FAA Industry Training Standards (FITS)

Scenario Based Transition Syllabus

For Multi-Function Displays

Version 1.1, September 12, 2005

FITS Training Master Syllabus
Scenario Based Training Guide

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Acknowledgements:

The Syllabus prepared by:

and the FITS Launch Partners:

How to use this FITS Syllabus

This FITS Multi-Function Display (MFD) Syllabus is intended as a guide for aircraft manufacturers, training providers, and flight schools to use in developing a specifics FITS curriculum for a specific aircraft, geographic region, and customer base. The syllabus lays out a series of flight scenarios that enable a pilot transitioning into an airplane equipped with MFD technology that provide information on a display screen, to master the technology, use the information displayed effectively in maintaining situational awareness, and most importantly the concepts of Risk Management and Aeronautical Decision Making.

This syllabus assumes the pilot in training (PT) is proficient in using GPS for navigation. If this is not the case, this syllabus can be combined with a GPS specific syllabus to comprise a training program in which the PT can learn GPS navigation with the aid of other specific equipment. If a suitable training device is available, this may be substituted for the flight training provided all learner-centered outcomes could be met in a scenario-based training format.

To Instructors
Each lesson consists of a scenario description followed by a list of specific tasks to be accomplished by the student. Each scenario also includes a "student centered" set of grading criteria. Within the confines of each scenario the Pilot in training (PT) and instructor are free to plan all the training activities in a way that supports the overall scenario flow, and provides the most realistic replication of real world, day to day flying.

To Pilots in Training (PT)
The emphasis in each scenario is on PT planning and the execution of each scenario with as little help as possible from the instructor. The value of scenario-based training is in the opportunities it provides to plan, execute, and respond to changing situations in a thoughtful way.

To Aircraft Manufacturers, Training providers, and Flight Schools
This generic syllabus is a guide for you to use in developing your specific transition curriculum. FITS acceptance is achieved by developing your specific curriculum and submitting it to:

The FITS Program Manager,
800 Independence Avenue, SW, Washington DC, 20591
202 -267-7922

Use of the FITS logo.
Once FITS accepted you are authorized to display the FITS Logo on approved FITS curriculums and in advertising about this particular curriculum. The FITS logo will not be used in relationship to non-FITS products.

Section 1 - FITS Introduction

FAA Industry Training Standards (FITS)

The FITS Program is a joint project of the FAA, the FAA -sponsored Center for General Aviation Research (CGAR), Embry Riddle Aeronautical University, The University of North Dakota, and various organizations and associations representing the General Aviation industry.

FITS Transition Training Mission Statement:

Improve pilot training to enable pilots to more safely, competently, and efficiently operate a Technically Advanced Aircraft (TAA) in the National Airspace System (NAS).

FITS "Essentials":

Pilot training in TAA requires an emphasis on realistic scenario-based training that will develop essential risk management skills, decision-making skills, and other higher-order thinking skills that are crucial in helping to reduce the general aviation (GA) fatal accident rate. Reduction of the GA fatal accident rate is one of the cornerstones of the FAA's "SAFER SKIES" initiative. FITS scenario-based training will also involve training for new communication, navigation and surveillance (CNS) systems, related airspace and procedures, and the problem of new-entrant pilots flying for transportation purposes

FITS recognizes the variety of advanced technology systems and the different combinations and permutations of these systems-

- Within a type of system (e.g. different operations of GPS navigators)
- Within categories of advanced technology systems such as a-
    - Primary Flight Display (PFD) that normally includes the following primary information on a single display:
        - Attitude
        - Heading
        - Altitude
        - Airspeed
        - Navigation (HSI, bearing, course, ground speed, etc.)
    - Multi Function Display (MFD) that could include any combination of the following information on a single display:
        - Traffic
        - Weather
        - Terrain
        - Navigation (bearing, course, ground speed, ETA, Sectional, Enroute or Terminal Approach charts, etc.)
    - Autopilot

FITS Training Goals

The advancement of:

- Higher Order Thinking
    - o Risk Management
    - o Aeronautical Decision-Making
    - o Situational Awareness (SA)
    - o Pattern Recognition (Emergency Procedure) and Decision-Making
- Aircraft Systems Competence
- Planning and Execution
- Procedural Knowledge
- Motor skills that do not require higher cognitive thinking before taking action (i.e. Psychomotor Skills.)

Section 2 - FITS Terminology/Definitions

Key Terms

Technically Advanced Aircraft (TAA)– is a general aviation aircraft that contains a GPS navigator with a moving map display, plus any additional systems. Traditional systems such as autopilots when combined with GPS navigators are included. It includes aircraft used in both VFR and IFR operations, with systems certified to either VFR or IFR standards. Note: there will be application to non-TAAs.

Light Turbine TAA- a jet or turboprop TAA certified for single-pilot operations, weighing 12,500 lbs or less, equipped with cabin pressurization, conventional (non-swept) wings and capable of operating in Class A airspace on normal mission profiles. (Note: Light Turbine TAA is specifically defined as having a non-swept wing due to the significantly increased training demands for pilots transitioning to swept wing aircraft)

Scenario-based Training (SBT) – is training system that uses a highly structured script of real-world experiences to address flight training objectives in an operational environment. Such training can include initial training, transition training, upgrade training, recurrent training, and special training. The appropriate term should appear with the term "Scenario-based," e.g., "Scenario-based Transition Training," to reflect the specific application.

Single Pilot Resource Management (SRM) – is the “art and science” of managing all resources available to a single-pilot to ensure the successful outcome of the flight.

Related Terms and Abbreviations

Aircraft Automation Management – is the demonstrated ability to control and navigate an aircraft by means of the automated systems installed in the aircraft.

Automated Navigation leg – is a flight of 30 minutes or more conducted between two airports in which the aircraft is controlled primarily by the autopilot and the on-board navigation systems.

> **A VFR Automated Navigation Leg** is flown on autopilot beginning from 1,000 ft above ground level (AGL) on the departure until the 45-degree entry to the downwind leg in the VFR airport traffic pattern.
>
> **An IFR Automated Navigation Leg** is flown on autopilot beginning from 500 ft AGL on departure (unless the limitations of the autopilot require a higher altitude, then from that altitude) until reaching the decision altitude or missed approach point on the instrument approach. If a missed approach is flown, it will also be flown using the autopilot and on-board navigation systems.

Automation Competence- is the demonstrated ability to understand and operate the automated systems installed in the aircraft.

Automation Surprise- is the ability of an automated system to provide different cues to pilots when compared to the analog systems they replace, especially in time-critical situations.

Automation Bias – is the relative willingness of the pilot to trust and utilize automated systems.

Candidate Assessment- is a system of critical thinking and skill evaluations designed to assess a student's readiness to begin training at the appropriate level.

Critical Safety Tasks/Events – are those mission related tasks/events that, if not accomplished quickly and accurately, may result in aircraft damage, injury, or loss of life.

Data link Situational Awareness (SA) Systems – are systems that feed real-time information to the cockpit on weather, traffic, terrain, and flight planning. This information may be displayed on the PFD, MFD, or on other related cockpit displays.

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

> (I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

(III) Learner centered grading (outcomes assessment) is a vital part of the FITS concept. Previous syllabi and curriculum have depended on a grading scale designed to maximize student management and ease of instructor use. Thus the

traditional: "excellent, good, fair, poor" or "exceeds standards, meets standards, needs more training" often meet the instructor's needs but not the student's. The grading scale/system is designed to emphasize two important point in student centered learning. First, the grading system should provide a clear picture about the progress the PT is making during the training. A typical grading scale including outstanding, satisfactory, marginal, and unsatisfactory can be accurate but often carries emotional baggage. That is, student have often been graded by this scale and have learned to identify that they are not doing well if they receive anything other than an outstanding grade on a graded task. Instructors recognize this problem and attempt to avoid sending negative signals to their students. When this happens, students are not given an accurate picture of the progress. This is often complicated by the problem the instructor has in attempting to show adequate progress during initial phases of training when students are not expected to be able to "Manage/Decide," but rather be able to accomplish the requirement with assistance and coaching. Second, the grading scale needs to communicate the instructor's assessment of the student progress clearly to the PT.

The grading scale needs to clearly indicate the student's progress so that the instructor or another instructor understands the PT progress. Thus, the FITS researcher are recommending a grading system that involves a grading scale designed to provide a better picture of the actual PT progress without the emotional baggage of traditional grading. The learner centered grading described above is a way for the instructor and student to determine the student's level of knowledge and understanding. "Perform" is used to describe proficiency in a skill item such as an approach or landing. "Manage-Decide" is used to describe proficiency in the SRM area such as ADM. Explain and practice are used to describe student learning levels below proficiency in both.

(IV) Grading should be progressive. During each flight, the student should achieve a new level of learning (e.g. flight one, the automation management area, might be a "describe" item by flight three a "practice" item, and by flight five a "manage-decide" item.

Emergency Escape Maneuver- is a maneuver (or series of maneuvers) performed manually or with the aid of the aircrafts automated systems that will allow a pilot to successfully escape from an unanticipated flight into Instrument Meteorological Conditions (IMC) or other life-threatening situation.

Mission Related Tasks- are those tasks required for the safe and effective accomplishment of the mission.

Multi-Function Display (MFD) - is a device that combines primarily navigation, systems, and situational awareness (SA) information onto a single electronic display.

Primary Flight Display (PFD) – is a device that combines the primary six flight instruments plus other related navigation and situational awareness (SA) information into a single electronic display.

Proficiency Based Qualification- is a qualification based on demonstrated performance rather than other flight time or experience.

Simulation- is any use of animation and/or actual representations of aircraft systems to simulate the flight environment. PT interaction with the simulation and task fidelity for the task to be performed are required for effective simulation.

Training Only Tasks – are training maneuvers that, while valuable to the PT's ability to understand and perform a mission related task, are not required for the PT to demonstrate proficiency. However, instructor pilots would be required to demonstrate proficiency in training-only tasks.

Section 3 - FITS TAA Transition Master Syllabus

Over the years, the airlines and the military have shifted their training philosophy toward a "train the way you will fly in the real world and fly the way you trained" approach to satisfy their flight training requirements. The airlines refer to this training approach as Line Oriented Flight Training (LOFT), and is now considered doctrine in the air carrier community.

The complexity of the national airspace under the FAA's Operational Evolution Plan (OEP) along with the introduction of new cockpit technologies make the idea of LOFT, or "scenario-based" flight training, an idea that demands serious consideration from the general aviation (GA) community.

The challenge is to develop an adaptable flight training system that will not only maintain but will greatly improve the safety and utility of increasingly complex (GA) flight operations. (Wright, 2002)

The concept of "scenario-based" flight training is attracting considerable support. This training approach, when coupled with state-of-the-art simulation and curricula, would be ideally suited to preparing GA pilots for operations in an increasingly complex national airspace system. In particular, it could provide an effective bridge between the training environment and the actual environment pilots will experience. The concept also provides a way for trainees to integrate various phases of training into a unified flight operation. Rather than, for example, conducting practice instrument approaches repeatedly, scenario-based training may enable a pilot to experience the complete transition from enroute to terminal to approach operations. (Wright, 2002)

GOAL

The goal of Transition Training is to prevent accidents by ensuring pilots have proper training in the specified systems and operating characteristics of every airplane model they fly. Transition Training, therefore, concentrates on those areas where the pilot will

encounter something that is distinctive or unique to that airplane model. No attempt is made to review general piloting knowledge or skills that would be the same in any airplane. Instruction in these areas is highly beneficial, but should be accomplished through other means.

MASTER SYLLABUS

This Master Syllabus document is a general outline of the items to be included in the ground and flight training of pilots transitioning into technically advanced aircraft (TAA). The Master Syllabus should be used to develop a Transition Training Guide for a specific airplane. "Specific airplane" includes airplane models that are sufficiently similar so that a pilot trained or experienced in one airplane model would not normally require Transition Training to operate another model.

TRANSITION TRAINING GUIDES

A Transition Training Guide is written for a specific airplane and is based on the Master Syllabus. Any person or company such as a certificated flight instructor, training organization, manufacturer, or aviation publisher may produce it. It can be very specific or may be only an outline that refers to the Pilot's Operating Handbook (POH) or FAA-approved Airplane Flight Manual (AFM).

Because the sequence of training may need to be altered to accommodate individual progress or special circumstances, the training guide/syllabus should be flexible. As complexity varies between airplane models, developers of Transition Training Guides may find it necessary to expand upon the information described herein. If the prescribed sequence of training is changed, it is the responsibility of the pilot training school or instructor to make sure that all necessary training is accomplished.

IFR TRANSITION TRAINING

Certain maneuvers in the flight section are prescribed as "IFR only". These maneuvers are required only for instrument rated pilots. They are included so that an instrument rated pilot in training (PT) may practice key IFR maneuvers in an unfamiliar airplane under the supervision of an instructor. PTs who are instrument rated and elect not to perform the IFR maneuvers, or PTs who are not instrument rated (VFR only) will receive a "VFR" endorsement in their logbook when training is satisfactorily completed. This type of endorsement indicates that only VFR transition training was completed. The presence or absence of this endorsement does not legally affect the pilot's instrument privileges in any airplane.

COURSE ELEMENTS

Scenario-based flight training (SBT) represents a non-traditional approach to GA pilot training. The most significant shift is observed in the move away from the traditional practice of analyzing a maneuver and breaking it down into manageable chunks,

establishing behavioral objectives, and measuring performance based on those objectives. SBT uses the same maneuvers, for the most part, but attempts to arrange or script them into more "real world" learning experiences. Practice of the task remains the cornerstone of skill acquisition, but the shift is away from meaningless drill in the practice area toward meaningful application as a part of a normal flight activity.

While the traditional approach to civilian flight training certainly has served the industry, there is ample evidence of the need for modifications to our traditional perspectives on developing safe, competent and efficient pilots. The traditional approach to pilot training is driven by regulations that use flight hours and the ability to fly maneuvers within certain parameters as the benchmark of competency. The emphasis during training is on individual psychomotor skill and, to a limited extent, pilot decision-making. After completion of training, the pilot goes on to fly in an environment that asks them to use skills, apply knowledge, and make decisions unassisted.

Consequently, traditional flight training curricula lack the continuity, consistency, and activities characteristic of the TAA of the future

While this Master Syllabus does not utilize the more traditional maneuver-based method of learning, it does attempt to provide a coordinated ground/flight sequence of training so that educational support materials are covered prior to the associated flight lessons. Additionally, the simple-to-complex "building block" approach is maintained in that each lesson increases in complexity and the PT is provided the opportunity to practice the maneuver in a "real world" flight experience.

STANDARDS

Several training items require a discussion of the limitations of an airplane component or system. In every airplane system, there are limitations based on two factors:

1. The capability of the equipment to perform a particular function and;
2. The individual pilot's ability to use that equipment.

Effective training and experience can enable safe operation of an airplane within its limitations. Some airplane systems are more complex and require a higher level of skill and interpretation. Pilot skills and knowledge vary with a pilot's total flight time, time-in-type, and recent flight training or experience. Therefore, pilots must be trained to recognize their personal limitations and the airplane's limitations.

Throughout the ground school and flight curriculum, emphasis should be placed on operating within airplane and pilot limitations. Risk management and decision-making skills should be especially emphasized. A discussion of limitations, as they apply to the PT's experience level, and with reference to potential problem areas, may prevent many accidents. For that reason, Transition Training Guides should include items that instructors may discuss with transitioning pilots concerning limitations of various

systems, flight characteristics of the specific airplane, and how these items may apply to a particular pilot.

GROUND TRAINING

The ground-based segments of the Master Syllabus are an integral part of the SBT course and should be mastered prior to in-flight training. The PT should demonstrate, through written and oral review, the knowledge to safely operate the specific airplane using the Pilot's Operating Handbook (POH) or FAA-approved Airplane Flight Manual (AFM) and airplane checklists. All immediate-action emergency procedures must be committed to memory. The instructor will discuss each incorrect response with the pilot to ensure complete understanding.

FLIGHT TRAINING

Each lesson in the flight-training phase of the SBT course consists of a scripted scenario, and each scenario increases in complexity as the PT progresses through the course. The instructor and PT should use the scenario as a "lesson plan" with the intent for the PT to study the plan and brief it as part of the pre-flight preparation.

The PT should demonstrate the necessary skill and experience required for the specific airplane. Operations must be accomplished within the parameters specified in the FAA Practical Test Standards (PTS) appropriate to the grade of PT's pilot certificate.

In addition, a PT who holds an instrument rating must demonstrate competency in the instrument maneuvers and procedures identified in the flight portion of the Master Syllabus within the parameters specified in the Instrument Rating PTS. If a PT chooses not to demonstrate competency in instrument flight in the specific airplane, the PT's logbook endorsement will indicate "VFR only". An instrument rated pilot with a "VFR only" logbook endorsement for Transition Training may remove the endorsement at a later date by completing the designated instrument maneuvers and training. The presence or absence of this endorsement does not legally affect the pilot's instrument privileges in any airplane.

Section 4 - FITS MFD Master Syllabus

GOAL

The goal of MFD Training is to help prevent accidents by ensuring pilots have proper training in the specified systems and operating characteristics of MFD to enhance situational awareness and collision-avoidance. Equipment specific training, therefore, concentrates on areas unique to the technology and information. No attempt is made to review general piloting knowledge or skills that would be the same in any airplane. Instruction in these areas is highly beneficial, but should be accomplished through other means.

As the use of GPS is integral to the overall MFD system, there is an assumption that a pilot training under a FITS-accepted MFD syllabus is proficient in the use of the GPS equipment installed in the airplane being used for training. If this is not the case, the MFD syllabus can be combined with the appropriate FITS-accepted equipment specific syllabus to comprise a training package for that pilot and equipment in a modular approach. It is suggested the GPS specific training be conducted before conducting the equipment specific training. However, it is possible that if the GPS training consists of multiple scenarios, the equipment specific training can be included in the latter stages of that training.

MASTER SYLLABUS

This document, the Master Syllabus, is a general outline of the items to be included in the ground and flight training of pilots learning how to use specific equipment. The Master Syllabus should be used by companies or individuals to develop a Training Guide for a specific airplane, or avionics equipment package. A typical avionics package can consists of various different types of equipment, each of which can be from different manufacturers. Therefore, it may be necessary to combine equipment specific syllabi in order to complete a program for a specific combination of avionics equipment.

MFD GUIDES

An MFD Training Guide is written for specific equipment and is based on the Master Syllabus. Any person or company, such as a Certificated Flight Instructor (CFI), training organization, manufacturer, or aviation publisher, may develop a syllabus. The primary recipients of this training would be those pilots who install a MFD in their airplane. Because sequence of training may need to be altered to accommodate individual progress or special circumstances, the training syllabus should be flexible. As technical complexity varies among specific types of equipment, those who develop MFD Training Guides may find it necessary to expand upon the information described in the Master Syllabus. If the prescribed sequence of training is changed, it is the responsibility of the curriculum developer to make sure that all necessary training is accomplished.

STANDARDS

In every airplane system there are limitations based on two factors:

1. The absolute capability of the equipment to perform a particular function and;
2. The individual pilot's ability to use that equipment.

Effective training and experience can enable safe operation of an airplane within these limitations. Some aircraft systems are more complex and require a higher level of skill and interpretation. Pilot skills and knowledge vary with a pilot's total flight time, time-in-type, and recent flight training or experience. Pilots, therefore, must be trained to recognize their personal limitations as well as the airplane's limitations.

Throughout the ground school and flight curriculum, emphasis should be placed on operating within aircraft and pilot limitations. Risk management and decision-making skills (also referred to as Single Pilot Resource Management (SRM)) should be consistently integrated into each scenario. A discussion of limitations, as they apply to the pilot's experience level, and with reference to potential problem areas, will enhance the decision process. MFD Training Guides should include discussions of system limitations, characteristics of the specific equipment, and how these items apply to a particular pilot.

GROUND TRAINING

The ground-based segments of the syllabus are an integral part of the SBT course and should be mastered prior to the in-flight training experience. The pilot-in-training (PT) should demonstrate, through written and oral review, the knowledge to safely operate the specific equipment, using the operating guides or manuals supplied with the equipment, the POH or Approved Airplane Flight Manual, and airplane checklists. All immediate-action emergency procedures particular to any piece of equipment covered by this syllabus must be committed to memory. The CFI will discuss each incorrect response with the pilot to ensure complete understanding. The instructor must integrate SRM concepts and techniques in each of these discussions.

Specific exercises should take the PT through the use of all knobs, buttons, keys, and other controls that may be used during the operation of the equipment. If there is a computer program that simulates the operation of the device, it should be used to the maximum extent practical to allow the PT to practice all phases of operation prior to flying. In some cases, specific equipment simulators may be available and should be used to the maximum extent possible to allow the PT to practice all system functions prior to flying. If these computer programs or simulation devices allow, the practice should be constructed to use realistic scenarios as soon as practical. In some cases, the equipment installed in the airplane may be used to provide ground training in the basic equipment operation. If this is the case, consideration should be made for an adequate external power supply to prevent depletion of the aircraft's on-board batteries and attention should be paid to the equipment operating limitations, if any, with respect to temperatures while on the ground.

FLIGHT TRAINING

The flight-training lesson consists of a highly scripted scenario consisting of a minimum of two legs. The first, or outbound leg is designed to allow the student to practice all equipment functions while describing and explaining how to use the information gaining to enhance situational awareness. The second, or return leg, is designed to allow the student to perform all functions of the equipment and to manage the flight and make appropriate decisions regarding all aspects of the flight while using the specific equipment to enhance situational awareness and collision avoidance to meet the completion standards for this course. There should be a break after the outbound leg during which the PT and instructor will debrief that leg, resolve any questions or concerns, and prepare for the return leg.

The intent is for the student to study the lesson script, prepare a scenario plan, and brief it as part of the preflight preparation.

It is vitally important that the pilot learn to "manage" the aircraft in the automated mode, as well as fly the aircraft by hand. Good SRM demands that the pilot be able to rely on the autopilot and automated navigation systems during times of high cockpit task loads. Instructors must ensure that emphasis is given to both automated and manual flight modes as described in each scenario.

The pilot-in-training should demonstrate the necessary skill and experience required for the specific aircraft. Operations must be accomplished within the tolerances specified in the Practical Test Standards appropriate to the pilot's airman certificate.

LESSON 1
MFD MASTER SYLLABUS - SCENARIO BASED TRAINING

OBJECTIVE

The Pilot in Training (PT) will be able to describe and explain the components and elements of the equipment installed in the aircraft, will be able to perform all functions necessary for complete operation of the equipment, including all menu and display functions, and will be able to interpret display information to enhance situational awareness, identify potential traffic conflicts and manage/decide on appropriate actions necessary to avoid collisions in flight operations, as well as in ground operations, and to use all available information to aid in SRM and ADM.

SCENARIO

Preflight

The PT will plan a VFR cross-country flight of about one and one-half hours to two hours in duration, to include a full stop landing at the departure airport.

The PT will perform all normal preflight activities, including determining the status of the MFD equipment, and describe his/her approach to management of the specific risks involved in this flight using the MFD for situational awareness and SRM. The instructor will provide the necessary guidance to insure that the plan provides for all the scenario activities and sub-activities listed for this lesson. The PT is evaluated on the ability to plan a comprehensive flight with conscious attention to all the required scenario activities.

The PT will perform all preflight procedures, engine start-up, avionics set-up, taxi and before-takeoff procedures for each leg of the scenario. This will include programming a flight plane through the use of the MFD, as well as MFD initialization and status assessment, and an effective pre-takeoff briefing.

These Preflight activities will be accomplished prior to takeoff for the flight

Leg 1 (VFR Operations)

The PT will perform a normal takeoff and departure to a safe altitude. During the departure phase, the PT will be expected to set the MFD to an appropriate range setting to identify the airport vicinity.

During the enroute phase of the flight, the PT will practice changing the settings on the display. The PT will practice various menu functions to change the depiction on the

screen. If the pilot is instrument rated, the pilot should perform some of these functions while in IFR or simulated IFR conditions.

The PT will practice getting destination airport information using the appropriate feature if equipped. If weather information, such as NEXRAD information, can be displayed on the unit, the PT will set the display appropriately. The PT will use this information to decide which runway to expect and how to manage the entry into the airport.

As the flight approaches the destination airport, the PT will set the range such that the hazards and traffic around the airport can be identified. The PT will use this information to plan the entry into the airport if it is a non-towered airport, or to help follow assigned traffic if so required by an ATC control tower.

After landing, the aircraft will be shut down and the instructor and PT will debrief the first leg of the flight.

Leg 2 (IFR Operations)

A different route will be programmed into the unit for the second leg of the trip. During this leg, the PT will perform all of the same functions as on the VFR Operations, except the learning standards will be conducted under IFR conditions, actual or simulated. The instructor is expected to provide any assistance. The PT may use the autopilot if installed, but should be able to operate the equipment and maintain positive aircraft control at all times. If available, the PT should practice using the specific equipment during taxi operations to become more familiar with the equipments capabilities and limitations in the event of poor visibility conditions.

Post-flight

The PT will perform all aircraft shutdown and securing procedures.

PREREQUISITES

Completion of training provider pre-training packet corrected to 100%.

Completion of a Quiz normal operating procedures, aircraft systems, and avionics corrected to 100%

PILOT IN TRAINING PREPARATION

Review the following:

a. Normal operating procedures in the POH
b. A worksheet on systems and procedures
c. Airport information for departure and destination airports.
d. Route of flight information for both trips.
e. Aircraft and avionics systems display and procedures.

BRIEFING ITEMS

A. INITIAL INTRODUCTION:

PTs should have a clear understanding of the Pilot in Command concept and how command is transferred. This should include a detailed pre-takeoff briefing procedure and format.

B. SINGLE PILOT RESOURCE MANAGEMENT (SRM)

a. Basic pre-flight and in-flight decision-making and risk management and how the specific equipment can be a valuable tool.

C. SAFETY

The following safety items should be briefed to all PTs:

a. Mid-air collision avoidance procedures. Also, the limitations of the equipment should be discussed to preclude over-reliance on it.

b. Taxi procedures and how to use the equipment, if possible, to monitor progress and prevent runway incursions.

Scenario One

(note: these activities will be completed as part of the training scenario and are not intended to be a list of training tasks to be completed in numerical order)

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

(I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

Leg One

Scenario Activities	Scenario Sub Activities	Desired PT Scenario Outcome
Preflight Planning	1. System availability 2. System status 3. Change Data Card	1. Explain/Practice 2. Explain/Practice 3. Explain/Practice
Preflight, Engine Start, and Taxi	1. System Initialization and self-tests. 2. Currency of Data Card 3. Setup 4. Airport Diagrams Displayed 5. SRM/Situational Awareness During Taxi Operations	1. Explain/Practice 2. Explain/Practice 3. Explain/Practice 4. Practice 5. Explain/Practice
Takeoff and Departure	1. Setting equipment 2. Loading a flight plan 3. Identifying functions 4. Identifying airways	1. Practice 2. Practice 3. Explain/Practice 4. Practice
Enroute	1. Identify Targets at various ranges 2. MFD Display Options 3. Map Orientation 4. Navigation Data 5. Identification of Potential Conflicts 6. Conflict Resolution/ Collision Avoidance 7. Weather Information 8. Nexrad Weather Radar Information (if available)	1. Practice 2. Explain/Practice 3. Explain/Practice 4. Explain/Practice 5. Explain/Practice 6. Explain/Practice 7. Explain/Practice 8. Explain/Practice
Airport Arrival: Terminal	1. Weather Information 2. Nexrad Weather Radar Information (if available) 3. Destination Airport Information 4. Identify Traffic at Destination Airport 5. Identify Potential or Actual Conflicts and Resolve 6. Loading Airport Charts 7. Loading Instrument Approach Charts/Approaches (if available)	1. Explain/Practice 2. Explain/Practice 3. Explain/Practice 4. Explain/Practice 5. Explain/Practice 6. Explain/Practice 7. Explain/Practice

Airport Arrival: Approach to Landing	1. Establish Approach and Landing Sequence 2. Airport/Runway Situational Awareness after Landing and during taxi operations	1. Explain/Practice 2. Explain/Practice

Leg Two

Scenario Activities	Scenario Sub Activities	Desired PT Scenario Outcome
Preflight Planning	1. System availability 2. System status 3. Change Data Card	1. Manage/Decide 2. Manage/Decide 3. Perform
Preflight, Engine Start, and Taxi	1. System Initialization and self-tests. 2. Currency of Data Card 3. Setup 4. Airport Diagrams Displayed 5. SRM/Situational Awareness During Taxi Operations	1. Manage/Decide 2. Manage/Decide 3. Manage/Decide 4. Perform 5. Manage/Decide
Takeoff and Departure	1. Setting equipment 2. Loading a flight plan 3. Identification of airways 4. Identifying functions	1. Perform 2. Perform 3. Manage/Decide 4. Manage/Decide
Enroute	1. Identify Targets at various ranges 2. MFD Display Options 3. Map Orientation 4. Navigation Data 5. Identification of Potential Conflicts 6. Conflict Resolution/ Collision Avoidance 7. Weather Information 8. Nexrad Weather Radar Information (if available)	1. Perform 2. Manage/Decide 3. Manage/Decide 4. Manage/Decide 5. Manage/Decide 6. Manage/Decide 7. Manage/Decide 8. Manage/Decide

Airport Arrival: Terminal	1. Weather Information 2. Nexrad Weather Radar Information (if available) 3. Destination Airport Information 4. Identify Traffic at Destination Airport 5. Identify Potential or Actual Conflicts and Resolve 6. Loading Airport Charts 7. Loading Instrument Charts/Approaches (if available)	1. Manage/Decide 2. Manage/Decide 3. Manage/Decide 4. Manage/Decide 5. Manage/Decide 6. Manage/Decide 7. Manage/Decide
Airport Arrival: Approach to Landing	1. Establish Approach and Landing Sequence 2. Airport/Runway Situational Awareness after Landing during Taxi Operations	1. Manage/Decide 2 Manage/Decide

Section 5 - FITS Master Learning Outcomes List

MFD 01	**MFD Equipment Operation**	
Lesson Objective- The student will demonstrate mastery of MFD equipment functions, the use of all available information depicted by the equipment for enhanced situational awareness, traffic identification and collision avoidance, planning, weather awareness, SRM, and Aeronautical Decision Making.		
Performance	Conditions	Standards
The training task is:	The training is conducted during:	The pilot in training will:
1. Overview of MFD System and Equipment Requirements	Pre-arrival eLearning, home study course, or classroom training	a) Be able to explain the major components of a general aviation MFD system and how they work together. b) Be able to explain the equipment installed on the training airplane. c) Be able to explain MFD use in air traffic control. d) Be able to explain how MFD equipment is similar and different than more traditional avionics equipment found onboard the aircraft.
2. MFD Equipment Operation	a) Pre-arrival eLearning, home study, or classroom training b) Simulator, training device, or static airplane c) In all phases of flight	a) Locate and be able to change the data card for the MFD unit. b) Turn on the equipment, monitor system initialization, resolve any messages, and decide if the system is functional and current. c) Be able to operate all menu functions via the function keys, soft or "smart" keys, or other input devices. d) Change the range settings, add and remove information from the display and display any aircraft, airport, weather, and/or airspace information available. e) Be able to explain why these operations are important to the safe operation of the aircraft.
3. Preflight Planning	a) Pre-arrival eLearning, home study course, or classroom training b) Pre-Flight Planning	a) Be able to explain the MFD system, availability and status by acceptable means.

4. Takeoff and Departure, Enroute, and Arrival (terminal and approach to landing) Operations, with emphasis on SRM, ADM and Risk Management	a) Pre-arrival eLearning, home study course, or classroom training b) Simulator, training device, or static airplane c) In all phases of flight	a) Identify and program a flight plan, including map orientation, navigation data, and labels. b) Demonstrate the use of a split screen function c) Demonstrate the use of the traffic function, including traffic depiction, alerts, traffic status indication, and symbology. d) Visually identify targets depicted on MFD whenever possible. e) Demonstrate the use of the terrain function f) Obtain and display NEXRAD, or other radar weather images, if available. g) Make adjustments to route of flight based on weather information obtained/depicted. h) Plan arrival into destination using weather and necessary information displayed. i) Plan arrival based on proper airport and instrument charts, if available j) Manage flight path to; decide on landing sequence (non-towered airports), or to maintain proper spacing from assigned traffic (at controlled airports) during arrival at destination. k) Use information to maintain situational awareness during taxi and other ground operations to avoid runway/taxiway incursions.

Appendix

Suggested Outline for Pre-Arrival Learning Guide

In an effort to assist the PT in getting the most out of their flight training sessions, it is strongly recommended that they first complete a home study course. This home study course, or pre-arrival learning guide is intended to introduce the PT to the equipment and its intended use. It is a basic overview of the equipment, and not an all-encompassing study guide. At the completion of the home study course, the PT should have a basic understanding of the equipment and a familiarity with its basic functions.

Lesson 1: Introduction to Equipment
Purpose: The purpose of this lesson is to introduce the PT to what the technology is. The intended applications of the equipment, as well as its limitations will also be introduced.

What is a MFD? Multi-Function Display- is a technological advancement that provides a display that integrates many of the navigation needs, in an easy and suitable package. Not only does MFD provide the pilot with map displays, but it can also alert the pilot to traffic, terrain, and weather information.

One of the primary applications of MFD is to improve a pilot's situational awareness. MFD can track and identify other aircraft with the proper equipment, as well as maintain situational awareness.

Another application of the MFD is to aid a pilot in navigation. With this system pilots can access accurate moving map displays along their intended flight path. In addition other pertinent information to the flight maybe displayed such as weather along the route, terrain that may be encountered, and traffic.

MFD is not designed nor is it intended to replace the pilot's responsibility to maintain situational awareness. The pilot will still be responsible for maintaining separation from other aircraft. MFD is another form of navigation aid but does not provide conflict resolution for weather, traffic or terrain.

Lesson 2: Equipment
Purpose: The purpose of this lesson is to introduce the PT to the primary components involved with the equipment.

Hard Keys- These are the keys that possess designated functions that do not change with the menu or programming features being accessed. The manufacturer of the equipment designates which keys are hard keys and what function they will perform. Typically hard keys can only access one function, regardless of what menu or function is currently in use.

Soft Keys – Soft Keys also contain designated functions, but the functions will change depending upon the menu item or function that is currently being accessed.

Function Keys –

Function – Shows the available functions.

Menu/Enter – Menu options that are typically available include moving map displays, flight planning, setting in barometric pressure for the aircrafts current location. This key shows the options for each function.

Displays – Displays typically pair with information contained in the data card and GPS systems. Displays can be as detailed as airport maps to assist the pilot taxiing at an unfamiliar airport to a terrain map comparable to the pilots choice of a VFR chart or low level Instrument chart.

Line Select – The selection of line items typically involves the use of the Soft Keys. The line items will vary from one menu to the next, and dependent upon the menu being accessed, the key used to select a line item will vary.

Lesson 3: Flight Planning
Purpose: The purpose of this lesson is to introduce the PT to the basic steps required in programming in a flight plan into the equipment. This lesson will not address each individual step involved in planning a flight from beginning to end, but those items that the equipment will need for the most basic flight plan.

Proper preflight planning and briefing procedures are necessary for any flight. After having completed weight and balance, fuel computations, and estimated time en route in the preflight, this information will need to be programmed into the computer system onboard the aircraft.

While programming in the route of flight, communication and navigation frequencies should also be entered to aid the pilot in reducing his or her workload during the flight. This reduced workload is intended to enhance the pilot's situational awareness during the flight.

Lesson 4: Terminology
Purpose: The purpose of this lesson is to introduce the PT to the manufacturer specific terminology used with their equipment.

Lesson 5: Symbology
Purpose: The purpose of this lesson is to introduce the PT to the most common visual features and symbology used by MFD equipment. It is important to note that some visual alerts will vary not only in color, but by the actual symbol used from one manufacturer to the next.

Lesson 6: Data Card
Purpose: The purpose of this lesson is to introduce the PT to the function and importance of the Data Card to the system.

The Data Card contains information such as map data, and should be checked for currency. Much like a VFR or Instrument charts, Data Cards do expire and must be kept current to ensure the pilot has the most up to date and correct information available. Check with the individual manufacturer to locate information regarding the expiration date or status of the Data Card.

The Data Card can be easily removed and installed on most systems. A typical configuration consists of a data card ejector button. After the Data Card has been released, pull it straight out of the slot. When installing the new Data Card do not touch the connector end of the card, push the Data Card straight into the slot until it is flush or slightly recessed with the face plate.