



F-3F-2

THE LAST OF THE CARRIER BI-PLANE FIGHTERS

HI-DEFINITION SIMULATION FOR MICROSOFT FLIGHT SIMULATOR 2020

AEROPLANE HEAVEN

COCKPIT GUIDE



FLIGHT MANUAL

You're virtually there.

INTRODUCTION

Originally constructed in 1934, the Grumman XF3F-1 prototype was powered by a Pratt & Whitney R-1535 engine in more refined form.

The production series F3F-1 proved to be a manoeuvrable, fast and deceptively (for its bulky looks) fast machine. With an incredibly short takeoff run of less than 200 feet, the aeroplane was the perfect response to the original brief for a carrier-based fighter.

In 1936, the prototype XF3F-2 took to the air with a new Wright Cyclone power plant, a top speed of 255 mph and a service ceiling of 33,800 feet. The US Navy ordered 81 Grumman F3F-2s in 1937. Development problems in the design programme for upcoming new monoplane fighters led to an 'extension' of the useful career of the F3F and the production of the F3F-3 version for 1938. Apart from some minor aerodynamic improvements, these machines were practically identical to the F3F-2.

Pilots enjoyed their 'flying barrels' immensely reporting them as a 'joy to fly' being fast, immensely strong and agile performers. Snap rolls, tight turns and loops were carried out with ease and the aeroplane could be put down in a perfect three pointer at varying speeds and weight configurations.

One intrepid test-pilot dived an F3F to 400 mph and reported that "the wings didn't come off".

The tough little Grummans became the mainstay fighters in all front-line squadrons of the US NAVY and MARINE CORPS throughout 1939 and on to the early days of the Second World War. Many design features such as the complex action retracting undercarriage and 'tubby' fuselage would find their way into the new breed of ship borne fighters, the legendary F4F Wildcats.

A total of 140 F2Fs and F3Fs were still on squadron strength at the outbreak of hostilities and the rugged little fighters remained in service as combat trainers, until as late as 1943.

LEADING PARTICULARS

Length	23ft. 2ins. (7.06m)
Height	9ft. 4ins. (2.84m)
Wingspan	32ft 0ins. (9.75m)
Wing Area	260sq.ft. (24.15sq.m)
Empty Weight	3,285 lb. (1,490 kg)
Max. Takeoff weight	4,795 lb. (2,175 kg)
Power Plant	1 x Wright R-1820-22 "Cyclone" 9 cylinder radial 960hp
Maximum Speed	264mph (229 kn) @ 15,250 ft. (4,658 m)
Cruise speed	150mph (130 kn)
Range	980 miles (850 nm, 1,600km)
Service ceiling	33,200 ft. (10,120 m)
Rate of climb	2,800 ft/min
Armament	1 x 30cal. And 1 x 50cal. Machine Guns and 2 x 100lb Bombs

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Aircraft in this simulation



VF-6 BU1033 aboard “WASP”.



VF-6 BU0986 aboard “ENTERPRISE”.



VF-4 BU0810 aboard “LEXINGTON”

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VMF-2 BU0976 aboard "SARATOGA"



US Navy fighter trainer from 1942



BU0972 U.S. Army Air Corps

It is worth noting that prior to WW2, the US military air services adorned their aircraft with brightly painted markings and much silver paint. The aircraft were kept in pristine condition by their ground crews and pilots took great pride in their mounts. The painted cowls signified the aircraft's position and pilot rank in a fighting group and the colour indicated the carrier from which they flew. Several fighting units flying in formation must have made quite an impression!

Sadly, the tragic events of Pearl Harbour in 1942 saw the end of such extravagant markings and the F3Fs, like their later off-spring, succumbed to more formal overall blue/greys and olive drabs. Things would never be the same again.

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In 1936, a special Grumman F3F-1 was built by the factory for Major Alford "Al" Williams, head of aviation for Gulf Oil Company and well-known aerobatic display pilot. The aeroplane was flown as a demonstrator for Gulf Oil (and Grumman) and appeared at air-shows and military displays all over the U.S. before WW2.

Called "Gulphawk II" and powered by a 1000hp version of the Cyclone, the aeroplane displayed its aerobatic capabilities, speed and strength to great effect. So much so that the airframe was not retired until 1948 when Williams flew it on its final flight to Washington, after which it was to take its rightful place in the now Smithsonian National Air and Space Museum.

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WALKAROUND



The first and obvious observation one can make when approaching an F3F for the first time is the stout appearance of the tubby fuselage. The enormous Wright Cyclone engine dominates everything, swinging its huge three blade variable pitch propeller.

The engine cowl incorporates muzzle tubes for the two machine guns. The right hand gun being a 50 calibre and the left, 30 calibre. The 50 cal. Is also mounted a little bit lower in the cowl on that side. The guns are charged from trigger and pull handles in the cockpit.



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Previously rare on a bi-plane, the fully retractable undercarriage was raised or lowered by chain-drive and crank, from the cockpit. It has a very interesting and complex action which is well-worth studying in use. The mechanical process has plagued modellers for years! This very same style of undercarriage continued through to the F4F Wildcat monoplane.



Atop the fuselage immediately in front of the windscreen is the optical gun sight with its standby sights and pins. It passes right through the lower section of the front screen and into the cockpit where the pilot would use the rubber eyepiece on the end of the sight.

The lower wings are somewhat shorter than the upper plane and have special handholds in the tips for ground crew to “walk” the aircraft around the field.

The port lower wing carries a retractable landing light and approach light on the underside of the leading edge. Toward the outer tip and on the top surface near the outer inter-plane strut is a “section” light for identification of the aircraft from the air.

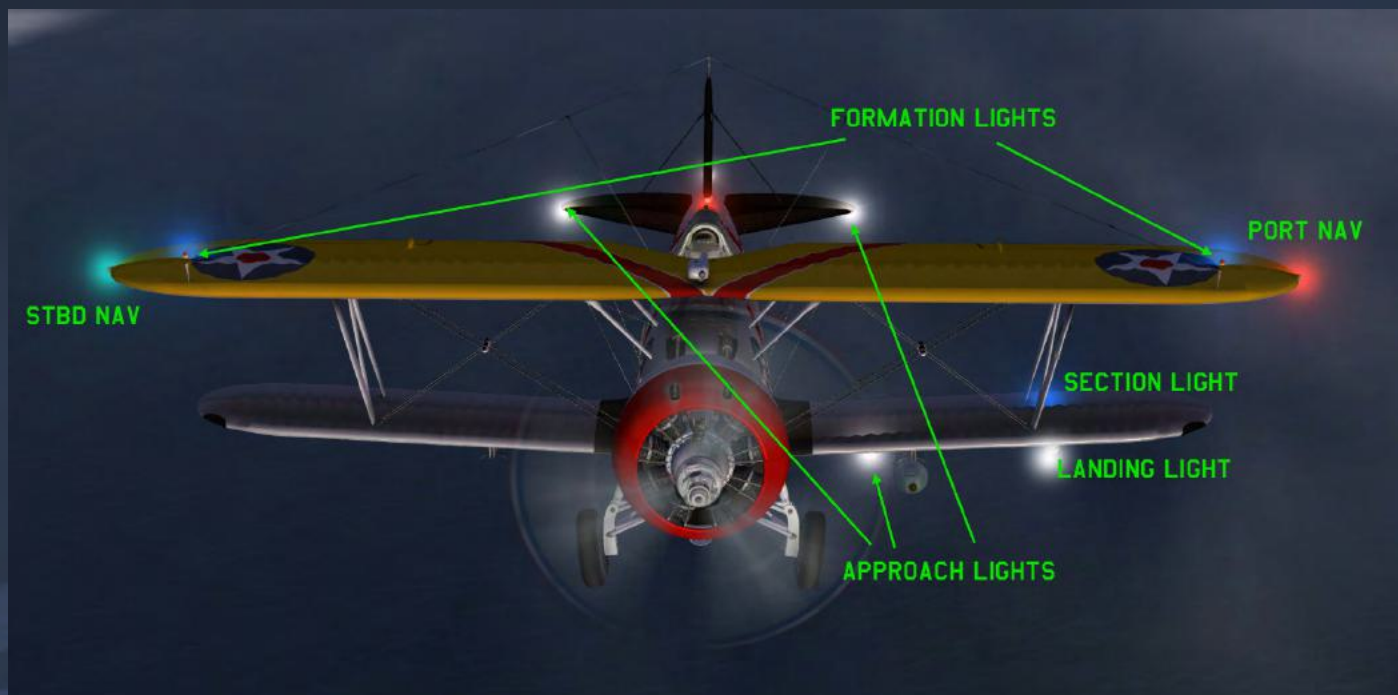
The upper wings carried squadron recognition and formation lights which could also flash. Navigation lights are housed in small pods at the wing tips. Just two large upper wing ailerons are used in this aeroplane and no flaps are used. Mounted here are also antenna masts and in the centre section a demountable gun camera for training purposes.



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Here's a shot showing all the lights on an F3F-2



The fuselage mid section carries the sliding fully-glazed canopy and steps for boarding. The turtle deck behind the canopy carries a small light used for section identification. As you move toward the tail you will see a large braced metal horizontal tailplane and fabric covered elevator. The big fin and rudder are needed for tight turning on carrier decks.

The castoring tail wheel unit is full retractable and aft of this is the housing for the retractable carrier-landing tail hook. A white navigation lamp is mounted at the end of the housing.

Well it's time to climb aboard and get acquainted with the cockpit. It's a big stretch up to that step so mind how you go!



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CARRIER BI-PLANE FIGHTER

Note:

A set of navigation instruments, namely a VOR/ADF display, RMI with OBS and an ADF tuner are fitted to an optional lower central panel. Officially, of course, the original F3F did not have the advantage of modern-day avionics. The pilot navigated using dead-reckoning and guidance from the ground or ship when available. We have provided these for those who prefer to navigate via IFR . The panel is accessed by clicking on the fascia of the bottom radio unit to the left of the main panel (12)



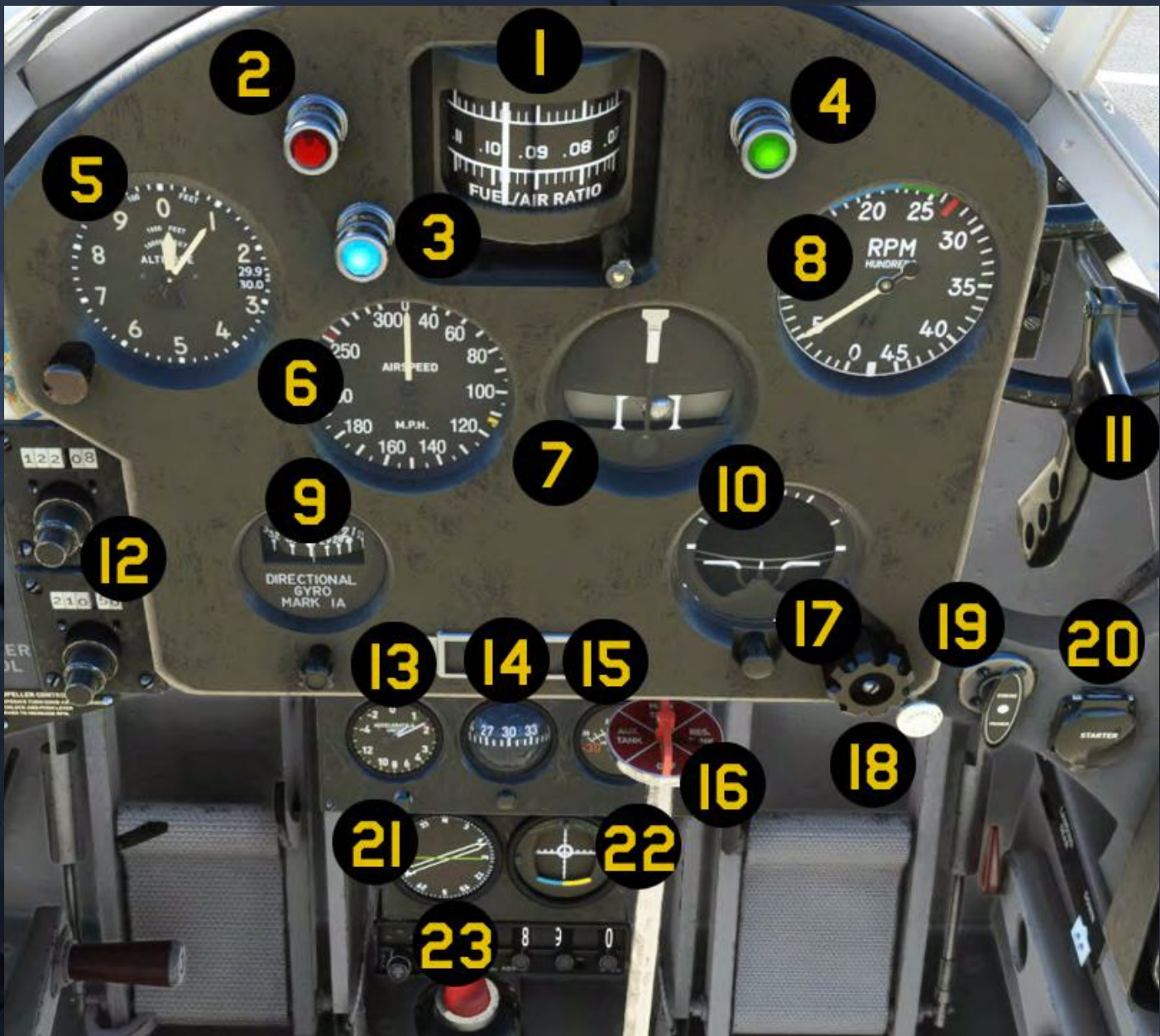
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The cockpit of the Grumman F3F-2 is very well equipped considering this is a pre-war bi-plane. It is laid out in a logical manner and is very easy to navigate and get used to. The four main areas of interest are:

The Main Panel ,The Left Console and The Right Console

MAIN PANEL



- 1. FUEL/AIR indicator. This instrument gives the pilot an instant indication of the mixture state of the engine. Particularly useful when climbing.
- 2. Oil pressure light (extinguishes on engine run).
- 3. Battery failure warning light.
- 4. Undercarriage lock indicator.
- 5. Altimeter.
- 6. Airspeed
- 7. Turn/Slip indicator.
- 8. Tachometer.
- 9. Gyro Compass.
- 10. Artificial Horizon.
- 11. Gun Charge handle (sim only).
- 12. Comms and Nav radios.
- 13. Accelerometer and G limits reset knob.
- 14. Compass.
- 15. Carburettor Temperature.
- 16. Tank selector and fuel cock.
- 17. Attitude indicator and Cage knobs.
- 18. Carburettor Heat control.
- 19. Engine Primer.
- 20. Engine Starter switch.
- 21. R.M.I.
- 22. CDI/Glideslope Indicator.
- 23. ADF Tuner.

LEFT CONSOLE



24. Landing Gear selector control 25. Supercharger control. 26. Propeller control.
27. Main Tank Contents. 28. Magnetos. 29. Tail hook control 30 . Mixture Control.
31. Throttle. 32. Throttle Friction knob. 33. Bomb controls (INOP).
34. Aileron Trim control and indicator .35. Left cockpit torch. 36. Rudder Trim control and indicator. 37. Elevator Trim Control and Indicator. 38. Tail wheel lock.

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RIGHT CONSOLE



39. Manifold Pressure **40.** Brake Pressure Indicator. **41.** Master Battery Switch and Voltmeter. **42.** Starter choice clickspot. **43.** Landing Gear Crank. **44.** Light Dimmers **45.** Generator Amps Indicator. **46.** Landing Light Switch. **47.** Cockpit Torch Lights Switch. **48.** Instrument Lights Switch. **49.** Compass Light Switch. **50.** Chart Light Switch. **51.** Receptacle Switch **52.** Section Lights Switch. **53.** Approach Lights Switch. **54 & 55.** Running Lights Switches. **56.** Approach Lights Switch. **57 & 58.** Formation Lights Switches. **59.** Generator Switch. **60.** Battery Switch **61.** Right Cockpit Torch. **62.** Canopy handle.

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PLEASE READ

The Aeroplane Heaven Grumman F3F-2 has a substantial amount of “bespoke” coding to ensure everything works as closely as possible to the real thing. Much of this code goes beyond the capabilities of the stock simulator and involves a clear understanding of the procedures to operate the aircraft systems properly. So, PLEASE READ the following as it will save you a lot of head-aches further down the track and will allow you to enjoy to the full, the many interesting features and functions of the F3F-2.

Operating the landing gear

There are two parts to the operation of the landing gear in an F3F-2. These are 1) GEAR SELECTION and 2) GEAR OPERATION.

To system employs a **Gear Selector and Lock switch (24)**. To select the desired state, UP or DOWN, you first pull the pin using the ring pull provided. This unlocks the selector which is attached to a bungee chord return. To select **DOWN**, toggle switch to the **DOWN** position and re-insert the lock pin. To lower the undercarriage, the pilot then swaps sides and uses the gear crank handle to lower the gear using the chain drive system. A small indicator near the crank handle will slide back and fore to indicate gear state. **REMEMBER** You cannot use the crank lever if you have not **UNLOCKED** and set the gear selector switch!

Starting the engine

An engine priming lever (19) is positioned adjacent to the starter and needs to be **UNLOCKED** before use. **USE MOUSEWHEEL (BACKWARD)** to unlock the lever which will revolve anti-clockwise to the unlocked position. **LEFT CLICK** to push the lever in and out to prime. A cold engine would probably need no more than 5 strokes.

MIXTURE CONTROL should be FULL-FORWARD. You will see the marker of the FUEL/AIR indicator (1) move to the right indicating a rich condition.

The starter (20) is a two-part operation. First flip the cover up and then push the button in.

VERY IMPORTANT !!!!!!!!!!!!!!!!!!!!!

You **MUST** press and **HOLD** the starter in. The Aeroplane Heaven F3F-2 has a set of special startup effects and props to simulate the unique start-up characteristics of the real Wright Cyclone engine. **HOLD THE STARTER IN UNTIL THE ENGINE FIRES.**

If you are using **cntrl/E** to start, You **MUST** press **cntrl/E** and **HOLD** the keys down **UNTIL THE ENGINE FIRES.**

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The F3F-2 had a cartridge start system and an electric start system.

We have given you an option of **MANUAL CARTRIDGE START** or **ELECTRIC START**. **USE THE CLICKSPOT ON THE RIGHT CONSOLE (42)** to select your preference.



Cartridge starting is when an oversize shotgun shell is loaded by the ground-crew into a special breach mechanism in the port wheelwell and the breach cocked. When the pilot wished to start the engine, the starter button would fire the cartridge which produced enough energy to swing the big prop over, sufficient to energise the mags and starter. Be prepared for a **LOUD BANG** when using the system!

YOU DO NOT NEED TO HOLD THE STARTER IN WHEN YOU USE THIS SYSTEM!

Other cockpit features

The cockpit torches can be rotated and panned to multiple positions, directing the lamps where you want them to shine.

PARKING BRAKES are fitted. These are the two crescent -shaped levers on each rudder pedal.

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Night lighting.

For the cockpit, you have a few choices. Firstly, the PROJECTOR LIGHTS switch (47) operates the cockpit torches, one each side. These torches can be panned and rotated to any desired angle by “grasping” the body of the torch and then moving it around.

The intensity of the torch light can be adjusted by using the forward LIGHT DIMMER (44) by hovering over the knob and using the mouse wheel.

The INSTRUMENT LIGHTS switch (48) will turn on the self-illumination in the gauges. The brightness can then be controlled by the middle LIGHT DIMMER (44) by hovering over the knob and using the mouse wheel.

The FORMATION, RUNNING (NavLights), SECTION and APPROACH lights all have three position switches which go from DIM to OFF to BRIGHT.

The LANDING LIGHT switch (46) will automatically extend the light body under the left wing whilst turning on the landing lamp.

NOTE: As all the switches are close together, it has been difficult to provide clickspots for the functions. As a result some of the clickpoints will not be directly over the switch stalks but more likely, alongside. A little patience is therefore required when operating the switches.

Let's go flying!

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FLYING THE GRUMMAN F3F-2

The “Flying Barrel” is actually a bit of a misnomer. Powerful and very agile, pilots of the day reported that the aeroplane was extremely rewarding to fly and possessed excellent performance and handling. An F3F-2 could get airborne in under 200 feet. The huge Wright radial hauling the tubby little airframe into the air at an impressive climb rate of 2,800 ft. per minute. On test, the aircraft was put into a dive, achieving well over 400 MPH before pulling out. Such was the strength of the airframe.

We’re now going to go through a typical procedure for starting and flying the Grumman F3F-2.

PRE START.

Check that the parkbrakes are set. The big radial imparts a large amount of torque when starting and the aircraft can leap forward if not braked.

Set the fuel tank selector to Main.

Set the propeller control to LOW RPM.

Set the mixture control to 50% and the throttle just cracked open.

Turn the battery switch ON. If you are going to use cartridge start, select MANUAL using the option control.

Check fuel contents

If making a cold start, unlock the Primer lever and prime the engine with up to 5 strokes. Lock the Primer back in.

START

Switch the magneto control to BOTH.

Open the starter cover and depress and HOLD the starter button until the engine has fired and is starting the first combustion pass. This will take quite a few seconds so be patient and keep holding the starter button in.

If you are using Cntrl/E to start, similarly, hold the keys down until the engine has started. If the engine fails to fire, just repeat the starter operation until it does.

With the engine idling, allow it to warm up and check that the low pressure light is out on the main instrument panel.

Check that the manifold pressure gauge is reading. Apply a small amount of throttle and the Manifold pressure should rise.

Return the throttle to idle and allow the engine to warm up for a minute or two.

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Check that the gear selector is down and locked using the selector switch lock pin which should be IN. The gear indicator should be showing DOWN and it should not be possible to move the gear crank handle.

Check that the arrestor hook lever is UP and that the tailwheel lock is UNLOCKED. Set a small amount of right rudder trim. When taking off, this will help offset the torque transmitted by the big radial.

Feed in a small amount of UP elevator trim.

Gently open the throttle a small amount and release the brakes. Once rolling forward start to steer to the runway using the rudder pedals. The freewheeling tailwheel yoke will help steer the aircraft in tight corners.

Once at the runway and lined up, LOCK THE TAILWHEEL.

TAKEOFF

Set the propeller control to MAX RPM and the mixture control to 100%.

Advance the throttle smoothly and release the brakes. The aircraft will accelerate quickly and will require some rudder input to counter torque.

PLEASE NOTE: As we go to press, the host simulator is still far from perfect in its handling of "tail-draggers" like the F3F. We have done much work to eliminate most of the poor ground behaviour of the simulator but you will still need CAREFUL INPUT of the rudder to keep the aeroplane straight on the takeoff roll.

Mercifully the F3F has a very short takeoff roll and will unstick itself in around 190 feet of runway. Be ready to "catch" the torque effect of the big prop with the stick to level the aircraft for the climb.

Once above 50 feet or so, unlock the gear selector by pulling the pin and select UP. Now cross to the other side console and crank the gear lever until the gear is up and the indicator light is extinguished on the instrument panel. Re-lock the selector switch, ensuring the pin is back IN. In real life, the pilot has to change hands on the stick to do all this. A trap for novice pilots!

CLIMB

Once the gear is up and locked, reduce the throttle slightly to achieve around 30 inches of mercury on the Manifold Pressure gauge.

Climb to your desired altitude and level out, reducing throttle for the cruise which should be around 150 mph.

It is important to monitor the mixture control as you climb to give the engine the correct air to fuel ratio. Setting the indicator in the centre of the Fuel/Air gauge will see you right for most conditions. Once above 3,500 ft. You will need to be ready to reduce the mixture control setting. A rise in engine RPM will be heard as you do this, indicating correct engine management.

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As temperatures drop at higher altitude, you may need to use the carburettor heat control. Check the Carburettor Temperature Gauge on the right side of the lower main subpanel. The Carburettor Heater control is situated next to the Primer Control.

CRUISE AND MANOEUVRES

The F3F-2 is a sprightly performer. She'll happily fly at 265 mph or more with the Supercharger (blower) in High Gear. Push the control in to shift gear and watch the difference! Monitor your manifold pressure and revolutions do not let either get into the red. Throttle back for manifold pressure and use the prop control to adjust the RPM on your tachometer. Snap rolls and loops are easy as long as you enter at good speed (at least 200mph) and the majority of display aerobatics are possible.

APPROACH and LAND

REMEMBER, YOU HAVE NO FLAPS!!

On approach to land, your speed should be reduced to around 90 mph. Set mixture control to 100%. Unlock the landing gear selector switch and select DOWN. Cross to the right console and use the crank handle to lower the gear. Ensure that the indicator is showing DOWN and the light has illuminated on the main instrument panel.

If you are on approach to a carrier, lower the arresting hook. Select Landing Camera View for better vision.

PLEASE NOTE: Once hard-deck carriers are included in the host simulator, we will upgrade the F3F-2 to full carrier-landing function.

Check that the tailwheel is LOCKED

Airspeed should be 75 – 85 MPH over the threshold. Pull throttle back to idle and pull the stick back gently to flair and attempt a three-point landing at 45-60 mph. Do not worry if you don't and the main wheels touch first as the aircraft will settle on its tailwheel soon after.

Keep the aircraft straight with small amounts of rudder correction. Once the tailwheel is on the ground, apply the brakes and slow to taxi speed. Remember that this an aeroplane designed for use on aircraft carrier decks, so the brakes are very, very good. Do not over-brake!

Of course on a carrier trap you will be at a dead stop by now!

You will find flying the "Barrel" a tremendously rewarding experience, especially when you trap on a carrier for the first time. Have fun with your F3F-2 and we hope you will enjoy her as much as we did making her.

The Aeroplane Heaven Team.

