DHC-3T TURBO OTTER USER GUIDE
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Credits
Introduction

Welcome to the MilViz Turbo Otter!

This User Guide has been prepared to help you get started with your new Turbo Otter.

It contains information regarding the installation and configuration of the aircraft, along with a set of condensed operating instructions and performance charts.

As always, our interest in your flying enjoyment does not cease with your purchase of the MilViz DHC-3T Turbo Otter. Worldwide, the Military Visualizations staff stands ready to assist and serve. For technical support, please post a request on our DHC-3T support forum. Our dedicated and talented staff is ready to help you.

For forum access please email oisin@milviz.com with your proof of purchase and your preferred or existing forum username.

A Brief Background

The popularity of de Havilland’s eminently capable DHC-3 Otter means that the aircraft from which the Turbo Otter derives needs very little in the way of introduction.

(For those interested, we’ve written a concise but thorough overview of this iconic aircraft’s history and included it in the user manual of the radial-equipped MilViz DHC-3 Otter. We recommend it. And the aircraft it comes bundled with as well!)

The Turbo Otter, as we’ve presented it, is rather unique amongst aircraft. Instead of a factory manufactured aircraft type with full documentation, this aircraft represents the combined efforts of an entire industry to keep a valuable and unique resource in the air, all the while maintaining modern performance, durability and safety standards.

Over the decades, there have been numerous approved STC’s for re-engined Otters, with a range of different powerplants under a rather distinctive pointy nose that all end up looking very similar due to a shared commonality in turboprop engine design.

In our title, we’ve used the designation DHC-3T. In fact, no ‘T’ Otters were ever produced by de Havilland. Indeed, the only time that the factory ever installed a PT-6 turboprop on an Otter was when they installed two of them on RCAF #3682 for testing STOL capabilities. The eventual outcome of that testing is well known - the DHC-6 Twin Otter.

So, while the Turbo Otter is widely operated and well known, perhaps even amongst the non-aviation crowd due to commuter and tourism flights in places such as the west coast of North America, there exists no ‘proper’ example that we can point to and say "Here is THE Turbo Otter."

But we can certainly try.

For the MilViz DHC-3T Turbo Otter, we’ve chosen to model ours as equipped with the venerable PT6A-34, which certainly features in a considerable percentage of Otter conversions.

So here’s to the Otter, in all of it’s forms. We hope your new Turbo Otter gives you many hours of enjoyment and takes you anywhere in the simulated world you wish to go!
Feature List

> **4 Versions of the Turbo Otter:**
  > Standard Landplane
  > Seaplane with Straight Floats
  > Amphibious Seaplane
  > Combination Wheel/Skis

> **Configurable Load & Layout:**
  > Passenger Seating
  > Passenger / Cargo
  > Adjustable Load Within Simulator

> **Highly Realistic Engine Simulation:**
  > Custom PT6A-34 Engine Model
  > Bypasses Default Limitations
  > 'By-the-numbers' Performance
  > Realistic Spool Up / Down Behaviour
  > Hot Starts / Windmilling Starts
  > Accumulation of Engine Damage
  > Proper Fuel Flow / Prop RPM Relationship
  > Carefully Tuned & Pilot Tested

> **Authentic DHC-3T Systems:**
  > Advanced Power Tailwheel
  > Hand Operated Wing Flaps Pump
  > Advanced Icing Simulation
  > Working Friction Knobs
  > Functional Emergency Power Lever
  > DHC-3T Fuel Transfer System

> **High Quality Textures & Modeling**
  > Exterior and interior rendered with exacting detail and precision
  > High resolution, beautiful textures with realistic weathering effects
  > Authentic, smoothly animated gauges and instrumentation

> Authentically detailed, custom coded, KAP 140 two-axis autopilot with altitude preselect

> Smooth integration with 3rd party avionics within the Virtual Cockpit, including RealityXP, Flight1, NavStax and REX Simulations

> Authentic Sound Environment featuring professionally created sounds matched to the aircraft and an immersive interior soundscape

> Configurable start-up options including ready-to-fly and cold n’ dark, with options for tie-downs & covers

> Autostart (CTRL+E) compatible

> TFDi RealLight included; beautiful and adjustable night lighting

> TFDi TrueGlass included; advanced rain, ice, and condensation effects visible on the cabin windows.

> Exceptionally detailed liveries based on real-world aircraft
# Section 1
## Installation & Configuration

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### Section Overview

Section 1 of this user guide covers the information needed for successful installation of the MilViz DHC-3T Turbo Otter. It also covers operation of the included MVAMS utility, as well as recommended realism settings, mouse operation, instructions for accessing support, and advanced controller configuration.
System Requirements

The following requirements apply as a general minimum to successfully install, configure and operate the MilViz DHC-3T Turbo Otter.

(Please note that your choice of scenery, location, simulator settings and 3rd party utilities may place additional demands on your simulation platform and may affect your simulator experience.)

Supported Platforms:

• Microsoft Flight Simulator X, Service Pack 2(SP2)
  (Note: Service Pack 2 is required, aircraft may not function correctly with Service Pack 1 or earlier. The Acceleration expansion pack is fully supported but not required.)

• Microsoft Flight Simulator X, Steam Edition
• Lockheed Martin Prepar3D, version 2
• Lockheed Martin Prepar3D, version 3
• Lockheed Martin Prepar3D, version 4
  (Note: Our product is tested with and designed to operate in the most recent updates to Prepar3D: this includes all hotfixes available at date of release. For compatibility with any future updates and hotfixes, please register for and visit our product forums. Compatibility with future versions of Prepar3D is not implied nor included.)

Supported Operating Systems:

• Windows Vista
• Windows 7
• Windows 10

Processor (CPU):

• 2.4 GHz single core processor required (3.0 GHz, multiple core processor or better recommended).

Video Card (GPU):

• DirectX 11 compliant video card with a minimum of 1024 MB video ram.

System Memory (RAM):

• 4 GB RAM (minimum).

Hard Drive:

• 2.5 GB or greater free hard drive space.

Gaming Controller:

• Joystick, yoke, or other gaming controller (a means of controlling the aircraft rudder, either with twist joystick function or dedicated pedals, is additionally recommended).
  (Note: All MilViz products require a minimum of one functioning gaming device such as a joystick for proper operation and control.)
Installation Instructions

Beginning Installation
As with other flight simulator add-ons, pre-installation precautions should involve closing any open applications, as well as temporarily disabling any active antivirus software.

Failure to temporarily disable antivirus software when installing may result in a non-functioning product and/or simulator!!!

After purchase, you will have been given a link or an option to download a compressed (.zip) file. This compressed file contains an executable (.exe) file, which is the installer for the MilViz DHC-3T Turbo Otter.

Using the Windows File Explorer or file compression utility of your choice, unzip this file to a location of your choosing.

Once unzipped, you may begin installation by right clicking on the executable (.exe) file, then selecting "Run as administrator". The installer will run, showing an initial welcome screen. Left click on the "Next" button to continue.

Note: Version numbers shown in any following images will likely differ from the downloaded product.

Licence Agreement
The screen will allow you to view the end user license agreement. Please take the time to review the included details. Clicking "I Agree" at this screen will confirm your acceptance of the license agreement, and will allow you to proceed to the next step of the installation.

Choose Simulator Version
The installer should automatically find all compatible simulator platforms on your system. Only compatible simulators will be displayed as options. (For example, the computer in the screenshot has only one simulator installed: FSX.)

Please note that you are unable to select multiple simulators at once; to install into multiple simulators, re-run the installer for each platform you wish to install to.
Component Selection

The only choices for components that make up this installation are the full aircraft and the Start Menu Shortcuts (for MVAMS). For obvious reasons, we don’t really recommend deselecting either of the preselected choices.

Install Location

The next screen shown will display the location where the MilViz DHC-3T Turbo Otter will be installed. This should be pre-filled out with the location of the simulator chosen in Step 2. If you wish to change the location where the Turbo Otter is to be installed, you may do so by left clicking the “Browse” button and selecting a different folder.

Clicking the ‘Install’ button will start the process of copying files to the correct locations.

Post Installation

Be sure to turn your antivirus program back to it's previous state. Also ensure to make sure that your FSX or P3D directory is off-limits to any automatic antivirus scanning. Failure to do this may result in a non-functioning simulator!

It may be worthwhile to back-up or save a copy of your downloaded installer. As new updates are released over time, we do not continue to offer older versions for download due to support issues.

If you have not done so by this point, we also encourage you to register for support forum access. To do so, please email oisin@milviz.com with your proof of purchase and your preferred or existing forum username and we'll get you set right up!
Uninstalling the DHC-3T Turbo Otter

The MilViz DHC-3T Turbo Otter may be uninstalled from a single simulator at a time by re-running the installer.

Once the installer opens, you may select the simulator you wish to uninstall from, then select the checkbox which is highlighted in a nice subdued yellow color and reads "UNINSTALL". Left click on the "Next" button to proceed with uninstalling the aircraft.

Note: Prior to uninstalling the aircraft, please be sure to back up any customized files or custom liveries you have installed if you wish to keep them.

Updating your DHC-3T Turbo Otter

The MilViz DHC-3T Turbo Otter is updated by one of two methods, with minor update notifications delivered through the MVAMS application, and major update notification being provided by your vendor.

To check for a minor update, open the MVAMS application via the MVAMS icon which has been placed on your desktop. If you do not see it, the MVAMS application is installed to 'C:\Users\(username)\AppData\Local\MVAMS'.

If a minor update for the Turbo Otter is available, a notification will appear here. Click yes to begin the update process, which largely mirrors the install process.

Major updates are beyond the scope of the MVAMS application, however, and require a new version of the aircraft to be downloaded and installed. Be sure to uninstall the previous version first, backing up any custom files or liveries prior to doing so.
MVAMS Overview

MVAMS stands for MilViz Addon Management System. It is a standalone application used by many of our product releases which represents our user-friendly solution to the growing complexity of options and choices available within our aircraft. It provides a central location to manage your aircraft, as well as providing incremental update capabilities.

The MilViz DHC-3T Turbo Otter fully integrates with (and installs, if not already present) the MVAMS application, allowing the user to configure avionics options, start-up state, sound options, aircraft load, as well as various visual options.

These options will persist across all variants and liveries of the Turbo Otter.

Starting MVAMS

If this is your first MilViz product that includes the MVAMS application, running the aircraft installer will place a shortcut icon on your desktop. If this is not your first MVAMS equipped MilViz product, the shortcut icon may already exist on your desktop.

You may use this icon to open the MVAMS application to configure your MilViz DHC-3T Turbo Otter to your liking. Immediately after your installation is complete, the MVAMS application will also open automatically.

Selecting Your Aircraft

When you open the MVAMS application, you are presented with the instruction to select an addon from the Quick Access menu. Clicking on the top left icon will bring up visual icons of any your installed MilViz addons which are integrated with the MVAMS application. Your newly installed Turbo Otter will now be one of the available selections.

The Management Tabs

For any given aircraft, the MVAMS application is organized with a tab selection bar located near the top of the window. The tabs available for any aircraft differ depending on what options are available for user configuration and are tailored to that aircraft. For the DHC-3T, the available tabs are Load, Radios, State & Sound, and Visual.

Configuring Load

The MilViz DHC-3T has two internal configurations available: passengers and cargo. Selecting either radio button will change the list of checkboxes available, as well as the diagram to the right which depicts the associated cabin layout.

All selections made in this screen will result in passengers and/or cargo being visible, as well as the appropriate weight being added to the aircraft. (Watch your weight! It’s possible to overload the aircraft if all items are selected!)

It should be noted that the rear cabin is not visible from the cockpit; all selections will be visible from the outside of the aircraft.
Configuring Radios

The MilViz DHC-3T Turbo Otter has some of the most comprehensive support for third party avionics in the 3D virtual cockpit that we’ve ever featured. At the time of release, we support configurations that include the Flight1 GNS 430 & 530, the Flight1 GTN 750 and 650, the RXP 430 & 530, the NavStax Bendix Radio Stack, and the REX/MilViz WX Advantage Weather Radar.

To change between panel configurations, simply select the desired choice from the dropdown selection box and click the button ‘Save Defaults’. (Note: If your simulator with this aircraft is active while you access this menu, you will need to reload your aircraft before you will see any change.)

It’s important to note that while the REX/MilViz WX Advantage Weather Radar is included with the DHC-3T Turbo Otter, it is a product-locked version that will only function with the Turbo Otter. All other third party gauges referenced are not included with the Turbo Otter and must be purchased separately from their respective publishers.

Configuring State

It is possible to have the MilViz Turbo Otter initially load in the simulator in one of three different states: A ‘cold n’ dark’ state, where everything is completely shut down; a ‘ready to start’ state, where all required steps prior to starting the aircraft have been performed; and a state we call ‘current condition’.

The ‘current condition’ state loads the aircraft in whatever condition the previous saved or loaded flight was in. This may be useful for saving flights with the aircraft running.

Starter Options

It’s possible to configure the default behavior of the starter switch. ‘Press and hold’ is the most realistic behavior. The starter switch is tied to the magneto event which is mapped to the ‘M’ key by default.

‘On/Off’ is the default behavior; this requires the pilot to turn off the starter switch at the appropriate time. The ‘Auto off’ option will automatically move the starter switch to OFF when the aircraft has started.

Configuring Sound

We’ve included the possibility to tailor the volume levels of the various cockpit sounds within the DHC-3T Turbo Otter. If it’s desired that the sounds remain at their default level, choose the option ‘Sunc to sim sounds’.

To change the relative volumes of the external or internal engine sounds as well as the internal cockpit sounds, choose the ‘Volume select’ option.

When the ‘Volume select option is chosen, the sliders below will adjust the volumes of the described sounds.

Configuring Visual Options

Choices pertaining to various external visual options may be made in the last tab; all choices will be visible within the simulator when the flight is first loaded.

It’s important that if the ‘Reds’ option is selected that the pilot remembers to remove the during their walkaround routine; a forgotten pitot cover will absolutely have negative consequences in flight!
Realism Settings

The MilViz DHC-3T Turbo Otter has been designed with the goal of replicating a high level of accuracy in regards to operation and flight response. To this end, development and testing have both been carried out using the highest realism settings available within the simulator.

The realism settings within both Flight Simulator X and Prepar3D exist in order to make simulated flying less of a chore, to remove some of the tasks which are necessary in real life to ensure a safe and proper flight. We fully encourage the use of many of these settings, if they help provide anyone with greater enjoyment of flight simulation.

In consideration of the above, our recommended settings exist not as a strict guideline, but as a means to ensure that the full level of accuracy available within our Turbo Otter may be experienced if desired. Without these recommended settings in place, particularly in regards to the section which controls the flight model, the aircraft may not perform as intended.

Realism Settings Overview

Flight Model
For the highest degree of realism, all sliders in the flight model section should be set fully to the right. Any movement to the left might cause the aircraft to become easier to fly at the expense of accuracy in regards to the intended flight model.

Instruments and Lights
The MilViz DHC-3T Turbo Otter has a sophisticated lighting system in place, so the “Pilot controls aircraft lights” should be checked. “Enable gyro drift” and “Display indicated airspeed” add to the realistic operation of any aircraft within the simulator, but may be left to user preference.

Crashes and Damage
The choices in this section may be left to user preference.

Engines
“Enable automixture” should not be selected in order to allow for functionality of the mixture lever. “Unlimited fuel” may be left to user preference, but disabling does allow for simulating fuel management. “Engine stress damages engine” may be left to user preference as well, but being present does introduce a certain amount of risk for engine mismanagement (simulator default, FSX Acceleration & Prepar3D only).

Special Effects
This may be left to user preference.

Flight Controls
“Autorudder” should be off so long as you have means to operate the aircraft rudder via rudder pedals or a twist axis on your joystick.
Mouse Operation

As per typical convention, all controls in the MilViz DHC-3T Turbo Otter can generally be operated by using the right or left mouse buttons, or in the case of levers, by holding a mouse button and dragging the control. In some cases, the mouse wheel may also be used for operating switches or controls.

Product Support

We are deeply committed to the satisfaction of our customers. If you encounter any issues with any of our products, require installation assistance, or just have a general question, we encourage you to visit our forums at http://milviz.com/forum/.

Support forums for our individual products are restricted to owners of that product. To register for a specific support forum, please contact oisin@milviz.com for registration information and details. Please note that proof of purchase will be required.
Advanced Controller Configuration

It is possible to configure both the throttle and propeller levers to accept reverse range operation for any standard controller. Within the aircraft’s panel folder, there is a subfolder titled ‘DH3’. Within this subfolder is a gauge file titled ‘controllers.xml’. This file may be edited with a text editor, modifying basic parameters so as to comply with the controller’s data.

We recommend that a backup copy of the original file is created before any editing takes place, in case you wish to revert to the original operation without reinstallation of the aircraft.

First of all, let’s say that a controller is defined like this:

**Joystick:**IDJoystick:**Axis:**IDAxis

**Joysttck:** fixed name, remains unchanged

**IDJoystick** : a number from 0 to n, usually 0 for the first controller, 1 for the second, etc. Value returned by the controller, must be set by the user.

**Axis:** Map name of the axis in use for a requested operation. Value returned by the controller, must be set by the user.

**IDAxis:** A number from 0 to n, usually 0. Returned by the controller, can be set by the user.

If FSUIPC registered version is installed, it is possible to detect all these values by going to Axis Assignment tab. When moving each lever (throttle, prop), lever data is displayed in two fields:

- **IDJoystick** number is displayed in Joy# field
- **Axis** name is displayed in Axis# field.
- **IDAxis** is usually 0, but could be displayed after Axis name (i.e. Z1)

Typical values for axis are X,Y,Z and S (for Slider). For example, one lever might be Joy# 0 Axis# Z and the other Joy#0 Axis#S.

To use this information to configure the operation of these controllers in the aircraft, edit the **controllers.xml** file as follows:

To configure the Throttle Axis:

```xml
<Macro Name="T_Idle">%
<Macro Name="T_Enable">0
<Macro Name="T_CtrlID">0</Macro>
<Macro Name="T_LastAxis">"Z1"</Macro>
<Macro Name="T_BetaFlap">0</Macro>
<Macro Name="T_BetaReverse">0</Macro>
``` 

In the **T_Idle** macro it is possible to select percentage of controller travel in where idle position will be set. In the example case, idle corresponds with 80 % of the lever moved down. Therefore, Normal operation will be from 20 to 100 % of lever axis and reverse from 0 to 20 % of lever axis.
In **T_ControllerID**, enter the **IDJoystick** value.

In **T_AxisName**, enter the name of the Axis together with extra data according to the following:
- For X,Y,Z, add the word Axis. I.E. ‘ZAxis’
- For S write **Slider**

In **T_AxisID**, enter the **IDAxis**. If not specified by FSUIPC leave at 0.

In **T_BetaFlip** macro it is possible to select whether or not to enable Beta/Reverse power lever positions in flight. Write 1 to enable, or 0 to disable. Disabled by default (for security reasons).

To configure the **Propeller Axis**:

```xml
<!-- PROPELLER MACROS -->
<!-- Put here 1 to enable propeller control, or 0 to disable -->
<Macro Name="F_Enable">0</Macro>

<!-- Put here percent of lever travel (0-100) in where HIGH PITCH is desired -->
<Macro Name="F_BPitch">90.00</Macro>

<!-- Put here Controller ID (Check FSUIPC Axis Assignment) -->
<Macro Name="F_ControllerID">0</Macro>

<!-- Put here Axis Name (Check FSUIPC Axis Assignment) -->
<!-- For "Slider" write slider, no quotes -->
<!-- For X, Y or Z, write Axis, XAxis or XAxis, no quotes -->
<Macro Name="F_AxisName">"Slider"</Macro>

<!-- Put here Axis ID, if more than one (Check FSUIPC Axis Assignment) -->
<!-- Usually goes 0 -->
<Macro Name="F_AxisID">0</Macro>
```

To enable Propeller control, write **1** in **P_Enable** macro definition.

The other macros work much the same as for the Throttle.

If a registered version of FSUIPC is not present, it is always possible to detect the required values within the simulator, by going into the controller configuration menus. *(Controls...)*

The **IDJoystick** value is not directly shown in FSX, but the controllers are typically listed in order, with the first being ‘0’. In P3D, the **IDJoystick** value is shown before the controller name.

The name of the Axis is displayed by scrolling through the list of controls to where the desired control is mapped (i.e. Throttle Axis), and reading the name of the Axis that appears in the column to the right.

**IMPORTANT:**

If one of these levers is already configured in FSUIPC by Axis Assignment and handled by FSUIPC itself and not FS/P3D, FSUIPC has privilege over this configuration and it will overwrite any values captured by the gauge.
# Event Mapping & Local Variables

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Section 2

Operating the DHC-3T

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Section Overview

Section 2 of this user guide is designed to introduce the pilot to the Turbo Otter, as well as provide an overview of the various systems and operating methods specific to the aircraft. Normal & Emergency Procedures are contained in this section, along with a chart of the Operating Limits.
An Overview of the Turbo Otter

A New Classic

What happens when you combine one of the hardest working single engine aircraft ever built with a proven turboprop engine that is well known for its reliability? Well for starters, you end up with an airplane that easily defies any attempt to put a limit on its lifespan.

There are many reasons why it makes sense to update the engine on the venerable DHC-3 Otter, starting with the fact that the last brand-new Otter rolled off the production line in Downsview over 50 years ago. 50 years is an amazing service life for anything, really!

Engines, in particular, are simply not designed to be operated indefinitely. Limits arise, driven by age, operating hours, and even the ever increasing cost of avgas. From a commercial operators point of view, these have all had a detrimental effect on the powerful (and long serving) nine cylinder R-1340 Wasp originally powering the Otter.

When repair & overhaul facilities began thinking about alternative means of powering the Otter, they really didn’t have to look far. The PT6A turboprop has built a stellar reputation of its own; de Havilland themselves chose variants of the PT6A for the Otter’s bigger brother - the Twin Otter.

There were four primary variants of the PT6A installed into the Otter, the PT6A-135, the PT6A-135A, the PT6A-34 (which is what we’ve based our Turbo Otter on) and the PT6A-34AG. All are capable of developing 750 shaft horsepower at sea level.

PT6A-34 Basics

The PT6A family of engines includes three series of models with increasing power levels, referred to as PT6A ‘Small’, ‘Medium’ and ‘Large.’ The increased power levels are achieved through the increase of compressor air flow and an increased number of power turbine stages.

The PT6A-34 is within the ‘Small’ series, and as previously noted, develops a maximum permissible takeoff power of 750 SHP (shaft horsepower) at sea level up to 87 °F (30.6 °C) ambient temperature.

The PT6A-34 engine has a three-stage axial, single stage centrifugal compressor driven by a single-stage reaction turbine. Another single-stage reaction turbine, counter-rotating with the first, drives the output shaft. Fuel is sprayed into the annular combustion chamber by fourteen individually removable fuel nozzles mounted around the gas generator case.

An ignition unit and two igniter plugs are used to start combustion. A hydro-pneumatic fuel control schedules fuel flow to maintain the power set by the power control lever.

The accessory drive at the aft end of the engine provides power to drive the fuel pumps, fuel control, the oil pumps, the starter-generator, and the tachometer transmitter.

The reduction gearbox forward of the power turbine provides gearing for the propeller and drives
the propeller tachometer transmitter, the propeller overspeed governor, and the propeller governor.

Propeller speed remains constant at any selected propeller control lever position through the action of the propeller governor, except in Beta range where the maximum propeller speed is controlled by the pneumatic section of the propeller governor.

Immediately following touchdown, partial or full reverse power may be obtained by retarding the power control lever below IDLE. Varying amounts of reverse power are available, depending upon how much the power control lever is retarded. Reverse power is also available for ground handling.

An important characteristic of the PT6A-34 engine is the physical disconnect between the gas generator and power generator turbines. The power turbine (and by extension the propeller) can spin freely from the gas generator section. This is why the PT6A-34 is referred to as a free turbine.

Changes to the Otter

The installation of the PT6A into the DHC-3 Otter results in a variety of changes both external and internal.

The most apparent change is the distinctive tapered engine shroud that surrounds the PT6A and pretty much screams, “I’m a turboprop!” However, it’s speaks to the excellent design of the aircraft that even though it represents a radical departure from the 9 cylinder radial that formerly graced the business end of the Otter, the long tapered nose looks completely at home.

This changes the overall length of the aircraft by four feet: formerly 41 feet 10 inches, the Turbo Otter stretches out to 45 feet 10 inches. The width of the aircraft does not change. The gross weight of the landplane version of the Turbo Otter does not change at all, and remains at 8000 pounds.

Internally, the Power, Propeller and Mixture levers now read Power, Propeller and Condition, with the power lever having it’s range extended downwards to allow for a beta range. An additional lever is added to the left of the Power lever, this is the Emergency Power Lever. It allows for the bypass of the fuel control unit to provide fuel to the engine in the event that the Power Lever fails to provide a response in the engine. It’s normally wired shut.

The fuel controls, and their operation, are changed significantly. Although the fuel tanks and tank capacities are unchanged from the original DHC-3 configuration, the routing of fuel lines and the flow of fuel to the engine has been changed. Fuel to the engine is supplied from the aft center fuel tank only. Fuel in the forward center tank flows through a check valve to the aft center tank via an interconnect line. Fuel in the forward or aft tanks is available only by means of transfer from either of these tanks to the center fuel tank. The function of the Fuel Selector Handle on the instrument panel is changed from selecting which fuel tank feeds the engine to which fuel tank will transfer to the center tank. It is in the OFF position for normal operation - until one desires to transfer fuel.

The oil tank under the floor of the cockpit has been removed, along with the fill spout and cap previously located below the pedestal. The oil tank is now an integral part of the engine.

Engine instrumentation is also changed to meet the requirements of monitoring the PT6A turbo-prop engine.

Engine Ratings

The engine ratings: power lever and propeller lever settings are as follows:

Takeoff: This rating is the maximum power permissible and corresponds to 750 SHP at sea level up to 87 °F (30.6 °C) for the PT6A-34. Takeoff power is limited to 3 minutes.

Maximum Continuous: This rating corresponds to 750 SHP at sea level up to 87°F (30.6 °C) ambient temperature day. The torque for this setting equals 64.5 or lesser value and must not exceed maximum continuous ITT of 790 °C or Ng of 101.6%. The propeller RPM associated with this condition is 2000 RPM.

Maximum Climb/Cruise: This rating corresponds to 700 SHP at sea level up to 83 °F (28.3 °C) for the PT6A-34 (climb) or 67 °F (19.4 °C) for the PT6A-34 (cruise).

Reverse: Either full or partial reverse power is obtained by moving the Power Lever to any position below IDLE. 720 SHP is available up to 85 °F (29.5 °C) ambient temperature.
Cabin & Controls Overview

Anyone with a passing familiarity with the original DHC-3 Otter will feel pleasantly at home here, seeing as the engine upgrade leaves the cabin relatively untouched. As with the original aircraft, no doubt is left as to the overall purpose of the Otter: It embodies the very essence of an honest day’s work.

Many of the Turbo Otters in service today show their age in the cockpit, albeit with pride. Functionality replaces form, the fine lines envisioned by the designers at de Havilland 60 years ago dented, bent, and re-purposed. To an Otter, this is not a matter of shame, however. This is more a badge of honor, the reflection of decades of labour, of sweat and grease, of muttered curses at inclement weather, a ‘make-it-work’ sensibility that simply gets the job done.

From the pilot’s seat everything is well thought out and easy to reach. The controls and instrumentation common to every aircraft are where you’d expect, with no real differences from the original Otter: The instrument panel in front of the pilot, a study control column reaching out from the center of the cabin floor, electrical switches under the flight instrument panel, a prominent pedestal in the center prominently displaying the power, propeller and fuel levers. (An emergency power lever, normally wired shut, has been added to the left side of the pedestal beside the power lever.)

The engine instrumentation panel, adapted to monitor the PT6A jutting out the front, is located above the pedestal. The rudder trim wheel and indicator is located on the cabin roof, while the trim wheel for the variable incidence tailplane is located on the right side of the pilot’s seat. Also to the left of the pilots seat, just slightly forward and lower than the previously mentioned trim wheel, is the wing flap pump lever and selector; the indicator for the wing flaps is located on the center windshield post, just above the glareshield. Above the flap indicator is the compass.

The fuel selector is located in it’s original spot to the left of the pedestal, re-purposed to allow transfer of fuel from the front and rear tanks to the center. Ample space for avionics is provided on the panel to right of the engine instrument gauges, with lighting controls located below the avionics.

Between the front seats sits a unique item: The hydraulic hand pump for raising and lowering the skis (when the aircraft is so equipped).
Engine Instrumentation

**Torquemeter:**
The torquemeter measures torque applied to the propeller shaft which is turned indirectly by the gas generator. The torquemeter is operated by engine oil pressure metered through a valve that is controlled by a helical ring gear that moves in response to the applied torque. This gear moves against a piston that controls the opening of a valve, which controls the oil pressure flow. This action makes the oil pressure proportional to torque being applied at the propeller shaft. A transducer is used to transfer the oil pressure into an electrical signal to be read by the engine instrument.

The torquemeter on the Turbo Otter indicates the pressure in PSI, with a normal operating range of 0 - 58.7 PSI.

**ITT Gauge:**
The Interstage Turbine Temperature (ITT) gauge monitors the relative temperature of the exhaust gases entering the first stage turbine inlet guide vanes. Temperature is an absolute engine operating limit and must be monitored to ensure the mechanical integrity of the turbines as well as to check engine operating conditions.

The ITT gauge on the Turbo Otter indicates a normal operating range of 400 to 790 °C. A momentary starting temperature of 1090 °C is generally indicated on the gauge as well.

**Propeller (Np):**
The propeller tachometer indicates the revolutions per minute (RPM) of the propeller shaft. The propeller tachometer on the Turbo Otter indicates a normal governed operating range of 1800 to 2000 RPM, with an indicated maximum limit of 2200 RPM.

**Gas Generator (Ng):**
Similar to the propeller tachometer, the gas generator tachometer displays the revolutions per minute of the gas generator shaft. Actual power generation on the PT6A is coming from the gas generator and determined by positioning of the power lever. Because of the free turbine design of the PT6A-34, this section of the engine is not mechanically connected to the propeller shaft and is monitored independently.

The normal operating range of the gas generator tachometer is 52.6 to 101.6%.
Throttle Quadrant & Pedestal Overview

1 Located on the top left of the pedestal, the power control lever modulates engine power from full REVERSE to MAXIMUM. The position for IDLE represents the lowest recommended level of power for flight operation. This lever may be moved below IDLE in order to obtain partial to full reverse power. As soon as the propeller blade angle decreases below the low pitch stop the BETA LIGHT will illuminate telling the pilot that the propeller is operating in the REVERSE range.

2 The propeller control lever is located immediately to the right of the power control lever. It signals the amount of blade angle commanded to the propeller governor, which then sets that blade angle to achieve a fixed RPM setting. Then, the governor makes automatic corrections to blade angle to maintain that constant RPM setting during flight. In the FEATHER position, it will cause the propeller to feather.

3 The condition lever, located on the top right of the pedestal, regulates a valve in the starting unit which controls fuel flow at the fuel control outlet from no flow at CUT OFF to normal idle at the RUN position. Inadvertent movement of the condition lever to the CUT OFF is achieved by the safety catch. On the MilViz Turbo Otter, the safety catch may be moved out of the way by right clicking it with the mouse.

4 The emergency power lever is located to the left of the power lever. This lever is an emergency by-pass of the fuel control unit to provide fuel to the engine in the event of Power Lever failure. This lever is safety wired closed. To operate with the mouse, first right click on the wire to remove.

5 The friction control knobs, located immediately underneath the power, propeller and condition levers, are used to keep the levers from moving when vibration is present. (In the MilViz Turbo Otter, they may be used to remove or reduce controller noise. At a setting of 100, the levers will not move at all.)

6 The emergency fuel shut off is located on the right front side of the lower pedestal. When pulled, it cuts off the flow of fuel to the engine.

7 Switches controlling the flight instruments are located mid front side of the lower pedestal. In addition, the Inverter switch is located here; it is required to be ON for the Torque and Fuel Flow gauges to work.

8 A rotary switch that controls the brightness of the instrument panel lighting is located on the left front side of the lower pedestal. This may be set at any level of brightness desired.

9 The icing doors are controlled by a lever located on the left front side of the lower pedestal. The ice doors should be set to open as and when conditions require.
1 The switches located on the starter panel and lower switch panel are modified from their function in the original DHC-3.

The Booster Coil switch is now the Engine Inlet Deice Boot switch (ENG DE-ICE). The engine switches are now composed of three switches. The first is the P3 Heater switch which heats the compressor air inlet line to the fuel control unit. The second is the ignition switch which turns on the engine ignition system. The last is the Start switch, which activates the engine starting system.

The MASTER SWITCH still controls all electrical power in the airplane, and the NAV MASTER switch controls power to the avionics.

2 The extinguisher panel contains not only a checklist for an in-flight fire, but also the fire warning lights, the guarded fire extinguisher switch and the extinguisher circuit breaker.

3 In the middle of the lower electrical panel are the switches which control the majority of the electrical equipment found on the Turbo Otter.

Switches are present for all external navigational lighting, the pitot heater, and the in-cabin fans.

Grouped with the switches is the rotary control for the heater.

4 The dual fuel boost pump switches are located above the power tailwheel control panel and directly behind the emergency power lever.

These fuel switches are independent of each other and used as required. They may be operated by clicking with the right mouse button.
Although the fuel tanks and tank capacities are unchanged from the original DHC-3 configuration, the flow of fuel to the engine has been changed. Fuel to the engine is supplied from the aft center fuel tank only. Fuel in the forward center tank flows through a check valve to the aft center tank via an interconnect line. Fuel in the forward or aft tanks is available only by means of transfer from either of these tanks to the center fuel tank.

The function of the FUEL SELECTOR HANDLE on the instrument panel is changed from selecting which fuel tank feeds the engine to which fuel tank will transfer to the center tank. It is in the OFF position for normal operation - until one desires to transfer fuel.

The main fuel line runs directly from the aft center tank, through the No. 1 and No. 2 fuel boost pumps, shut-off valve, and fuel filter; to the engine. Either fuel boost pump will supply sufficient fuel to the engine. However, both fuel boost pumps must be on to transfer fuel from the forward or aft tanks to the center tank.

When the center fuel tank has 40 gallons remaining a red fuel low level light comes on. This light is located on the lower left side of the pilot’s instrument panel and is labeled MAIN TANK LOW LEVEL LIGHT.

Fuel should be transferred when the center tank has no more than 60 gallons remaining. Do not wait for the MAIN TANK LOW LEVEL LIGHT to come on before transferring fuel. If the airplane is at aft c.g. transfer from the rear tank first, and if the airplane is at forward c.g. transfer from the forward tank first.

To transfer fuel turn on both fuel boost pumps and maintain level flight. Rotate the fuel selector valve from OFF to either the forward or aft tank position. Fuel will automatically transfer from the selected tank to the center tank.

The pilot can ascertain if the fuel is successfully transferring by observing a decrease in the fuel quantity of the selected tank and an increase, or stationary position, of the center tank fuel quantity. Monitor the center tank fuel quantity gauge to make sure the tank doesn’t overflow before the fuel transfer is complete.

When transfer is complete, a red warning light, located below the torque and ITT gauges, will illuminate. This light is labeled FWD AND AFT FUEL TANK EMPTY LIGHT. When transfer is complete, rotate the fuel selector valve to OFF and turn off No. 2 pump.
Flight Controls

All control surfaces are mass-balanced and are conventionally operated by a control column and rudder pedals.

Wing Flaps

The wing flaps are of the full-span, double-slotted type. The outboard trailing edge portions of the flaps are operated independently as ailerons. Differential control of the ailerons is maintained at all flap positions, and lowering the ailerons with the flaps does not prevent lateral control of the airplane.

The wing flaps are operated hydraulically by a flap actuating jack assembly, located in the fuselage roof between the front and rear wing attachment lugs. Hydraulic fluid, contained in a separate reservoir located aft of the firewall on the left hand side, is pumped into the flap actuating jack assembly by means of a handpump located beneath the pilot’s seat.

Wing flaps are selected UP or DOWN with a selector lever and after they are pumped to the desired position with the handpump, they are automatically locked by a hydraulic ratchet valve which is part of the flap actuating jack assembly.

The wing flaps position indicator is located on the vertical frame member of the windshield and is marked UP, CRUISE, CLIMB, TAKEOFF AND LANDING and DOWN. The wing flaps position indicator is mechanically connected to the right hand flap bellcrank in the fuselage roof, and moves vertically in a slot in the FLAPS label.

The wing flaps selector lever is mounted on the tailplane trim pedestal, to the right of the pilot’s seat. CRUISE, LAND, or intermediate positions of the wing flaps are obtained by moving the wing flaps selector lever to up or down position and then pumping the flaps to the desired position, as shown on the wing flaps position indicator.

Overall, the flight controls remain unchanged from the original DHC-3 except that the flap “full down” angle has been decreased and the same flap position is used for both takeoff and landing.

Variable Incidence Tailplane

The incidence of the tailplane may be adjusted in flight by rotating the TAILPLANE TRIM handwheel at the right side of the pilot’s seat.

The tailplane trim position indicator operates mechanically and its pointer moves over a label marked NOSE DOWN, TAKE OFF SETTING and NOSE UP.

It is essential for the tailplane to be trimmed to the correct incidence before take-off is attempted. The action of the tailplane trim wheel is too slow to allow correction for wrong trimming at the last moment, and a badly trimmed tailplane cannot be overcome with elevator control.

Rudder Trim

The rudder trim tab is actuated by a handwheel in the cockpit roof, incorporating a position indicator which moves over a scale marked L and R indicating the direction and amount of trim applied.
Tailwheel Power Steering System

The tailwheel power steering system on the DHC-3 Turbo Otter is identical to that installed in the original. The system facilitates taxiing in strong winds and can be used to equal advantage when operating on wheels or on combination wheel-skis.

The tailwheel power steering system consists of an electric steering unit which steers the tailwheel fork, a magnetic clutch for the steering unit, and a remote control power steering panel in the flight compartment. The system is protected by a push-to-reset circuit-breaker located on the circuit-breaker panel behind the co-pilot's seat.

When the tailwheel power steering system is switched on, the steering unit is engaged through its magnetic clutch, and the tailwheel or tail ski will immediately respond to the movements of the rudder pedals.

When switched to the locked position, the steering unit immediately centers and locks the tailwheel fork in the fore-and-aft position, regardless of the position of the rudder pedals.

With the tailwheel power steering system is switched off, the tailwheel will castor freely.

The three-position power steering switch is located in the center of the power steering panel, and it can select GROUND STEERING, OFF, or TAILWHEEL LOCK.

When the power steering switch is selected to GROUND STEERING, the amber light will come on, and the tailwheel or tail ski will now be steerable in response to movements of the rudder pedals. For any other selection of the power steering switch, the amber light will be off, except during a press-to-test operation. The power steering system can be locked, so that the tailwheel or tail ski is in the fore-and-aft position for take-off and landing, by selecting the power steering switch to TAILWHEEL LOCK. With the power steering switch in this position, the green light will come on, and the tailwheel or tail ski will be locked in the centered position.

When a fully castoring tailwheel is required, during ground handling or taxiing in light winds, select OFF with the power steering switch, and the tailwheel will castor freely.
Autopilot

The DHC-3T Turbo Otter features an in-depth, custom coded autopilot that overcomes many of the limitations involved with the default unit. The KAP 140 included in the Otter is a rate based, two axis, digital autopilot with altitude preselect.

The roll axis on the KAP 140 includes a wing leveler, heading select and VOR/LOC intercept and tracking. The KAP 140 can also be coupled to GPS and RNAV receivers as well. Roll rate information is derived from the turn coordinator.

Pitch axis features include vertical speed, glideslope and altitude hold along with altitude preselect option. Pitch information is derived from a pressure sensor and accelerometer. The KAP 140 Autopilot System operates independent of the aircraft’s artificial horizon. Therefore, the autopilot retains roll stabilization and all vertical modes in the event of vacuum system failure.

It is well beyond the scope of this basic user guide to give full instructions regarding use; as such, a separate manual for the autopilot has been included with your Turbo Otter.

We encourage our pilots to read that document completely in order to gain understanding about the proper use of this equipment.

Included KAP 140 Features (as installed in the Turbo Otter)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Status</th>
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<tbody>
<tr>
<td>DG (Directional Gyro)</td>
<td>YES</td>
</tr>
<tr>
<td>Turn Coordinator</td>
<td>YES</td>
</tr>
<tr>
<td>Automatic Electric Elevator Trim</td>
<td>NO</td>
</tr>
<tr>
<td>Manual Electric Trim</td>
<td>NO</td>
</tr>
<tr>
<td>FUNCTION MODES</td>
<td></td>
</tr>
<tr>
<td>Control Wheel Steering (CWS)</td>
<td>NO</td>
</tr>
<tr>
<td>Auto Capture</td>
<td>YES</td>
</tr>
<tr>
<td>Auto Track</td>
<td>YES</td>
</tr>
<tr>
<td>All Angle Intercept</td>
<td>YES (from ROL mode)</td>
</tr>
<tr>
<td>Auto 45-degree Intercept</td>
<td>YES (from HDG mode)</td>
</tr>
<tr>
<td>Remote Barometric Input</td>
<td>NO</td>
</tr>
<tr>
<td>ALT Hold (ALT); ALT Preselect/ALERT</td>
<td></td>
</tr>
<tr>
<td>Heading Select (HDG); NAV (VOR/RNAV/GPS)</td>
<td></td>
</tr>
<tr>
<td>Approach (APR); Glideslope (GS); Back Course (REV); Wing Leveler (ROL); Vertical Speed Hold (VS)</td>
<td></td>
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Operating the Cabin Doors

The MilViz DHC-3T Turbo Otter features operable doors at all points of entry. There exists a front cabin door on both sides of the aircraft, a double wide, fully opening door arrangement into the passenger / cargo area on the left side of the aircraft as well as a single door into the passenger / cargo area on the right side of the aircraft.

To operate the front cabin doors from within the virtual cockpit, click the LEFT MOUSE BUTTON on the door lever located on either door.

To operate the doors from the outside, or to open or close the rear doors, use the keyboard combination SHIFT+E, followed in quick succession by the numbers 1 or 2.

Hiding the Yoke

A common issue within the simulator is that it’s possible for the yoke to obscure switches and controls, such as those on the Turbo Otter’s lower switch panel.

To alleviate that issue, the yoke, along with the entire control column, may be toggled on or off.

To hide the yoke, click the LEFT MOUSE BUTTON on the control column wheel. To show the yoke again, click in the location where the yoke would meet the floor.
BEFORE ENTERING AIRCRAFT

Carry out an exterior inspection of the airplane as detailed below. Check the stowage of cargo and baggage, and determine the load distribution and C.G. position. Check fuel quantities, and that fuel is the proper jet fuel.

Starting at the cockpit door, port side, make the following checks. The numbers correspond to the checkpoints shown in the included illustration.

1. COCKPIT AND SERVICING POINTS.

All switches off. Fuel filler caps and hydraulic reservoir caps secure. Drain fuel sumps.

2. LANDING GEAR.

Landing gear and fairings for damage. Grounding chain for security and contact. Tires for cuts, bruises, slippage and proper inflation. Brake lines and hose for fluid leaks.

3. POWERPLANT SECTION.

Check security and condition of engine cowling, panels, and exhaust stubs. Check engine air inlet, screen and exit are secure and unobstructed. Check ice vane retracted. Check engine oil quantity and secure oil cap. Check propeller for condition and oil leaks. Check security of spinner.

4. STARBOARD WING.

All hinges clear. Aileron trim tab neutral. Wing tip and navigation light assembly for dents or damage.

5. STARBOARD FUSELAGE SIDE.

Fuselage side for dents or wrinkles. Underside for fuel leaks Cabin access ladder stowed and secure. Cabin entrance door closed. Wing and fuselage antennas, lead-ins, and loop housing for damage.

6. EMPENNAGE.


7. TAILWHEEL ASSEMBLY.

Tailwheel tire for proper inflation, cuts, bruises, and slippage. Check shock strut for inflation and leaks.

8. PORT FUSELAGE SIDE.

Fuselage side for damage or wrinkles. Underside for fuel leaks. Hand fire extinguisher in rear cargo door secure. Cargo doors closed. Wing and fuselage antennas and lead-ins for damage.

9. PORT WING.

All hinges clear. Aileron trim tab neutral. Wing tip and navigation light assembly for dents or damage. Pitot head cover removed.
Important!!!

If you are using this aircraft within Flight Simulator X, it is very important that you take into account the following in order to correctly set the aircraft up for flight with a turbine engine:

a) A flight should be set up from the simulator menu. I.E. Select the aircraft, location, time, and weather from the FS Free Flight Menu and begin the flight. The simulator will then be setup for a turbine engine profile. Positioning the aircraft where you want, along with a possible cold and dark state and saving the flight will allow this to be used at any time.

b) If you load up from a previously saved flight or loaded aircraft, it must be a jet or turboprop aircraft, NOT a piston engine. The simulator will be using the fuel and mixture setup of the previous aircraft when the DHC3-T loads, which means that the custom management of the turbine engine profile is going to be at odds with this and the simulator may either crash to desktop or simply not start or run correctly.
Starting Procedure

UPON ENTERING AIRCRAFT

a. Parking Brake - Set.
b. Flight Controls - Unlocked.
   Check for correct, free, and full movement.
c. Trim tabs - As required.
d. All switches - OFF (except generator switch on Junction
   Box which is to be left ON at all times.).
e. Condition lever - IDLE CUT OFF.
f. Fuel emergency shutoff - IN.
g. All circuit breakers - Set on, including flight and engine instru-
   ment circuit breaker switches.
h. Inverter Switch - ON.
i. Fuel transfer selector - OFF.
j. Flight instruments - Check. Set altimeter.
k. Master Switch - ON.
l. Push-to-test lights - TEST.
m. Fuel quantities - Check gage indications.
n. Communications equipment - Test.

BEFORE START

a. Master switch - OFF.
b. All doors - Closed and secure.
c. Propeller area - clear.
d. Brakes - Checked Set.
e. Power lever - IDLE.
f. Standby emergency power lever - Wired to OFF.
g. Prop control - INCREASE position.
h. Condition lever - IDLE CUT OFF.

ENGINE START

a. Master switch - ON.
b. Cabin heat control lever - COLD.
c. No. 2 fuel boost pump switch - ON. Check fuel low pressure
   warning light goes out. Then turn switch OFF.
d. No. 1 fuel boost pump switch - ON. Check fuel low pressure
   warning light goes out.
e. P3 heater - ON.
f. Engine ignition - ON.
g. Starter switch - Hold ON and
   check for oil pressure rise.
h. Condition Lever -RUN after sta-
   bilized Ng at or above 12% (18%
   is OPTIMAL).
i. ITT and Ng - MONITOR (1090
   °C maximum - not to exceed 2
   seconds) and engine acceler-
   ates to normal idle (52.6% Ng).
j. Oil pressure - CHECK.
k. Engine starter and ignition
   switches - OFF (when engine
   attains idle RPM).

GROUND RUN-UP

a. Engine warm-up - With Power
   Lever at IDLE, check oil pressure
   is above 85 psi and oil tempera-
   ture is above 0 °C.
b. Ensure that the propeller control
   system is purged by feathering
   and unfeathering the propeller
   once, with the Power Lever in
   IDLE position.

Taxiing & Takeoff

TAXIING - LANDPLANE

a. Wing flaps - CRUISE to improve
directional control.
b. Engine temperatures - Monitor
   for normal ranges.
c. Parking brake - OFF. Test wheel
   brakes as soon as airplane
   starts moving.
d. Rudder pedals - Operate to con-
   trol steerable tailwheel. Opera-
   te Power Steering System as
   applicable.
e. Power Lever - Momentarily
   advance beyond IDLE to initiate
taxiing speed. When momentum
   is obtained, retard to IDLE. If
taxi speed becomes too high at
   IDLE, reduce speed by moving
   the Power Lever into REVERSE
   range as necessary to control
   speed.

BEFORE TAKEOFF

a. All doors properly closed and
   LOCKED.
b. Tailplane trim - TAKEOFF SET-
   TING.
c. Rudder and aileron trim - SET
   GENERAL position.
d. Wing flaps - TAKEOFF AND
   LANDING position.
e. Directional gyro and artificial
   horizon - Caged.
f. Radios/NAV aids - Check as
   required.
g. All instruments in correct
   ranges.
h. Pitot head heater - ON when
   required.

TAKEOFF

a. When aligned on runway - Tail-
   wheel locked.
b. Power Lever - Advance smooth-
   ly to takeoff power according
to either the torque limit (58.7
   psi), ITT limit (790°C), or Ng limit
   (101.5%), whichever governs.
c. Direction - Maintain through
   rudder control.
d. Allow airplane to fly itself off in
   a tail-down attitude at approxi-
   mately 60 MPH IAS and then
   permit airspeed to build up to
   80 MPH IAS by 50 feet above
   runway. If obstacles are pres-
   ent maintain 66 MPH IAS or
   more after liftoff until obstacles
   are cleared and then permit
   airspeed to build up to 80 MPH
   IAS.
Climb & Cruise

CLIMB

a. Flaps - UP.
b. Ignition - OFF.
c. Tailwheel lock - OFF (if installed)
d. Climb speed - 91 MPH IAS.
e. Power - Reduce Power Lever smoothly to maximum recommended normal climb power according to either the torque limit (64.5 psi @ 2000 RPM); ITT limit (765 °C); or Ng limit (101.5%), whichever governs. This is recommended maximum cruise power for maximum engine life.
f. If OAT is 41 °F or less with visible moisture - Ice doors to ICING CONDITION, and inlet deice boot switch to ON.

CRUISE

a. Flaps - UP.
b. Power - The following are recommended maximum cruise power limits: torque limit (60.2 psi @ 2000 RPM, 54.8 psi @ 2200 RPM); ITT limit (740 °C); or Ng limit (101.5%), whichever governs.
c. If OAT is 41 °F or less with visible moisture - Ice doors to ICING CONDITION, and inlet deice boot switch to ON.
d. Fuel Transfer (only after center tank has less than 60 gallons remaining):
   (1) Both fuel boost pumps must be ON for the fuel to transfer.
   (2) When at FWD CG - Fuel Transfer Selector to FWD tank first then AFT tank after FWD tank is empty.
   (3) When at AFT CG - Fuel Transfer Selector to AFT tank first then FWD tank after AFT tank is empty.
   (4) After fuel transfer - Fuel Transfer Selector OFF and No. 2 boost pump OFF.

CAUTION:
The pilot should ensure that the fuel transfer system operates before the aircraft is flown farther from an airport than the range capability of the remaining fuel in the center tank.

NOTE:
Anytime the aircraft is operated in the proximity of heavy moisture the pilot should turn the Ignition Switch ON as a precaution. Also when the fuel in the center tank is below 40 gallons, turn the Ignition Switch ON as a precaution.

Descent, Approach & Landing

DESCENT

a. Power Lever - Reduce as desired.
b. Airspeed - As desired (do not exceed VMO = 143 MPH IAS, landplane; 133 MPH IAS, seaplane/skiplane).
c. If OAT is 41 °F or less with visible moisture - Ice doors to ICING CONDITION, and inlet deice boot switch to ON.

APPROACH

a. Propeller Lever - Full INCREASE.
b. Tailwheel - Locked.
c. Flaps - As required (below 91 MPH IAS, landplane; 91 MPH IAS, seaplane/skiplane).
d. Brakes - Check.
e. If OAT is 41 °F or less with visible moisture - Ice doors to ICING CONDITION, and inlet deice boot switch to ON.
f. If Heater is operating - BLOWER switch ON above 90 MPH IAS.

LANDING

a. Flaps - TAKEOFF AND LANDING position.
b. Ignition - ON.
c. Airspeed on final - 80 MPH IAS.
d. Propeller - Reverse range as required after tail wheel is firmly on ground.
e. Brakes - As required.

GO-AROUND AND BALLED LANDING

a. Power Lever - Advance smoothly to takeoff power according to either the torque limit (64.5 psi); ITT limit (790 °C); or Ng limit (101.6%), whichever governs.
b. Airspeed - 66 MPH IAS until obstacles are cleared. Then 80 MPH IAS.
c. Tailplane trim - As necessary to maintain a safe airspeed.
d. Flaps - As required.

AFTER LANDING

a. Tailwheel - Ground steering.
b. Flaps - CRUISE setting for taxi.
c. Landing light - OFF.
d. Ignition - OFF.
e. Tailplane trim - NEUTRAL

ENGINE SHUTDOWN

a. Parking brake - Set.
b. Power Lever - IDLE. Allow engine to stabilize for one minute at IDLE.
c. Tailwheel control - OFF.
d. Propeller Lever - FEATHER.
e. Condition Lever - IDLE CUT OFF.
f. Fuel boost pumps - OFF (after Ng is below 5%).
g. P3 Heater - OFF.
h. Deice boot switch to OFF.
i. Radios - OFF.
j. Anticollision light - OFF.
k. Master Switch - OFF.
Emergency Procedures

**ENGINE FAILURE DURING TAKEOFF RUN.**

a. Apply brakes - control column fully back all the time.
b. Condition Lever - IDLE CUT OFF.
c. Maintain directional control.
d. Ignition - OFF.
e. Fuel boost pumps - OFF.
f. Master Switch - OFF.
g. Fuel emergency shutoff - If necessary - PULL SHARPLY (to break wire lock and close).

**ENGINE FAILURE AFTER TAKEOFF.**

a. Lower nose immediately to attain airspeed of 85 MPH IAS.
b. Maintain directional control.
c. Propeller Lever - FEATHER
d. Condition Lever - IDLE CUT OFF.
e. Ignition - OFF.
f. Fuel boost pumps - OFF.
g. Fuel emergency shutoff - PULL SHARPLY (to break wire lock and close).
h. Master Switch - OFF.
i. LAND STRAIGHT AHEAD. CHANGE DIRECTION ONLY ENOUGH TO AVOID OBSTACLES.

**ENGINE FAILURE IN FLIGHT.**

a. Propeller Lever - FEATHER.
b. Condition Lever - IDLE CUT OFF.
c. Both fuel boost pump switches - OFF.
d. P3 heater switch - OFF.
e. Power Lever - IDLE.

**ENGINE FLAMEOUT.**

The indications of an engine flameout will be a drop in the ITT, a drop in the torque pressure, a drop in gas turbine RPM (Ng), and a drop in propeller RPM. The flameout may result from the engine running out of fuel, or possibly caused by an unstable engine operation. Once the fuel supply has been restored to the engine or the cause of the unstable operation eliminated, the engine may be restarted in the manner described under NORMAL AIR-START, WINDMILLING AIR-START, or EMERGENCY AIR-START, as appropriate.

**NORMAL AIR-START - STARTER ASSIST.**

Note: The normal starter assist airstart envelope is from sea level to 16,000 feet and from minimum flying airspeed to VMO (143 MPH IAS, landplane; 137 MPH IAS, seaplane).

a. Propeller Lever - Anywhere in the operating range.
b. Power Lever - IDLE.
c. Fuel emergency shutoff valve - Push in to open.
d. Condition Lever - IDLE CUT OFF.
e. Both fuel boost pump switches - ON.
f. Fuel inlet pressure - 5 psig minimum.
g. P3 heater switch - ON.
h. Ignition - ON.
i. Starter switch - Hold ON and check for oil pressure.
j. Condition Lever - RUN after stabilized Ng at or above 12% (18% is OPTIMAL).
k. ITT and Ng - MONITOR (1090 °C maximum not to exceed 2 seconds) and engine accelerates to normal idle (52.6% Ng).

**WINDMILLING AIR START (NO STARTER ASSIST).**

a. Propeller Lever - INCREASE.
b. Icing door - NORMAL position.
c. Power Lever - IDLE.
d. Condition Lever - IDLE CUT OFF.
e. P3 heater switch - ON.
f. Airspeed - 112 MPH IAS MINIMUM.
g. Both fuel boost pump switches - ON.
h. Ignition switch - ON.
i. Minimum Ng for acceptable start - 12% (18% is OPTIMAL).
j. Condition Lever - RUN. Monitor ITT limit is not exceeded.
k. Oil pressure - CHECK.
l. Propeller Lever - As desired.
m. Power Lever - As required after ITT has peaked.

**Note:** A re-light normally should be obtained within 10 seconds, and will be evidenced by a rise in ITT and gas generator (Ng) RPM.

a. Oil pressure - CHECK.
b. Engine starter and ignition switches - OFF (when engine attains idle RPM).
c. Propeller Lever - Desired operating range.
d. Power Lever - As required.
Emergency Procedures (Continued)

**EMERGENCY AIR-START**
(BELOW 10% NG WITHOUT STARTER ASSIST).

a. Propeller Lever - INCREASE.
b. Icing door - NORMAL position.
c. Power Lever - IDLE.
d. Condition Lever - IDLE CUT OFF.
e. P3 heater switch - ON.
f. Both fuel boost pump switches - ON.
g. Ignition switch - ON.
h. Condition Lever - RUN. Monitor ITT limit is not exceeded. If over-temperature tendencies are encountered the Condition Lever should be moved to the IDLE CUT OFF position periodically during Ng acceleration to idle.
i. Power Lever - As required after ITT has peaked and Ng is above 50%.
j. j) Oil pressure - CHECK.
k. k) Ignition switch - OFF.
l. l) No. 2 fuel boost pump - OFF.

**EMERGENCY POWER LEVER.**

Use the following procedure if the engine fails to respond to the normal Power Lever.

a. Power Lever - IDLE.
c. Push down on the Emergency Power Lever round knob and advance lever SLOWLY. Monitor ITT while advancing Emergency Power Lever to desired power.

cautions: The Emergency Power Lever bypasses the fuel control unit therefore all the normal engine safety limits are inoperative. The Emergency Power Lever should be moved SLOWLY while all engine readings are kept within limits.
d. Land as soon as possible.

**GENERATOR FAILURE.**

Generator failure will be indicated by illumination of the red Generator Failure Warning Light. If the Generator Failure Warning light comes on turn off all non-essential electrical equipment and land as soon as possible.

**FUEL BOOST PUMP FAILURE.**

If fuel pressure drops below 5 psi turn on remaining boost pump. If fuel pressure remains below 5 psi engine will continue to run in cruise but not for climb or go-around power. Fuel can not be transferred unless both boost pumps are operational. With a fuel boost pump failure the pilot should land as soon as possible.

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**Engine Failures in the MilViz DHC-3 Turbo Otter**

Our Turbo Otter contains the capability to monitor the condition of the engine. All parameters are carefully monitored during the operation of the aircraft. Should the engine be abused, mis-started, or operating limits ignored, the engine will eventually stop, depending on current torque and other random factors. Once the engine stops, all oil pressure will be lost and it is not possible to restart the engine.

Once this has occurred, it will be necessary to reload the aircraft.

This damage does not persist across multiple flights - only the flight currently undertaken will be affected.
# Engine Operating Limits (PT6A-34)

Note: The operating limits presented do not necessarily occur simultaneously.

<table>
<thead>
<tr>
<th>Power Setting</th>
<th>SHP</th>
<th>TORQUE (psi) (1)</th>
<th>ITT (°C)</th>
<th>Ng (%) (2)</th>
<th>Np (RPM) (1)</th>
<th>OIL PRESSURE (psig) (7)</th>
<th>OIL TEMP (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takeoff and Max.</td>
<td>750</td>
<td>64.5 (1)</td>
<td>790</td>
<td>101.6</td>
<td>2200 (1)</td>
<td>85 to 105</td>
<td>10 to 99</td>
</tr>
<tr>
<td>Continuous (12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle</td>
<td></td>
<td>685 (5)</td>
<td>52.6</td>
<td></td>
<td></td>
<td>40 (MIN)</td>
<td>-40 to 99</td>
</tr>
<tr>
<td>Starting (9)</td>
<td></td>
<td>1090 (4 &amp; 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-40 (MIN)</td>
</tr>
<tr>
<td>Momentary</td>
<td>68.4</td>
<td>850 (4)</td>
<td>102.6 (4)</td>
<td>2420</td>
<td></td>
<td></td>
<td>0 to 99</td>
</tr>
<tr>
<td>Max. Reverse (8)</td>
<td>720</td>
<td>64.5</td>
<td>790</td>
<td>101.6</td>
<td>2120</td>
<td>85 to 105</td>
<td>0 to 99</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Maximum sustained torque limit is 1970 ft-lb (64.5 psi). Ng must be set so as not to exceed power limitations (maximum torque is 58.7 psi @ 2200 RPM and 64.5 psi @ 2000 RPM, with a straight line variation between these settings).
2. For every 10 °C (18 °F) below -30 °C (-22 °F) ambient temperature, reduce maximum allowable Ng by 2.2%.
3. Overspeed, overtemp, and overtorque action is not listed within this chart.
4. These values are time limited to two (2) seconds.
5. Increase Ng to keep within this limit.
6. Starting temperatures above 850 °C should be investigated for cause.
7. Normal oil pressure is 85 to 105 psig at gas generator speeds above 72% Ng with oil temperature between 60° to 70 °C (140° to 158 °F). Oil pressure below 85 psig is undesirable and should be tolerated only for the completion of flight, preferably at reduced power setting. Oil pressure below 40 psig is unsafe and requires that a landing be made as soon as possible, using minimum power to sustain flight.
8. Reverse power operation is limited to one (1) minute.
9. Use of starter is limited to 30 seconds ON, one minute OFF, 30 seconds ON, one minute OFF, 30 seconds ON, then one hour OFF to cool.
10. In event of failure of the propeller governor toward overspeed, it is permissible to complete a flight with the propeller control via the overspeed governor, providing the overspeed limit is not exceeded.
11. Accessory drive seal leakage should not exceed 3 c.c. per hour.
12. Maximum Continuous Power, MCP, 2000 RPM @ 64.5 psi; Takeoff Power, 2200 RPM @ 58.7 (limited to 3 minutes).
Engine Instrumentation Markings (PT6A-34)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Red Line Minimum Limit</th>
<th>Red Line Maximum Limit</th>
<th>Yellow Arc Caution</th>
<th>Green Arc Normal Operating</th>
<th>Green Arc Normal Operating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torquemeter</td>
<td>--</td>
<td>58.7 psi</td>
<td>--</td>
<td>40 to 790 °C</td>
<td>790 °C</td>
</tr>
<tr>
<td>Interstage Turbine Temperature</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Propeller Tachometer (Np)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1800 to 2000 RPM</td>
<td>2200 RPM</td>
</tr>
<tr>
<td>Gas Generator Tachometer (Ng)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>52.6 to 101.6%</td>
<td>101.6%</td>
</tr>
<tr>
<td>Oil Temperature</td>
<td>-40 °C</td>
<td>-40 °C to 10 °C</td>
<td>10 °C to 99 °C</td>
<td>85 to 105 psi</td>
<td>105 psi</td>
</tr>
<tr>
<td>Oil Pressure</td>
<td>40 psi</td>
<td>40 to 85 psi</td>
<td>85 to 105 psi</td>
<td>5 to 35 psi</td>
<td>35 psi</td>
</tr>
<tr>
<td>Fuel Pressure</td>
<td>5 psi</td>
<td>--</td>
<td>5 to 35 psi</td>
<td>3.5 to 5.1 inHg</td>
<td>5.1 inHg</td>
</tr>
<tr>
<td>Vacuum Gage</td>
<td>3.5 inHg</td>
<td>--</td>
<td>3.5 to 5.1 inHg</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Airspeed Limits

<table>
<thead>
<tr>
<th>Indicated Air Speed- IAS (MPH)</th>
<th>Corrected Air Speed - CAS (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Operating Limit Speed, $V_{M0}$</td>
<td>143</td>
</tr>
<tr>
<td>Maneuvering Speed, $V_A$</td>
<td>125</td>
</tr>
<tr>
<td>Maximum Flap Extended Speed, $V_{FE}$</td>
<td>91</td>
</tr>
</tbody>
</table>
Credits

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