

The Medallion Foundation, Inc

**FLY-IT ROTARY WING
INSTRUCTION
MANUAL**

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PURPOSE

The purpose of this manual is to instruct users of Medallion Foundation Inc. (Medallion) Rotary Wing simulation equipment in the operation of the hardware and software components; as well as provide an introduction and step by step guide for setting up Controlled Flight Into Terrain (CFIT) Avoidance scenarios.

This manual's focus is on basic operating exposure and CFIT Avoidance simulations; it will not replace any instruction from a qualified Certified Flight Instructor, nor is it intended to be used as a flight training guide.

First time users are encouraged to seek out additional advice from other pilots who are familiar with the operation and flight characteristics of simulation devices and who have experience in flying CFIT Avoidance scenarios.

Medallion Foundation's programs are designed for trained and qualified pilots. The content of this manual is intended for such an audience and assumes all users are familiar with common aviation terms and have flying experience

SECTION 1: INTRODUCTION

1.1 Training Approval

The Flyit helicopter is approved for logged time up to 7.5 hours of VFR training. Any logged time must be witnessed and signed off by an appropriately rated helicopter instructor.

SECTION 2: FLY-IT ROTARY WING OPERATION

2.1 Equipment

The Helicopter is an enclosed unit which houses an 8 foot diagonal screen, instructor station with 3 screens, two keyboards, two computer mice; and helicopter cockpit console. The helicopter is flown by the cyclic and throttle controls with appropriate buttons and dials and a flat panel screen which displays instrumentation. There is also an add-on control representing a Robinson type cyclic.

- The Center and Right screen at the instructor station are the “Main Screens”, and are controlled with the white mouse and keyboard.
- The Left screen at the instructor station is the “Instructor Screen”; and is controlled by the black mouse and keyboard.

2.2 Software

The helicopter uses MS Flight Simulator 2002. The device is used with an instructor station. The instructor has the ability to change weather, set equipment failures, and move the aircraft to a new location while the pilot is flying.

MS Flight Simulator 2002 includes enhanced graphics loaded from Eterra’s satellite imagery of select mountain passes within Alaska. These enhanced areas allow pilots to fly through mountain passes in simulation with a high degree of realism and varying weather conditions before flying those passes in real aircraft.

The following list includes those passes which are included in the enhanced graphics package.

Anaktuvuk	Merrill
Antigun	Portage
Chickaloon	Rainy
Isabel	Thompson
Lake Clark	Windy
Mentasta	Broad

2.3 Beginning a Session

When beginning a session with the Medallion helicopter, take a look at the equipment you will be using. There should be a sign-in sheet, and a copy of this manual; there may also be various charts, an airport facility directory or other useful material left by other users.

2.4 Computer and Console Startup

The Flyit helicopter must be started in the order described here. Skipping steps or completing steps out of order may result in communications failure between the computers and console.

- Locate the main computer Power switch on the lower right rear corner of the helicopter cockpit console. Behind a small black door the Power switch is on the bottom left side of the disk drives.

- Move to the instructor station and push the power button (Silver Button beneath Red placard) on the computer under the desk (don't confuse the computer with the batter back up unit, which is much smaller).

Wait until both computers have finished booting up before continuing.

- Locate the EPIC power switch access on the lower right side of the helicopter cockpit console, just above the main computer door, the access is a hole with the placard "EPIC" under the opening. This is a rocker type switch, about 1.5 inches in and slightly down, and will "rock" toward you to turn on.
- Back at the main computer screen (Center), locate the EPIC icon. Double click on the icon to start the program.
 - If the program does not start and instead gives you an error message; click OK to remove the error messages and double click on the icon once more to try the start again.
 - If the program is loading it will take approximately 10-15 seconds to boot, and a few "dings" may be heard.
- Open MS Flight Sim 2002 on the main Center computer: Double click on the "Start Flight Simulator" desktop icon
 - The instructor screen should have the Microsoft Flight Sim initialization screen open with a window hourglass cursor. This is normal. If the program has already started you will see a screen titled "Flight Instructor Multiplayer Connect".
- Once the main computer screens have MS Flight Sim open, Click OK on the Right side of the Instructor screen.
- Click OK on the Instructor screen again.
- Click Multiplayer on the Right Main Screen.
- Click "Open Multiplayer Session" on the Left side of the Right main screen.
- Click "Join" on the lower Right side of the Right main screen.
- Click OK on the Instructor screen when the message appears that a "student has joined the session"

You are now ready to fly. Please turn to section 3 for detailed instructions on the program.

SECTION 3: MS FLIGHT SIMULATOR 2002

3.1 Program Launch

MS Flight Sim opens on the Right main computer screen to a display which has a menu on the left 1/3 of the display; the remaining display is still showing the Multiplayer screen.

The Left side menu options are:

- Welcome - (opens the MS Flight Simulator 2002 “get started” tutorial).
- Learn to Fly – delivers you to the program instruction area with flights designed for introduction to MS Flight Sim.
- Create a Flight – This menu screen offers 4 selections with drop down menus and a spinning aircraft underneath – this is where you would select aircraft, location, weather, and time/date settings for creating a customized flight.
- Select a flight – Choose this option to select a pre-saved flight or mountain passes.
- Multiplayer – opens the screen to select a Multiplayer section – you will choose this option for using the Flyit helicopter FTD in correlation with the Instructor screen.
- Settings – This section is where the pilot may manipulate display options, realism settings, and calibrate the controls.
- Library/Help – the main help menus, information about the program, and tutorials can be found here.

3.2 Flying with MS 2002

Once you have selected and confirmed a Multiplayer session; click on the “Create A Flight” or “Select a Flight” options.

Select A Flight

If you have chosen Select A Flight you will then choose either the “My Saved Flights” or the FLYIT option in the list under #1. Choose your aircraft from the available options under #2. Once you have made your selections click on Fly Now. The program may take several minutes to load the scenery and open the flight environment.

When the scenery does open you will be on the ground and ready to fly. The instrumentation will be displayed on the flat panel in front of the pilot on the helicopter cockpit console and also on the main computer Center screen.

Occasionally the instrument panel and Home screen will be switched, with the Home screen appearing on the flat panel instrumentation display in the helicopter cockpit console. (this happens most often when the computer is re-setting itself after a crash, or when switching aircraft mid-flight)

To remedy this problem:

- Undock the instrument panel by right-clicking on the screen and selecting Undock. Then click on the now undocked panel and manually move it over to the Right screen.

Create A Flight

At the bottom of the Create A Flight page, a tool bar with buttons for “Fuel and Payload”, “Load”, “Save” “Flight Planner”, and “Failures”.

- Save Flight – Click on this button to save your aircraft, location, weather, equipment loads, and failures to develop a custom scenario. (such as a CFIT Avoidance scenario)
- Fuel Settings - The pilot can choose different fuel and pay loads to experiment with aircraft handling characteristics.
- Failures - Any system can be set to fail in the program. Components can be failed on cue, or randomly. There is also small box with black push buttons on the support ledge behind the helicopter cockpit console – each push button corresponds to a component or system on the aircraft which can be failed by the instructor.
- Flight Planner - Opens to a series of options to build a flight plan before flying

3.3 Aircraft Selection

When flying the Flyit Helicopter: only the Flyit models of aircraft are used. To choose an aircraft in MS Flight Sim 2002; click on the change button under the menu “Current Aircraft” on the Select A Flight screen.

- New page will open with Aircraft selection option.
- List will drop down of available aircraft manufacturers. Choose a manufacturer then click on the aircraft model.
 - Aircraft model must have FLYIT designation after the name.
- Click OK to confirm your selection

3.4 Selecting Location

Changing location is accomplished by clicking the change button on the “Current Location” menu on the Create A Flight screen.

- Box will open fields for displaying locations by Airport Name, and Airport ID, A list of available airports is provided so the pilot can click on the correct one.
 - There are also filters at the bottom of the box with drop down menus for choosing country, region, city, state, and runway.
- Click OK to confirm selections

3.5 Time and Season

Click on the Change button under “Current Date and Time” menu.

There are several selections to choose from for the time of day: Dawn, Day, Dusk, or night. You can also input a specific time which can also be displayed as GMT.

For Seasons: winter, spring, summer, and fall are available choices as well as a customized field for specific months, and a calendar to choose specific days.

3.6 Weather

Weather can be changed from the Right Main Computer Screen, or from the Instructor Screen.

Create A Flight Screen:

To change the weather from the Create A Flight screen; click on the change button under the “Current Weather” menu to open the weather options box.

The option for “Real World Weather” doesn’t work because the computer is not connected to the internet.

Slider Bars for Clouds, Precipitation, Visibility, Wind Speed are provided. Select your settings or Click “Advanced Weather” for more options

Instructor Screen:

Changing the weather from the Instructor Station can be accomplished by clicking on the Weather button and then on Advanced Weather.

Any time settings are completed; Click OK 2 times to accept Advanced Weather on the Right Main Screen and the Instructor Screen.

3.6.1.1 Advanced Weather

Advanced weather can be programmed from the Instructor station or the Right Main Screen

There are 4 tabs across the top of the screen for different atmospheric conditions.

- Clouds
 - o Precipitation settings are here.
- Wind
- Temperature/Pressure
- Visibility

Clouds can be set in layers; bases and tops can be defined. To add a layer, click on the legend button showing a (+) sign with a cloud. After a layer has been added, scroll the mouse pointer to the uppermost border of that layer... a double ended arrow will appear. Click on the cloud layer border and move it up or down to the desired altitude (zoom in or out on the cloud layer box with the magnifying glass + or - buttons to refine altitude selection).

To delete a layer, click on that layer (layers turn a bright Blue when selected) and click on the button showing a (-) sign with a cloud.

Select cloud layer coverage.

- Few = 1/4
- Scattered = 3/8 - 1/2
- Broken = 5/8 - 7/8
- Overcast = Full coverage

Add turbulence and icing

- Turbulence and icing are selected by the desired severity.

Add Precipitation - selected by the type, and rate.

- Base altitude box for selecting where the precipitation dissipates or stops. (Default is set to the earth's lowest altitude (-1,499) so all precipitation will fall to the ground if setting is not changed.

Fog can also be set by creating a cloud layer at the ground level, making the tops from 500-3000' and also creating a visibility layer in the same manner. Set the visibility to 5 miles or less for realism.

Visibility is set globally and refined by a slider bar which goes from fractions of a mile to unlimited.

Wind layers can also be selected, MS Flight sim has imbedded the ability for transitions between layers so an abrupt shift does not take place (of course you can always modify that by increasing the windshear).

The wind layer box is identical to the cloud layer box and is customized by altitude, shear, gusts, direction, speed, and turbulence.

Selecting wind direction is done by first selecting a particular layer, then clicking and dragging with the mouse on the circular wind direction tool.

Gusts can be factored in by clicking on the "Gusts to" text box and typing in the desired gust-speed in knots.

The program automatically sets the lowest temperature to ground level at your location; then applies the standard lapse rate. Modification of the Temperature and Barometric Pressure is accomplished by adding layers much like wind and clouds.

Changing the atmospheric pressure will affect aircraft performance just as in the real-world.

Advanced weather can be programmed for a single weather station, multiple weather stations, or on a global level.

3.7 Flying Screen/Display

After you have selected your aircraft, time/season, weather, location, and any equipment malfunctions you are ready to fly.

- Click the “Fly Now” button on the Right Main Screen. The program will load your selections and present you with a display of your aircraft cockpit in the environment which you selected.

3.7.1 Accessing the Menu

If you wish to modify any part of your flying experience you’ll need access to the menu.

Pressing (P) on the keyboard will pause your session. The ALT key will bring up a standard windows menu bar across the top of the screen. From this menu you can access any element of the program. (Note: Remove the menu from the top of the page by pressing the ALT key once more.)

If you wish to begin flying in mid-air, not taking off from a runway, pause the simulation at this time (P), and press the (ALT) key on the keyboard to bring up the menu. Select the World tab, the select Map. The settings for altitude, airspeed, and heading can be modified.

3.7.2 View Modes and Options

The Kneeboard has an all inclusive list of keyboard commands for interfacing with MS Flight Sim.

Locate the kneeboard by pressing the ALT key, then choosing Aircraft, and Kneeboard.

3.8 Save or Load a Flight

3.8.1 Saving a Flight

When saving a flight the program will record: Aircraft selection, location, failures, weather settings, and altitude / heading information.

From the Create A Flight screen

- Click Save on the toolbar across the middle of the screen
- Name your flight.
- click OK

If you are currently flying:

- Click the ALT key on the keyboard
- Choose the Flights tab
 - Select Save Flight
- Name your flight and
- click OK

3.8.2 Loading a Saved Flight and Mountain Passes

From the Create A Flight Screen

- Click Load on the toolbar across the middle of the screen
- Choose the saved flight from the drop down list
- Select Fly Now

If you are currently Flying

- Press ALT key then choose the Flights tab, and
- Choose the saved flight from the drop down list
- Select Fly Now

3.9 Program and Flyit Shut Down Procedures

When you have finished your session in MS Flight Simulator; exit the program by pressing the ALT key, then clicking on Flights – End Flight. Then Click on Multiplayer and “Disconnect from Multiplayer Session”. Confirm the selection

Confirm on the Instructor Screen that the multiplayer session has ended.

Click Exit on the Instructor screen, and the “X” in the upper Right Corner of Right Main screen to exit both programs. Confirm the selections.

Click on Start – Turn Off Computer on the both the Instructor and Center computer screens. A window will pop up on the screens – confirm you wish to shut the computers off.

Turn off the EPIC program by flipping the switch inside the access on the helicopter cockpit console.

The fan and/or projector screen may appear to be on; however this is a normal part of the shut-down. A timer will be displayed on the projector screen during shutdown. Both elements will turn off when the projector is cooled down.

SECTION 4: CFIT AVOIDANCE

4.1 Introduction

Definition:

CFIT occurs when an airworthy aircraft is flown, under the control of a qualified pilot, into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending collision.

Some contributing factors of CFIT accidents:

Deteriorating Visibility:

- Avoidance Considerations and Preparation: Pilots should recognize that deteriorating weather conditions may exist on the route of flight, even if all indication is for fair weather. Follow pre-determined weather minimums and execute a 180 degree turn or divert when those minimums are met.
- Knowledge of in-flight visibility. Develop a procedure(s) for estimating in-flight visibility and utilize the procedure when flying in the ATD.
- Develop procedure for course reversal: consider terrain, aircraft performance, obstruction clearance, and communication.

Flat Light:

Flat light is an optical illusion, also known as "sector or partial white out." It is not as severe as "white out" but the condition causes pilots to lose their depth-of-field and contrast in vision. Flat light conditions are usually accompanied by overcast skies inhibiting any good visual clues. Such conditions can occur anywhere in the world, primarily in snow covered areas but can occur in dust, sand, mud flats, or on glassy water. Flat light can completely obscure features of the terrain, creating an inability to distinguish distances and closure rates. As a result of this reflected light, it can give pilots the illusion of ascending or descending when actually flying level. However, with good judgment and proper training and planning, it is possible to safely operate an aircraft in flat light conditions.

Avoidance Considerations and Preparation:

The key to preparation is recognizing that flat light/gray out conditions may exist on your route of flight. Consider whether terrain on your route of flight is flat, featureless, and covered with snow. Featureless terrain means there aren't any trees, rocks, stumps or other characteristics available that enable you to accurately judge your height above ground. Will you be flying low level over glassy water out of sight of land? Will there be overcast? If you will be flying over snow covered featureless terrain with an overcast, you will more than likely encounter flat light/gray out conditions during a portion of your flight.

- Do you or operate within an area where flat light/gray out can occur?
- Do you operate during flat light/gray out conditions? If yes, what are the procedures you use for operations during these conditions?
- Preflight – do you expect flat light or gray out conditions to be present on your route of flight today? Yes, or No. If yes, what are you prepared to do if flat light/gray out is encountered?
- Mission Requirements: will you traverse an area of flat light route of flight? If so, consider establishing a "minimum enroute altitude" or a "minimum sector altitude" so to provide a safe height above ground. If there is overcast in the area of intended flight, and it is low enough that you can't maintain a safe distance above the ground and at least regulatory distance from

clouds, consider a different route or cancel the flight. If the flight requires landings, plan ahead and possibly take something along to mark the ground around the landing area.

White Out:

As defined in meteorological terms, white out is when a person becomes engulfed in a uniformly white glow. The glow is a result of being surrounded by blowing snow, dust, sand, mud or water. There are no shadows, no horizon or clouds and all depth-of-field and orientation are lost. A white out situation is severe in that there aren't any visual references. Flying is not recommended in any white out situation. Flat light conditions can lead to a white out environment quite rapidly, and both atmospheric conditions are insidious: they sneak up on you as your visual references slowly begin to disappear. White out has been the cause of several aviation accidents in snow-covered areas.

Self-Induced White Out:

This effect typically occurs when a helicopter takes off or lands on a snow-covered area. The rotor down wash picks up particles and re-circulates them through the rotor system. The effect can vary in intensity depending upon the amount of light on the surface. This phenomenon can happen on the sunniest, brightest day with good contrast everywhere. However, when it happens, there can be a complete loss of visual clues. If the pilot has not prepared for this immediate loss of visibility, the results can be disastrous.

Avoidance Considerations and Preparation:

Recognize that whiteout conditions may exist on your route of flight for the day. Consider whether the terrain on your route of flight is flat, or snow covered with little to no prominent markings. Will you be flying at low level over calm water? Will there be overcast? If you will be flying over calm water with low overcast conditions, you may encounter gray out. Practice in recognizing and avoiding conditions which are conducive to the onset of white out/gray out.

- Do you operate in an area where white out occurs?
- What is your company's procedure for recognizing and avoiding white out/gray out?
- Flight – Can you file IFR? Have a plan if going VFR. Keep visual contact with the ground with adequate ground clearance?
 - Never fly past the last good visual reference point on your route of flight. Execute a 180 degree turn or otherwise divert before you get to the visual reference point
- What are your procedures for exiting an encounter with whiteout conditions?

Escape Maneuvers:

Escape Maneuvers are intended for use as an avoidance or 'escape' from inadvertent flight into flat light, white out or deteriorating visibility. These maneuvers should be planned out in advance and used as a procedure to be followed. The procedure may call for continuing into the condition after filing IFR, diverting, declaring an emergency, or other form of avoidance. Action is the key when you recognize that your minimums have been exceeded.

Medallion provides both the fixed wing ATD and the Fly-It helicopter to practice CFIT Avoidance scenarios. Pilots are encouraged to utilize these scenarios for practice in recognition of the above conditions and perform their escape maneuvers in a simulation environment.

Pilots are encouraged to develop their own weather minimums before starting a session on the ATDs. Having a firm plan of action helps prepare you to be looking out for the visual cues indicating the flight may be entering one of the three conditions common to CFIT accidents.

Keep in mind while performing the CFIT Avoidance scenarios: Depending on your level of experience and comfort level as a pilot, your minimums and escape maneuver may not be the same as your buddy's.

4.2 CFIT Avoidance Scenarios

The following are three scenarios developed for practicing CFIT Avoidance recognition techniques and escape maneuvers. These scenarios are designed to work in Microsoft Flight Sim. Each scenario can also be re-located to better replicate the pilot's real life flying experience.

Tips for setting up these scenarios:

- Stratus clouds work the best for either program.

4.2.1 ATD set-up for Deteriorating Visibility (VFR into IMC)

1. Position aircraft at Anchorage International Airport. The route of flight will include a VFR departure from ANC and flight up Turnagain Arm, finishing up Portage Pass.
2. Set Stratus cloud layer base at ANC OVC 3000 feet – tops as desired
3. Set visibility at ANC to 10 miles.

Pilot begins flying up Turnagain Arm toward Portage

4. Decrease the cloud layer and visibility in increments
5. As the weather deteriorates, Pilot begins estimating in-flight visibility. Pilot continues to assess visibility as the flight continues.
6. When weather minimums are reached. Pilot executes the course reversal or divert according to the pre-determined procedure.
7. Debrief or alter as necessary.

4.2.2 ATD Set Up for Flat Light

ATD setup for simulating flat light conditions over featureless snow covered ground or water.

1. Place the aircraft on a 10 mile final to ANC RNWY 7R at 1500ft MSL, heading of 070. Freeze aircraft at this location.
2. Put a cloud deck (undercast) beneath the aircraft with the base at ground level, and the tops at 200ft MSL.

The top of the undercast layer is the simulation of featureless snow covered terrain, or flat calm water with an overcast.

3. Place a second cloud deck over the aircraft with the base at 5500ft MSL. (NOTE: the weather is 5500ft overcast and visibility is good. VFR conditions)
4. Set the visibility to 20mi.
5. Unfreeze aircraft and begin flying to ANC
6. As you fly this route, try to determine your height above the “ground”. Begin a series of gradual climbs and descents; as you maneuver, continue to call out or estimate your height above the “ground”. (You will not be able to determine your height above ground until you “crash”)
7. Replace the aircraft at the original position and begin the same scenario again. This time, practice your procedure for **recognition of the onset and avoidance** of flat light/gray out conditions. i.e.; escape maneuver, transition to instruments, diverting, etc.

4.2.3 ATD Set Up for White Out

White Out/Gray Out

ATD set-up for demonstrating whiteout conditions in snow or gray out over water.

1. Place the aircraft over Nenana airport at an altitude of 2000 feet on a heading of approximately 010 and freeze.
2. Put a cloud deck (undercast) under the aircraft with a base at ground level, and tops at 1000 feet MSL. The top of the undercast is the simulation of featureless snow covered terrain, or flat calm water under an overcast.
3. Place a second cloud deck over the aircraft with a base at 5500 feet MSL.
4. Set the visibility at 5mi.
5. Unfreeze the aircraft and begin toward the hills that provide a good ground reference. Notice that everything in front of the aircraft is white except for the hills. (MS Flight Sim programmed for Winter does a great job of realism here)
6. Continue the flight until you have lost sight of the hills. As you approach the hill, notice that there aren't any additional ground reference points beyond the hill.
7. You will notice that you are now looking at uniformly white or gray glow and you have no horizon, clouds, or depth perception. The only way to fly now that you have flown past your last point of reference is to use your instruments.
8. Replace the aircraft at the original starting position and begin the flight again. Practice your procedures for **recognition of the onset and avoidance** of whiteout or gray out conditions. Your procedures should include at a minimum, never flying past your last visible ground reference point.