C152

OPERATIONS MANUAL

Just Flight™

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DUCHESS
MODEL 76

Just Flight™

Operations Manual

X-Plane 12 must be correctly installed on your PC
prior to the installation and use of this C152 simulation.

CONTENTS

INTRODUCTION

The C152 is a two-seat, piston-engine aircraft equipped with fixed tricycle landing gear and a fixed-pitch propeller – ideal for touring and flight training.

Based on its predecessor, the C150, the aircraft was fitted with a more powerful engine in addition to other minor changes, such as an increased useful load.

The C152 was first introduced in 1977 and production ended in 1985. Over 7,500 C152s have been built and they continue to be flown all around the world.

Aircraft specifications

Dimensions

Length	7.3 m (24.1 ft)
Wingspan	10.2 m (33.4 ft)
Height (to top of tail)	2.6 m (8.6 ft)
Wing area	14.9 m^2 (160 ft^2)

Engine

Type	Lycoming O-235 four cylinder, horizontally opposed, air-cooled piston
Power	110 horsepower at 2,550 RPM
Propeller	Two-blade, fixed-pitch

Weights

Empty weight	1,081 lb (490 kg)
Maximum weight	1,670 lb (757 kg)
Maximum baggage weight	120 lb (54 kg)
Maximum useful load	589 lb (267 kg)

Fuel and oil

Fuel capacity	26 US gallons (13 per wing tank)
Usable fuel	24.5 US gallons
Oil capacity	6 US quarts

Performance

V_{NE} (never exceed speed)	149 KIAS
V_{NO} (max. cruising speed)	111 KIAS
V_A (manoeuvring speed)	104 KIAS (at 1,670 lb) 93 KIAS (at 1,350 lb)
V_{FE} (max. flap speed)	85 KIAS
V_{SO} (stall speed)	43 KIAS (landing configuration)
Service ceiling	14,700 ft
Range	590 nautical miles (75% power at 8,000 ft)

Paint schemes

The C152 is supplied in the following six paint schemes:

- D-EIYF (Germany)
- G-BHZH (UK)
- HB-CHA (Switzerland)
- I-SCDX (Italy)
- N530CA (United States)
- OK-POH (Czechia)

The C152 also comes with Thranda's innovative Dynamic Livery system, allowing you to create and save your own custom liveries from the EFB.

INSTALLATION, UPDATES AND SUPPORT

You can install this C152 software as often as you like on the same computer system:

1. Log in to your Account on the Just Flight website.
2. Select the 'Your Orders' button.
3. A list of your purchases will appear and you can then download the software you require.

To install the aircraft in X-Plane 12:

1. Download the C152 from your Just Flight Account.
2. Unzip the downloaded .zip file. The resulting folder will be named 'JF_C152'.
3. Copy the 'JF12_C152' folder into the 'X-Plane 12/Aircraft' folder.

Accessing the aircraft

To access the aircraft in X-Plane 12:

1. From the Main Menu, click 'New Flight' or go to the Flight Configuration window.
2. Click on the 'C152' in the aircraft selection screen.
3. Click 'Customize' and choose a livery from the drop-down menu in the top right.
4. Click 'Start Flight'.

Uninstalling

To uninstall this software from your system:

1. Go to your X-Plane 12 folder.
2. Open the 'Aircraft' folder.
3. Delete the 'JF12_C152' folder.

Recommended X-Plane settings

For maximum enjoyment of this aircraft in X-Plane, we recommend setting your joystick 'Stability Augmentation' sliders to 0. This will help prevent control issues, such as running out of pitch trim, and results in more realistic flight behaviour.

To turn off Stability Augmentation, follow these steps:

1. Launch X-Plane and go to the 'Settings' window.
2. Go to the 'Joystick' tab.
3. Click on the 'Control Sensitivity' button along the bottom of the window.
4. Set all three of the 'Stability Augmentation' sliders to 0% to disable them.
5. The 'Control Response' sliders can be set as desired.
6. Press 'Done'.

Updates and Technical Support

For technical support (in English) please visit the Support pages on the Just Flight website.

As a Just Flight customer you can obtain free technical support for any Just Flight product.

If an update becomes available for this aircraft, we will post details on the Support page and we will also send a notification email about the update to all buyers who are currently subscribed to our regular emails.

Regular News

To get all the latest news about Just Flight products, special offers and projects in development, just subscribe to our regular emails.

We can assure you that none of your details will ever be sold or passed on to any third party and you can, of course, unsubscribe from this service at any time.

You can also keep up to date with Just Flight via Facebook and X.

SYSTEMS GUIDE

Airframe

The C152 is a single-engine, all-metal aircraft with fixed landing gear. The aircraft has seating for two occupants, a 120-pound luggage compartment and a 110 HP engine.

The basic airframe is constructed out of aluminium alloy, with wingtips and fairings made of fibreglass. The fuselage is a semi-monocoque structure. There is a passenger door located on each side of the aircraft.

The wings are externally braced and have a one-degree dihedral angle. The trailing edge of the wing provides a mount for the flaps and ailerons. The four-position wing flaps are electrically controlled by a lever located in the centre of the panel. Each wing contains one fuel tank.

A vertical and horizontal stabiliser, elevator and rudder make up the empennage. The horizontal stabiliser contains the elevator trim tab actuator.

Fuel system

The fuel system was designed with simplicity in mind. Fuel is contained in two 13 US gallon tanks, one in each wing. Of the total 26-gallon capacity, only 24.5 gallons are usable.

A fuel shut-off valve, located on the floor between the two seats, allows the pilot to control the flow of fuel to the engine.

Fuel quantity is indicated by electrically operated gauges on the lower left panel. There is a separate fuel quantity gauge for each tank. The gauges cannot be relied upon for accurate readings and the fuel level should be checked manually before flight.

Electrical system

Electrical power is supplied by a 28-volt DC system which is powered by an engine-driven, 60-amp alternator and a 24-volt, 14-amp hour battery. The power is supplied through a single bus bar. A master switch controls the power to all circuits except the engine ignition system, clock and flight hour recorder. Avionics should be turned off prior to starting the engine.

Master switch

The master switch is a split-rocker type switch with OFF (down) and ON (up) positions. The left half of the switch (ALT) controls the alternator and the right half of the switch (BAT) controls all the electrical power to the aircraft.

In normal conditions both halves of the switch are placed in the same position, but the BAT side of the switch can be turned on separately to check equipment while on the ground.

Ammeter

The ammeter indicates the flow of current (in amperes) from the alternator to the battery, or from the battery to the electrical system. If the engine is operating and the master switch is on, the ammeter indicates the rate of battery charging. If the alternator is not functioning, or if the electrical load exceeds the output of the alternator, the ammeter indicates the rate of battery discharge.

A low voltage light indicates that the alternator has failed and that the battery is supplying all electrical power.

Circuit breakers

Most of the electrical circuits are protected by push-to-reset circuit breakers located on the lower centre of the panel. Left-click on the circuit breakers to pull them out or push them in.

Vacuum system

The vacuum system provides the suction necessary to operate the air-driven gyro instruments – the directional and attitude indicator. The system consists of an engine vacuum pump, a vacuum relief valve, a filter and the necessary plumbing.

A suction gauge, mounted on the left panel, provides valuable information to the pilot about the operation of the vacuum system. A decrease in pressure, or zero pressure, over an extended period may indicate a problem with the vacuum system.

Normal vacuum readings are between 4.6-5.4 inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM.

Pitot-static system

The system supplies both pitot and static pressure for the airspeed indicator, altimeter and vertical speed indicator.

Pitot pressure is picked up by the pitot head on the bottom of the left wing. The switch for pitot heat (labelled PITOT HT) is located on the left lower panel. Static pressure is sensed by button-type vents on each side of the aft fuselage. A static port is located on the lower left side of the forward fuselage.

Lighting system

Lights fitted to the aircraft include navigation, anti-collision beacon, taxi, landing, instrument panel and cabin dome lights. The lights are controlled by rocker switches on the left lower panel.

A rheostat control knob on the left lower panel controls the integral instrument lighting. A cabin dome light is located on the overhead panel and is controlled by the DOME LT switch on the left lower panel.

Instrument markings

Airspeed indicator markings

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White arc	35-85	Full flap operating range. Lower limit is maximum weight VSO in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green arc	40-111	Normal operating range. Lower limit is maximum weight VS1 with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow arc	111-149	Operations must be conducted with caution and only in smooth air.
Red line	149	Maximum speed for all operations.

Engine indicator markings

INSTRUMENT	Red line or arc Minimum limit	Green arc Normal operating	Red line Maximum limit
Tachometer	————	1,900-2,550 RPM	2,550 RPM
Oil temperature	————	100-245°F (38-118°C)	245°F (118°C)
Oil pressure	25 PSI	60-90 PSI	100 PSI
Vacuum gauge	————	4.6-5.4 inHg	————

Limits

Weight limits

Maximum weight: 1,670 lb (757 kg)

Maximum weight in baggage compartment: 120 lb (54 kg)

Centre of gravity limits

Weight (lb)	Forward limit Inches aft of datum	Rearward limit Inches aft of datum
1,670	32.65	36.5
1,350 and below	31.0	36.5

The reference datum is the front face of firewall.

Manoeuvre limits

This aircraft is certificated in the utility category. The utility category is applicable to aircraft designed for limited aerobatic operations; these are limited to stalls (except whip stalls), lazy eights, chandelles, spins and steep turns.

Flight load factor limits

Positive load factor (maximum): +4.4 G (+3.5 G with flaps down)

Negative load factor (maximum): -1.76 G

Fuel limitations

Total capacity: 26 US gallons

Unusable fuel: 1.5 US gallons

Usable fuel: 24.5 US gallons

Landing gear

The C152 is equipped with fixed tricycle landing gear.

The nose gear is steerable through a 30-degree arc each side of centre by use of the rudder pedals and toe brakes.

The hydraulically actuated disc brake system includes toe brakes on the left and right set of rudder pedals. The parking brake is controlled by a knob on the lower left part of the panel.

Doors and exits

The aircraft is fitted with a door on either side of the fuselage.

Each door can be opened from within the cockpit by clicking on the associated door latch to pull it to the open position. It can be closed by clicking on the door handle to pull it closed.

Both pilot doors can also be opened from the Aircraft Options section of the EFB.

Flight controls

Dual flight controls are provided. The flight control system consists of conventional aileron, rudder and elevator surfaces which are operated through mechanical linkages – a yoke for the ailerons and elevator, and pedals for the rudder (and brakes).

The trim tab is controlled by a trim control wheel located in the centre of the panel. Rotating the wheel forward gives nose-down trim and rotation aft gives nose-up trim.

Electronically controlled single-slot flaps are provided. The flap control is in the centre of the panel. To extend or retract the flaps, move the lever to the desired flap setting of 10, 20 or 30 degrees. An indicator located on the left side of the lever shows the flap movement. The flap system is protected by a 15-ampere circuit breaker labelled FLAP.

The aircraft will experience a pitch change during flap extension or retraction. This pitch change can be corrected by either elevator trim or increased yoke force.

Engine

The C152 is powered by a four-cylinder, horizontally opposed engine rated at 110 horsepower at 2,550 RPM. It is equipped with a starter, alternator, two magnetos, a vacuum pump and an oil filter.

Engine controls

The engine controls consist of a throttle control and a mixture control knob. These controls are located on the lower centre of the instrument panel.

The throttle knob is used to adjust the engine RPM, with the full forward position being fully open and the full aft position being fully closed. The mixture control knob is used to adjust the air-to-fuel ratio. The engine is shut down by placing the mixture control knob in the fully lean position.

The carburettor heat control knob is located to the left of the throttle.

Engine instruments

Indicators enable the pilot to check oil pressure, oil temperature and RPM. The engine instruments are located on the lower left panel.

Ignition and starter system

Engine ignition is provided by a dual magneto on two spark plugs per cylinder. Ignition is controlled by a key-operated rotating selector on the lower left portion of the left panel. The selector operates clockwise, with right, left, left/right and start positions.

Primer system

To assist with engine starting, the aircraft is equipped with a manual priming system. The primer is operated by a plunger knob on the lower left panel, which features a lock to prevent inadvertent use. To operate the knob, left-click once to unlock it and then again to pull it out. Right-click to push in the knob, and once you have finished priming the aircraft, right-click again to lock it.

Stall warning system

An approaching stall is indicated by a stall warning horn which is activated between 5-10 knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on a graph in the OPERATING DATA MANUAL included with this C152 software.

The stall warning horn emits a continuous sound and is not dependent on electrical power.

PANEL GUIDE

The instrument panel features the primary flight instruments and the engine instruments, as well as radios and navigation equipment.

The attitude and directional indicator, located on the left-hand instrument panel, are vacuum-operated. The vacuum (suction) gauge is co-located with these gauges. The turn indicator is electrically operated.

The radios are located in the centre section of the panel and the circuit breakers are in the lower right corner of the panel. The engine controls and wing flap lever are below the radios on the centre panel.

The radio stack can be swapped out for the modern GTN750 touchscreen if either the TDS GTNXi or the Reality XP GTN750 payware plugin is installed.

The right-hand instrument panel also contains the tachometer, ammeter and other instruments such as the flight hour recorder.

Additional features include door windows and two sun visors.

A large baggage area behind the rear seats is accessible from the cabin. When baggage is loaded, it is the pilot's responsibility to ensure that the aircraft's centre of gravity falls within the allowable CG range.

EFB 2D pop-out

The EFB 2D pop-out arrow appears in the top left corner of the screen every time you load the C152.

Left-click on this arrow to open the 2D EFB pop-out:

This icon can easily be faded out and hidden completely by hovering your mouse over it and moving the scroll wheel. It will re-appear for the next flight.

Please see the separate EFB manual for further details of EFB operation.

Left main panel

1. Airspeed indicator (ASI) – indicates airspeed in knots (outer scale) and MPH (inner scale)
2. Suction gauge
3. Attitude indicator (AI) – a pitch reference knob allows for the pitch bars (aircraft symbol) position to be adjusted nose-up or nose-down
4. Clock – a knob allows for adjustment of the hour and minute hands
5. Altimeter – a barometric pressure scale is provided for hPa/mb. The pressure setting knob tooltip displays the currently selected pressure in hPa/mb or inHg, depending on which unit of measurement is currently selected in the Instrument Options section of the EFB.
6. Omni-course (VOR 1) indicator – driven by the KX 175B. The indicator features a CDI needle, fail flag and back course light.
7. Low voltage warning light
8. Turn and bank indicator
9. Direction indicator – caging knob (bottom left) controls rotation of the compass card
10. Vertical speed indicator (VSI)
11. ADF indicator – driven by 300 ADF system. HDG knob controls rotation of the compass card.

Control lock

A control lock can be fitted to lock the ailerons and elevator control surfaces in a neutral position. The control lock features a red flag which covers the ignition switch.

To install or remove the control lock, click on the clickspot to the left-hand side of the control wheel rod.

The lock can only be fitted when the aircraft is on the ground.

Hiding the yoke

To enable easier access to the controls, you can hide the yokes by using the clickspot where the yoke enters the instrument panel.

Left lower panel

1. Parking brake knob
2. Left and right fuel quantity indicators
3. Oil temperature and pressure indicators
4. Primer plunger knob
5. Master switch (battery/alternator)
6. Ignition/magneto selector
7. Panel light knob
8. Starter engaged light
9. Electrical switches – (left to right) dome light, pitot heat, navigation lights, strobe lights, beacon light, taxi light and landing light

Cabin doors

1. Window – the latch must be moved prior to opening/closing the window
2. Door latch – click to open or close the door

Centre panel

1. KMA 20 audio selector
2. KX 175B COM 1 / NAV 1 radio
3. 300 ADF receiver
4. RT-359A transponder

Centre panel with GTN750

The C152 offers compatibility with the TDS GTNXi and Reality XP GTN750; these units will be swapped out for the GTN750 touchscreen when either plugin is enabled.

1. GTN750 touchscreen

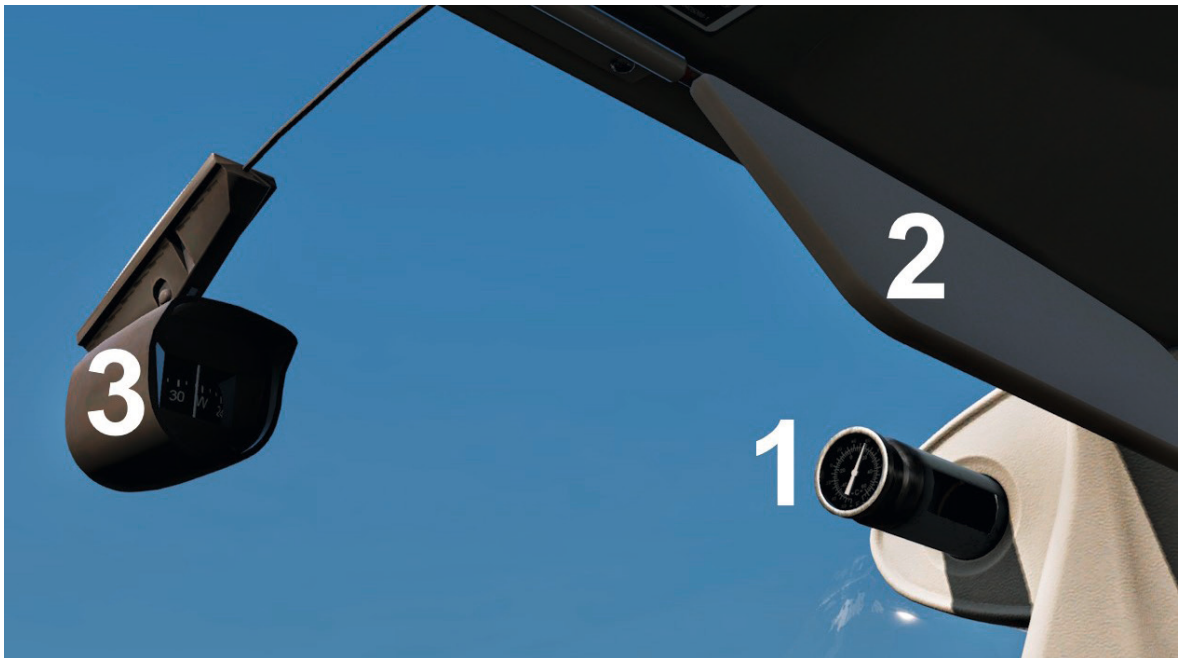
Lower centre panel

1. Carburettor heat control knob
2. Throttle control knob
3. Mixture control knob
4. Flap control lever and position indicator
5. Cabin air and heating control knobs
6. Elevator trim wheel and position indicator
7. Circuit breakers

Right panel

1. Tachometer (RPM) – incorporates an engine hour totaliser
2. Intercom controls
3. Ammeter
4. Flight hour recorder

Upper cockpit



1. Outside air temperature indicator
2. Sun visors – click and drag to move
3. Whiskey compass

Lower cockpit

1. Fuel shut-off valve

KMA 20 – audio selector

1. Microphone selector switch
2. AUTO switch
3. Receiver selector switches
4. Marker beacon sensitivity and lamp test switch
5. Marker beacon lights

The KMA 20 is an audio control system which provides control over transceiver and receiver outputs through the use of selector switches. The simulator doesn't allow for separate speaker and headphone outputs so both buttons perform the same function.

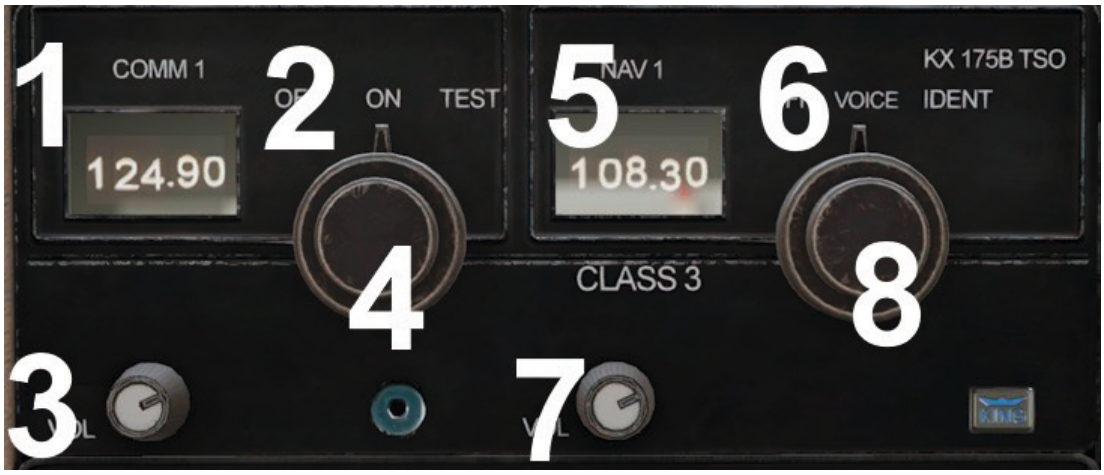
The COM 1 and COM 2 switches are used to toggle the COM 1 and COM 2 transceiver audio, allowing you to select COM 1 and/or COM 2 as the audio source(s) to monitor.

The NAV, DME, MKR and ADF switches are used to toggle the associated audio sources.

When the AUTO switch is placed in either the SPEAKER or the PHONE position, the unit will automatically match the corresponding receiver audio with the selected transmitter. This is not simulated, due to limitations in X-Plane.

The microphone selector knob connects the microphone to the selected output.

KX 175B – COM 1 / NAV 1 radio



1. COM 1 frequency display
2. COM 1 power/test switch
3. COM 1 volume knob
4. COM 1 frequency selector knobs
5. NAV 1 frequency display
6. NAV 1 power/mode switch
7. NAV 1 volume knob
8. NAV 1 frequency selector knobs

The KX 175B is a very simple COM/NAV radio and acts as COM 1 / NAV 1.

COM controls

Rotate the power/test switch to the ON position. Turn up the volume using the volume knob and then rotate the concentric selector knobs to tune in a COM frequency.

The COM radio will operate with either ON or TEST selected.

NAV controls

Rotate the power/mode switch to the VOICE position. Turn up the volume using the volume knob and then rotate the concentric selector knobs to tune in a NAV frequency.

Rotate the power/mode switch to the IDENT position to hear the audio identifier.

300 ADF receiver

1. Power/volume knob
2. Mode selector knob – selects BFO, REC, ADF or TEST mode
3. Frequency display
4. Frequency select knobs – tune the ADF frequency

Frequency selection

The ADF frequency is displayed on three counters.

The frequency is selected using the frequency select knobs which are rotated either clockwise or anti-clockwise. The right inner knob tunes the 1s. The right outer knob tunes the 10s. The left knob tunes the 100s and the 1,000s.

Operating modes

REC mode provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer on the ADF indicator will be deactivated and immediately turn to the 90° relative position and remain there during reception.

ADF mode activates the bearing pointer on the ADF indicator, causing it to point in the direction of the station relative to the aircraft heading.

BFO mode permits the carrier wave and the associated Morse code identifier broadcast on the carrier wave to be heard.

With TEST mode selected, the bearing pointer on the ADF indicator will be deactivated, immediately turn to the 90° relative position and remain there.

ADF test

Select TEST mode and confirm that the bearing pointer moves directly to the parked 90° position. Make sure that the unit is tuned to a usable frequency and then select ADF mode. Confirm that the needle moves to the station bearing.

RT-359A – transponder

1. Function selector knob
2. Reply light
3. Identification push-button
4. Dimmer knob (non-functional in this simulation)
5. Test push-button (non-functional in this simulation)
6. Code windows
7. Code knobs

Operating the transponder

The function selector knob should be in the OFF position before starting the aircraft's engine. Select the required reply code by rotating the four code knobs (one per code digit). The code will be displayed in the four code windows.

After starting the engine, turn the function selector to standby (SBY). The transponder will take approximately 45-50 seconds to become operational. Once you are airborne, turn the function selector to ON, enabling normal Mode A operation.

Turn the function selector to the altitude (ALT) position for altitude reporting (Mode C) to ATC.

Important codes

7700: Emergency

7600: Communications failure

7500: Hijacking

0000: Reserved for military aircraft

Squawk ident

When you are asked to ident by ATC, press and release the ident push-button. Your aircraft will be positively identified to the air traffic controller.

Reply light

During normal operation the reply light will flash to indicate that the transponder is functioning properly and replying to interrogations from ground radar. Interrogations occur at 10-15 second intervals, corresponding to each radar sweep.

GROUND EQUIPMENT

The aircraft can be fitted with chocks and tie-downs whilst on the ground.

The chocks and tie-downs are activated by the toggle buttons in the Aircraft Options section of the EFB. They can appear whenever the aircraft is on the ground and stationary, with the engine off and the parking brake applied.

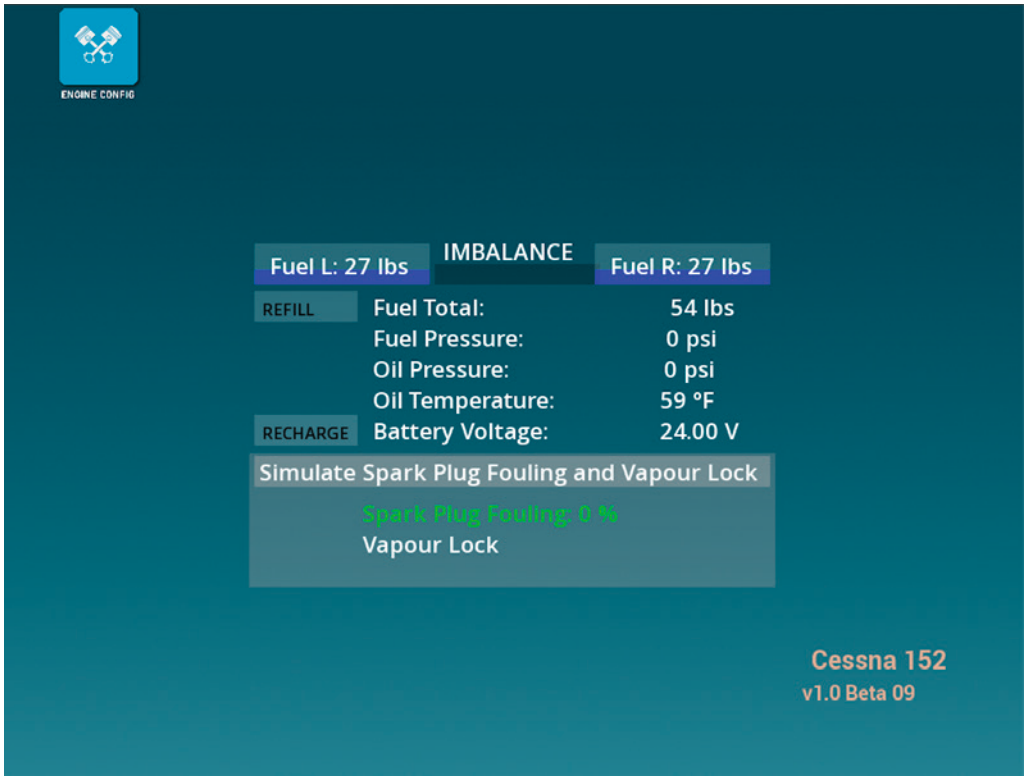
They will disappear when those conditions are no longer met.

FAILURES

In addition to supporting the simulator's own failures system, this C152 simulation includes a few of the more common failures found on these aircraft:

1. **Spark plug fouling** – this can occur if the engine is kept at low RPM for prolonged periods and symptoms include rough running with a subsequent increase in cockpit vibration. If fouling occurs, increase engine RPM and aggressively lean the mixture. This can be done at low power settings on the ground without harming the engine. An indication of the amount of spark plug fouling can be found on the EFB's Engine Configuration app.
2. **Vapour lock** – this can occur for up to approximately 30 minutes after the engine has been shut down. After shutdown, fuel vapour can remain within the fuel lines as the result of high temperatures. This vapour disrupts the operation of the fuel system and creates an incompatible mix of air and fuel, so you might need a few attempts at starting the engine before ignition occurs. This problem is more likely to occur when operating in high temperatures.
3. **Battery failure** – the battery can be quickly drained either by leaving electrical systems switched on without the engine (and therefore alternator) running or by repeated attempts to start the engine. The battery can be recharged by using the Engine Configuration app on the EFB.

These failures are enabled by default and can be disabled/enabled by clicking on 'Simulate Spark Plug Fouling and Vapour Lock' in the EFB's Engine Configuration app.



If you are unable to start the engine, please check the **fuel flow**. To ensure sufficient fuel flow for ignition, confirm that the fuel pump is switched on and the mixture lever is set to rich (forward). Confirm fuel flow using the flow gauge prior to attempting an engine start. Refer to the NORMAL PROCEDURES section in the manual for more information.

FLYING THE C152

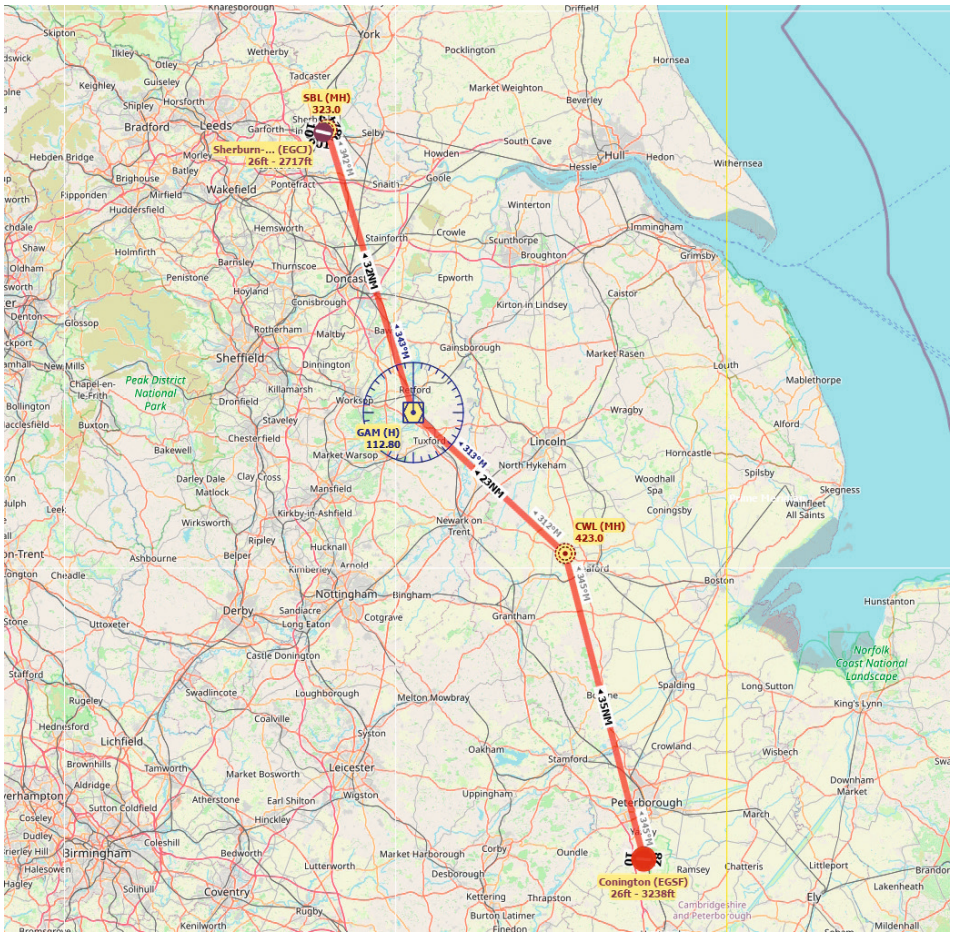
In this tutorial flight we will be departing from Conington airfield, located six miles south of Peterborough and 20 miles north-west of Cambridge, UK. We will be heading north-west, passing to the east of RAF Wittering and RAF Cottesmore before flying over RAF Cranwell and Gamston airfield.

We will approach Sherburn-in-Elmet from the south-east, covering approximately 89 nautical miles. This flight is the ideal length for learning about the essential systems on board the C152.

We will be using Just Flight's Conington scenery in this tutorial but the tutorial can be flown using default scenery or other payware renditions of Conington.

Here are the details for today's flight:

EGSF – CWL (423.0) – GAM (112.80) – SBL (323.0) – EGCJ



Estimated time en route: 40 minutes

Route distance: 89 nautical miles

Departure time: 1200 (local time)

Weather: Clear

Now that we are prepared for the flight we can proceed to the cockpit to begin our pre-flight checks. To load up the C152 tutorial flight, follow these steps:

1. Start X-Plane 12.
2. From the Main Menu, click **New Flight**, or go to the Flight Configuration window.
3. Click on the **C152** in the Aircraft Selection screen.
4. Click **Customize** and choose a livery from the drop-down menu in the top right. Uncheck the box labelled **Start with engines running**.
5. Under the Location box, type **EGSF** and select **Peterborough Conington**. Click the **Customize** button.
6. Under ‘Starts’ select **Ramp** and choose a ramp start location. Press **Confirm** when done.
7. Click **Start Flight**.

You should now find yourself sitting in the cockpit at Conington airfield. The aircraft is configured in a ‘cold and dark’ state with all the cockpit systems switched off, as you would find the aircraft prior to the first flight of the day. By beginning in this configuration we will need to spend some additional time setting up the cockpit, but doing so will allow you to learn a considerable amount about the features and functions on board this light aircraft.

This tutorial will cover the necessary steps for you to get from point A to point B, but it will not explore each system in depth. Please refer to the rest of this manual for details of each system.

Getting started

The first step is to open both doors to allow entry into the cockpit. In the 3D cockpit, click on the ‘PULL TO OPEN’ door latches to push them open.

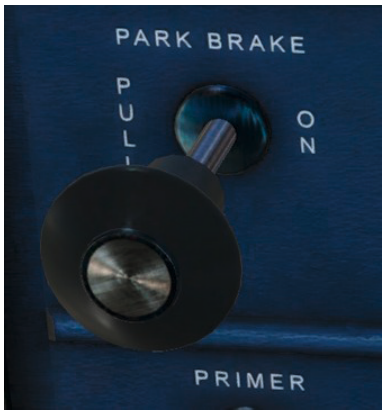
We can now start working through the pre-flight inspections.

First, remove the control lock from the left yoke by left-clicking on it. Open the Aircraft Options app on the EFB and remove all tie-downs and chocks.

To enable easier access to the controls, you may want to hide the yokes by using the clickspot at the base of the yoke, where it enters the panel.

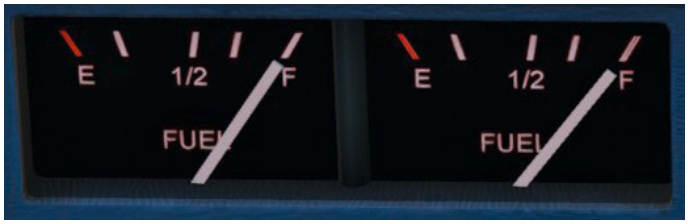
Check that the magneto selector is set to **OFF** (rotated fully anti-clockwise) and that the ignition key is removed.

Confirm that the parking brake knob is pulled **ON**.

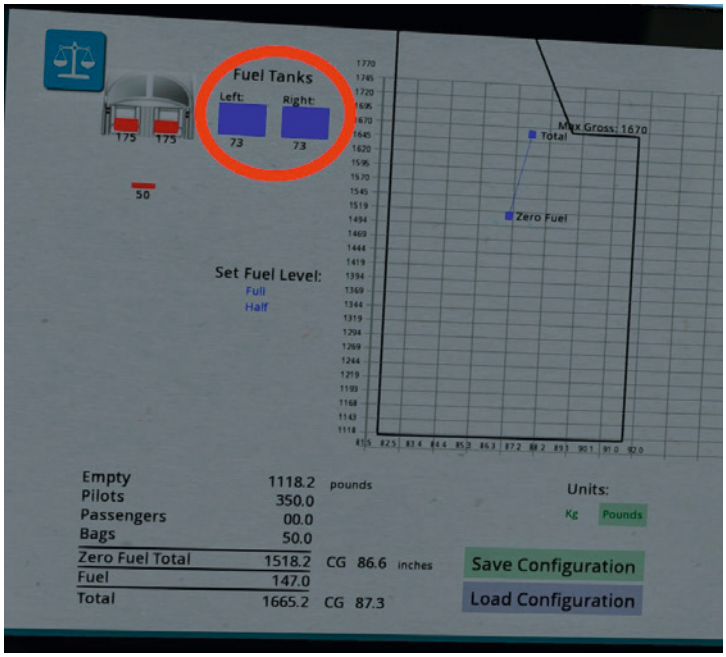


Check that all avionics are **OFF** and that the mixture knob is set to **IDLE CUT-OFF**. Then switch **ON** the battery master.

Check the left and right fuel quantity gauges to confirm that we have full tanks (25 gallons per tank).



If this is not the case then we can use the weight and balance app on the EFB to fill both tanks using the mouse scroll wheel



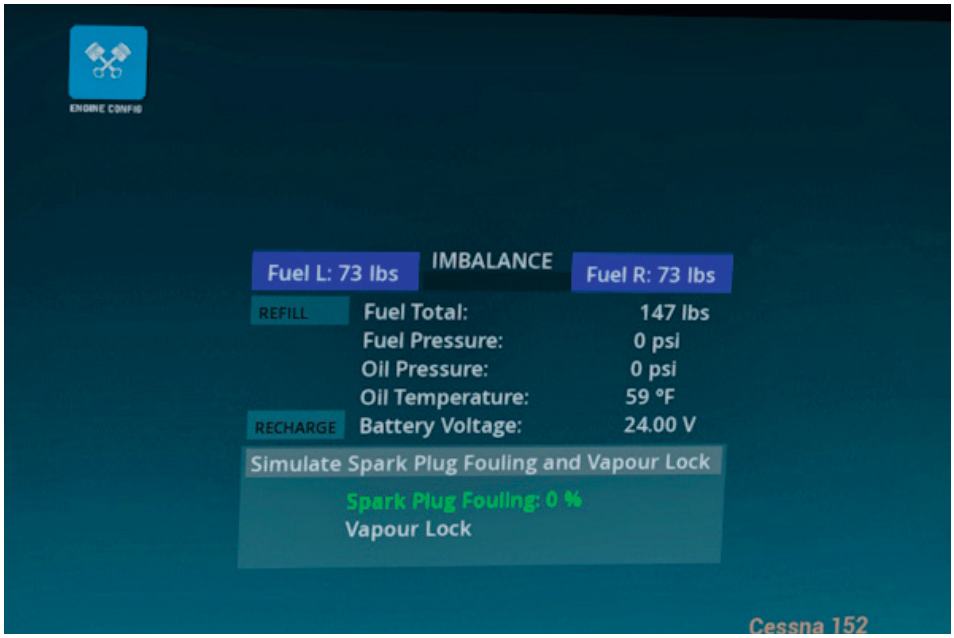
Switch **ON** all the exterior lights and extend the flaps to **30**°.

Switch to an exterior view and confirm that all the lights are illuminated and that the flaps are fully extended before returning to the cockpit and switching **OFF** the lights and battery master.

Check that you have full and free movement of the flying controls and then move the elevator trim through its full range before returning it to the centre (take-off) position.

Switch to an exterior view and carry out a visual inspection of the aircraft. The wheel chocks and tie-downs should not be visible. Confirm that the towbar is not connected/visible.

Open the Engine Config app on the EFB This allows you to refill the fuel, recharge the aircraft battery and check the engine stats.



Use the menu to recharge the battery in case it has discharged while you've been finding your way around the cockpit.

We are now finished with the EFB's Engine Config app, so press the Home button.

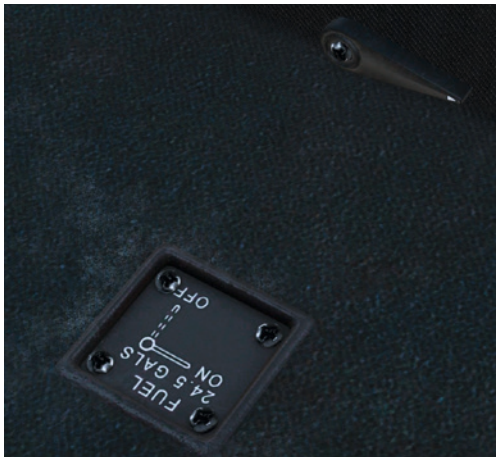
Starting the engine

To avoid battery draining, we will start the engine before configuring the avionics for our departure.

Close the passenger doors by clicking on the door latches to pull them shut.

Check that the parking brake is set and that all circuit breakers are pushed in.

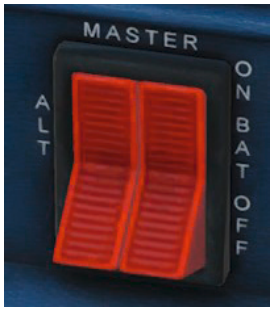
On the floor, make sure that the fuel shut-off valve lever is in the **ON** position.



On the throttle quadrant, move the mixture knob to the **FULL RICH** (fully forward) position and advance the throttle knob to approximately **1/4 open**.

Confirm that the carburettor heat lever is set to **OFF** (pushed in).

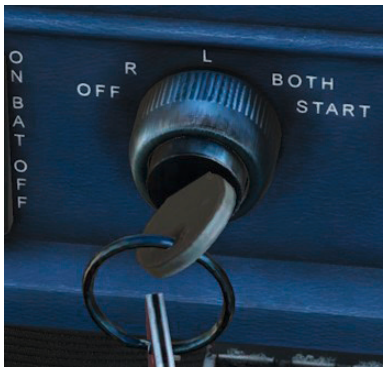
Switch **ON** the battery master and alternator switches to provide electrical power to the aircraft.



Turn **ON** the beacon and navigation lights, warning anyone in the area that we are about to start the engine.

Insert the ignition key by rotating the magneto switch one click to the right.

Check that the area surrounding the aircraft is clear of obstructions and then rotate the magneto/start selector to the **START** (fully clockwise) position.



When the engine starts, release the magneto/start selector and it will return to the BOTH position. Check that the oil pressure and temperature are rising.

With the engine running and the alternator charging the battery, we can now switch on the avionics. Starting at the top of the centre panel and working down, switch on the KMA 20, KX 175B, 300 ADF and RT-359A units.

Configuring the avionics

We now need to configure the avionics for our departure.

Using the knob on the direction indicator, rotate the compass card to ensure that it matches the heading shown on the whiskey compass. Alternatively, use the ‘vacuum DG sync to magnetic north’ key command.

Once we are settled into our climb to the north we will make a turn to fly towards the first waypoint on the route, Cranwell (CWL) NDB. In preparation, tune the NDB frequency (**423.0**) into the 300 ADF unit.

Tune the second waypoint on our route, Gamston VOR (**112.80**), into the KX 175B (NAV 1) unit.

Rotate the OBS knob on the VOR 1 indicator to select **313 degrees**. This is the course inbound to the Gamston VOR from the Cranwell NDB.

Taxi

We can now taxi to the runway. Check that the area around the aircraft is clear of obstacles and then release the parking brake. Apply power slowly to get the aircraft rolling and then start your taxi to the threshold of runway 28.

Steering the aircraft with the rudder pedals only is generally sufficient. The combined use of the rudder pedals and the brakes permits, if necessary, tight turns.

Check the operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

Stop at the holding point just short of runway 28. We can carry out the power (ground) checks here.

Set the parking brake and advance the throttle knob to obtain 1,700 RPM and then rotate the magneto selector to the **LEFT** position, note the RPM drop and then rotate it back to the **BOTH** position. Repeat the process for the right magneto.

To carry out a carburettor heat check, pull the carburettor heat lever to **ON**, check for a small drop in RPM and then push the carburettor heat lever to **OFF**. If the RPM increases to significantly more than the original 1,700 RPM, icing conditions are likely to be present. With clear skies and moderate temperatures for our flight, however, that shouldn't be an issue.

Check that the suction, oil temperature, oil pressure and ammeter readings are within limits.

Finally, reduce the throttle to idle and check for rough running. Return the throttle to a quarter open.

We can now run through the before take-off checks.

Move the flap lever to **10°** and look left and right to confirm that the flaps have extended.

Confirm that the battery master and alternator switches are both set to **ON**.

Check that the carburettor heat lever is set to **OFF** and that the mixture knob is in the **FULL RICH** (fully forward) position.

Confirm that the magneto selector is in the **BOTH** position and that the primer is pushed in and locked, then switch **ON** the landing light.

Confirm that the elevator trim wheel indicator sits in the centre (TAKEOFF) position.

Confirm that both doors are latched and that you have full and free movement of the flying controls.

Finally, switch **ON** the PITOT HEAT switch.

With the before take-off checks complete, have a look left and right, verify that nothing is on approach and that the runway is clear, and then taxi onto the runway.

Take-off

Line up with the runway centre line and then come to a stop. Smoothly apply full power and, as the aircraft starts to gather speed, keep it running down the centre line with rudder inputs. As you approach **55 knots** start to raise the nose of the aircraft.

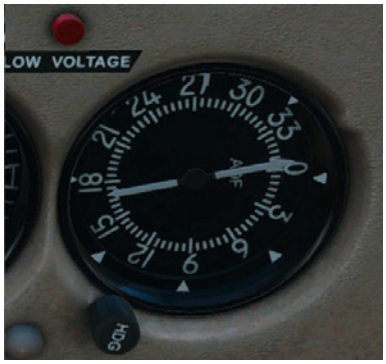
Make elevator inputs as required to maintain an initial climb speed of approximately **65 knots**, holding the runway heading (276 degrees).

Climb

Retract the flaps as you climb through 300ft AGL.

We can now begin a turn towards the first waypoint, Cranwell (CWL) NDB. With the NDB now in range, the needle on the ADF indicator will point towards it. The ADF indicator's compass card is not controlled by a directional gyro and therefore it won't rotate automatically as the aircraft changes heading. Instead, rotate the compass card using the heading knob until your current magnetic heading is at the top of the gauge and then check the needle to get the relative bearing to the NDB.

The needle should indicate a bearing of approximately 350 degrees, although at this range it will wander slightly. Bank the aircraft to the right to bring it onto a heading of **350 degrees** whilst continuing your climb.



Continue to use the heading bug to make any further adjustments to continue tracking towards the NDB.

Lower the nose of the aircraft to maintain a cruise climb speed of **80 knots**.

Cruise

Level the aircraft out as you approach 2,500ft and once the aircraft has reached **90 knots**, reduce the throttle to maintain that airspeed. An RPM of 2,200 should be sufficient.

With the aircraft stabilised in cruise, you can sit back and take in the views across the Fens and Lincolnshire. RAF Wittering ('Home of the Harrier') and RAF Cottesmore (which used to house the Tri-national Tornado Training Establishment) can be seen past the port wing.

It is a good idea to periodically run through the 'FREDA' checks whilst in the cruise:

F – check the fuel gauges to ensure that there is sufficient fuel for the remainder of the flight.

R – check that the correct radio frequency is selected and that the transponder is set as required.

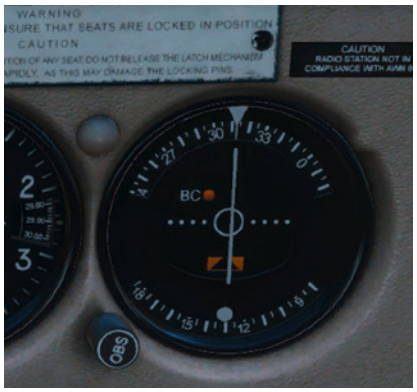
E – check the engine instruments (oil temperature and pressure).

D – check that the direction indicator is correctly aligned with the whiskey compass reading and that you are on the correct heading (towards the Cranwell NDB in this case).

A – check that the barometric pressure setting is correctly set on the altimeter.

RAF Cranwell should be visible ahead of the aircraft approximately 20 minutes into the flight. As the airfield begins to disappear under the nose of the aircraft, we will begin our turn towards the Gamston VOR. We tuned in the frequency and selected the correct OBS on the VOR 1 indicator.

The CDI needle should be moving towards the centre of the gauge as we approach the airfield. As it reaches the central mark on the gauge, begin a left turn to **313 degrees** – the course towards the VOR.



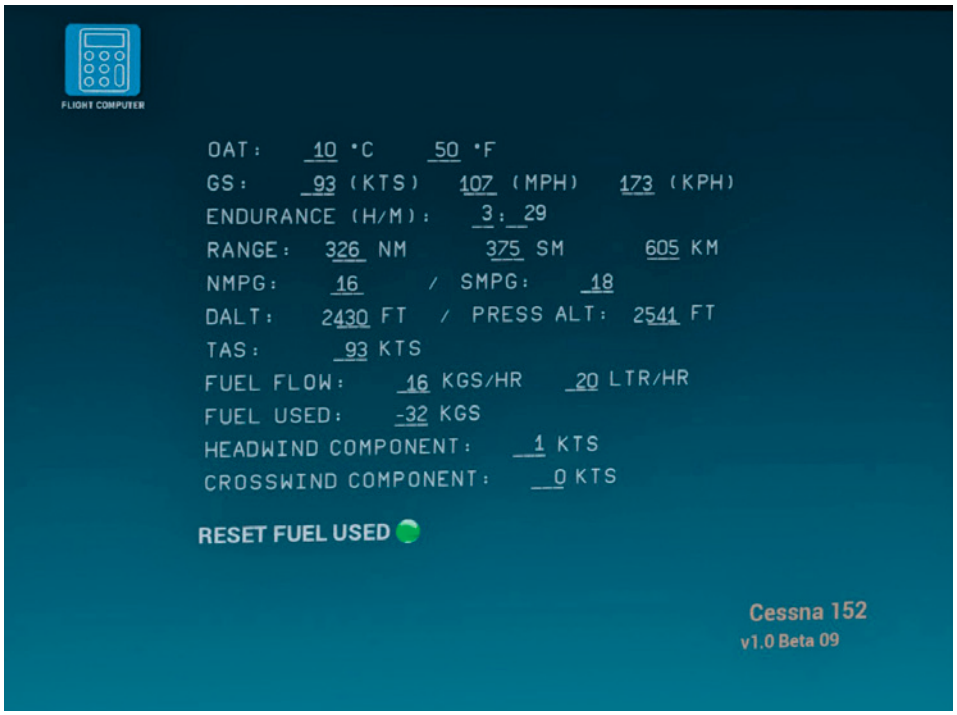
After reaching Gamston we will make a right turn towards Sherburn-in-Elmet. The airfield has a co-located NDB which we can use to locate it. Tune the NDB into the ADF receiver – **323.0**. The NDB is not yet in range so the ADF indicator needle will not yet show a bearing.

The leg to the Gamston VOR should take approximately fifteen minutes. This is the ideal opportunity to take a quick look at some of the features of the aircraft.

The C152 has a relatively basic avionics fit which is well suited to its role as a training and touring aircraft. In addition to the primary instruments, the cockpit is fitted with omni-course (VOR 1) and ADF indicators for navigation purposes.

In the centre of the panel is the radio stack which features the KMA 20 audio selector, KX 175B COM 1 / NAV 1 radio, 300 ADF receiver and RT-359A transponder.

Another useful feature for navigation is the Flight Computer panel, which can be opened from the EFB. The flight computer shows a variety of real-time information related to everything from speed to fuel burn/flow and range/ endurance.



Use any remaining time to explore the cockpit using the PANEL GUIDE for reference.

The ADF indicator needle should spring to life shortly before reaching Gamston. Begin a right turn as you approach the airfield to bring the aircraft onto a heading towards the Sherburn-in-Elmet NDB, approximately **344 degrees**.

Approximately twenty miles before reaching the airfield you will fly overhead Doncaster Sheffield Airport, formerly RAF Finningley and now home to Vulcan XH558.

Descent

Sherburn-in-Elmet is located to the east of the city of Leeds and to the south of what used to be RAF Church Fenton. We are going to land on the westerly hard runway.

As the airfield comes into view, pull the carburettor heat **ON** and reduce the throttle to obtain **1,700 RPM**. Lower the nose and trim the aircraft to begin a descent at **90 knots**.

Begin a right turn as you approach the airfield to bring the aircraft onto a left base leg for runway 29.

Approach and landing

As you descend, confirm that the landing light is switched **ON**, the mixture is set to the FULL RICH **(fully forward)** position, the primer is pushed **IN** and the parking brake is **OFF**.

Once established on the base leg, raise the nose to reduce your airspeed to **80 knots** and extend the flaps to the **20°** position. Pitch the nose down to maintain **65 knots**.

With the airfield in the 10 o'clock position, turn the aircraft onto final approach and extend the flaps to the **30°** position.

When passing 300 ft push the carburettor heat to **OFF**.

As the aircraft arrives over the runway, start to bring the aircraft into a flare, gently raising the nose just above the horizon. Reduce the throttle to idle and the aircraft should touch down smoothly.

Apply gentle braking and, once the aircraft has slowed to a fast walking pace, turn right off the runway. When you are safely off the runway, raise the flaps.

You can also switch **OFF** the landing light and pitot heat.

Shutdown

Begin your taxi to the nearest available parking spot.

Once you have come to a stop at your chosen parking spot, engage the parking brake and switch **OFF** the avionics.

Bring the throttle knob back to **IDLE** and then bring the mixture knob back to **IDLE CUT-OFF** to shut down the engine.

Once the engine comes to a stop, rotate the magneto selector to the **OFF** position and remove the ignition key.

Switch **OFF** the navigation and beacon lights and then switch **OFF** the alternator and battery to disconnect the electrical power.

Open the passenger doors.

Congratulations – you have completed the C152 tutorial flight!

NORMAL PROCEDURES

Airspeed (IAS) for normal operations

Take-off:	
Normal climb out	**65-75 KIAS**
Short field take-off, flaps 10°, speed at 50ft	**54 KIAS**
Climb (flaps up):	
Normal	**70-80 KIAS**
Best rate of climb (V_Y)	**67 KIAS**
Best angle of climb (V_X)	**55 KIAS**
Landing approach:	
Normal approach, flaps up	**60-70 KIAS**
Normal approach, flaps 30°	**55-65 KIAS**
Short field approach, flaps 30°	**54 KIAS**
Operating speed in turbulent air:	
1,670 lb	**104 KIAS**
1,350 lb	**93 KIAS**
Maximum demonstrated crosswind	**12 KIAS**

Pre-flight

Cockpit

Control lock	**REMOVE**
Parking brake	**SET**
Mixture	**IDLE CUT-OFF**
Ignition switch	**OFF**
Master switch	**ON**
Fuel gauges	**CHECK QUANTITY**
Flaps	**30°**
Master switch	**OFF**
Fuel shut-off valve	**ON**

Left/right wing

Flap and aileron	**CHECK**
Wing tip and lights	**UNDAMAGED**
Tie-down	**REMOVED**
Fuel tank	**CHECK LEVEL**

Nose section

Chocks	**REMOVED**
Towbar	**REMOVED (NOSE GEAR)**
Oil	**CHECK LEVEL**
Propeller	**GOOD CONDITION**
Air inlets	**CLEAR**
Landing/taxi light	**CHECK**

Tail section

Fin	**CHECK CONDITIO**N
Rudder	**CHECK CONTROLS**
Trim tab	**CHECK CONTROLS**
Tail cone	**CHECK CONDITION**

Before starting engine

Parking brake	**SET**
Circuit breakers	**IN**
Carburettor heat	**OFF**
Avionics	**OFF**
Fuel shut-off valve	**ON**

Engine starting

Caution: *If a positive oil pressure is not indicated within 30 seconds after an engine start, stop the engine and determine the cause of the trouble. In cold weather it will take a few seconds longer to get a positive oil pressure indication.*

Hot engine

Mixture	**FULL RICH**
Carburettor heat	**OFF**
Prime	**AS REQUIRED (up to 3 strokes)**
Throttle	**HALF AN INCH OPEN**
Master switch	**ON**
Ignition switch	**START**

When the engine starts:

Ignition switch	**BOTH**
Oil pressure	**CHECK**
Throttle	**800-1,000 RPM**

Taxiing

Taxi area	**CLEAR**
Parking brake	**RELEASE**
Throttle	**APPLY SLOWLY**
Brakes	**CHECK**
Steering	**CHECK**

Steering the aircraft with the rudder pedals only is generally sufficient. The combined use of rudder pedals and brakes permits, if necessary, tight turns.

Check the operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

Before take-off

Parking brake	**SET**
Flight controls	**FREE and CORRECT**
Fuel shut-off valve	**ON**
Mixture	**RICH**
Elevator trim	**TAKEOFF**
Throttle	**1,700 RPM**
Magnetos	**CHECK (max. drop 125 RPM)**
Carburettor heat	**CHECK (for RPM drop)**
Vacuum	**4.6-5.4 inHg**
Oil temperature	**CHECK**
Oil pressure	**CHECK**
Ammeter	**CHECK**
Lights	**AS REQUIRED**
Throttle	**RETARD**
Brakes	**RELEASE**

Take-off

Lined up on runway	**CHECK COMPASS**

Normal technique

Flaps	**0-10°**
Carburettor heat	**OFF**
Throttle	**FULL OPEN**
Accelerate to 50 KIAS.	
Yoke	**Back pressure to rotate smoothly to climb attitude**
Climb speed	**65-75 KIAS**

Short field take-off

Flaps	**10°**
Carburettor heat	**OFF**
Brakes	**APPLY**
Throttle	**FULL OPEN**
Mixture	**RICH**
Brakes	**RELEASE**

Accelerate to 54 KIAS.

Yoke	**Back pressure to rotate smoothly to climb attitude**

Maintain 54 KIAS until obstacle is cleared then accelerate to 65 KIAS.

Flaps	**Retract after reaching 60 KIAS**

Climb

Airspeed	**70-80 KIAS**
Throttle	**FULL OPEN**
Mixture	**RICH below 3,000ft**
	LEAN for maximum RPM above 3,000ft

Cruise

Power	**1,900-2,550 RPM (no more than 75%)**
Elevator trim	**ADJUST**
Mixture	**LEAN**

Before landing

Mixture	**RICH**
Carburettor heat	**ON (before closing throttle)**

Landing

Normal landing

Airspeed	**60-70 KIAS (flaps UP)**
Flaps	**AS REQUIRED (below 85 KIAS)**
Airspeed	**55-65 KIAS (flaps DOWN)**
Touchdown	**MAIN WHEELS FIRST**
Landing roll	**LOWER NOSE-WHEEL GENTLY**
Braking	**MINIMUM REQUIRED**

Short field landing

Airspeed	**60-70 KIAS (flaps UP)**
Flaps	**30° (below 85 KIAS)**
Airspeed	**MAINTAIN 54 KIAS**
Power	**REDUCE to idle as obstacle is cleared**
Touchdown	**MAIN WHEELS FIRST**
Brakes	**APPLY HEAVILY**
Flaps	**RETRACT**

After landing

Flaps	**UP**
Carburettor heat	**OFF**

Securing aircraft

Parking brake	**SET**
Avionics	**OFF**
Mixture	**IDLE CUT-OFF**
Ignition switch	**OFF**
Master switch	**OFF**
Control lock	**INSTALL**

Stalls

The stall characteristics of the C152 are conventional. An approaching stall is indicated by a stall warning horn which is activated between 5-10 knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

EMERGENCY PROCEDURES

Airspeed (IAS) for emergency operations

Engine failure after take-off	**60 KIAS**
Manoeuvring speed (1,670 lb)	**104 KIAS**
Manoeuvring speed (1,350 lb)	**93 KIAS**
Maximum glide	**60 KIAS**
Precautionary landing with engine power	**55 KIAS**
Landing without engine power (flaps up)	**65 KIAS**
Landing without engine power (flaps down)	**60 KIAS**

Engine failures

Engine failure during take-off run

Throttle	**IDLE**
Brakes	**APPLY**
Flaps	**RETRACT**
Mixture	**IDLE CUT-OFF**
Ignition switch	**OFF**
Master switch	**OFF**

Engine failure immediately after take-off

If sufficient runway remains for a normal landing, land straight ahead.

Airspeed	**60 KIAS**
Mixture	**IDLE CUT-OFF**
Fuel shut-off valve	**OFF**
Ignition switch	**OFF**
Flaps	**AS REQUIRED**
Master switch	**OFF**

Engine failure during flight

Airspeed	**60 KIAS**
Carburettor heat	**ON**
Primer	**IN/LOCKED**
Fuel shut-off valve	**ON**
Mixture	**RICH**
Ignition switch	**START then BOTH**

Forced landings

Emergency landing without engine power

Airspeed	**65 KIAS (flaps up), 60 KIAS (flaps down)**
Mixture	**IDLE CUT-OFF**
Fuel shut-off valve	**OFF**
Ignition switch	**OFF**
Flaps	**AS REQUIRED**
Master switch	**OFF**
Brakes	**APPLY ON TOUCHDOWN**

Precautionary landing with engine power

Airspeed	**60 KIAS**
Flaps	**20°**
Selected field	**POSITION FOR APPROACH**
Avionics	**OFF**
Flaps	**30°**
Airspeed	**55 KIAS**
Master switch	**OFF**
Ignition switch	**OFF**
Brakes	**APPLY ON TOUCHDOWN**

Fires

During engine start on ground

Engine	**CONTINUE TO CRANK**
Master switch	**OFF**
Ignition switch	**OFF**
Fuel shut-off valve	**OFF**

Engine fire in flight

Throttle	**CLOSED**
Mixture	**IDLE CUT-OFF**
Fuel shut-off valve	**OFF**
Cabin heat	**OFF**
Master switch	**OFF**
Airspeed	**85 KIAS**

Execute emergency landing without power.

Electrical fire

Master switch	**OFF**
Avionics	**OFF**
Cabin heat	**OFF**

Land as soon as possible.

Electrical failures

Over-voltage light illuminates

Master switch	**OFF**
Master switch	**ON**
Over-voltage light	**CHECK OFF**

If over-voltage light illuminates again, terminate flight as soon as practical.

Ammeter shows discharge

Alternator	**OFF**
Avionics	**OFF**

Terminate flight as soon as practical.

Icing

IMPORTANT! *Flight into known icing conditions is prohibited.*

Carburettor heat	**ON**
Cabin heat	**FULL HOT**
Pitot heat	**ON**
Engine	**MAX. RPM**

Adjust course and/or altitude to obtain best outside air conditions. Divert to nearest airport.

Spin recovery

Rudder	**HOLD OPPOSITE DIRECTION OF ROTATION**
Yoke	**FULL FORWARD, AILERONS NEUTRAL**
Throttle	**IDLE**

When spinning stops, centralise rudder, level the wings and ease out of the dive.

Airspeed indicating system failure

In case of erroneous indications in flight:

Pitot heat	**ON**

If erroneous indications persist, carry out a precautionary approach, maintaining an adequate airspeed margin above stall warning speed.

CREDITS

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Testing and logic	Erick Stromback

Special thanks to all the testers and to Flying Club Conington for giving us permission to photograph their aircraft.

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