NORTH AMERICAN AVIATION T-28D TROJAN

Access to the contents is available via the bookmarks of your PDF reader.

Quick Start Guide

Don't like reading manuals? Then at least try reading this bit before you take-off.

- Selecting the aircraft. The Trojan will appear as "North American T28D". If you are using the filters at the top of the Select Aircraft screen the Aircraft manufacturer is North American, the Publisher is Ant's Airplanes and the Aircraft Type is Single Engine Prop.

- This package includes 3 model variants. The DUAL contains controls for both cockpits, the SOLO for the front cockpit only (which means it has the best framerates) and the ATTACK which is the SOLO variant but with weapons.

- Calibrate Throttle, Mixture and Propeller controls. The T-28 uses some clever custom programming to process throttle quadrant input. For most users this should work straight out of the box but if not, open the Animation Manager (shift+4) and select the Controls tab and follow the instructions on that page to setup your controls.

- The mixture control has three settings only, Idle/Cutoff, Normal and Full Rich. When set to Normal the mixture is automatically adjusted to provide the best air fuel mixture ratio. Do not have automixture enabled in FSX preferences.

- The Supercharger is located on the throttle quadrant. The R1820-86A engine has a two stage supercharger. Use LOW blower for altitudes up to 15,000' and HIGH blower for altitudes above that.

- Starting the engine. Ensure the battery is on and then right click on the starter button to run the auto start procedure. To manually start you will have to read the rest of the manual.

- Animation Manager is the hub of the aircraft and allows you to adjust weight, fuel (don't use FSX menus for this) and weapons configuration, display checklists, perform preflight exterior inspection, control animations, set preferences, alter sound settings and monitor engine wear and tear.

- There is no 2D main panel with this aircraft. It has only a 3D virtual cockpit and only a small selection of 2D popup gauges.

Backup your files

Please take a moment to make a safe backup of your installer program. While you're at it make a text file and note the details of your order (eg retailer, order number, date of order) including your user code. If any updates are made then they will be distributed by your retailer and may be obtained by logging onto your user account with your retailer. So, make a note of your user account details.

Introduction

Congratulations on your purchase and welcome to the wonderful world of the T-28D.

The T-28D is a variation of the North American Aviation T-28 aircraft. The Original T-28A was first used in 1948 by the U.S. Air Force as primary trainer but it was only used in this role for less than a decade. The A model had a two-bladed propeller and a seven cylinder Wright Cyclone R-1300 engine. The Navy became interested in the aircraft for jet transition in 1952 and ordered the B model which featured the three-bladed Hamilton Standard propeller and a nine cylinder R1820-86 engine. The C model was developed for aircraft carrier use and featured a tail hook, shorter prop (to avoid striking the deck of the carrier) and beefed up frame.

The last new T-28 was delivered in 1956 however the Navy was still using the T-28 up to 1984 when it was replaced by the T-34C turboprop.

Despite being designated as a trainer the T-28 flew in combat in SE Asia during the 60's.

The T-28D is essentially a converted T-28A. A larger engine was installed (either the nine cylinder Wright Cyclone R-1820-56S which developed 1300 horsepower or the R-1820-86A with 1425 horsepower). This necessitated a larger engine cowling. A three-bladed prop replaced the two-bladed prop. The original canopy was replaced with the lower profile model used in the B and C versions.

This FSX version is based on VH-TRO which is owned by Warbird Aviation based at Archerfield, QLD. This aircraft has the more powerful 1425 horsepower R-1820-86A engine installed.

There are three models available for each variant: A DUAL cockpit version, a SOLO version and an ATTACK version. The aircraft is flown from the front cockpit when flown solo. When used for training the student flies from the front seat with the instructor in the rear seat. The SOLO model is recommended for FSX pilots as this model does not include the rear cockpit and instruments which saves considerably on frame rates and memory requirements.

System Requirements

This aircraft was developed with the FSX SP2 SDK. You therefore need either Microsoft's Flight Simulator X SP2, Acceleration or FSX Gold. Before purchase you should try the donationware T-28A version. The T-28A will give a good indication of how well the T-28D will perform on your system. Use of FSX without Service Pack 2 or Acceleration is not supported.

Support

If you are having problems with the operation of the aircraft please email me at support@antsairplanes.com. Problems with downloading the package should be directed to the retailer as they are responsible for delivery of the download.

Features

- T-28B and T-28C versions. The T-28C is the tail hook version of the T-28B

- Solo, Dual and Attack models. Each version comes in 3 models. Dual version has both cockpits modelled, Solo version front only (for better framerates) and Attack version has weapons.

- Animation Manager. Has checklists and controls to change displays and options. Weight and fuel

and weapon load out and saving settings can all be controlled in game.

- Wear and Tear modelling. Simulates the effects of engine damage from misuse.

- Realistic Prop Torque. Simulates the effects of prop torque more realistically than possible with default FSX.

- VC Rain and Fog effects. Simulates rain, icing and fog effects on the canopy.

- Exterior Inspection. Available in the Animation Manager allows a virtual walk around of the aircraft before takeoff.

- Weapons Systems. Available in the Attack version allows the pilot to actually fire rockets and guns and drop bombs.

What's in this manual

The next couple of pages contains some basic information about the software. Each section can easily be selected using your PDF reader's bookmarks.

- The Virtual Cockpit: Identifies the instruments of the virtual cockpit

- 2D popup Panels: Describes the 2D popup panels. Note that there is no main panel for this aircraft. It should be flown from the virtual cockpit.

- Animation Manager: Describes the functions of the Animation Manager 2D popup panel which allows the user to adjust various preferences.

- Aircraft Systems: Provides instructions on how to operate the aircraft's various systems including such things as engine, wing flaps, canopy and radios.

- Wear and Tear: Describes the engine and aircraft wear and tear module which simulates engine damage.

- Propeller Torque Effects: Description of the effects of the propeller.

- VC Rain and Fog Effects: Describes the virtual cockpit rain and fog effects.

- Flight Training: Discusses the flight characteristics of the aircraft

- Normal Checklists: This can be used as a tutorial for how to fly the aircraft. There are condensed checklists contained within the Animation Manager for use in flight.

- Emergency Procedures: What to do when things go pear shaped.

- Carrier Based Operations: Procedures for aircraft carrier operations (T-28C only)

- Weapons Systems: Describes the Attack version's weapon systems.

- Performance Data: Information about the aircraft's performance.

- History: A brief history of the T-28 aircraft.

- Multiplayer: Notes on multiplayer use.

Installation

This aircraft is designed for Microsoft's Flight Simulator X. Installation is handled by an installer program which places the files into the correct location. Simply click on the installer to start the process. The installer will read FSX's location from the registry. Ensure that this is correct and that the installer is pointing to your Flight Simulator X folder.

If you are upgrading from an earlier version you can simply run the installer and it will overwrite any existing files with no need to uninstall the previous version.

Selecting the Trojan

Once the aircraft has been installed start FSX and click on Free Flight. Click on Change... under Current Aircraft. Ensure Show all variations is ticked. The Trojan will appear as "North American T-28D". If you are using the filters at the top of the Select Aircraft screen the Aircraft manufacturer is North American, the Publisher is Ant's Airplanes and the Aircraft Type is Single Engine Prop.

Each repaint is available as a Dual or Solo version. The Solo version has only the front cockpit instrumentation and only one pilot (the plane is flown from the front cockpit when flown solo). The Solo version provides the best possible framerates. The Dual version has both cockpits and both pilots.

When you first select the T-28D you should see the following message. Click Run to allow FSX to run the T28D.GAU file (the T-28D will not work without this gauge file).

You should then see another message. Click Yes (despite the messages warnings the T28D.GAU will not be loaded whenever you start Flight Simulator and will only be loaded when you load the T-28D aircraft)

You will need to do this process twice. Once for the T28D.GAU and once for the T28DWeights.GAU.

Model Variants

The T-28D is available in three variants, SOLO, DUAL and ATTACK. The DUAL model contains instrumentation for both the front and rear cockpits. The SOLO model contains instrumentation for the front cockpit only. As the SOLO model contains less parts it will provide the best framerates within FSX. The ATTACK version is the same as the SOLO version but it has 6 weapon stations, an armament panel and gunfight.

Flying from the rear seat in the Dual model

The Dual model is setup for flight from the front cockpit but you can use an alternate aircraft.cfg file where the camera views are setup for flight from the rear cockpit. The alternate file is located in the FSX/SimObjects/Airplanes/Ants Trojan T28D folders. To use this file rename the original "aircraft.cfg" to something different and then rename "Aircraft for rear cockpit view.cfg" to "aircraft.cfg".

What's new in Version 2.1

Version 2.1 is a minor free update that mostly fixes some bugs. The installer is the complete package and will overwrite any existing version T-28D installation.

- Updated engine sounds
- Installer for Prepar3D V2 version
- Fixed missing VC rain effect on front canopy
- Fixed left elevator trim tab animation problem
- Definitely fixed multiplayer flooding issue
- Fixed oxygen pressure to 450psi max
- Increased temperature produced by alternate air

What's new in Version 2.0

Version 2.0 is a major free update that adds many new features to the T-28D. The installer is the complete package and will overwrite an existing version 1.0 or 1.1 T-28D installation.

- Added Attack model with 6 weapons stations pylons, armament panel and gun sight
- Firing Bombs, Rockets and Guns
- New Animation Manager
- Fuel and payload can now be adjusted with Animation Manager (no need to use FSX menus)
- New aircraft walkaround for preflight inspection
- New wear and tear modelling to simulate aircraft engine wear.
- Virtual cockpit rain, icing and fogging effects
- Exterior structural icing effects
- New 2D popup for radio gauges
- Improved flight dynamics
- Joysticks can be made visible or not
- Kohlsman display can be set to inHg or mb
- Improved inverted flight engine performance
- Fixed texture mapping on left elevator trim tab

- Fixed texture bump mapping on right wing leading edge
- Added outside air temperature bulb to exterior
- Various fixes to repaints
- Added 3 new repaints
- Added key mapping to supercharger and gear warning horn

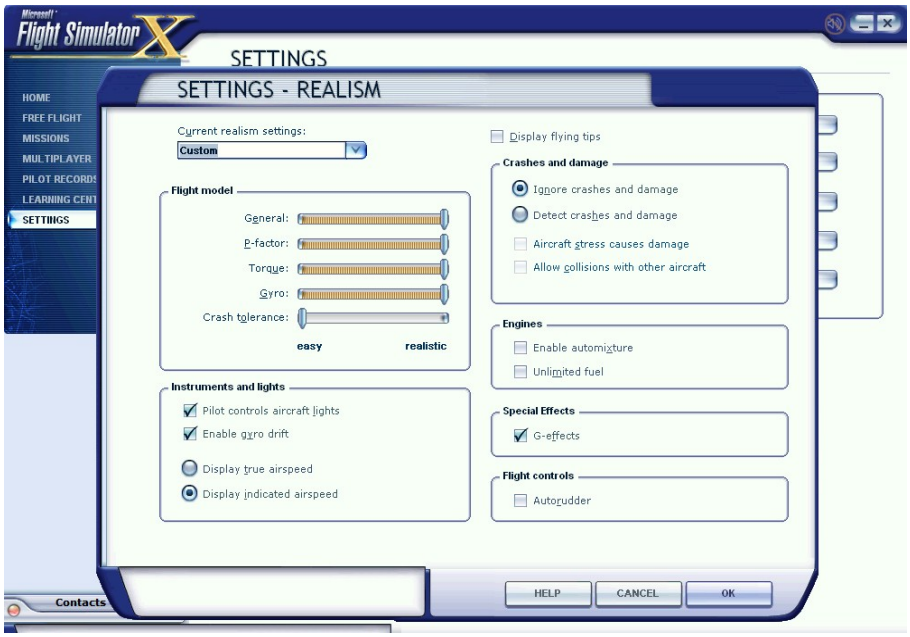
Differences between B&C and D models

Ant's Airplanes also sells the T-28B&C models as a separate package. The following is a list of the differences between the T-28B&C and the T-28D . Pilots who have flown the T-28B&C should familiarise themselves with these differences to avoid dying in new and spectacular ways.

- Different panel layout with the locations of many instruments changed
- Different attitude indicator, airspeed, manifold pressure, engine rpm gauges
- Different switch panel and lighting system
- Supercharger handle in front cockpit only
- Different operation of the Carburetor Air Control
- Speed brake on T-28B and C but not on T-28D

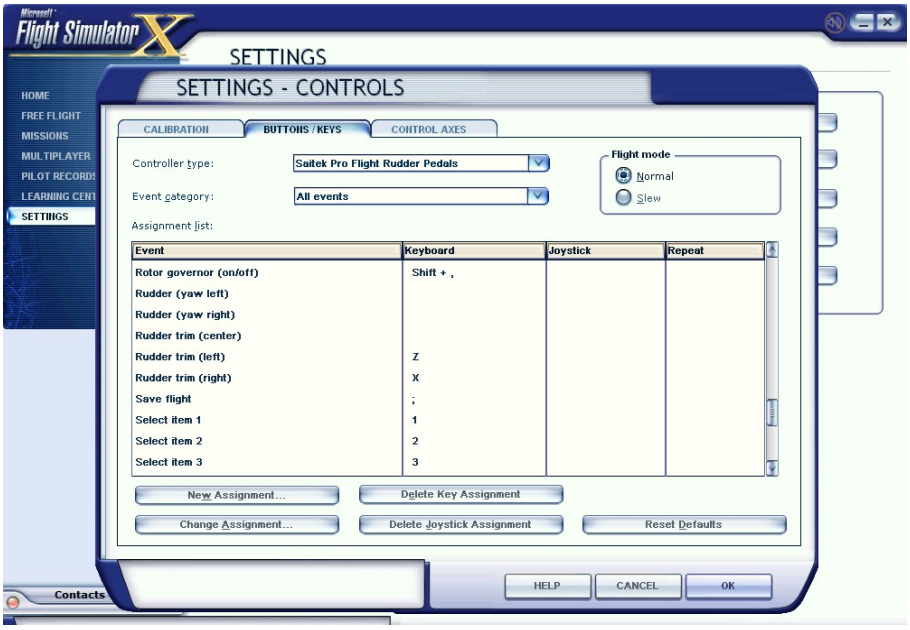
Recommended Settings

The aircraft has been designed with realism settings set to maximum. Ensure that the Flight Model sliders are set to realistic. Crash tolerance can be set to personal preference. It is recommended that Autorudder be turned off if using Realistic Prop Torque Effect.



Ensure Automixture is not selected. The T-28D uses a custom automixture logic to accurately simulate the T-28D mixture control and this will only work properly if FSX automixture is turned off.

If you are using the Realistic Prop Torque Effect it is recommended that you assign rudder trim commands to key commands. I have assigned my Z and X keys to control the rudder trim but you can use any key or joystick buttons you like. You may also like to assign key commands for the cowl flaps open and close for easy access.



The following T28 specific functions are assigned to FSX key commands for easier access:

Supercharger: Cabin Alert - Seatbelts

Gear Horn: Cabin Alert - No Smoking

Gun Sight Range Control: Decision Height (Increase and Decrease)

Fuel and Payload

The Trojan has an unloaded weight of 6,424 lbs and a maximum weight of 10,400 lbs.

The Trojan has two fuel tanks, one located with each wing. Each tank holds 86.3 gallons with 85.5 gallons usable. The total fuel capacity is 172.6 gallons or 1044 lbs.

There is a baggage compartment located underneath the aircraft directly behind the wings.

Solo flight is only possible from the front seat as flying from the rear seat may put the centre of gravity outside of safe limits.

Pilot and Passenger weights are each 200 lbs and this includes the parachute and other equipment that each pilot wears.

You can show or hide the passenger by using the Animation Manager (shift+4).

You can use the Animation Manager to adjust fuel and payload without needing to use the FSX menu system.

It is not recommended that you alter the weights for Stations 1-6 for the Attack model using the FSX menu system. Doing so will may lead to peculiar display of the weapons or failure of the weapons system to operate correctly. Use the Animation Manager to cycle through the weapons configuration of each station and this will reset the weights to the correct values.

The Virtual Cockpit

The T-28D features a fully 3D virtual cockpit with smooth 3D gauges. As these gauges are an integral part of the 3D model there is no 2D panel available for this aircraft. There are a handful of 2D popup gauges which provide easier access to some of the more difficult to reach gauges.

Interaction with the various gauges, knobs and buttons is done via mouse.

Switches

Switches are simply activated by clicking on the switch with the mouse. Some switches have multiple positions (e.g. the generator switch), left click or right click to set the switch to the desired position. Some switches are also spring loaded. You will need to hold down the mouse button to hold these switches in position.

Knobs

Knobs can be operated with a left click to decrease the value or a right click to increase the value. If you click and drag the mouse left or right you can also adjust the value. You can also turn knobs by using the mouse scroll wheel.

There are two models available: Solo and Dual. The Solo model consists of the front cockpit only. The Dual model has both the front and rear cockpits. The front and rear cockpits are nearly identical with only a couple of variations between them. Certain systems (e.g. the lights, cowl and oil cooler flaps, radios) can only be operated by one cockpit at a time depending on which cockpit has control.

Cockpit

The cockpit can be divided into 5 areas. The Left Console, the Throttle Quadrant, the Instrument Panel, the Switch Panel and the Right Console.

The Instrument Panel

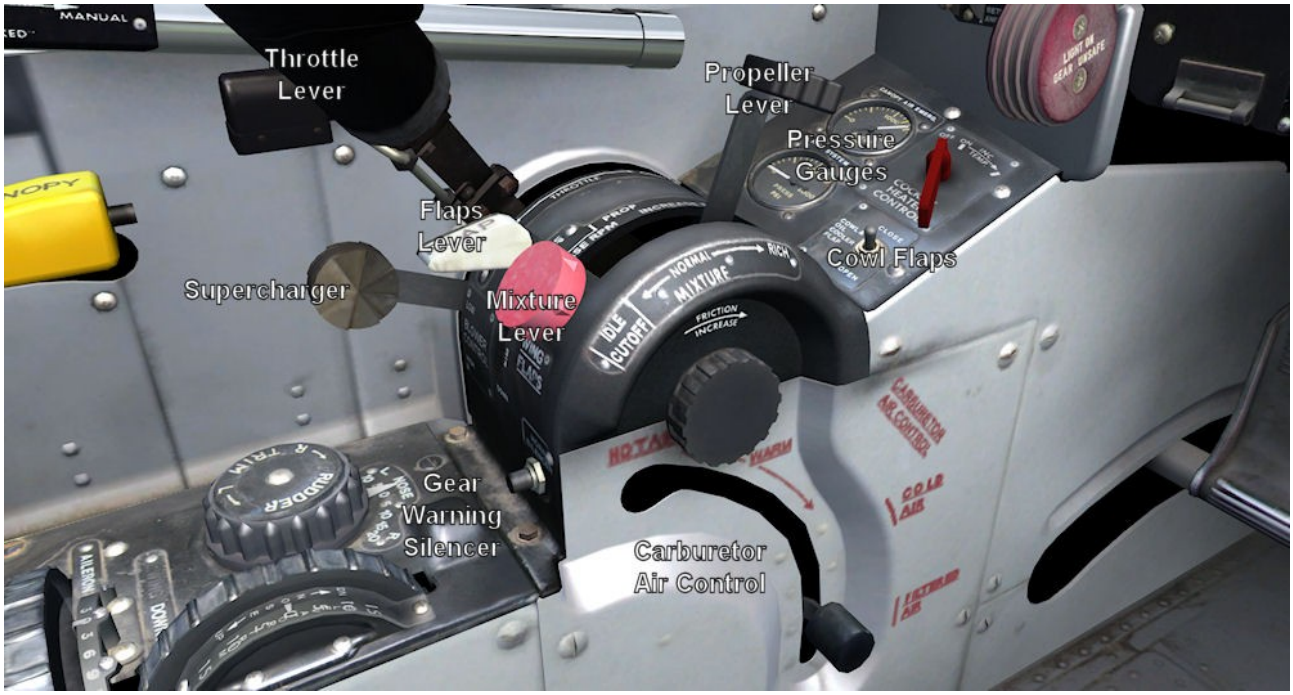
Contains the main aircraft instruments. Note the oxygen regulator is located above the right console in the rear cockpit.

The Left Console

Contains the fuel cutoff switch, trim controls, throttle quadrant, cowl and oil cooler flaps switch, hydraulic pressure gauges and hydraulic hand pump (front cockpit only).

The trim controls are also available as a 2D popup for easy access.

The Throttle Quadrant



Contains the aircraft engine controls.

The Switch Panel

Contains most of the electrical control switches as well as the lighting switches (except for the landing light switch which is located on the left of the Instrument Panel).

Two position switches are changed by clicking on them.

Three position switches are changed by left clicking to move up and right clicking to move down.

The Right Console

Contains the Radio controls. The front cockpit has a radio card which shows the preset radio frequencies for the comms radio. The radio set is available as a 2D popup for easier access.

A rheostat allows adjustment of the red edge lighting for the radios.

2D Popup Panels

The T-28D features a fully 3D virtual cockpit with smooth 3D gauges. As these gauges are an integral part of the 3D model there is no 2D panel available for this aircraft. There are a handful of 2D popup gauges which provide easier access to some of the more difficult to reach gauges.

Trim Panel (shift+2)

Provides easier access to the aileron, rudder and elevator trim controls. If using the Realistic Prop Torque Effects it is recommended that you assign the left and right rudder trim controls to a convenient key command.

Radios (shift+3)

Shows the front radio set and radio card located on the front right console.

The radio card shows the preset UHF Comm radio channel frequencies. These can be adjusted by clicking on the individual frequencies. Radio frequencies are saved as part of your preferences. The radio channel being used is selected with the UHF Comm radio channel knob.

Animation Manager (shift+4)

Displays the Animation Manager. See the next section for more information on the Animation Manager.

GPS (shift+5)

This will display the default FSX 295 GPS to aid in FSX navigation.

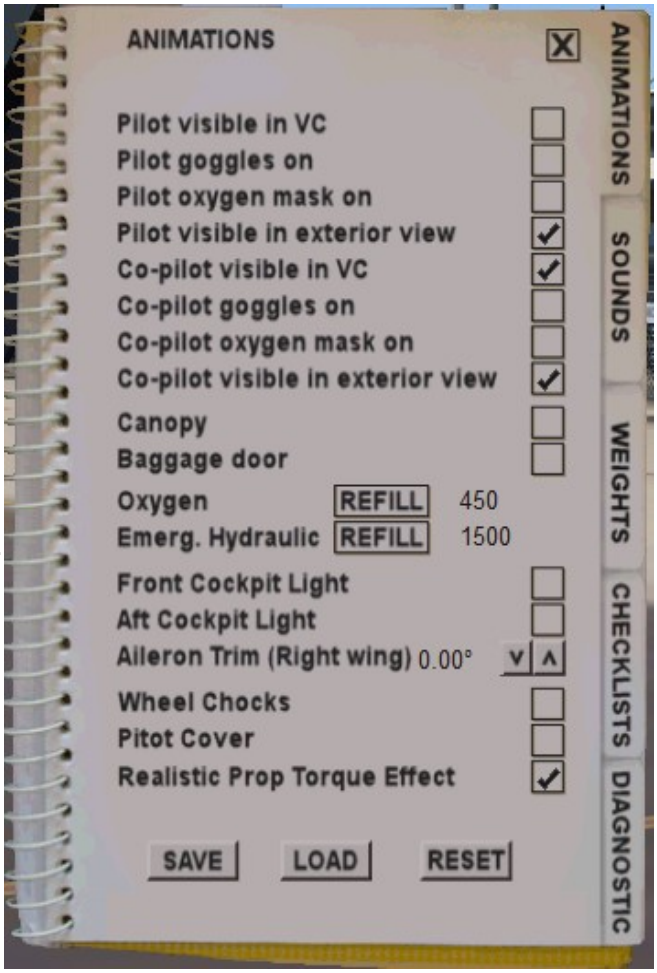
Autopilot and Transponder (shift+6)

The T-28D does not have an autopilot. However, sometimes people need to step away from the computer and at those times an autopilot will be useful. The default autopilot is therefore available for those who wish to use it. I have written a new heading gauge to allow adjustment of the autopilot heading. Transponders were not around when the T-28D was in service but to make use within FSX easier the default transponder is shown here.

Animation Manager

The Animation Manager is a 2D popup which allows the user to make numerous settings for the aircraft.

On the right edge of the Animation Manager there are 5 tabs which allow the user to select different pages.



Animations Tab

Allows the user to display various items as well as refill consumables. The user also saves, reloads or resets their settings on this page. The settings are common to both the Dual and Solo models. Adjustment to the Co-pilot settings will not be visible in the Solo version.

The pilot can be set to be visible within the virtual cockpit, their goggles can be put on or off. If their oxygen mask is put on then the oxygen supply will be used and the oxygen blinker will animate.

The co-pilot has similar settings. Note that in the Solo model these settings will have no effect.

The Canopy and Baggage Door can be operated.

Oxygen and Emergency hydraulic air cylinders may be refilled.

The utility cockpit lights can be turned on or off.

The left and right aileron trim tabs are individually adjustable. The right wing aileron trim is ground adjustable only and can be set only on this screen. Adjusting the aileron trim control in the cockpit will adjust the left aileron trim tab.

Use XPNDR for MP weapons will hijack the transponder code to transmit information about the weapons configuration in multiplayer mode. Refer to the Multiplayer section for more information.

Wheel chocks can be placed. The Pitot cover will place "REMOVE BEFORE FLIGHT" streamers over the pitot tube and in the ground landing gear locks. Ensure you have removed these before take off.

NOTE: Most changes will take effect immediately. However, if you change the Realistic Prop Torque Effect or the Castoring Nose Wheel Steering these options make changes to the aircraft.cfg file so you must click Save to save the setting and either quit FSX and restart or load a different aircraft and then reload the T-28. Alternatively you can use the FSX Aircraft (reload) key command.

Clicking on Save will write your preferences to disk. Preferences are set on the Animations, Sounds and Weights page and are all saved at once and affect all variants of the T-28D. The following settings are saved:Clicking on Save will write your preferences to disk. The following settings are saved:

- Pilot and Co-pilot visibility settings

- Right aileron trim setting

- Realistic Prop Torque Effect setting

- Sound level settings (see Sounds Tab)
- UHF Comm Radio frequency channels.
- Interior Light rheostat settings.

Load will reload your preferences from disk.

Reset will restore the preferences to the default settings (it will not write these settings to disk).

Sounds Tab

Allows the user to adjust the custom sounds. Three sliders are available for adjusting the volume of Switches, Engine Noises and Open Canopy Wind Noise. A tick box turns on or off all custom sounds.

Engine Noises are the engine starter sounds. Normal engine sounds are controlled via the FSX sound system.

Open Canopy Wind Noise is the sound of wind when the canopy is open while in flight.

Switches are the various knobs, buttons and switches noises within the cockpit.

Note that the FSX sounds menu should be used to change the usual FSX sounds. It is recommended that you set the FSX sounds to your usual settings and then you can balance the T-28D sounds.

These settings are saved as part of your preferences when you click on SAVE on the Animations Tab.

Weights

Displays information about the aircrafts weight and fuel load as well as the centre of gravity. Changes made here will directly affect the weight and fuel load of the aircraft within FSX. There is no need to use the FSX menu system to alter weight and fuel.

The bottom half of this page is used to set the weapons stores. Refer to the Weapons Systems section for more information on how to use this section.

Click on Save to write your preferences on the Animations, Sounds and Weights pages to disk.

Click on Reset to reset the pilot and copilot weights (in the solo and attack models the copilot weight will be zero), the fuel to maximum and the weapons configuration to guns, rockets and bombs fully armed (attack version).

Exterior Inspection

Attention EZdok camera users: The EZdok camera interferes with the camera controls used by the T-28 during the Exterior Inspection. Select Add-Ons/EZdok camera addon/Global disable to turn off EZdok while using the Exterior Inspection. Don't forget to turn EZdok back on when you have completed the exterior inspection.

Clicking on this section can only be done while the aircraft is on the ground. Clicking on the Exterior Inspection tab will switch the camera view to an external camera located above the left wing and pointed at the engine cowling. A checklist of items will appear on the Animation Manager page and any items that need attention will be noted. Clicking on the NEXT PAGE button will move the camera to the next area for inspection with an appropriate checklist. If any area needs attention you will need to go to the Maintenance Tab to make adjustments.

Checklists Tab

Displays condensed forms of the aircraft checklists as well as the aircraft performance charts. Along the bottom of the page are links which you can use to jump straight to the first page of the Normal or Emergency checklists or the Performance charts. Use the page links to switch between

each page. The first page of the Performance charts show the settings for LOW blower operation up to 15,000' altitude and the second page shows HIGH blower operation 20,000' and above.

Normal Procedures

Displays condensed forms of the aircraft normal checklists. Clicking on the PREV PAGE and NEXT PAGE buttons will step through each checklist.

Emergency Procedures

Displays condensed forms of the aircraft emergency checklists. Clicking on the PREV PAGE and NEXT PAGE buttons will step through each checklist.

Reference Data

The first page of the Performance charts show the settings for LOW blower operation up to 15,000' altitude and the second page shows HIGH blower operation 20,000' and above.

Controls

The T-28 requires some custom coding to reinterpret throttle, mixture and propeller joystick input. If any of these three joystick axis do not work you can use this page to try to recalibrate the T-28. There is a section for throttle lever, mixture lever and propeller lever. Each section has the same controls.

Key is the name of the FSX command being sent by your throttle lever. Move your throttle to see what command is being used.

As you move the throttle you should see the Value change between -16384 and +16384 (note that your joystick range may not reach these exact values. for example, testing with my Saitek produces a range of -16193 to 16192).

If the Value does not change when you move the throttle lever click on Method to change it from 1 to 2. Changing the Method will change the way the throttle lever is read and should resolved most issues with joysticks not being read.

If your throttle does not show any change in Value with either Method 1 or 2 then contact support@antsairplanes.com providing details of the joystick used, any software you use for calibrating the joystick and if you are a FSUIPC user any settings you have for Axis Assignment and Joystick Calibration relating to the Throttle, Mixture and Propeller Levers.

You can calibrate the range of values that your throttle lever sends. Move the throttle to the minimum/idle position and click on Set Min. The Set Min will be set to the current Value. Move the throttle to the maximum position and click on Set Max and calibration will be complete.

ALWAYS USE SET MIN FIRST. The actual values that are saved are Set Min and the Range (which is not displayed). Set Max is equal to Set Min plus the Range. If you Set Max first and then Set Min then you will almost certainly get unexpected results when you move the throttle lever.

You can use the Set Min and Set Max controls to invert or limit the range of your throttle lever if you like. For example, to invert controls move the throttle to maximum and click on Set Min then move the throttle to minimum/idle and click on Set Max.

Repeat the process for the Mixture and Propeller Levers. Remember that the Mixture lever will only move to one of three positions, IDLE CUTOFF, NORM and RICH.

Click on SAVE to save your preferences (note that this will save all your settings on the Animations Page as well). Clicking on RESET will restore your Control settings to the default values.

FSUIPC USERS: Registered users of FSUIPC who use the Joystick Calibration Tab of FSUIPC may notice control levers flicking between positions. This can be reduced by resetting any Joystick Calibration in FSUIPC and using the T-28 Animation Manager Controls to manage Set Min and Set

Max settings.

Maintenance

Allows maintenance to the engine and aircraft. Refer to the Wear and Tear section for more information on these items.

There are three pages which can be selected with the NEXT PAGE and PREV PAGE buttons. The first page shows the status of the aircraft with text descriptions of the state of each part. The next page shows the numerical value of state of each part and is useful for debugging.

The third page may be the most useful when flying the aircraft as it describes any conditions which are currently causing damage to the engine.

Engine

The T-28D was usually equipped with a Wright Cyclone R-1820-56S engine. The source aircraft for this model (VH-TRO) has a R-1820-86A engine and it is that engine that has been modeled. This engine is a 9 cylinder air cooled engine capable of producing 1425 horsepower. The engine is equipped with a single stage, two speed, engine driven supercharger, a direct cranking starter and an injection type carburetor with an electric primer valve.

The throttle, mixture, propeller and carburetor air controls are interconnected between both cockpits.

The supercharger control handle is available in the front cockpit only. The supercharger should be set to the LOW position (handle up) for ground operations and for flight up to approximately 12,000ft. Above this altitude the supercharger should be moved to the HIGH position (handle down). During descent the supercharger handle should be moved to LOW.

FSX NOTE: Correct usage of the supercharger handle is important to get the correct performance from the engine.

Mixture control lever has three settings: RICH, NORMAL and IDLE CUTOFF. The RICH position is used for all ground operations, take-off, climb and landing. The NORMAL position is used for all other normal flight conditions. The IDLE CUTOFF position shuts off fuel flow to stop the engine.

The injection type carburetor on the R-1820 is equipped with an automatic mixture control to maintain the mixture setting selected regardless of changes in altitude or temperature. No intermediate position between RICH and NORMAL or between NORMAL and IDLE CUTOFF should be selected to arbitrarily adjust the mixture.

Due to the way fuel is supplied by gravity to the fuel pump inverted flight for more than 10 seconds should be avoided. Exceeding this limit may cause the engine to cutout.

FSX NOTE: It is recommended that FSX Realism Settings be set so that automixture is turned off for the T-28D mixture control to work best.

Cowl and oil cooler flaps switch

The cowl and oil cooler flaps switch is located on the left console, just ahead of the throttle quadrant. Placing the switch in the open position (left click) will extend both cowl flaps (one on each side of the engine) and the oil cooler flap (on the lower left side of the engine cowling). When the flaps are fully open the switch will automatically return to the off position. Intermediate flaps settings can be selected by returning the switch to the off position (right click). To close the flaps right click and hold. The close position is spring loaded and releasing the mouse button will return the switch to the off position. The flaps can only be operated by the pilot who last actuated the shift control switch. For all ground operations the cowl and oil cooler flaps should be in the fully open position.

Carburetor Air Lever

Located below the throttle lever there are four positions. COLD AIR, WARM, HOT AIR and FILTERED AIR. With the lever in the HOT AIR position the ram-air scoop is closed and hot air from a shroud around the exhaust stack is drawn into the carburetor. When in the COLD air position all carburetor air is admitted through the ram-air scoop. Operation of the Carburetor Air Lever will control the Carburetor Air Temperature.

In the FILTERED AIR position the ram-air and hot-air ducts are closed and air is drawn in through louvres in the top of the cooling and through a filter before entering the carburetor. Filtered air is used in dusty conditions to avoid damaging the engine.

Use caution in the use of the carburetor air handle. Extremely high carburetor air temperatures contribute to detonation and resulting engine damage. Avoid exceeding 38 deg C with the

supercharger in the low position and avoid exceeding 15 deg C with the supercharger in the high position. In addition engine power is reduced by use of alternate air because airflow is decreased.

Ignition Switch

Located to the right of the Instrument Panel the ignition switch controls the left and right engine magnetos. The BOTH position is used at all times the engine is operating except when the left or right magneto is being tested. The OFF position stops the engine by grounding out the ignition system.

Manual Start or Auto Start?

You can choose to start the engine using the manual procedure or an automatic procedure. Right clicking on the engine starter (on the Switch Panel) will start the automatic procedure. Using the FSX key command "Starter 1" will also engage the automatic starter. Full details on how to start the engine are contained within the Normal Procedures.

FSX Note: Using CTRL+E to start the engine will start the engine but it will not run the custom startup routine. Beware using CTRL+E as it will disengage the generator. Ensure the generator switch is on after starting using CTRL+E.

Changing Power Settings

To prevent excessive pressure in the cylinders it is important to adjust the propeller and throttle correctly.

Whenever the engine power is to reduced retard throttle first then the prop lever.

When increasing power advance the prop lever first then the throttle.

Military Power versus Normal Power

Military power is 51.5 in Hg at sea level. Normal Power is 47 in Hg at sea level.

With the supercharger at High and the altitude at 15,000 ft Military Power is 49 in Hg and Normal Power is 43 in Hg.

To prevent excessive engine wear time at military power should be limited to 5 minutes with rich mixture or 30 minutes with normal mixture.

Stopping the Engine

The correct method of stopping the engine is simply to place the mixture control in IDLE CUTOFF without advancing the throttle.

Engine Shutdown Temperatures

It is very important to idle the engine until cylinder head temperatures have dropped to 150 degrees Celsius or less before shutting down. Cylinder heads will usually be cooled by the time the parking area is reached as long as cowl and oil cooler flaps are fully open. In hot weather the temperature may not go down to 150 degrees Celsius. In this case the engine should be shut down when the temperature has stabilised. Maintain 1200 rpm during the cool down to provide prop wash cooling.

It should also be noted that the engine should be run for 60 seconds at 1200 rpm prior to stopping. In a radial engine the lower cylinders are vulnerable to the flow of oil into the cylinder head when the engine is stopped. This may cause liquid lock on a subsequent start. Liquid lock will place severe loads on the engine and connecting rods have been bent when an attempt has been made to start a liquid locked engine. Under normal operation the scavenge oil pumps can easily return all oil accumulating in the engine sumps. However, at lower rpm the scavenge pumps are relatively inefficient and may not be able to scavenge all the oil unless a sufficient time period is allowed for this purpose.

Oil System

The engine lubrication is supplied from an 8.8 gallon oil tank.

An oil dilution system (Switch Panel) that dilutes the oil with gasoline before engine shutdown to lower the viscosity of the oil whenever a cold weather start is anticipated.

A magnetic chip detector warning light on the instrument panel indicates the presence of metal particles in the engine oil system. If this light indicates during flight then a landing should be made as soon as possible.

Fuel System

Each wing contains a single fuel tank. These tanks are interconnected and fuel flows equally from both tanks to a sump tank located within the fuselage. A single boost pump in the sump tank in the fuselage pumps fuel to the engine-driven fuel pump. There is no user controllable fuel pump in this aircraft.

A gauge on the Instrument Panel indicates the total fuel quantity in pounds. Total usable fuel is 1044 pounds. An amber light will indicate if the fuel level is low.

The fuel cutoff handle is located on the left console.

Control Shift System

All instruments essential to flight are duplicated within both cockpits so the aircraft can be flown by either pilot. However, certain systems may only be controlled by one cockpit at a time. These systems are the battery, generator, inverters, starter, cowl and oil cooler flaps and all external lights.

Each cockpit has a Cont. Shift switch located on the Switch Panel. Activating this switch will transfer control to that cockpit. A light adjacent to the switch will indicate when control is obtained. The rear cockpit Cont. Shift switch can override the front switch. Note that control of the radio equipment is separately switched using the radio control panel.

Electrical Power System

Control of the electrical system is maintained in only one cockpit at a time. Control is obtained by operating the control shift switch on the Switch Panel.

Battery switch

Located on the Switch Panel turns on or off the battery.

Generator switch

Located on the Switch Panel and is guarded. Click on the guard to access the generator switch. Closing the guard moves the generator switch to the ON position. The OFF position disconnects the generator and the RESET position reconnects the generator if it has been automatically disconnected because of an overvoltage condition.

Note that the generator only becomes operative with the engine operating above 1100 rpm.

Generator Volts

A voltmeter on the Instrument Panel indicates generator voltage output. The generator will only be active when the engine is operating above 1100 rpm. Normal indication is approximately 28 volts. If the voltage exceeds 31 volts then the generator overvoltage red light on the Switch Panel will light up.

Generator Load

A loadmeter on the Instrument Panel indicates percentage of generator output being used by the

electrical system. The generator can deliver up to 200 amps. An indication of 0.5 means the generator is delivering 100 amps.

Generator Overvoltage Light

A red light on the switch panel indicates if the generator voltage exceeds 31 volts. The generator will be disconnected from the electrical system.

Inverter Switch

An inverter switch on the Switch Panel supplies main bus power to the main and spare inverter. The inverters provide AC power to the Radio compass, attitude indicators and directional indicator. Should the main inverter fail the spare inverter will automatically connect. Failure of the main or spare inverter is indicated by warning lights on the Switch Panel. The amber MAIN OUT indicates failure of the main inverter. The red BOTH OUT indicates both inverters are off.

Hydraulic Power System

Hydraulic power is used to operate the landing gear, wing flaps, canopy and nose wheel steering.

The hydraulic system is an on demand system. In normal flight the hydraulic system will be depressurised. When any hydraulic control is operated the pressure will build up to operate the system. Pressure is maintained within the system whenever the gear or flaps are down or in any position other than up and locked.

In case of hydraulic pump failure the hand pump can be used to operate the hydraulically controlled systems (no effect in FSX).

Flight Control System

Ailerons and Elevators are controlled by the control stick.

Interconnected rudder pedals control the rudder and nose wheel steering. Wheel brakes are actuated by pressure on the top of the rudder pedals.

A rudder pedal release lever at the bottom of the Instrument Panel allows the user to adjust the pedals for the desired leg length. Click and hold the rudder pedal release lever, move the rudder pedals using your joystick or rudder pedals and then release the rudder pedal release lever to set the new pedal position.

The aileron, elevator and rudder trim tab control wheels (Left Console) allow adjustment of the trim tabs. The aileron control only affects the left aileron trim tab. The tab on the right aileron is adjusted only on the ground (use the Animation Manager to adjust the right aileron trim tab).

The trim tabs are available as a 2D popup to allow easier adjustment of these controls.

The flight controls can be locked by using the control lock in the front cockpit. Click on the control lock and it will raise into position and lock the flight controls. When the throttle is closed it will be locked into position until the control lock is released. Use of the control lock during flight is not recommended.

Wing Flaps

The wing flaps are hydraulically operated and may be set to UP, 1/4, 1/2, 3/4 or full DOWN. The flaps lower 37 degrees when in the full DOWN position.

The flaps can be extended to 50 degrees which enables the pilot to use the steps on the flaps. An external manual lever allows the flaps to be extended down by pulling the lever and manually pushing the flaps down to 50 degrees. In this aircraft, right clicking on the flaps lever when in the DOWN position will extend the flaps to the 50 degree position. This is only possible when the engine is stopped. If the flaps are in the extended position when the engine is started then hydraulic pressure will automatically move the flaps to 37 degrees.

FSX NOTE: Right click on the flaps lever with the engines off to extend the flaps to the 50 degree down position. The flaps cannot be extended to 50 degrees when hydraulic pressure is present (i.e. the engine is running).

Landing Gear System

The retractable tricycle landing gear is hydraulically operated. The landing gear handle is on the left of the Instrument Panel in each cockpit.

Landing gear position indicators are located on the lower left of each Instrument Panel. Each indicator shows cross hatching if the gear is in any unlocked condition or if there is no electrical power. The word "UP" appears when the gear is up and locked (normal flight condition). A diagram of a wheel appears when the gear is down and locked and there is electrical power (i.e. the battery is on).

Landing Gear Warning Light and Horn

The landing gear handle includes a red light. The light comes whenever the gear is in any unlocked position. It also comes on if the gear is up and locked and the throttle is retarded to below cruising speed. A warning horn will also sound under these same conditions. A horn silencer button is located on the base of the throttle quadrant. Pressing this button will silence the warning horn but the gear handle light will still come on. Advancing the throttle will reset the horn silencer.

Landing Gear Ground Safety Locks

Red "REMOVE BEFORE FLIGHT" streamers are attached to a pin which is inserted into the gear to prevent accidental retraction of the landing gear on the ground. This streamer is removed when you deselect "Pitot Cover" in the Animation Manager.

Exterior Gear Position Lights

To aid in determining gear position from the ground at night each gear strut has a small white light installed. Each light comes on when the related gear is down and locked and the position (navigation) lights are turned on.

Canopy

The T-28D canopy is usually hydraulically operated although manual operation is possible if there is no hydraulic pressure. Left click on the canopy control and the lever will automatically be moved to the appropriate position.

A pressurised air cylinder can be used to open the canopy in an emergency. Right click to operate the emergency open. Emergency operation can only be used once. You will need to reset the air cylinder using the Animation Manager after use of the emergency open.

Lighting System

Exterior Lights

A retractable landing /taxi light is located in each wing. The landing light switch is located to the left of the Instrument Panel. Place the switch in the Extend On will extend the landing lights and turn them on. It takes a few seconds for the landing lights to extend. Landing lights should not be extended at speeds above 140kts.

FSX NOTE: These landing lights use the Lotussim style landing light system.

Position lights (navigation lights) are located on the tip of each wing and on the rudder. The lights are controlled by a switch on the Switch Panel and can be set to STEADY, FLASH or OFF (use left and right mouse clicks to switch between each position). If set to FLASH the lights flash at a rate of approximately 40 flashes per minute. A dimmer switch can control the intensity of the position lights. Two settings are available, BRIGHT or DIM.

Fuselage lights are located on the top and bottom of the fuselage. These are red rotating beacon lights. The Fuselage light switch (located on the Switch Panel) has three positions: BRIGHT, DIM or OFF. Use left and right mouse clicks to switch between each position.

This aircraft is not fitted with a passing light (although there is a passing light switch on the Switch Panel).

To aid in determining gear position from the ground at night each gear strut has a small white light installed. Each light comes on when the related gear is down and locked and the position (navigation) lights are turned on. These lights will come on automatically and are not controlled by the pilot.

Interior Lights

Located on each Switch Panel are rheostats for controlling the interior lighting. The rheostats allow the pilot to control the intensity of each set of lights. If the rheostat is turned fully left then the light will be turned off. Any other position will turn the light on.

The aircraft has an extensive interior lighting system which allows any combination of lights to be set. Each cockpit has individually lighting controls.

The Instrument Panel is lit by either red lights or ultraviolet lights or any combination of these two lighting systems. The UV lights have a switch which must be set to ON to operate the UV lights. The UV lighting is a black light that reacts with special paint on the instrument dials.

The Sw. Panel rheostat controls the intensity of red edge lighting within the Switch Panel.

The Console rheostat controls the intensity of red lights located above the left and right consoles.

A Radio Panel rheostat is located to the right of the radios on the right console and this light controls red edge lighting within the radio instruments.

The Standby Compass (located on the top left of the cockpit) is lit by the Standby Compass switch on the Switch Panel in the front cockpit.

To the right of each pilot there is a red utility light. Turn this light on by clicking on the light itself. As this is difficult to access you may turn on these lights using the Animation Manager (shift+4).

FSX NOTE: Using the panel lights key command will turn on or off all interior lighting. The aircraft will remember your preferred settings and restore them when you press the panel key. These settings will be saved as part of your preferences when you save your settings using the Animation Manager.

Oxygen System

The aircraft is fitted with a gaseous oxygen system. Included in the system is a pressure-breathing, diluter demand regulator, a blinker type flow indicator and a pressure gauge in each cockpit. The oxygen system may be refilled by using the Animation Manager (shift+4, Animation Tab). Normal pressure for takeoff is between 400 and 450 psi.

Oxygen regulator

The oxygen regulators are located to the right of the instrument panel in the front cockpit and above the right console in the rear cockpit. The regulator automatically supplies a proper mixture of air and oxygen at all altitudes. The diluter level should always be at NORMAL OXYGEN except in an emergency. Oxygen supply duration is considerably reduced with the diluter level at 100% OXYGEN.

The emergency valve knob should be opened only in an emergency. Turning the knob counter clockwise opens the valve and directs a steady stream of oxygen into the mask.

FSX NOTE: To use oxygen the pilot and copilot should be wearing the oxygen mask. Use the

Animation Manager (shift+4, Animation Tab) to set the position of the oxygen mask. Oxygen masks need only be worn above 10,000' altitude. The blinker flow indicator will display the use of oxygen. The T-28D will determine if there are two pilots if the passenger weight is greater than zero and the copilot is visible in the exterior view.

Oxygen Pressure Gauge

The pressure gauge is to the right of the Instrument Panel in both cockpits and registers the oxygen cylinder pressure.

Oxygen Flow Indicator

The oxygen flow indicator is to the right of the Instrument Panel in both cockpits and shows that oxygen is flowing though the regulator. The eye of the indicator blinks with each breath. When the emergency valve is opened the indicator does not blink but remains open.

Oxygen Duration

The table displays the oxygen duration in hours with two crew members. Double the figures when flying solo. Note that oxygen supply is insufficient to last total time aircraft can remain aloft.

	Gauge Pressure PSI							
Altitude	400	350	300	250	200	150	100	<100
25,000	2.1	1.8	1.5	1.2	0.9	0.6	0.3	Descend to altitude not requiring oxygen
20,000	2.4	2.0	1.7	1.3	1.0	0.7	0.3	
15,000	2.9	2.4	2.0	1.6	1.2	0.8	0.4	
10,000	3.8	3.3	2.7	2.2	1.6	1.1	0.5	

Radios

The aircraft features a period radio set typical of those used on original T28 aircraft. However, some adjustments have been made to make this more usable within the FSX world.

Interphone

Starting at the top of the radio stack is the Interphone panel which provides intercockpit communication. This is largely just for show in FSX. The only switches that operate here are the Marker, ADF and VHF Nav switches on the top right which allow the pilot to hear the Morse code signals from these radio stations.

ADF Radio

Provides ADF navigation communication. The lower right has a MODE knob. To operate the ADF you first need to ensure you have control of the radio. Move the MODE knob into the spring loaded CONT position to obtain control of the ADF radio. Unlike the other radios there is no light to indicate you have control. You can check you have control by moving the LOOP knob into any position other than centred. If you have control and there is power available (ensure the inverter switch is on as the ADF radio uses DC power) then the loop antenna located above and behind the rear seat will rotate in the direction and speed set by the LOOP knob.

Once you have established that you have control of the ADF radio place the MODE into the ADF position. The ADF frequency is selected by rotating the Band Select knob and then using the Tuning knob to select the desired station.

Use the mouse wheel to make coarse changes to the Tuning knob setting. Finer changes can be made by left and right clicking or clicking and dragging the Tuning knob.

Needle 1 on the Radio Magnetic Indicator on the Instrument Panel will display the heading to the station.

UHF Command

UHF command radio has 18 preset comm channels in addition to one guard station. Select the desired channel using the CHANNEL knob. If the mode is set to T/R then the radio will be on. Setting the mode to T/R+G REC will allow the current channel and guard (G) channel to be heard at the same time.

To the right of the radios in the front cockpit only is a card with the comm frequencies for each channel displayed. These can be edited by simply clicking on the frequency to alter either the whole number or the fractions. Use left and right mouse clicks or the mouse wheel to adjust the frequency. This card is available as a 2D popup for easier adjustment (shift+3).

If you use the FSX Air Traffic Control system to change radio frequencies then those frequencies will be written into the current channel and displayed on the card. You could use this to easily program the channels. For example, select channel 1 then use the FSX ATC system to select the ATIS frequency. Then select channel 2 and use the FSX ATC system to select the Ground frequency. You can now switch between ATIS and Ground by selecting either channel 1 or 2. Alternatively you could put the ATIS frequency into the guard (G) channel and the ground frequency into channel 1. Changing the mode to T/R+G REC would then allow you to hear ATIS and Ground at the same time.

Control of the UHF Command radio is switched between cockpits by using the UHF command switch in the radio Control Shift panel. Move the switch to gain control of the radio. An amber light will indicate that you have control.

If you select save settings using the Animation Manager then the current frequencies will be saved as part of your preferences.

FSX NOTE: In the FSX world communication is over the VHF frequency ranges and UHF is no longer used for communication. This radio has been modified to work with VHF frequencies and is therefore misnamed. No points for any rivet counters who point out this discrepancy.

VHF Nav

Provides VHF navigation. Whole numbers for the desired radio frequency are selected by clicking on the cover of the frequency display (in the real aircraft a dial is located beneath this cover, this is difficult to access using a mouse) . Fractions are adjusted using the knob in the centre.

Lateral and vertical deviation is displayed on the Course Indicator on the Instrument Panel. The Course Indicator has a knob for adjusting the OBS setting. A Marker light is also on the Course Indicator to indicate if the aircraft is passing over any ILS marker. To the left of the Course Indicator is a light displaying which cockpit has control of the VHF Nav. If the light is lit in your cockpit then you do not have control.

Needle 2 on the Radio Magnetic Indicator on the Instrument Panel will display the heading to the station.

Control of the VHF nav is switched between cockpits by using the VHF NAV-GYRO COMP switch in the radio Control Shift panel. Move the switch to gain control of the radio.

Control Shift

Allows control of the UHF Command and VHF Nav radios to be switched between cockpits. An amber light indicates if you have control. To switch control simply move the appropriate switch. The UHF Command switch will give you control of the comms radio. The VHF NAV-GYRO COMP switch will give you control of the VHF Nav radio.

Note that the ADF radio control is switched by moving the ADF radio MODE knob to the spring loaded CONT position.

Transponder

Rather than spoil the appearance of the VC with a modern transponder (which was not available on the original aircraft) the transponder is only available as a 2D popup (shift + 6).

Navigation Instruments

Radio Magnetic Indicator (RMI)

The compass card of the RMI rotates to indicate the gyro magnetic compass. The index mark at the top of the instrument acts as a lubber line.

The No. 1 pointer indicates the heading to the ADF station set by the ADF radio.

The No. 2 pointer indicates the magnetic bearing to the VOR station set by the VHF NAV radio.

Course Indicator

The course indicator on each instrument panel consists of vertical and horizontal crossbars, a magnetic heading pointer , a "TO-FROM" indicator and the "COURSE" indicator. The vertical crossbar moves laterally to indicate the lateral deviation from a selected VOR or ILS course.

The horizontal crossbar is used in conjunction with ILS glide slope receivers and indicates the deviation above or below the glide slope.

A red signal flag appears for each crossbar whenever there is insufficient signal.

The magnetic heading indicator (identified by the white circle on the needle) indicates the angle between the compass heading and the course set into the course indicator. The indicator facilitates reading for wind correction and desired track.

The "TO-FROM" indicator indicates whether the selected course is to or from the station being received. If there is no signal then the window will show neither.

A marker light is in the upper right of the instrument and comes on when the aircraft is directly over marker beacon facilities (ie ILS markers).

The knob in the lower left allows adjustment of the desired course.

Wear and Tear Effects

Using the Animation Manager (shift+4) you can turn on or off the engine wear and tear effects for the T-28D. By default these effects are turned off.

The wear and tear effects simulate engine damage and with this effect turned on the pilot must be careful to ensure proper operation of the aircraft to avoid unexpected engine failure. Using the Exterior Inspection of the Animation Manager will show any items that require maintenance.

To turn on wear and tear effects open the Animation Manager (shift+4) and from the front cover click on the Animations page. If you are not on the front cover when the Animation Manager opens click on the FRONT COVER button on the very top of the page.

Note that turning off wear and tear will not repair any aircraft damage, it will only prevent further damage occurring. Any engine damage should be fixed with the Maintenance page of the Animation Manager.

Engine Damage Summary

Open the Animation Manager (shift+4) and from the front cover select the Maintenance tab. Click on NEXT PAGE twice to display the Engine Damage Summary. This page displays any current conditions which are causing engine damage, propeller damage or spark plug fouling. You may like to keep this page open during your first few flights as it provides a handy real time reminder on how to fly the plane within acceptable limits.

Note: This page will display the causes of any damage. Damage will only occur if wear and tear effects are on.

Maintenance

To perform maintenance open the Animation Manager (shift+4) and from the front cover click on the Maintenance Tab.

Note that wear and tear is individually stored for each of the six variants but not for each repaint. For example, all the T-28B Dual repaints share wear and tear settings.

The Maintenance section has 3 pages which can be selected with the NEXT PAGE and PREV PAGE buttons. The first and second pages are the same except the second page displays engine status with numerical values rather than the text descriptions use on the first page. There are 5 sections on the first and second pages which are described as follows:

Engine

Total hours shows the total hours flown since buying the aircraft. Hours since last overhaul is the number of hours since the engine was last fixed. Status can be either Good, Poor, Bad, Repair or FAILED. An engine with a Bad or Repair status will likely have a smoky exhaust and will consume more oil than normal. An engine that has failed will not operate and must be repaired. An engine with a Repair status is likely to fail shortly and should be repaired as soon as possible.

Propeller

Propeller hours are the total hours since the prop was last changed. Prop governor shows the condition of the prop governor and can be either Good, Poor, Bad, Repair or FAILED. A prop governor with a Repair status is likely to fail shortly and should be repaired as soon as possible.

Fluids and Pressures

Oil level is the most important number as radial engines like to drink oil. The oil tank holds 12.2 gallons although 3.4 is unusable. The oil level should be between 5 and 12.2 gallons for optimum engine performance. If the oil level drops below 5 gallons the efficacy of the oil system is comprised resulting in higher engine temperatures. Any less than 3.4 gallons and the oil system is

severely comprised and engine failure is likely.

A typical 2 hour flight can easily consume 1 gallon of oil.

The hydraulic reservoir has a capacity of 2.5 gallons. If the engine is in need of repair then a hydraulic leak is possible. If the hydraulic reservoir is empty then it is likely that the hydraulic system will fail.

Oxygen level is the total pressure of the oxygen system. Using the oxygen masks will drain the oxygen system. The oxygen should be pressurised to 450 psi at the start of each flight.

Emerg. Hydraulic is the emergency hydraulic pressure used to operate the canopy in an emergency. This should be 1500 psi.

Tires

Shows the pressure of the landing gear tires. The front tire should be between 52 and 55 psi while the main gear should be between 77 and 80 psi. Click on FILL to pump them up. Tires will naturally lose pressure over time. Tires will lose pressure more quickly during landing and takeoff. If doing touch and gos keep an eye on the tire pressures.

Electrical

Shows the hydrometer reading. This should be between 1.275 and 1.300. If less than 1.240 replace the battery.

Antiskid Brakes

Pilots using a button or key press to control brakes rather than rudder pedal toe brakes may experience brake lockup as brakes controlled by buttons or key presses are either fully on or fully off. It is recommended that these users leave antiskid brakes on (ticked). Unticking antiskid brakes is only recommended for those pilots with rudder pedals and toe brakes. Click on SAVE on the Animations tab to always use this antiskid brake setting.

Factors affecting wear and tear

Proper operation of the engine within temperature limits ensures long life of the engine. Operating outside the limits increases engine wear and tear which can lead to engine failure at inopportune times.

Proper warmup

Allow the engine to warm up before operating above 1600 rpm. The warm up should be performed with the engine operating between 1200 and 1600 rpm and the cowl flaps open (do not rush the warm up). Operating the engine above 1600 rpm when the CHT is below 130 deg C can lead to excessive wear.

Note that on the maintenance page you will get a warning when the engine temp is below 130 deg C. This is unavoidable and the damage is very minor. Also during warmup you will get a SP Fouling: MPx100 less than RPM. Again this is unavoidable. Avoid excessive idling during ground operations. To clear spark plug fouling during warm up increase manifold pressure to field pressure for 30 seconds every 10 minutes.

Proper cool down

This is one of the most important factors in engine wear. A large amount of heat is generated during flight and this is retained after shutdown. Without any cooling airflow over the engine the retained heat can spread throughout the engine resulting in warped or cracked intake pipes, warped rocker box covers, damage to insulation on electrical wires, magnetos or generators.

For this reason it is very important to idle the engine until cylinder head temperatures have dropped below 150 deg C before shutting down.

Maintain CHT within limits

During flight it is important to maintain cylinder head temperature within 150 - 245 deg C. Operation outside of these temperatures may contribute to engine damage or detonation. Ensure proper use of cowl flaps during climb to ensure the engine does not get too hot.

Maintain Carburetor Air temperature

Excessive carburetor air temperature can lead to detonation which will lead to engine damage. Maintain carburetor air temperature below 38 deg C with the Supercharger in the LOW position and below 15 deg C with the Supercharger in the HIGH position.

Check Oil Level

Radial engines have very high oil consumption rates (especially when compared to modern aircraft). If the oil level is below 5 gallons then this may lead to increased oil and engine temperatures and decreased oil pressure. If the oil level is below 3.4 gallons then engine failure is very likely very soon. Oil consumption is dependent on engine power with typical oil consumption of 0.5 gallons per hour. A worn or damaged engine will have higher oil consumption. The Pilot should check the oil level before the start of each flight.

High RPM/Low Map Operation

Operation at high rpm and low RPM is one of the major causes of master rod bearing, piston and ring failures. A minimum of 1 inch MAP for each 100 rpm should be maintained during descents.

Avoid excessive RPM

Operation above the 2700 rpm limit will place stress on the engine and prop governor. Fast throttle bursts should be avoided above 2500 rpm. Due to the rapid acceleration of the engine the engine will overspeed before sufficient high pressure oil can be supplied to the governor to correct the overspeeding condition.

Prop Governor Failure

If the prop governor fails the most likely situation is the prop will fail to a high rpm , low pitch condition resulting in a runaway propeller. If the propeller RPM suddenly increases (and engine manifold pressure increases as well) prompt action is required. Retard the throttle, climb to load the propeller (reduce airspeed to below 150kts for best chance of recovering control of the prop), manipulate the prop control lever to restore governing. Land as soon as practicable.

Detonation

Detonation is the result of one type of abnormal combustion of part of the fuel air mixture. When detonation occurs combustion progresses normally during initial burning then at some point the rate of combustion speeds up tremendously resulting in an explosion. This explosion pounds the cylinder walls producing "knock". In flight the knock is not heard due to other engine noises but it can be detected by observation of a short sharp flame from the engine exhaust. Engine power is also reduced during detonation. Contributing causes of detonation are:

- High cylinder head temperature caused by too long a climb at too low an airspeed or by cowl flaps not being adjusted correctly.

- High mixture temperature caused by improper use of carburetor air control handle.

Spark Plug Fouling

Spark plug fouling is a principal cause of ignition trouble which in turn is one of the most common engine maintenance and operating problems. The problem of fouling during various phases of flight are discussed in the next few paragraphs along with recommended measures for prevention and elimination.

Ground Operation

Prolonged ground running at idle rpm, particularly with rich mixture. Symptoms include excessive rpm drop during ignition check at field barometric pressure. Prevention involves ensuring ground operations are kept to a minimum. Elimination of fouling is less dependable than adequate preventive measures. However, after each 10 minutes of ground operation the engine should be operated at a manifold pressure equal to the field barometric pressure for a short period.

Take Off

Fouling can occur during takeoff as the rapid change in combustion temperatures and pressures under take off are favourable to spark plug misfiring. Prevention is best achieved by ensuring cylinder head temperatures are within limits and not too cool. Reduce MAP 2 to 5 inches or as required to restore smooth engine operation.

Cruise

Conditions favourable to fouling include long continued application of a given set of engine conditions typical of cruise flight. Associated contributing factors include abnormally cool cylinder head temperatures and low manifold pressure at high engine rpm. A periodic change in power settings will usually forestall fouling. Each hour of cruise flight should be followed by any of the following actions: flight in rich mixture for 5 minutes; change of 3 to 5 inches MAP; or a change of 100 to 130 rpm.

Descent

Contributing factors to fouling are low cylinder head temperatures, low manifold pressure with high engine rpm or low carburetor air temperatures. Use power settings to maintain engine conditions approximating cruise power levels. During descent maintain at least 1 inch MAP per 100 rpm (20 inch MAP and 2000 rpm is preferable to 15 inch MAP and 2500 rpm) Use 15 to 20 deg C Carburetor air temperature to aid in distribution, to avoid engine cooling and to prevent icing.

Notes about the smoke system

The effects of a worn engine are generated using the FSX smoke system. Using the Toggle Smoke key command the pilot can turn on and off a smoke effect (T-28s are not usually fitted with a smoke system but in the FSX world people like them). If the pilot would like to edit the smoke effect in the aircraft.cfg he should only edit Smoke.0 (as this is the usual smoke effect). They should not change Smoke.1, Smoke.2 or Smoke.3 as these are used for the effects of the worn engine. If the pilot would like to add additional smoke streams he should use Smoke.3 and onwards. Special coding is used to control Smoke.1, Smoke.2 and Smoke.3 independently of the FSX smoke system and smoke key commands.

Propeller Torque Effects

Using the Animation Manager (shift+4) you can turn on or off the Realistic Prop Torque Effect for the T-28D. In real aircraft the various propeller effects will affect the pitch, yaw and roll of the aircraft during flight. Realistic Prop Torque Effects will more accurately reflect these changes. If you change the Realistic Prop Torque Effect setting you must Save the setting and quit FSX and restart for the change to take effect. Alternatively you can use the FSX Aircraft (reload) key command reset the aircraft.

The Trojan will respond to these propeller torque effects and it will be necessary for the pilot to use rudder trim to compensate. It is recommended that you use the FSX controls to assign rudder trim left and right to key or joystick commands to allow easy adjustment of trim. The trim panel is also available as a 2D popup (shift+2) to allow easy access to the trim controls.

There are four ways that the motion of the propeller affects the aircraft. In all these discussions it is assumed that the propeller rotates in a clockwise direction as seen from the cockpit. Most aircraft do this but there are some that rotate anti clockwise (e.g. the Tiger Moth).

Propeller Torque

As the propeller rotates there is an opposite rotation in the aircraft. This is most noticeable in a helicopter where a tail rotor is needed to prevent the helicopter spinning in the opposite direction to the main rotors. In an aircraft where the propeller is rotating clockwise (as seen from the cockpit) there is a small roll to the left (anti clockwise). At higher speeds the wings movement through the air helps counteract this roll. The propeller torque is most noticeable at slow speeds and high engine rpm. i.e. at takeoff or a go-around. The pilot needs to apply some right aileron at these times to maintain level flight.

Gyroscopic Precession

Gyroscopic precession is caused when a force is applied to a rotating disk. In an aircraft the rotating disk is the propeller and engine. The force applied is either by pitch up/down or rudder left/right. Gyroscopic precession is most noticeable in a tail dragger aircraft during takeoff when the tail wheel lifts off the ground.

In this situation the propeller is pitched down as the body of the aircraft moves parallel to the ground. We can then think of a pushing force acting on the top of the propeller disk and a pulling force acting on the bottom of the propeller disk.

Since the propeller is rotating these forces will not act at these points but will be offset 90 degrees. With a propeller turning to the right that means the pushing force will be on the right side of the disk and the pulling force on the left side of the disk. The end result will be a yaw to the left.

In flight anytime push forward on the stick there will need to be some right rudder to compensate for gyroscopic precession. Pull back on the stick and left rudder will be needed.

In reality these actions are very subtle in a typical aircraft. The effect is most noticeable in aerobatic aircraft or tail draggers during takeoff when lifting the rear wheel.

P-Factor

P-factor is a term for asymmetric or unbalanced propeller loading. If the propeller is not meeting the oncoming airflow head on then the upward moving blade on the left side generates less thrust than the downward moving blade on the right side. This provides more thrust to the right side of the aircraft which yaws the aircraft to the left.

At high power settings and high angles of attack (i.e. slower airspeeds) p-factor is more noticeable.

P-factor is most noticeable in tail dragger aircraft as the propeller is distinctly angled to the airflow during the start of the takeoff roll. Tricycle geared aircraft maintain a level attitude during the takeoff

roll so there is little P-factor until lift off. P-factor is a weaker force than prop wash.

Prop Wash

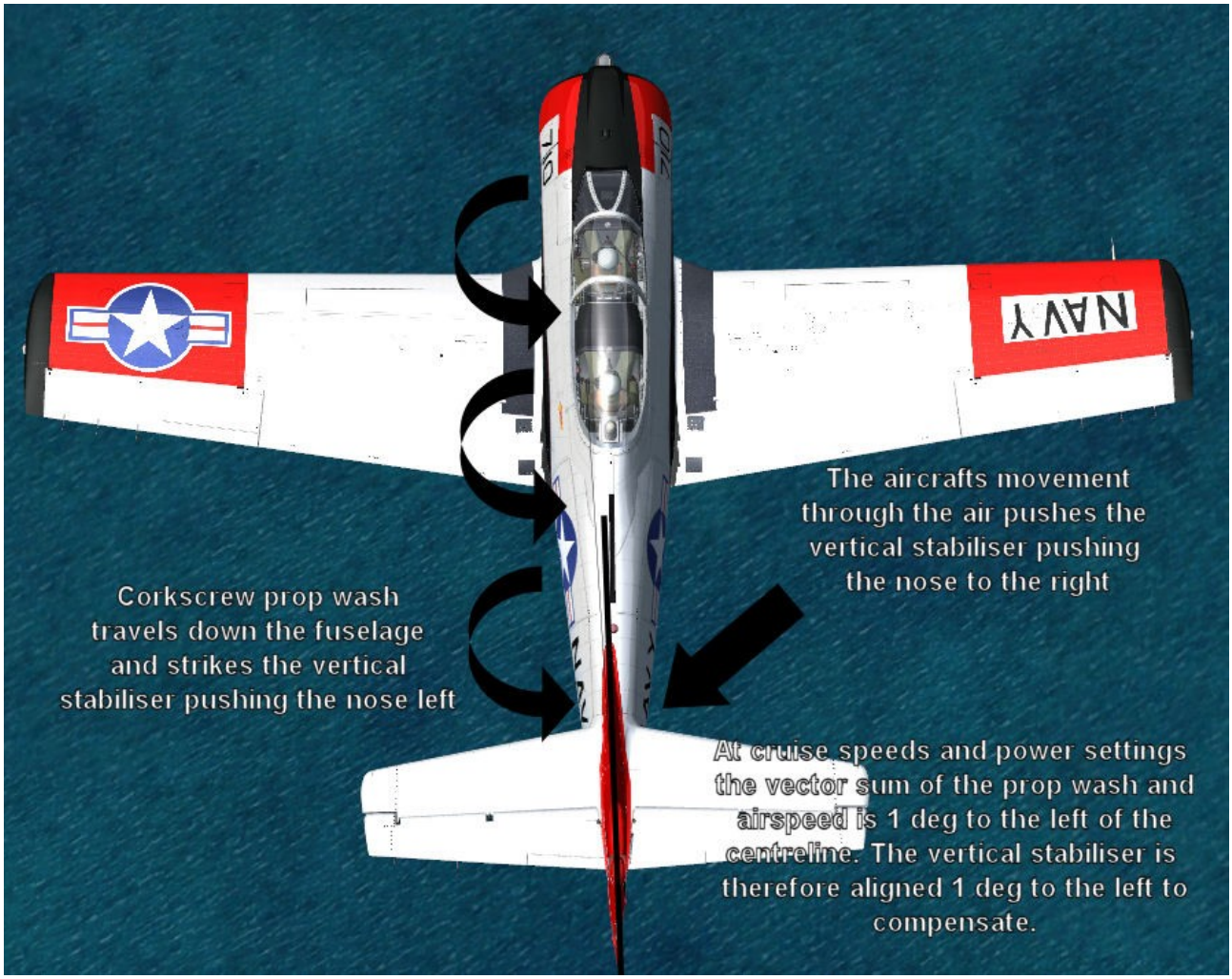
As the propeller rotates the prop wash rotates clockwise as it travels down the fuselage. This prop wash strikes the left side of the vertical stabiliser which pushes the tail right and the nose left.

The effect is most pronounced at high power settings and low airspeeds (i.e. at take off or a go around).

As the airspeed increases the free airstream passing the aircraft pushes against the right side of the vertical stabiliser and helps to counteract the prop wash. In addition the prop wash is more elongated and thus has less force

In the T-28D these left and right pushing forces are almost in complete balance at normal cruising speeds. The vertical stabiliser of the T-28D is actually offset by one degree to the left to balance the prop wash and free airstream.

At conditions other than normal cruise speed use of the rudder trim will be necessary to maintain straight flight. For example, when starting the descent the power will be reduced but the airspeed will remain around the same as cruise speed. The aircraft will then yaw to the right (due to the vertical stabiliser being offset) so left rudder trim will be necessary.



VC Rain and Fog Effects

Using the Animations page of the Animation Manager (shift+4) the pilot can set whether they would like to display various effects on the canopy. Each effect is described below

Rain effects

Shows raindrops on the canopy when there is rain or snow.

Fog effects

During cold conditions (ie air temperature below 5 deg C) if the pilot executes a rapid descent (in excess of 3000fpm) it is possible that fog will form inside the canopy which will reduce visibility.

To reduce the chance of fog ensure the following:

- Cockpit Air Control is OPEN

- Window and Canopy defrost is ON

- Cockpit Heater Control is ON (turn to max temp to provide more effective defogging)

Fog can be quickly cleared by opening the canopy.

If the pilot is planning on making a rapid descent (eg a dive bomb attack) then he should set the canopy defrost controls appropriately before starting the descent to avoid canopy fogging.

Ice effects

In icing conditions the pilot may notice buildup of ice on the edges of the canopy. To reduce the possibility of ice forming the pilot should ensure the following:

- Cockpit Air Control is OPEN

- Window and Canopy defrost is ON

- Cockpit Heater Control is ON (turn to max temp to provide more effective deicing)

- Ensure pitot heat is ON

Structural ice effects

In icing conditions the pilot may notice a buildup of ice along the leading edges of the wings and the horizontal and vertical stabilisers.

There is no structural deice in the T-28 so the pilot should avoid flying through known or forecast icing conditions.

VC Transparency

This function has 4 settings which control the transparency of dirt and dust on the canopy. The pilot can select from Maximum (which shows the most dirt and dust), Medium, Minimum or Clear (which makes the canopy completely transparent).

FLIGHT TRAINING

This section will discuss the flight characteristics of the T-28 and is recommended reading for all student pilots.

Straight and level flight

Straight and level flight is a condition in which the aircraft is flown holding a constant altitude and heading. The T-28 can be flown in straight and level flight at varying airspeeds however the most common condition, known as NORMAL CRUISE is 180 kts of airspeed, 2000 rpm, with sufficient manifold pressure to maintain altitude, approximately 28 to 30 in Hg with mixture set to NORMAL.

Straight and level flight requires almost no pressure on the controls provided the aircraft is properly trimmed and the air is smooth. When the air is rough the flight attitude may change with each bump. Do not fight the controls to prevent these bumps, just make smooth adjustment in the flight attitude.

Climb

The climb is accomplished by combining nose attitude and power. The normal climb is the attitude and airspeed at which an aircraft climbs most efficiently at climbing power. The most efficient climbing airspeed for the T-28 is 140 kts at sea level. This airspeed will decrease 1 knot for each 1000 feet of altitude while maintaining a constant nose attitude.

To make the transition to a climb from normal cruise:

1. Raise the nose to the climbing attitude.

2. Select mixture RICH.

3. Advance the propeller control to 2400 rpm

4. Advance the throttle to 36 in Hg or the stop (At higher altitudes the aircraft will be unable to generate 36 in Hg). Retrim for the climbing airspeed (elevator and rudder trim) and adjust the cowl and oil cooler flaps as necessary to maintain the cylinder head and oil temperatures within limits.

As the airspeed decreases and the power increases the prop wash effect will be more noticeable. To maintain heading and balanced flight it will be necessary to increase right rudder pressure smoothly as the airspeed decreases and to relieve this increasing rudder pressure by constantly trimming the aircraft.

500 ft prior to the desired altitude cowl and oil cooler flaps should be closed, temperatures permitting. The transition from a climb to normal cruise is starter approximately 100 ft prior by smoothly lowering the nose toward the level flight attitude. As the airspeed increases apply forward stick to prevent the aircraft from climbing and left rudder to prevent yaw. Constantly retrim to relieve control pressures.

When the airspeed has increased to 170 kts retard the throttle to 28 in Hg, adjust the propeller to 2000 rpm and place the mixture in normal and retrim.

Descent

The T-28 can descend at various airspeeds and power settings however the normal descent is performed at 170 to 220 kts.

To transition from normal cruise to a normal descent lower the nose smoothly to a descending attitude and adjust manifold pressure so as not to exceed limits. Allow airspeed to increase as desired. Retrim the aircraft.

To return to normal cruise from a normal descent smoothly advance the throttle to normal cruise power when about 50 feet above the desired altitude and simultaneously raise the nose to the normal cruise attitude. Level off at the desired altitude with 180 kts or more of airspeed and allow

the airplane to seek airspeed consistent with the power setting. Don't forget to retrim.

The Turn

During the execution of a turn coordinated use of all three flight controls is required. Failure to maintain balanced flight in a turn not only produces a sloppy inefficient turn but also places the aircraft in an unsafe flight condition during the landing approach.

Establishing the desired angle of bank will require coordinated aileron and rudder. To make a left turn use aileron to bank the aircraft and left rudder to prevent side slip. When the aircraft is in a bank only a portion of the lift generated by the wings act vertically. Since the weight of the aircraft must be overcome by lift to accomplish a level turn the nose of the aircraft must be raised to increase the angle of attack. As the angle is increased drag will also increase and additional power will be required to maintain speed.

As the aircraft approaches the desired heading the wings must be leveled. Just as rudder was required rolling into the turn, rudder will be required while rolling out. When the wings are level both aileron and rudder must be neutralised and power returned to normal. In addition as the wings are leveled the back elevator pressure required during the turn must be relaxed or the nose will rise above the desired attitude.

Take-off

Taxi into position on the active runway in accordance with the local airport regulations.

Ensure your trim is set 0,0,5 (5 degrees of right rudder) and flaps are half down.

Things happen quickly during the T-28 take off. With an aircraft gross weight of 7500 lbs the take off roll can be as short as 500 ft.

To take off advance the throttle smoothly to 1800 rpm holding the brakes. Make a final check of the engine instruments. Release the brakes and smoothly advance the throttle to 47 in Hg. Directional control during the take off roll is maintained with rudder alone. It is important to detect any changes in heading and to make corrections immediately.

The propeller torque effect will tend to pull the nose of the aircraft to the left and roll to the left. as full power becomes effective right rudder pressure will be necessary to remain straight on the runway. Right aileron may be necessary to maintain wing level. As the speed increases and the controls become more effective the effect of torque will become less noticeable. When the elevator control becomes effective apply back pressure to the stick and position the nose to the take off attitude of approximately 10 degrees of nose up pitch. Maintain the attitude and allow the aircraft to smoothly fly off the runway at 75 to 80 kts.

Just after lift off additional right rudder and aileron will be necessary to compensate for propeller torque until the aircraft has accelerated to 120 kts.

When comfortably airborne and when a safe landing can no longer be made on the runway retract the landing gear.

At 500 ft AGL slowly and smoothly reduce power to 36 in HG and 2400 rpm. Maintain the take off attitude until the airspeed has reached 120 kts. After power reduction transition to the 140 kt climbing attitude. Retrim the aircraft to relieve control pressures. This will involve left rudder trim and nose down trim.

Slow Flight

Slow flight is a condition in which the aircraft is flown in balanced flight with an airspeed which is reduced to a point near the minimum at which controlled flight can be maintained. Slow flight is practiced to develop your coordination and sense of feel of the controls at low airspeeds. Since slow flight may be executed with a relatively high power setting propeller torque effects will be prominent. It is an excellent torque and trim exercise.

Transition from normal cruise to slow flight by

1. Retard manifold pressure to 23 in Hg
2. Retard propeller to 1850 rpm
3. Mixture control full RICH
4. Retrim elevator and rudder as airspeed reduces to 140 kts

Configure for landing by setting full flaps and lowering the landing gear. Lowering the flaps will cause a slight nose up attitude. Lowering the landing gear will cause a nose down attitude. Compensate for these changes and retrim as necessary.

When the throttle is advanced below 100 kts considerable right rudder pressure and trim will be necessary to compensate for propeller torque.

Practice flying the aircraft in straight and level flight until you are satisfied with your ability to maintain a constant altitude and airspeed.

Make at least two 90 degree level turns maintaining 20 degree angle of bank. Add throttle in order to maintain altitude in level turns. If you are already at a near minimum airspeed raising the nose any appreciable amount is impractical.

Practice losing and gaining altitude by coordinating throttle with nose attitude while in slow flight configuration. For these climbs and descents change altitude at least 200 feet and maintain 90 kts. To start a descent reduce throttle to 20 in Hg and lower the nose to maintain 90 kts. This will be your 90 kt landing approach attitude. To climb advance the throttle and raise the nose to maintain 90 kts. Be sure to check all temperatures and compensate with cowl flap adjustments. To level off from a climb reduce power and lower the nose to the level flight attitude. Remember to retrim to maintain balanced flight.

Transition from slow flight to normal cruise by advancing propeller to 2400 rpm. Advance throttle to 36 in Hg and raise the wheels. When the wheels indicate up raise the flaps. Maintain altitude and heading while the airspeed increase to 170 kts. Remember to retrim to maintain balanced flight.

Upon reaching 170 kts reduce the throttle to 28 in Hg and propeller to 2000 rpm and mixture control to NORMAL. Adjust cowl flaps to control temperatures and remember to retrim the aircraft.

Stalls

Stalls are taught to develop your ability to recognise a complete stall or an approaching stall and to recover correctly before the stall develops into a spin.

Transition to slow flight and then make opposing 180 degree turns left and right keeping alert for traffic and airborne conflicts. Care should be taken in choosing a practice area so as not to be located near airways, VOR sites or other dense traffic routes.

Minimum altitude for recovery from stall maneuver is 5000 ft AGL

Note that the T-28D does not have a stall warning system.

Landing Attitude Maneuver

This maneuver will simulate a last minute wave off in the landing pattern just prior to touching down on the runway.

Transition to slow flight configuration with full flaps and gear down. Set 20 in Hg and select 90 kts approach attitude. When on simulated short final advance the propeller control smoothly and slowly!! to full forward being cautious to avoid over speeding the engine. Maintain balanced flight and trim for this attitude. Raise the nose smoothly to the landing attitude. When the approaching stall is recognised recover by applying maximum allowable manifold pressure (47 in Hg), maintain the landing attitude. Fly the aircraft out of the dangerous situation in balanced flight without a loss

of altitude.

When a positive rate of climb and an increase in airspeed have been established raise the landing gear. Raise the flaps when altitude has increased 300 ft. At 120 kts set normal climb power of 36 in Hg and 2400 rpm. Retrim aircraft as required and adjust cowl flaps to control temperatures.

Power off stalls

This stall might occur while you are descending in an actual or simulated emergency. Recovery is made with power off so that you will become proficient in recovering from a stall without power in the event of an actual engine failure.

Check the cowl flaps closed and perform clearing turns. Upon the completion of the first 90 degrees of clearing turn, close the throttle and retard the propeller control to full decrease rpm simultaneously. Transition to a 130 kt descending attitude. Retrim the aircraft for this descent. Raise the nose 30 degrees above the horizon and maintain balanced flight. Hold this attitude until the aircraft stalls. Expect some slight aircraft buffeting as the stall approaches. As airspeed diminishes it will be necessary to increase the back stick gradually in order to maintain the nose attitude 30 degrees above the horizon. The stick will be at or near the full back position when the stall occurs. Commence the recovery as soon as the aircraft stalls by reducing the angle of attack. This is accomplished by positioning the nose slightly below the 130 kt descending attitude. Maintain this attitude until the airspeed reaches 130 kts. Then resume a 130 kt descent. To complete the maneuver, raise the nose to the level flight attitude and return to normal cruise.

Wings will be maintained level through use of rudder and ailerons.

Approach turn wave off

This is the proper wave off technique used to recover from a nose high slow landing approach. The maneuver is practiced to unsure the student will recognise a dangerous approach and wave off before the stall occurs.

Transition to slow flight configuration with full flaps and gear down. Set 20 in Hg and select 90 kts approach attitude. Roll smoothly into a 20 degree banked turn. When established with 20 degree bank and a 90 kt descent smoothly raise the nose to the landing attitude. Wave off by adding the maximum allowable manifold pressure (47 in Hg) and simultaneously rolling the wings level maintaining the nose in the landing attitude. When a positive rate of climb and an increase in airspeed have been established raise the gear, then raise the flaps. Accelerate to normal climb schedule.

Since the nose will be trimmed for a descending attitude the nose will rise and veer to the left unless firm control pressure are maintained. When the throttle is advanced forward stick pressure must be held to keep the nose in a level flight attitude, right rudder pressure must be increase to overcome the effects of propeller torque.

Standard Field Entry and Departure Procedures

These uniform procedures are executed to ensure the maximum safety and minimum confusion of aircraft approaching or departing an airfield.

There are five items of major importance which must be considered in order to make a standard field entry.

1. Intended point of landing: This is the point on the runway where you intend to touch down. It should be the middle of the first third of the runway or in the box if practicing precision landings.

2. Landing line: This is an imaginary line extending through the intended point of landing and parallel to the course over which the aircraft will actually pass in the final straight away and landing (the runway centreline should match the landing line)

3. Wing line: This is an imaginary line extending through the intended point of landing which

parallels the direction of the wind. It may or may not coincide with the landing line.

4. Landing pattern: Is a geometric race track course flown at 1500 ft AGL (or 1000 ft) so that a landing approach may be executed in a systematic sequence. The landing line, upwind leg, and downwind leg form the sides of the race track pattern. These lines are joined together by the upwind turn and by the approach turn at the downwind end of the pattern. Downwind is flown at a wing tip distance in wings level flight.

Traffic Pattern Operations

From normal cruise speed of 180 - 200 kts

Power: MAP 23 in Hg, 1850 rpm, Mix - RICH

Airspeed: slow to 140 kts

Cowl flaps normally closed. Maintain proper CHT 180-200 degrees.

At Mid field downwind lower the landing gear and check . Airspeed to 120 kts in level flight

At 120 kts and abeam the touchdown point lower full flaps. Lower the nose to maintain 120 kts and begin your descent and base leg turn simultaneously.

Intercept the landing line with approximately 1200 ft of straight away and 300 feet of altitude slowing to 95 kts. Level the wings then assume the final approach attitude. Advance the propeller to full increase rpm.

Do not reduce power below 20 in Hg until in the flare.

When approaching the point of intended landing start a transition to the landing attitude by using smooth back pressure on the stick. Touchdown should be made on the main wheels in a nose high attitude. As speed decreases lower the nose wheel to the runway.

Precision Spin

A spin is an aggravated stall that results in auto rotation. The aircraft is completely stalled, falling toward the ground, following a corkscrew path through the air with the nose oscillating below the horizon. In all normal spins you have control of the lift and drag of both the rudder and the elevator. Manipulation of these controls will permit you to cause, maintain or remove the conditions of a spin. A precision spin is one in which recovery is initiated after one and one half turns.

To perform a spin check the cowl flaps are closed and establish the aircraft in straight and balanced flight. Start the spin at an altitude which will ensure the aircraft can be returned to normal flight no lower than 5000 ft above the terrain.

Since considerable altitude will be lost in the spin ensure the area below is clear of traffic or clouds by making clearing turns. At the start of the last 90 degrees of clearing turn close the throttle (use the gear warning horn button to cancel the gear warning sound) and retard the propeller control to full decrease rpm. Roll out of the clearing turn on the desired heading with approximately 120 kts.

Level the wings and smoothly raise the nose to 30 degrees above the horizon. Maintain the altitude and as the stall occurs apply full rudder in the desired direction of spin and apply full back stick. Do not use aileron in the entry, during the spin or before the rotation stops on recovery.

To recover from a spin slowly apply full rudder opposite to the direction of rotation. Follow immediately with positive forward stick to just slightly forward of the neutral position. Hold the controls in this position until rotation stops. Neutralise the controls and commence a smooth pull out. Continue this pull out until the nose is positioned slightly above the horizon. With the nose in this position advance the propeller control and throttle to a power setting of 1850 rpm 23 in Hg. Check all pressures and temps and then reset cruise power.

Be careful not to apply excessive back stick after the rotation stops. This may cause a secondary

stall.

Spins shall be practiced in the clean configuration. In the event of an unintentional spin with gear and flaps down they shall be retracted immediately to effect recovery and prevent possible damage. If the unintentional spin was entered with power on throttle should be closed for recovery.

Spin Characteristics

Spin entry consists of a roll or snap in the direction of the applied rudder. The nose of the aircraft drops sharply during the first half of the turn then returns to the horizon during completion of the first turn.

The nose will continue to oscillate until a stabilised spin is established with the nose remaining at approximately 45 degrees below the horizon.

When recovery control is applied the nose of the airplane drops. When the spin stops the airplane will be in an approximately 70 - 90 degree dive. Slowly pull out of the dive to avoid a secondary spin.

Normal Checklists

The following procedures have been adapted from the real world procedures and modified for use in FSX. THEY SHOULD NOT BE USED FOR REAL WORLD AVIATION.

Condensed checklists are available on the Checklists page of the Animation Manager (shift+4).

EXTERIOR INSPECTION

Fuel quantity - CHECK

Using the Animation Manager (shift+4) set the fuel load and check the pilot and co pilot weights.

Right aileron trim tab - SET

The right aileron trim tab is ground adjustable only. If any adjustment is needed use the Animation Manager (shift+4) to make the change

Baggage door - CLOSED and LOCKED

Pitot tube and Wheel Locks streamers - REMOVED

Use the Animation Manager to ensure these items are set correctly.

INTERIOR CHECK

Seat - ADJUST

Rudder pedals - ADJUST

Use the Pedal release on the bottom of the instrument panel to adjust the reach of the rudder pedals.

Parking brakes - SET

Flight Controls - UNLOCK

Ensure the flight control lock is down. The control lock prevents movement of the ailerons, elevator and throttle.

Hydraulic hand pump - DOWN

Cockpit air handle - CLIMATIC

Adjust handle according to the cockpit temperature required for pilot comfort.

Fuel shutoff - ON

Trim tab wheels - 0,0,5 (set 5 degrees of right rudder)

Set rudder trim to 5 degrees right

Wing flap handle - DOWN

Throttle - Open approximately 1/2 inch

Supercharger handle - LOW

Propeller lever - FULL INCREASE

Mixture lever - IDLE CUTOFF

Friction lock knob - ADJUST

Carburetor air lever - COLD AIR

Filtered air position is used for operation in dusty areas.

Cockpit heater - OFF

The cockpit heater should be off for all take-offs due to the fire hazard involved.

Landing lights - OFF

Windshield and Canopy defrost - CLIMATIC

During warm weather cool air is circulated to remove fog or moisture.

Landing gear handle - DOWN

Altimeter - SET

Set altimeter to field elevation.

Clock - SET

Manifold pressure - CHECK

Note manifold pressure gauge reading (field barometric pressure) for later use during engine power check.

Ignition switch - OFF

Generator switch - ON

Inverter switch - OFF

Pitot heater - OFF

Control shift - FORWARD

Hold control shift switch forward in the cockpit of the pilot desiring control until control light comes on.

Light switches - OFF

Light rheostats - OFF

Interphone - MIXED SIGNALS

Command mixing switches - SET

Radio compass, VHF, command set - OFF

Circuit breakers - IN

External power - CONNECTED (if avail)

Battery switch - ON (if no ext power)

Landing gear indicators - CHECK

Landing gear warning light - CHECK

Chip detector light - TEST

Press the chip detector warning light to check the light is working.

Fuel quantity gauges - CHECK

Fuel pressure - CHECK

Low fuel light - TEST

Exterior lights - TEST

Check operation of the:

Position lights (nav lights)

Fuselage lights (rotating beacons)

Passing lights (not available in this aircraft)

Landing and taxi lights

Gear down lights (nav lights must be on)

Interior lights - TEST

Check operation of the:

Instrument panel lights (ultraviolet and red)

Console lights

Extension lights (cockpit utility lights)

STARTING ENGINE(manual)

The manual engine starting procedure is a bit more complicated than you find in most FSX aircraft and involves some deft mousework.

Cowl and oil cooler flap switch - OPEN

For maximum cooling open cowl and oil cooler flaps to full.

Fire guard - Posted

Propeller danger area - Clear

Call "clear" and receive acknowledgment from fire guard

Throttle - Open approximately 1/2 inch

Supercharger handle - LOW

Propeller lever - FULL INCREASE

Mixture lever - IDLE CUTOFF

Starter button - Depress (left click) (Rotate propeller through 8 blades)

In the real aircraft you must hold the starter button down but this is impossible to do in FSX. Left click on the starter button to hold it down, left click again to release the starter. Engine starter will start to rotate propeller. Count 8 blades passing

Ignition switch - Both

Primer button - Depress repeatedly

Repeatedly press the primer button to inject fuel into the engine. After 4 or 5 presses the engine should start.

Starter button - Release when engine fires (this will be done automatically)

Mixture lever - RICH

Move the mixture to the full RICH position after the engine has started. Adjust throttle until engine is running smoothly between 1000 and 1200 rpm.

If engine fails to start within 30 seconds let starter cool for 3 minutes before repeating starting procedure.

Oil pressure - CHECK

If pressure does not register in 10 seconds or rise to 40 psi in 20 seconds stop engine and investigate.

Throttle - 1200 to 1400 rpm

Adjust throttle to smoothest speed as soon as oil pressure permits.

Whenever the aircraft is stopped operate at 1200 to 1400 rpm. This prevents plug fouling, creates propeller blast for engine cooling and ensures proper operation of the DC generator.

STARTING ENGINE(auto)

The auto start procedure takes the hard work out of starting the Wright Cyclone radial engine. To commence the auto start procedure you can either use a key command to start the engine (FSX key "Starter 1") or right click on the T-28D starter button.

FSX Note: Using CTRL+E to start the engine will start the engine but it will not run the custom startup routine. Beware using CTRL+E as it will disengage the generator. Ensure the generator switch is on after starting using CTRL+E.

Cowl and oil cooler flap switch - OPEN

For maximum cooling open cowl and oil cooler flaps to full.

Fire guard - Posted

Propeller danger area - Clear

Throttle - Open approximately 1/2 inch

Supercharger handle - LOW

Propeller lever - FULL INCREASE

Mixture lever - RICH

The auto start procedure will take control of your mixture lever and move it to the appropriate settings. When the auto start is finished it will return the mixture to full RICH. To prevent engine cutout after starting ensure your mixture lever is at full RICH before starting.

Starter button - Depress (right click)

The following steps will now occur automatically:

-Ignition switch - Off

-Mixture lever - IDLE/CUTOFF

-Rotate prop through 8 blades

-Ignition switch - Both

-Primer button - Depress Repeatedly

-Starter button - Release when engine fires

-Mixture lever - RICH

The auto start procedure is now complete and the engine should be running.

Oil pressure - CHECK

If pressure does not register in 10 seconds or rise to 40 psi in 20 seconds stop engine and investigate.

Throttle - 1200 to 1400 rpm

Adjust throttle to smoothest speed as soon as oil pressure permits.

Whenever the aircraft is stopped operate at 1200 to 1400 rpm. This prevents plug fouling, creates propeller blast for engine cooling and ensures proper operation of the DC generator.

BEFORE TAXIING

Communication equipment - AS DESIRED

Hydraulic pressure gauge - CHECK

Check within green range

Cowl and oil cooler flaps - CHECK OPERATION

Move cowl and oil cooler flaps switch to CLOSED. You need to right click on the switch and hold as the switch's closed position is spring loaded. Check visually that the flaps are closed. The cowl flaps are only visible from the front cockpit. Move switch to OPEN and check flaps are fully open. Keep the flaps fully open during ground operations for maximum cooling.

With approximately 1200 to 1400 rpm check the following electrical system items

Voltmeter - 28 VOLTS

Loadmeter - Normal Indication is 0.5 or LESS

Inverter switch - SPARE ON (Check MAIN OUT light on)

Inverter switch - OFF for 3 secs (Check BOTH OUT light on)

Inverter switch - MAIN ON (Check both inverter lights off)

Pitot heater - CHECK OPERATION

Have ground crew check operation or observe increase in loadmeter reading. Return switch to OFF.

Engine idling speed - 700 to 900 rpm

With throttle closed check tachometer reading for 700 to 900 rpm

Ignition switch grounding - CHECK

Turn ignition switch OFF momentarily. If engine does not cease firing completely when the switch is OFF the magnetos are not ground. Shut down engine and warn personnel to remain clear of propeller until difficulty has been remedied.

Perform ignition switch check as rapidly as possible to prevent severe afterfire in exhaust system when switch is again turned to BOTH.

Attitude indicator - CAGE then UNCAGE

Altimeter - SET to field pressure

TAXIING

Area - CLEARED FOR TAXIING

Wing flap handle - UP

Wheel chocks - REMOVED

Use the Animation Manager (shift+4) to ensure wheel chocks are removed.

Parking brakes - RELEASE

Wheel brakes - CHECK

Advance throttle and allow aircraft to roll straight ahead. As soon as the aircraft is moving close

throttle and apply brakes evenly to check adequate braking action. Taxi slowly using brakes to slow down or stop. Do not ride the brakes as they will wear rapidly. Use either brakes or nose wheel steering to maintain directional control.

If the aircraft is standing still do not operate rudder pedals because such action will cause undue wear of the nose wheel tire.

Nose wheel steering - CHECK

Check nose wheel steering during taxiing. If nose wheel steering is inoperative a takeoff should not be attempted.

Flight instruments - CHECK

a. Airspeed indicator - check reading

b. Direction indicator - set take off heading under top index, check heading against magnetic compass for proper indication while taxiing.

c. Standby compass - card swings freely, bowl full of fluid.

d. Attitude indicator - check for tip error during taxi turns.

e. Turn and slip indicator - check needle deflection in the direction of turn while taxiing.

ENGINE RUN-UP

Park the aircraft as near into the wind as possible for engine run-up to aid engine cooling.

Oil temp - MIN 40C

Oil pressure - STEADY (above 1200 rpm)

Cyl head temp - MIN 120C

Mixture lever - RICH

Propeller Operation - CHECK

At 1600 rpm check propeller by pulling propeller lever back to full DECREASE RPM and note RPM drop of approximately 400 rpm. Return Propeller lever to full INCREASE RPM and check for full recovery of rpm.

Loadmeter and Voltmeter - CHECK

Above 1300 rpm check the loadmeter and voltmeter are registering to ensure proper operation of the DC generating system. The DC generator will not operate below engine rpm of approximately 1100 rpm. The loadmeter should be within 0.3 to 0.5 and the voltmeter should be approximately 27.7 volts.

Supercharger - CHECK

At 1600 rpm with propeller control at full INCREASE RPM move supercharger handle to HIGH. A sudden decrease in rpm will indicate that the high ratio clutch has engage. Advance throttle to obtain 30 in Hg. Return supercharger control handle to LOW. A sudden decrease in manifold pressure indicates that the two speed supercharger mechanism is working properly.

One daily operation of the supercharger clutch during preflight engine check is satisfactory.

Power - CHECK

Adjust throttle to obtain manifold pressure equal to field barometric pressure (as read on manifold pressure gauge before starting engine) and check for 2275 (+/- 75) rpm.

Ignition System - CHECK

With throttle adjusted to obtain manifold pressure equal to field barometric pressure check ignition

system with IGNITION switch at L and R for maximum drop of 75 rpm. Return IGNITION switch to both between checks to allow speed to stabilise.

Oil Pressure - CHECK

At 1800 rpm ensure oil pressure is 65 psi minimum.

Throttle - 1200 to 1400 rpm

Radios - TUNED and CHECKED

Pitot heat - CHECKED and set as desired

BEFORE TAKE-OFF

Flight controls - CHECK FREE MOVEMENT

Fuel shutoff - ON

Trim - 0,0,5 degrees right rudder

Wing flap handle - 1/2

Carburetor air lever - COLD AIR (FILTERED if dust is present)

Flight instruments - SET

Pitot heater - AS NEEDED

Canopy handle - CLOSED

Shoulder harness - LOCKED

NORMAL TAKE-OFF

Roll into take-off position and align nose wheel with runway. Advance throttle smoothly to Maximum Power (47 in Hg). As airspeed increases and elevator control becomes effective lift the nose wheel at 70 knots smoothly to take-off attitude. Maintain this attitude and allow the aircraft to fly itself off.

MINIMUM RUN TAKE-OFF

A minimum run take-off is a maximum performance maneuver with the aircraft near stalling speed at lift-off. Hold brakes and apply max power. Pull airplane off smoothly at a speed of approximately 65 to 70 knots. Hold speed of approximately 75 knots until over obstacle. After passing obstacle use normal climb speed. Flaps up gradually.

CROSS-WIND TAKE-OFF

Align the aircraft straight down the runway. Advance throttle smoothly to Maximum Power (47 in Hg). During the ground roll apply aileron as necessary to maintain wings level. To avoid skipping leave the nose wheel on the runway until the airspeed reaches 90 knots. Apply sufficient back pressure to make a positive break with the ground. This will avoid side loads on the landing gear. After becoming air-borne correct for drift by making a coordinated turn into the wind.

NIGHT TAKE-OFF

As for daylight operation. Don't be alarmed by exhaust flames.

AFTER TAKE-OFF CLIMB

Landing gear handle - UP

When comfortably airborne apply brakes to stop the wheels spinning and retract the landing gear.

Landing gear indicators - CHECK

Wing flap handle - UP

Do not retract flaps below 90 knots to prevent inadvertent sink.

CLIMB

Normal climb at sea level is 140 knots, 36 in Hg and 2400 rpm. Maintain 36 in Hg but allow the airspeed to decrease at a rate of 1 knot per thousand feet.

Advance the throttle to maintain manifold pressure during climb.

Adjust cowl and oil cooler flaps as necessary to maintain cylinder head and oil temperatures within the prescribed operating ranges.

Carburetor air lever - CLIMATIC

Position carburetor air lever toward HOT AIR as necessary to maintain carburetor air temperature within prescribed operating range.

Move the supercharger control handle to HIGH when altitude requires. If operating Military Power approx 13,500' will produce the best results. For normal rated power approximately 15,000' is optimum. When shifting to high blower use the following procedure:

a. Propeller lever - 1600 rpm

b. Supercharger - HIGH

c. Propeller and Throttle - DESIRED POWER

NORMAL CRUISE

Mixture Control - NORMAL

For best fuel endurance ensure Mixture Control is set to NORMAL during the cruise phase.

Normal cruise speeds are 180 to 200, 30 in Hg, 2000 rpm below 10,000' and 155 knots above 10,000'.

DESCENT

To prevent possible fogging of the windshield during descent turn windshield and canopy defrost handle and cockpit heater control handle to ON prior to descent.

Shift supercharger handle to LOW at any cruise rpm to preclude the possibility of subsequent overboosting of the engine at lower altitudes. Use RICH mixture to minimise possibility of engine backfire or cutout if sudden application of power is required. Close cowl flaps to minimise overcooling of the engine.

Use of low cruise rpm and highest manifold pressure is preferable to idle power descent or high rpm, low manifold pressure descent. Descent at idle will excessively cool the engine. Typically descent uses 20 in Hg and 2000 rpm.

Carburetor air lever - AS NEEDED

Supercharger - Move to LOW at any cruise rpm to prevent

overboosting engine

Cowl flaps - AS NEEDED

Mixture lever - RICH

Throttle - 20 in Hg

NORMAL DESCENT at 170 kts

BEFORE LANDING

Command radio - TUNED

Fuel shutoff - ON

Carburetor lever - COLD AIR

Mixture lever - RICH

Propeller lever - 2400 rpm

Cowl flaps - AS NEEDED

Cockpit heater - OFF

Shoulder harness - LOCKED

RECTANGULAR LANDING PATTERN

Enter pattern at 120 kts

Landing gear handle - DOWN

Landing gear indicators - CHECK

Downwind leg - 110 to 120 kts

Base leg - 100 to 110 kts

Wing flap lever - DOWN

Final approach - 100 kts

Throttle - CLOSED

Propeller lever - FULL RPM

Landing lights - AS REQUIRED

Touchdown speeds depend on gross weight.

6000lbs	72kts
6400lbs	73kts
7200lbs	76kts
6800lbs	79kts

7600lbs	80kts

AFTER LANDING

Canopy handle - AS DESIRED

Trim tab wheels - ZERO

Wing flap handle - UP

Cowl flaps - OPEN

ENGINE SHUTDOWN

Parking brakes - SET

Ignition switch grounding - CHECK

Canopy handle - OPEN

Wing flap handle - DOWN

Inverter switch - OFF

Mixture lever - IDLE/CUTOFF

Ignition switch - OFF

Throttle - CLOSED

Fuel shutoff - OFF

Comm switches - OFF

Battery switch - OFF

All electrical switches - OFF(except generator switch)

When a cold weather start is anticipated dilute oil as required. Allow oil to cool to 40 deg Celsius or below. Dilute oil at 1200 rpm. Oil dilution of 5% can be done in 45 seconds. Shut down engine 30 seconds after dilution is complete to circulate diluted oil throughout engine.

Cylinder head temperature should not be above 150 deg Celsius when stopping the engine. If this temperature cannot be attained because of atmospheric conditions stop engine when cylinder head temperature stabilises.

BEFORE LEAVING AIRCRAFT

Flight controls - LOCKED

Form 781 - COMPLETE

Wheels - CHOCKED

Parking brakes - RELEASED

Wing flap manual operation lever - (right click on flap lever to put wing flaps fully down)

Ground safety pins - INSTALLED

Pitot cover - INSTALLED

ACROBATIC MANEUVERS

All acrobatic maneuvers originate from acrobatic cruise which is 180 kts, mixture RICH, rpm 2200. Manifold pressure at required setting to maintain airspeed.

Barrel Roll
Entry speed 180 kts.

Wing Over
Entry airspeed 200 kts

Loop
Entry airspeed 220 kts. Make a 3 1/2 g pullup

Immelmann
Entry airspeed is 240 kts. Make a 3 1/2 g pullup and recover with approximately 100-120kts

One-Half Cuban Eight
Entry airspeed is 240 kts. Make a 3 1/2 g pullip. Recover on the entry altitude and 180 degrees from original heading.

EMERGENCY PROCEDURES

ENGINE FAILURE DURING TAKE-OFF

(BEFORE BECOMING AIR-BORNE)

Throttle - CLOSED

Brakes - APPLY

Canopy handle - EMERG OPEN

Mixture lever - IDLE CUTOFF

Fuel shutoff - OFF

Ignition switch - OFF

Battery switch - OFF

Generator switch - OFF

ENGINE FAILURE DURING TAKE-OFF

(AFTER BECOMING AIR-BORNE)

Glide - ESTABLISH

Canopy handle - EMERG OPEN

Mixture lever - IDLE CUTOFF

Fuel shutoff - OFF

Ignition switch - OFF

Battery switch - OFF

Generator switch - OFF

ENGINE FAILURE DURING FLIGHT

(PARTIAL POWER FAILURE)

Airspeed - GLIDE 105 kts

Fuel shutoff - ON

Fuel pressure gauge - 15 to 17 psi

Throttle - 18 to 25 in Hg

Mixture lever - FULL RICH

Propeller lever - FULL INC RPM

Ignition switch - Check BOTH

Battery switch - Check ON

Generator switch - Check ON

Carburetor air lever - CLIMATIC

ENGINE FAILURE DURING FLIGHT

(COMPLETE POWER FAILURE)

Glide - ESTABLISH

Attempt engine air start:

Mixture lever - IDLE CUTOFF

Propeller lever - FULL INC RPM

Throttle - FULL OPEN for 5 sec then set baro press for altitude

Fuel shutoff - ON

Ignition switch - BOTH

Battery switch - ON

Primer button - DEPRESS and HOLD

Throttle - 28 in Hg max

Fuel pressure - 15 to 17 psi

Mixture lever - RICH

Primer button - RELEASE

Land as soon as possible

FUEL PRESSURE DROP

Throttle - LEAVE IN POSITION

Maintain watch for engine fire

Proceed to nearest airfield

Check for fuel leakage

If fuel leakage initiate "Engine

Fire During Flight" procedure

FORCED LANDING

Canopy handle - EMERG OPEN

Throttle - CLOSED

Glide - 105 kts

Fuel shutoff - OFF

Wing flap lever - UP

Cockpit heater handle - OFF

Mixture lever - IDLE CUTOFF

Propeller lever - FULL DEC RPM

Landing gear handle - DOWN

Wing flap lever - As required

Ignition switch - OFF

Battery switch - OFF

Shoulder harness - LOCKED

Trim - Adjust

PROPELLER FAILURE

FAILURE TO LOW PITCH (HIGH RPM)

Throttle - RETARD to maintain rpm within limit

Attitude - NOSE UP to dec airspeed and inc load on propeller

Propeller lever - move to DEC RPM then INC RPM several times

FAILURE TO HIGH PITCH (LOW RPM)

Throttle - Adjust to lowest in Hg to maintain flight

Mixture lever - RICH

Propeller lever - move to DEC RPM then INC RPM several times

Land as soon as possible

ENGINE FIRE DURING STARTING

Mixture lever - IDLE CUTOFF

Starter button - HOLD DEPRESSED

If engine does not start:

-Continue cranking

-Ignition switch - OFF

-Generator switch - OFF

-Fuel shutoff - OFF

-Carburetor air lever - COLD AIR

-Throttle - FULL OPEN

If fire continues:

-Starter button - RELEASE

-Battery switch - OFF

-Signal ground crew to extinguish

-fire

Get out of aircraft

ENGINE FIRE AFTER STARTING

Mixture lever - IDLE CUTOFF

Throttle - FULL OPEN

Ignition switch - OFF

Battery switch - OFF

Fuel shutoff - OFF

If fire continues signal ground

crew to extinguish fire

Get out of aircraft

ENGINE FIRE DURING FLIGHT

Mixture lever - IDLE CUTOFF

Fuel shutoff - OFF

Ignition switch - OFF

Cowl flaps - OPEN

Battery and generator - OFF

Cockpit air handle - EMERG OFF

If fire is extinguished make

a forced landing

If fire is not extinguished bail out

FUSELAGE FIRE DURING FLIGHT

Airspeed - Reduce immediately

Check cause of fire by shutting off

the following one at a time:

-Cockpit heater handle - OFF

-Generator switch - OFF

-Battery switch - OFF

If fire is extinguished make a forced landing

If fire persists shut down engine and bail out

FUSELAGE FIRE ON GROUND

Mixture lever - IDLE CUTOFF

Throttle - CLOSED

Ignition switch - OFF

Battery switch - OFF

Generator switch - OFF

Fuel shutoff - OFF

Signal ground crew to extinguish fire

Get out of aircraft

WING FIRE DURING FLIGHT

Wing light switches - OFF

Pitot heater switch - OFF

Try to extinguish fire by sideslipping

aircraft away from flame

If fire persists bail out

ELECTRICAL FIRE

Battery and generator - OFF

Generator switch - ON

If generator circuit is defective

-generator switch - OFF then battery

-switch - ON

Turn on each circuit individually

Turn defective circuit off when it is identified

ELIMINATION OF SMOKE

Airspeed - Reduce immediately

Cockpit air handle - OPEN

Air outlets - OPEN

If smoke enters cockpit from air outlets cockpit air handle - EMERG OFF

Windshield and canopy defrost - ON

Canopy handle - OPEN

ELIMINATION OF FUEL FUMES

Airspeed - Reduce immediately

Cockpit air handle - OPEN

Air outlets - OPEN

Windshield and canopy defrost - ON

Canopy handle - EMERG OPEN

All electrical switches - OFF

-(except ignition)

Landing gear handle - DOWN

-(if fumes persist)

Land as soon as practical

BAIL-OUT

Fly aircraft toward uninhabited area

Airspeed - slow as possible

Wing flap lever - DOWN

Elevator trim - slightly nose down

Warn other pilot

Seat adjustment - pull back and raise

Disconnect radio leads

Canopy handle - EMERG OPEN

Unfasten safety belt and harness

Bail out

LANDING EMERGENCIES

GEAR RETRACTED

Establish normal flaps down approach

Canopy handle - OPEN

Shoulder harness - LOCKED

Cockpit heater handle - OFF

Flare as in normal landing

Shut down engine before touchdown

When aircraft stops get out immediately

FSX Note: A gear up landing will break the engine and will require the aircraft to be reloaded to fix

the engine.

ONE MAIN GEAR RETRACTED

Make normal flaps down approach wing low on side with gear down

Canopy handle - OPEN

Shoulder harness - LOCKED

Cockpit heater handle - OFF

Touch down on extended main wheel

Use aileron to hold up other wing

Shut down engine

When wing tip strikes, max braking on extended wheel

DITCHING

Follow radio distress procedure

Personal equipment - Stow

Radio leads - Disconnect

Unbuckle parachute

Landing gear handle - UP

Canopy handle - OPEN

Battery switch - OFF

Wing flap handle - DOWN

Make normal approach with power and flare to normal landing attitude

Shoulder harness - LOCKED

Ignition switch - OFF, just before impact

ELECTRICAL FAILURE

Generator switch - RESET then ON

If overvoltage light comes on again:

-Generator switch - OFF

-Voltage rheostat - ADJUST

Generator switch - RESET then ON

Overvoltage warning light - CHECK

-If light remains on - Check voltage

-Voltage rheostat - ADJUST

If voltage cannot be brought within allowable limit:

-Generator switch - OFF

-Inverter switch - SPARE ON

-Nonessential electrical equipment - OFF

LANDING GEAR OPERATION

RETRACTION ON GROUND

Landing gear handle - UP

EMERGENCY EXTENSION

Airspeed - 100 kts

Landing gear handle - DOWN

Yaw aircraft to help lock gear down

Gear indicators - CHECK FOR SAFE INDICATION

WING FLAP OPERATION

Wing flap handle - AS DESIRED

Hydraulic hand pump - OPERATE TO POSITION FLAPS

CANOPY OPERATION

Canopy handle - EMERG OPEN

If canopy fails to open:

-Canopy handle - MANUAL

-Pull canopy open manually

If canopy still fails to open:

-Check battery switch - ON

-Canopy handle - OPEN and depress solenoid button

-Operate hydraulic hand-pump

Weapons Systems

The Attack version of the T-28 features weapons systems. This comprises 6 external stores stations which can be fitted with gun pods, rockets or bombs, an armament control panel and a gun sight The pilot can select the stores and rearm weapons using the Weights section of the Animation Manager.

FSX Note: These weapons actually work and are not just here for show. Firing rockets or dropping bombs will create an AI model which can impact with other (or you own) aircraft and with the terrain. You may like to turn off display of aircraft labels to prevent a small label appearing on each rocket or bomb you fire. Aircraft drag and weight are all dynamically affected by the weapons loaded.

External stores

6 external stores stations are located lower surface of the wings, 3 on each side. The stores stations are numbered 1 to 6 from port to starboard. Stores are placed symmetrically (ie station 1 and 6, 2 and 5, 3 and 4) and can be any order (guns may only be placed on stores 3 and 4).

Gun packages

Detachable gun pods containing an Type M2 .50 caliber machine gun and 315 rounds of ammunition can be mounted on stations 3 and 4 (the two inner most stations on each wing).

Bombs

A Mk 83 100lb bomb can be mounted on each station. The maximum number of bombs that can be carried is 6, one for each station.

Rockets

A rocket launcher can be mounted on each station. Each rocket launcher carries three 2.25 inch SCAR rockets. The maximum number of rockets that can be carried is therefore 18 (6 stations by 3 rockets per station). All three rockets on a particular station are ripple fired with a single press of the fire (BRAKES) switch.

Camera

A camera is installed in the leading edge of the left wing to photograph the target.

FSX Note: This camera does nothing in FSX.

Armament control panel

The armament control panel is located on the floor beneath the main panel in the front cockpit only. FSX Note: As this is located in a difficult location you may like to disable display of the joystick for easier access to the control panel or you may prefer to use the 2D popup panel.

STORES JETTISON BUTTON

In an emergency all stores can be jettisoned by pressing this button. The aircraft should be in level flight (less than 10 deg bank and pitch) otherwise the stores will not jettison. Gun pods cannot be jettisoned.

STA SELECT ADVANCE

Placing this switch in the NORMAL position will advance the station selector automatically after firing. Place the switch in the DISABLE position allows the pilot to manually control the station selector.

PANEL LIGHT

Adjusts the brightness of the light above the armament control panel.

FSX Note: In the 2D panel the brightness cannot be adjusted. In any position other than OFF the armament control panel light will be on.

ARMAMENT MASTER

Provides power to the armament control panel. This switch must be ON to operate any of the weapons systems and the gun sight

ARMAMENT SELECTOR

To fire the guns, bombs or rockets the switch must be set to the appropriate position. This selector is used with the STATION SELECTOR to properly arm the weapon. For example, if rockets are stored in station 1 and 6 the ARMAMENT SELECTOR must be set to ROCKETS and the STATION SELECTOR set to 1 or 6-1 to fire the rockets. If the ARMAMENT SELECTOR is in any other position the rockets will not fire.

If this switch is set to GUNS and gun pods are mounted on stations 3 and 4 then the guns will fire regardless of the STATION SELECTOR position.

STATION SELECTOR

Determines which station is to be fired. If you start with the STATION SELECTOR on 1 and the STATION SELECT ADVANCE switch is set to NORMAL then the firing order will be 1, 5, 3, 6, 2 and 4. If you start with the STATION SELECTOR on 6-1 then stations 1 and 6 will be fired together followed by stations 2 and 5 and then 3 and 4.

Setting the STATION SELECTOR to ALL will ripple fire all 6 stations.

RETICLE SELECTOR

Used to control the display of the collimated reticle in the gun sight OFF will turn off display of the reticle. GYRO will display 6 diamonds which provide a lead computing gun sight FIXED displays the fixed reticle for use with ground attacks using bombs or rockets. FIXED and GYRO shows both reticles at once.

RETICLE DIMMER

Controls brightness of the reticle displayed on the gun sight

GUN FIRING SWITCH

This is a three position switch. In the centre position or in the spring loaded SAFE position the guns will not fire. You must move this switch to the READY position to fire the guns (assuming the ARMAMENT SELECTOR switch is set to GUNS as well).

FIRE CONTROL SELECTOR

Has three positions and adjusts the sight reticle for the correct offset point depending on the weapon selected.

FSX NOTE: This switch has no effect in FSX.

DIVE ANGLE SWITCH

Is used during bomb release and rocket attack. For attack angles between 0 and 35 degrees the switch is set at 35 & UNDER. For attack angles above 35 degrees set the switch to 35 & ABOVE.

BOMB ARMING SWITCH

Controls whether the bombs are dropped with the nose or tail fuses armed.

FSX NOTE: This switch has no effect in FSX. All bombs are dropped armed.

Using Animation Manager to set stores

The Weights page of the Animation Manager is used to select weapons and rearm any weapons. On this page is an image of a T-28. Below this image are 6 boxes representing each of the store stations from station 1 on the outboard left wing to station 6 on the outboard right wing. As the image is front on station 6 is on the left of the screen and station 1 is on the right.

Clicking on any of these boxes will cycle through the available stores from empty to bombs to rockets. The two centre boxes (stations 3 and 4) can be set to gun pods. Each time you select a new store type it will be loaded with the full amount of stores available (ie bombs = 1, rockets = 3 and bullets = 315)

The bottom half of the box will show the number of bombs, rockets or bullets on the current station.

As stores must be symmetrically loaded clicking on station 1 or 6 will adjust both stations 1 and 6. And likewise for stations 2 and 5 and stations 3 and 4.

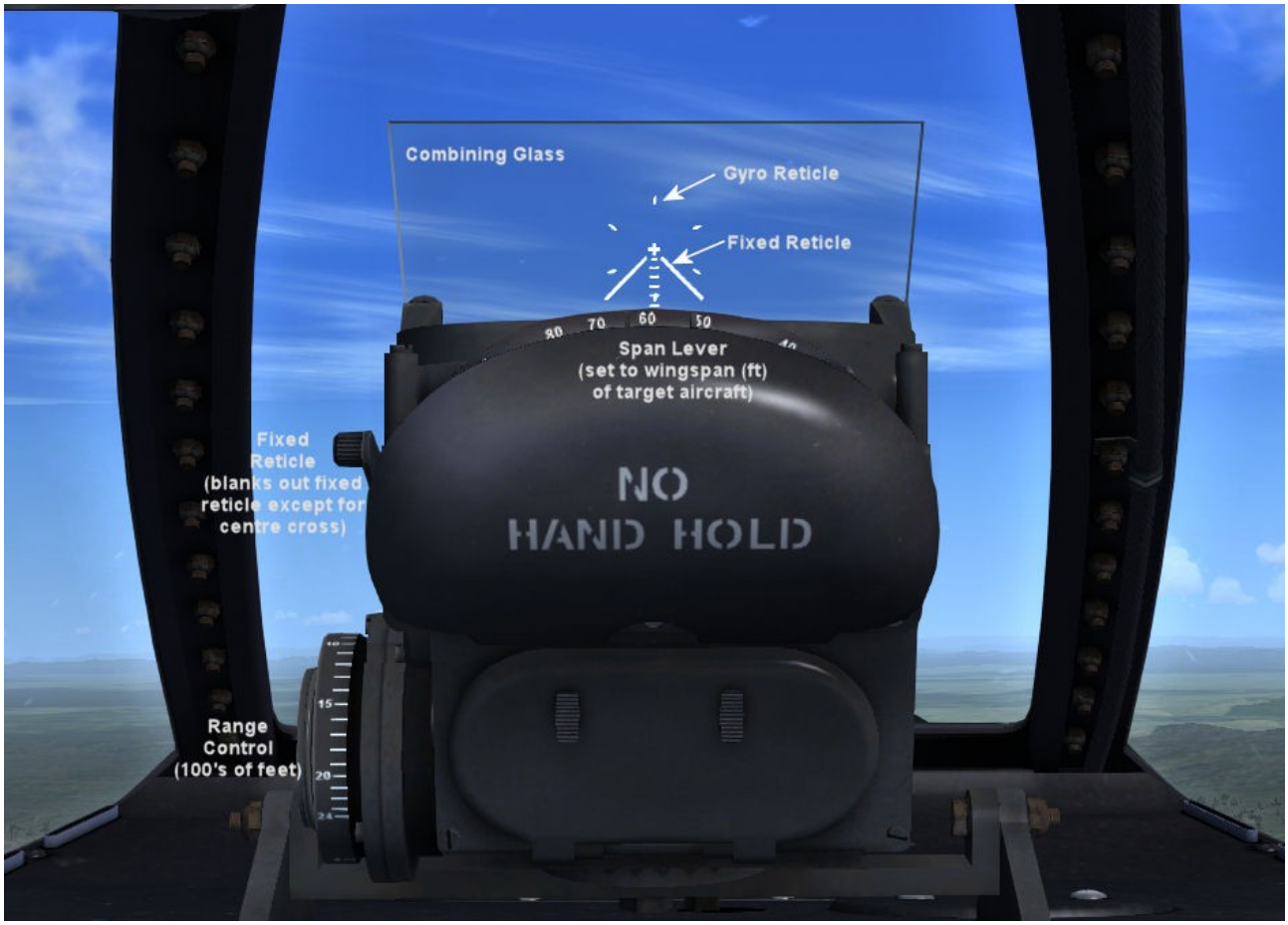
Clicking on the REARM button will reload all stations.

The total weight of the stores currently loaded is shown in the top half of the screen. Empty bomb racks and rocket launchers have weight and will contribute to the total stores weight.

Clicking on SAVE will save the current weapon setup.

Note: This page is available when flying the solo and dual model versions but weights will only be adjusted if the attack model is loaded.

Gun sight



The gun sight is based on the K-14 / Mark 23 gun sight and is mounted above the glareshield of the front cockpit. Power is supplied to the gun sight via the Armament Control Panels Master Switch.

The Air Force version of the gun sight used in the T-28D (the K-14) differs from the Navy version used in the T-28B/C (the Mark 23) in three respects:

- The shape of the fixed reticle (the one shown in the picture above is of the Navy version)

- The Air Force version includes a sun shield controlled by a lever on the right side of the gun sight.

- The Range Control in the Air Force version is calibrated in yards from 200 to 800.

The gun sight has two reticles, a gyroscopic sight designed to automatically compute the lead angle required to hit a target and fixed reticle for firing rockets and dropping bombs.

The gyro and fixed reticle images seen in the combining glass are focused at infinity be means of the collimator lenses. As the lenses are focused very accurately, parallax is reduced to a minimum which allows motion of the pilot's head without any apparent shift between the target and the reticle images.

Display of the gyro and/or fixed reticle is controlled by the RETICLE SELECTOR on the Armament control panel. This can be set to off, gyro, gyro and fixed or fixed only. In addition the fixed reticle lever on the left side of the gun sight can be used to blank out all of the fixed reticle except for the centre cross.

The gyro reticle consists of six diamonds in a hexagonal pattern. To ensure accurate computation of the lead angle two factors need to be considered. The target span lever (behind the crash pad on the front of the gun sight) needs to be set correctly to match the wing span of the target aircraft.

The range control is then adjusted until the target aircraft is framed exactly within an imaginary circle formed by the six diamonds. The range control is calibrated from 200 to 800 yards.

FSX Note: The range control is mapped to the FSX decision height variable. The pilot can use the FSX controls screen to assign key or joystick button commands to Increase Decision Height and Decrease Decision Height.

How to fire weapons

Weapons are fired using the FSX brakes command. The brakes command is used as it allows the user to assign the command to any key or joystick button they like using the FSX controls. The user can also click on one of the 3 buttons on the joystick in the VC to fire weapons but as one of these is in a difficult position to access (ie the guns switch on the front of the joystick) using the brakes command may be more convenient.

To prevent accidental misfiring (eg when using the brakes during landing) it is good practice to only set the ARMAMENT SELECTOR when you are ready to use weapons. Once you have finished firing weapons return the ARMAMENT SELECTOR to the OFF position.

- Use the Animation Manager - Weights Page to select the stores and select REARM to ensure all stations are fully loaded

- Turn ARMAMENT MASTER switch ON

- Set ARMAMENT SELECTOR to appropriate weapon type for station 1

- Set STATION SELECTOR to station 1

- If using GUNS ensure GUN FIRING switch is set to READY

- Set RETICLE SELECTOR to appropriate setting (GYRO for guns and rockets, FIXED for bombs)

- Set RETICLE DIMMER to appropriate brightness

- Adjust TARGET SPAN LEVER to width of target

- Use SIGHT RANGE DIAL (if GYRO is selected) to place target within diamonds

- Press BRAKES to fire

Performance Data

Max airspeed 2,500ft or less - 340 kts

Max airspeed 15,000ft - 320 kts

Max airspeed 25,000ft - 275 kts

Max airspeed 35,000ft - 225 kts

Max acceleration - +6/-2 g

Max airspeed with landing gear and/or flaps extended - 140 kts

Max airspeed with landing lights extended - 120 kts

Best Power Off Glide Speed - 130 kts (gear and flaps up)

Stall Speed (7,500lbs, gear and flaps up) - 69 kts

Stall Speed (7,500lbs, gear and flaps down) - 59 kts

Performance and Endurance Low Blower

The following chart shows Manifold Pressure, Engine RPM, Indicated Airspeed in Kts and estimated range in Nautical Miles. Supercharger **LOW**. Aircraft gross weight 7,500 lbs. First row is Military Power, Second Row is Normal Power. Final row provides maximum distance. FT indicates full throttle

Sea Level	5000'	10,000'	15,000'
51.5" 2700rpm 265kts 256NM	46" 2700rpm 262kts 266NM	FT 2700rpm 237kts 308NM	FT 2700rpm 221kts 369NM
47" 2500rpm 259kts 282NM	46" 2500rpm 257kts 287NM	FT 2500rpm 235kts 338NM	FT 2500rpm 219kts 451NM
39" 2300rpm 237kts 431NM	37" 2300rpm 233kts 456NM	35" 2300rpm 227kts 472NM	FT 2300rpm 211kts 620NM
32" 2000rpm 204kts 723NM	30" 2000rpm 200kts 749NM	30" 2000rpm 195kts 800NM	FT 2000rpm 190kts 836NM
30" 1400rpm 175kts 892NM	28" 1400rpm 170kts 933NM	27" 1500rpm 168kts 954NM	FT 1600rpm 162kts 984NM
26.5" 1400rpm 155kts 964NM	25" 1400rpm 154kts 985NM	24" 1500rpm 156kts 995NM	22" 1600rpm 151kts 1005NM

Performance and Endurance High Blower

The following chart shows Manifold Pressure, Engine RPM and Indicated Airspeed in Kts. Supercharger **HIGH**. Aircraft gross weight 7,500 lbs. First row is Military Power, Second Row is Normal Power. Final row provides maximum distance. FT indicates full throttle

20,000'	25,000'	30,000'	35,000'
FT 2600rpm 219kts 364NM	FT 2600rpm 198kts 441NM	FT 2600rpm 175kts 687NM	FT 2600rpm 150kts 826NM
42" 2500rpm 216kts 400NM	FT 2500rpm 197kts 523NM	FT 2500rpm 172kts 759NM	FT 2500rpm 148kts 866NM
36" 2400rpm 208kts 508NM	FT 2400rpm 194kts 641NM	FT 2400rpm 170kts 815NM	FT 2400rpm 145kts 897NM
29" 2200rpm 189kts 769NM	28" 2200rpm 185kts 810NM	FT 2200rpm 161kts 928NM	FT 2200rpm 135kts 985NM
27" 2000rpm 182kts 841NM	FT 2000rpm 171kts 913NM	FT 2000rpm 148kts 1005NM	FT 2000rpm 117kts 1005NM
FT 1600rpm 154kts 995NM	FT 1700rpm 145kts 1015NM	FT 1950rpm 143kts 1128NM	FT 2150rpm 132kts 1015NM

History

In 1946 North American Aviation (NAA) developed the XSN2J-1 prototype by redesigning the SNJs fuselage and converting the aircraft from a tail dragger to a tricycle landing gear. The prototype had a 1100 horsepower R-1830-78 Wright Cyclone engine and a tail hook for carrier landings. At the time the US Navy was looking for a new primary-basic trainer and were planning to phase out SNJs by 1950, however, in the end the Navy decided not to award the contract.

The US Army Air Corps Air were seeking designs for the new XBT trainer which was to be a replacement for their T-6 Texan trainers. In 1948 the newly established and independent US Air Force authorised NAA to produce two test aircraft and one static aircraft. The prototype was reconfigured with a smaller 800 horsepower engine, 2 bladed propeller and the tail hook removed. This new prototype (XT-28) first flew in Sep 1949 and after evaluation a contract was awarded for production of the T-28A.

The T-28A was fitted with the 7 cylinder 800hp Wright Cyclone R-1300 engine which in such a heavy airframe produced rather modest performance. Apparently this was a deliberate decision so that the aircraft would have a similar take off to the early slow spooling jets. Between 1950 and 1958 1,194 A models aircraft were delivered.

The Air Force only used the T-28A for a short time and by 1956 the aircraft was being replaced by Beechcraft T-34's and Cessna T-37's. The T-28A was still operated by Air National Guard units into the late 1950s though.

In 1952 the Navy again looked at the T-28A however the aircraft failed to meet the Navy's requirements. NAA replaced the engine 7 cylinder 800 horsepower engine with a much larger 1425 horsepower R-1820-9 HD and replaced the 2 bladed propeller with the Hamilton Standard 3 bladed propeller. The first prototype T-28B flew in 1953 and the Navy took delivery of 489 T-28B's from 1954 to 1955. The B model has a belly mounted airbrake added, fully castoring nose wheel, larger engine cowling to accommodate the new engine and the height of the front and rear canopies are lowered to help reduce drag.

The C model was introduced in 1955. This model was designed for carrier qualification training and the tail and rudder were modified to accomodate a tail hook. Structural modifications were made to handle the stresses involved in carrier landing (especially by trainees) and the propeller diameter was shortened to avoid striking the deck. Up to 1957 the Navy took delivery of 299 new T-28C's as well as converted T-28B's.

In 1958 the French Air Force were involved in counter insurgency in Algeria and needed to replace the T-6 they were using at the time. The French wanted to buy B models but the US Navy had none surplus. At this time the US Air Force was starting to retire their A models and a company called Pacific Airmotive Corporation started selling them to civilians after converting them by installing either a 1300 or 1425 horsepower engine.

The French purchased 150 T-28A's from Pac-Aero (a subsidiary of Pacific Airmotive and licensed by NAA to make the modifications) and delivered them to SUD Aviation who adapted them by installing the 1425 horsepower engine (sourced from surplus B-17s) and the 3 bladed propeller. In addition, weapons pylons and cockpit armour were added. This new version was termed the "Fennec" (desert fox).

By 1959 Military Assistance Program countries were receiving free or heavily discounted ex Air Force T-28A's for various military applications. T-28's were sent to countries such as Ecuador, Bolivia, Argentina, Mexico, Philippines, Ethiopia, Korea and South Vietnam.

Up till 1961 the T-28 featured the standard Navy trainer colours of overall yellow with anti glare black markings on the top of the engine cowling and black markings on the fuselage sides to mask the exhaust dirt.

In 1961 the trainers colour scheme was changed to overall white with orange markings on the

nose, tail and wings. Other colours such as dark blue and grey would also be used.

During the 1960's the United States required an aircraft to be used in counter insurgency and close air support and following the lead of the French with the Fennec the T-28D model was created. Ex USAF T-28A models were fitted with the 1425hp engine and the wings strengthened to carry pylons for weapons stores. In addition to the old A models T-28B's and T-28C's were also modified. These modifications were done at North American's Columbus division from 1961 through 1969 and in this time 313 A's were converted to D's while 38 T-28B's and 100 T-28C's were modified. In addition 72 T-28D's were remanufactured under a separate contract by Fairchild Republic.

From 1961 the T-28 was used by covert special operations groups for reconnaisance,bombing and air support in south east Asian countries such as Laos and Cambodia. The USAF used T-28s in Thailand until 1972. American pilots (mostly Air America pilots) and ground crew provided support and training for Thai and Laotian pilots.

In 1961 the 4400th Combat Crew Training Squadron trained the Vietnamese Air Force to fly the T-28, C-47 transport and B-26 bomber. The aircraft originally used South Vietnamese colours but as the war escalated the aircraft used full US markings. The South Vietnamese Air Force used the aircraft until 1964.

In 1963 Cambodia received some T-28s but in 1964 all technical support ceased as the US personnel were expelled from the country.

By the end of 1963 combat losses were increasing primarily due to improved enemy anti-aircraft weapons. NAA was requested to propose improvements to the T-28 and this led to the development of two prototypes fitted with 2450 horsepower Lycoming T-55 turbo prop engines. This new design was called the YAT-28E but unfortunately one of the prototypes was lost in testing (killing the pilot) and a third prototype was commissioned. At around this time the US Navy was looking for a new light attack reconnaissance aircraft and with the introduction of the NAA OV-10A Bronco in 1966 the plans for the turboprop T-28 were shelved.

From 1964 to 1967 the French sold their Fennecs to Argentina and Morocco and some were later on sold to Uruguay and Honduras. Some of the aircraft sold to Argentina were fitted with a tail hook and used as attack planes. Fennecs would eventually be used in combat in countries in North Africa, South America, Central American and Haiti.

From 1971 to 1975 the United States sent T-28s to Cambodia (now known as the Khmer Republic after a change in government in 1970) to assist the war against North Vietnamese in Cambodia.

During the 1980's the Philippines used T-28s against communist insurgents active in the south of the country.

On 13 Feb 1984 the last T-28 instructional flight was flown ending a 31 year period of training Naval Aviators. The C model had been retired earlier due to fatigue issues related to carrier operations.

It is estimated that there are about 250 to 300 T-28's still in operation around the world today. After the retirement of the aircraft as a military trainer many of those aircraft were allowed onto the civilian market.

Variants

XT-28 : Prototype. 2 built

T-28A : USAF version with 800hp Wright Cyclone R-1300 7 cylinder engine, 2 blade propeller. 1,194 built

T-28B : US Navy version with 1425hp Wright Cyclone R-1820 9 cylinder engine. 3 blade propeller. Speed brake and fully castering nosewheel. 489 built. Armed T-28B's were used in SE Asia and were fitted with two ordnance pylons and a large gun pod under each wing.. MTOW 8,500lb.

T-28C : US Navy version as T-28B but with shortened propeller, strengthened nose gear and arrester hook for carrier landing training. 266 built.

T-28D : ex USAF T-28A converted for counter insurgency roles from 1961. 1425hp Wright Cyclone R-1820-76A engine and two ordnance pylons and large gun mod under each wing. Modification sequence numbers 1 to 131.

T-28D-5 : as T-28D but converted from 1965. Wing strengthening and internal ammunition storage in the wings which allowed for a smaller gun pod. Three ordnance pylons in addition to the gunpod under each wing. MTOW increased to 10,500lbs. Modification sequence numbers 132 to 321.

AT-28D-5 : as T-28D-5 but converted from 1973. Additional radio equipment. Modification sequence numbers 001 to 050.

T-28D-10 : as T-28D-5 but converted from ex USN T-28B. Speed brake removed. Modification sequence numbers 401 to 450.

Fennec : USAF T-28A converted with 1,425hp Wright Cyclone R-1820 engine by Sud Aviation from 1959 for use in the French AF. 148 aircraft converted.

YAT-28E : T-28D powered by 2,445hp Lycoming YT-55L-9 turboprop. 3 prototypes built.

T-28R-1 Nomair : Ex-USAF refurbished for Brazilian Navy.

T-28R-2 Nomair : Ex-USAF converted into two or five place general aviation aircraft.

RT-28 : Photo reconnaissance conversion for Royal Lao Air Force.

VH-TRO

The aircraft that this FSX model is based on is serial number 51-3722 and started life as a T-28A. Converted to a D model (modification sequence number 125) it was delivered to the Royal Thai Air Force in 1965. In 1972 the aircraft was with the Royal Laos Air Force and in 1974 ended up in the Philippine Air Force. Using parts of 51-3782 the aircraft was sold as RP-R280 in 1989 and came to Australia for restoration. In 2001 the aircraft was registered as VH-TRO. The aircraft flies with the paint scheme for 53-8364 (which is a B model) and is currently operated by Warbird Aviation (www.warbirdaviation.com).

Repaint details

Some repaints represent modern flying Trojans while others represent original period aircraft. Some of the modern paints represent original colours but may not be historically accurate eg N8539A.

VH-TRO: see above

TL530: US Air Force colours.

N8539A: A modern aircraft painted in red and white Navy colours

517692: A modern aircraft painted in French fennec colours

138232: A modern aircraft painted in grey Navy colours

F-AZHR: A modern French registered aircraft painted in yellow Navy colours

AD-496: Camouflage colours.

138258: Original counter insurgency (COIN) colours circa 1971 based at Udorn, Thailand. Note the tail number as 0-38258.

52-1204: Original Fennec No 14 colours circa 1962 as flown in Algeria.

51-3531: Original COIN aircraft eventually transferred to the Royal Laos Air Force. Colours are a mixture of the COIN colours with the Erawan on the side colours circa 1971. Note the tail number as 0-13531.

Multiplayer

Use XPNDR for MP weapons

Set this option using the Animation Manager's Animation page. By default this mode is off.

FSX sends only a small selection of variables during multiplayer mode. The T-28 gives you the option of using the transponder (which is one of the few transmitted over MP) to encode the weapons configuration (ie guns, bombs, rockets) so that other players will see your aircraft the same as you do.

In this mode the T-28 will "hijack" the transponder code and use it to encode the weapons setup. If you try to change (or FSX ATC changes) the transponder code the T-28 will detect this and overwrite your changes.

If you do not use the transponder to transmit this data then other players attack aircraft will appear with guns on stations 3&4, rockets on stations 2&5 and bombs on stations 1&6. This is how the attack aircraft will always appear in the aircraft selection screen.

Each player flying a T-28 attack version within the MP session needs to turn on "Use XPNDR for MP weapons" for the display of weapons to work properly. You may get unexpected display of weapons if you have "Use XPNDR ..." on will the other players have it off.

You should not use "Use XPNDR for MP weapons" if you are using FSX ATC, flying on VATSIM or some similar network which requires ATC to see your transponder setting.

Display of rockets and bombs

Bombs and rockets are created as AI aircraft. If bombs and rockets are not selectable aircraft then they will be substituted by another aircraft for other MP players when created (I have found the rockets are substituted by the default glider for example). This is why you can select the bombs and rockets in the aircraft selection screen.

Other players in a multiplayer session who do not own the T-28 can download the free bombs and rockets package from www.antsairplanes.com. This package will install the bombs and rockets AI models which should allow them to see the weapons in multiplayer.

If you do not play multiplayer you can delete or rename the Panel folder within the "Ants_T28_Bomb" and "Ants_T28_Rocket" folders. This will hide the aircraft from the selection screen. During singleplayer mode this will work fine and in multiplayer mode it will work for the player shooting the bombs or rockets but it will result in substitutions if another player shoots bombs or rockets.

A known bug is the rockets generate an explosion effect when launched from another players aircraft in MP. I don't know why they do this but they do.

Shared Cockpit

It is strongly recommended that you do not use shared cockpit mode. The T-28 uses a great number of local variables (L: type) and these will flood any server when used in shared cockpit mode. Local variables are only transmitted in shared cockpit mode and are not transmitted in normal multiplayer mode.

Flooding

Flooding is a term used to describe when excessive data packets are sent during MP. The T-28D version 1 and 1.1 had a flooding problem caused by constantly updating the spoiler settings which were to control the drag caused by an open canopy or cowl flaps. This problem has been fixed for the T-28B&C and for the T-28D version 2 and you should not experience any flooding problems with the T-28 in MP mode. However, see the notes above about shared cockpit mode which is not recommended.

FAQs and Known Issues

Does the T-28B&C work with Prepar3d?

Yes, for P3D Version 2 there is a special version. During the installation process you will have the option to install the T-28 for P3D. If using the T-28 with FSX and P3D you should run the installer twice, once to install to FSX and again to install to P3D. Note that the P3D version is not compatible with earlier versions of P3D before V2. If using an earlier version of P3D you can install the T-28 FSX version into the Lockheed Martin/Prepar3D directory. The differences with the P3D V2 version are:

- the collimated HUD is built differently due to differences between FSX and P3D.

- the interior model contains more polygons due to the different shadows used with P3D.

Why doesn't this support Tac-Pack?

Because Tac-Pack is used by only a small minority of users. I thought it would be better to spend the time developing weapons that were usable by 100% of my customers rather than creating a weapons system that only 5- 20% of customers could use. Using Tac-Pack would mean the majority of customers would have had no weapons at all and if they did want weapons they would have needed to spend nearly twice as much as the cost of the T-28 on another addon to get them.

Cockpit shadowing

There are no shadows in the virtual cockpit: FSX requires the cockpit to have completely closed geometry to display shadows correctly. In the interests of better frame rates I chose not to make this model compatible with virtual cockpit shadows.

Error message when saving preferences

An error message in the Animation Manager when trying to save preferences error indicates that the files cannot be opened to save your settings. The most common cause of this problem is Windows preventing the Animation Manager program from writing files. If you right click on the FSX program and select "Run as administrator" this should tell Windows that it is OK for the Animation Manager program to write files.

FSUIPC users throttle and mixture axis settings

The T-28D remaps throttle and mixture input from the pilot to achieve the correct engine behaviours. These are done by sending FSX "Throttle Set" and "Mixture Set" commands. FSUIPC users should avoid assigning these FSX commands to a joystick axis. Use instead "Axis Throttle Set", "Axis Throttle1 Set" or "Throttle1 Set" for Throttle settings and "Axis Mixture Set", "Axis Mixture1 Set" or "Mixture1 Set" for Mixture settings.

Windows 8 users

It may be necessary to download and install Microsoft's DirectX 9.0c. The custom sounds use directsound which is no longer included in DirectX 11 which is shipped with Windows 8. If you cannot hear any sound when you operate a switch in the virtual cockpit or use the engine starter then download and install DirectX 9.0c from here:

http://www.microsoft.com/en-us/download/details.aspx?displaylang=en&id=8109

Installed files

The following files are installed by this package. No default files are altered or deleted by this package.

Microsoft Flight Simulator X\Effects

Ants_T28D_xxx (all effects starting with)

Microsoft Flight Simulator X\SimObjects\Airplanes

Ants Trojan T28D (all files and folders within)

Ants Trojan T28D Solo (all files and folders within)

Microsoft Flight Simulator X\Uninstall Ants T28D.exe (the uninstall program)

A shortcut to the T-28D Pilot's Handbook is placed on your desktop. This file is located in the Ants Trojan T28D folder.

Ant's Airplanes is added to your Start menu. You can access the Pilot's Handbook as well as the uninstall program from here.

Credits

Modeling, sounds, textures, flight dynamics, manuals by **Anthony Lynch.** Visit my website at www.antsairplanes.com to download some free scenery and aircraft.

Special thanks to **Kim Rolph-Smith** from Warbird Aviation at Archerfield, Brisbane. This model is based on VH-TRO which is flown by Kim. www.warbirdaviation.com

Thanks to **Klotz Karl-Heinz** for Aircraft Airfile Manager.

Thanks to beta testers: Spud, Randy Daniell, Cameron Reynolds, Rod Vaughan, Treetops, TerribleT, THibben

Thanks to PRB for performance data files

Thanks to Mr McGee for information about historic Navy paint schemes.

Copyright

Sources

The aircraft used as a model is VH-TRO from Warbird Aviation, Archerfield, QLD

www.warbirdaviation.com.au

The information in this Pilot's Handbook has been drawn from many sources. Listed below are the main publications, articles and websites used:

"T-28 Pilot's Flight Operating Instructions" by US Navy, reprinted by Periscope Film LLC

"Flight Manual T-28A and T-28D aircraft" by USAF, reprinted by North American Trainer Association

"Flight Training Curriculum T-28B/C/D" by US Navy

"November Seven Nine Zulu. Story of the North American NOMAD" by Frank Compton

"South East Asia T-28's" by Steve Darke

"T-28 Aerodynamics Primary" by Naval Air Training Command

"T-28 Engineering Primary" by Naval Air Training Command

"Air America: North American T-28s" by Dr Joe F. Leeker

www.t28trojanfoundation.com

www.northamericantrainer.org

www.pfiquet.be/fennec/history.htm

www.warbirds-eaa.com

www.avialogs.com