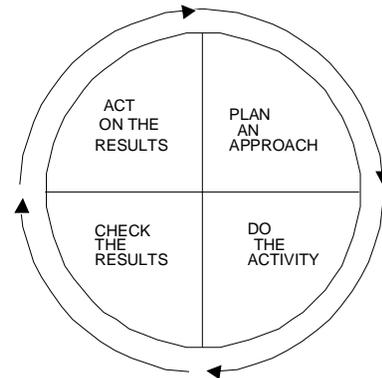
The Shewhart Cycle is a systematic approach to achieving a continuous improvement in quality. The cycle includes planning, doing, checking, and acting. Because the approach involves repetition, it is represented graphically as a circle in Figure 5.

How to use it

Steps in the Shewhart cycle are:

Figure 5. Shewhart Cycle.

- **Plan an approach for quality improvement.** Study the process flow and any existing data. Formulate possible improvements, experiments to be run, or additional data to be gathered.
- **Do the activity planned.** Implement the planned improvement effort. Train the individuals who are responsible for implementation.
- **Check the results.** Measure the results of the improvement effort you implemented. Analyze the data you collected.
- **Act on the results.** If the effort was truly an improvement, standardize and document it. If it was not successful, determine what could be done to improve it.
- **Repeat.** Continue around the cycle again by planning and carrying out further activities.



Section C

Distinctive Features of ISD

Introduction

Actual instructional design offers great potential for creativity and cost avoidance through application of state-of-the-art instructional technology and advances in management, communication, and behavioral sciences. Still, there are real-world constraints; therefore, compromises and trade-offs may be necessary. These are management decisions.

The instructional designer who applies the ISD process is better able to present what the trade-offs involve, so that commanders and managers can make timely, effective, and cost-efficient management decisions.

A commander or manager who understands the process and renders sound, timely decisions on these matters is an invaluable asset to instructional development programs.

What is required? (Continued)

From the description of the ISD process in Section B, it is apparent that developing an instructional system involves considerable effort. You may ask, "Is it necessary to invest all of this effort in every course?" Obviously, practical considerations such as time and resources available to develop the system and the number of students to be trained, dictate that the procedures and techniques described in AFMAN 36-2234 be selectively applied. Although the ISD process is flexible, there are limits on how much of the process can be bypassed and still produce an effective, cost-efficient instructional system.

- The minimum requirements in the development process that should be accomplished are listed below.
 - As best you can, determine the essential job tasks.
 - Determine the skills and knowledge required to perform these tasks.
 - Determine if personnel with the necessary skills and knowledge already exist. If they do not, proceed with the balance of this list.
 - Derive objectives that, if met, would ensure these skills and knowledge.
-

-
- What is required?**
- Develop test items for these objectives that can be used to determine whether or not the objectives are achieved.
 - Devise the means for the student to achieve these objectives.
 - To the extent that you can, determine whether or not the student has achieved these objectives.
 - Where the objectives were not achieved, revise the system as necessary.
-

- Key concepts**
- There are several key concepts that make the ISD process distinctive.
- The instruction to be provided is determined by job requirements.
 - Instruction requirements are based on a behavioral analysis that results in measurable, observable objectives.
 - Instruction is provided only on that portion of the job requirements that the student has not already mastered.
 - Measurement is keyed to the objectives, and students are measured against criteria rather than in comparison to a norm.
 - The instruction is student-oriented. Objectives are stated in terms of student performance. Instruction is also described in terms of student activity.
 - The student and the instructor both know the instructional goals and when they have been attained.
 - If the system doesn't teach, it may be the fault of the system design (rather than the student) and the system must be reworked until it is effective.
-

Potential benefits (Continued)

Based on many years of successful demonstrations, there is empirical evidence that competent use of the ISD process can improve instruction in distinct ways.

Effectiveness. Through use of design and development procedures, careful selection of what requires instruction, measurement and evaluation of instruction, and revision of the instructional system until it meets its objectives, the effectiveness of the instruction will be greatly increased.

Potential benefits **Cost-efficiency.** The ISD process indicates that effective instruction can be developed in a highly cost-efficient manner. Also, added visibility of the education and training process provided by ISD aids in the justification and equitable distribution of resources. While it is not reasonable to believe that use of the ISD process will always result in dollars saved, it is evident that ISD will provide a more cost-efficient means of developing instruction.

Section D

Responsibilities of Commanders and Managers

Introduction The Air Force expects you, as a commander or manager, to support the application of the ISD process. It is your responsibility to ensure that the process is used to develop an effective and cost-efficient instructional system while continually improving the quality of the process.

What you should do As a commander or manager, you should:

- Rely on an ISD process to develop instructional systems.
- Ensure that sufficient numbers of competent individuals are assigned as instructional designers and managers.
- Provide adequate training for your untrained instructional designers and managers.
- Coordinate your instructional system requirements through the unit ISD managers and base support organizations.
- Provide resources (people, funds, equipment, time, etc.) to support the process.
- Conduct periodic quality checks and eliminate instruction unrelated to the job.

What you shouldn't do As a commander or manager, you should not:

(Continued)

- Require a course to be developed before you have determined that there is a valid education or training problem, that a course is an effective, cost-efficient solution, or that an existing course could fix the problem. For example, don't say: "We need a one-week course in shop safety because the accident rate in our machine shop has been increasing for the past six months." Instead, say: "The accident rate in the machine shop has been increasing for the past six months. Conduct an analysis to determine what must be done to correct the situation." If education or training is part of the solution, develop the

necessary instruction.

- Set unreasonable suspense dates for development of the instructional system. Development of instructional systems can be a relatively slow process; however, normally there are
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What you shouldn't do

options in the development process that will make a substantial difference in the development time. Imposing an unrealistic suspense date may force the instructional designers to bypass essential parts of the process that can cause the system to be ineffective and inefficient.

- Delay planning for the instructional system if you are managing the acquisition of a defense or support system. The initial planning for the system should actually start before entering the analysis phase of the ISD process.
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Section E

Air Force Manuals and Handbooks

**Air Force Manual,
AF MAN 36-2234,
Instructional
System
Development**

This manual describes the principles and processes of Instructional System Development (ISD) for developing education and training programs in the United States Air Force. This manual applies to personnel who plan, design, develop, implement, approve, administer, conduct, evaluate or manage instruction for the Air Force.

**Air Force
Handbook,
AFH 36-2235,
Volume 2, *ISD
Automated Tools /
What Works***

This handbook provides information and guidance for applying instructional technology and ISD process described in AFMAN 36-2234.

**Air Force
Handbook,
AFH 36-2235,
Volume 3,
*Application to
Acquisition***

This handbook provides the necessary information and guidance to ensure that the ISD process is properly applied during defense acquisition.

Air Force Handbook, AFH 36-2235, Volume 4, *Manager's Guide to New Education and Training Technologies*

This handbook provides an overview of the communications and computer technologies for education and training.

Air Force Handbook, AFH 36-2235, Volume 5, *Instructional Technology and Distance Learning*

This handbook provides the necessary information and guidance for designers of instructional systems on how and when to incorporate training technologies into ISD.

Air Force Handbook, AFH 36-2235, Volume 6, *Guide to Needs Assessment*

This handbook provides the necessary information and guidance for conducting a Training Needs Assessment.

Air Force Handbook, AFH 36-2235, Volume 7, *Design Guide for Device-based Aircrew Training*

This handbook provides the necessary information and guidance to ensure that the ISD process is properly applied during design of instruction for device-based aircrew training.

Air Force Handbook, AFH 36-2235, Volume 8, *Application to Aircrew Training*

This handbook serves as a guide for Air Force personnel who plan, design, develop, approve, administer, or manage aircrew training in the Air Force.

**Air Force
Handbook,
AFH 36-2235,
Volume 9,
*Application to
Technical Training***

This handbook serves as a guide for Air Force personnel who plan, design, develop, approve, administer, or manage technical training in the Air Force.

**Air Force
Handbook,
AFH 36-2235,
Volume 10,
*Application to
Education***

This handbook serves as a guide for Air Force personnel who plan, design, develop, approve, administer, or manage education in the Air Force.

**Air Force
Handbook,
AFH 36-2235,
Volume 11,
*Application to Unit
Training***

This handbook serves as a guide for Air Force personnel who plan, design, develop, approve, administer, or manage unit training in the Air Force.

**Air Force
Handbook,
AFH 36-2235,
Volume 12, *Test
and Measurement***

This handbook serves as a guide for Air Force personnel who plan develop Criterion-Referenced test and measurement instruments, who validate instructional resources and operationally evaluate instructional systems

Section F Summary

ISD checklist

In summary, an ISD checklist for commanders and managers will help you manage the ISD process within your organization. A sample checklist is provided below.

ISD Checklist for Commanders and Managers
- Do I understand the ISD process?
- Do I recognize why it takes the requisite detail to design an effective, cost- efficient instructional system?
- Do I provide leadership, management, and resource support?
- Do I define the limiting constraints such as time, manpower, or equipment?
- Do I ensure that the ISD process results in continual quality process improvements?
- Do I encourage instructional designers to be creative and imaginative when designing instructional systems?
- Has an Office of Primary Responsibility (OPR) been identified for managing and coordinating the instructional development process?
- Have I required only essential documentation of the ISD process?

RICHARD E. BROWN III, Lt General, USAF
DCS/Personnel

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

AFPD 36-22	Military Training
AFI 36-2201	Developing, Managing and Conducting Military Training
AFI 36-2301	Professional Military Education
AFMAN 36-2234	Instructional System Development
AFMAN 36-2236	Handbook for Air Force Instructors
AFH 36-2235	Information for Designers of Instructional Systems (12 Volumes)
Vol 1	ISD Executive Summary for Commanders and Managers
Vol 2	ISD Automated Tools/What Works
Vol 3	Application to Acquisition
Vol 4	Manager's Guide to New Education and Training Technologies
Vol 5	Advanced Distributed Learning: Instructional Technology and Distance Learning
Vol 6	Guide to Needs Assessment
Vol 7	Design Guide for Device-based Aircrew Training
Vol 8	Application to Aircrew Training
Vol 9	Application to Technical Training
Vol 10	Application to Education
Vol 11	Application to Unit Training
Vol 12	Test and Measurement Handbook