FLIGHT TEST CHECKS

VORTEX GENERATOR INSTALLATIONS		LAA/FT-VG Issue 4
A/C Type:	Reg:	Date:
Vortex Generator Make/Model:		
VGs Installation Instructions Title:		
Summary of VG positions:		

GENERAL

Aircraft Owner:			Aerodrome:		
Aerodrome Elevation:	ft	Aerodrome Temp:	°C	QNH:	mb

Weather significant to tests (eg. Cloud base, wind speed/direction, any turbulence, etc).

LOADING

Unless it is impractical to do so, the aircraft should be loaded to maximum take-off weight or maximum landing weight if it is lower. Ballast should be used in order to comply with any prescribed loading requirements.

The CG position for each test flight must be discussed with and have LAA Engineering's agreement before test flying commences.

The CG position must remain within the limits stated on the aircraft's Operating Limitations document from take-off and throughout the flight as fuel is consumed.

If data entered exceeds the weight or CG position limits stated on the aircraft's Operating Limitations document, this application will fail.

Max Take Off / Max Landing Weight (lb/kg)	lb lb	kg kg	Permissible CG range (in/mm – fwd/aft of datum)	_____in/mm Fwd/Aft* of datum to _____in/mm Fwd/Aft*

**Delete as appropriate*

Flight No.:				
Take-off Weight (actual) (lb or kg)	lb	kg	Take-off CG position	in/mm* Fwd / Aft of datum*
Zero Fuel Weight	lb	kg	Zero Fuel CG position	in/mm* Fwd / Aft of datum*

TAKE-OFF: to be made with full power and flaps (if fitted) at the take-off position.

Runway direction	degrees	Wind direction/speed	deg kts
Headwind component	kts	Crosswind component	kts
Wing flap setting	degrees	Unstick speed	kts
Was artificial stall warner triggered?		YES	NO
DESCRIPTION OF BEHAVIOUR:			

CLIMB (CS-VLA 65)

Flight conditions:	Clear of cloud and turbulence and well clear of any hills which could produce wave conditions.
Configuration:	Normal for best rate of climb (see Manual).
Power:	Maximum Continuous with air intake in 'Cold' or 'Ram' air position.
Altimeter:	1013 mb (29.92 in Hg).
Speed: (IAS kts) (From AFM, POH)	Scheduled best rate of climb speed (V_Y); Before starting to record climb data, establish the aircraft in the climb at best rate of climb speed and maintain heading and speed ± 2 knots throughout.

Notes:

1. Sustained 5 minute climb is required to be carried out to provide sufficient data points to calculate a reliable rate of climb figure. Engine parameters for the 2nd and 4th minute are not required

2. However, where the rate of climb exceeds 1500 ft/min, or an aircraft with a Cirrus Minor or Gipsy Major engine is fitted, then a 3 minute climb will be accepted.

3. Do not allow engine to exceed limits.

4. Plot the climb performance results using the grid on the following page or the spreadsheet that is available from the flight testing section of the LAA website then print and attach it.

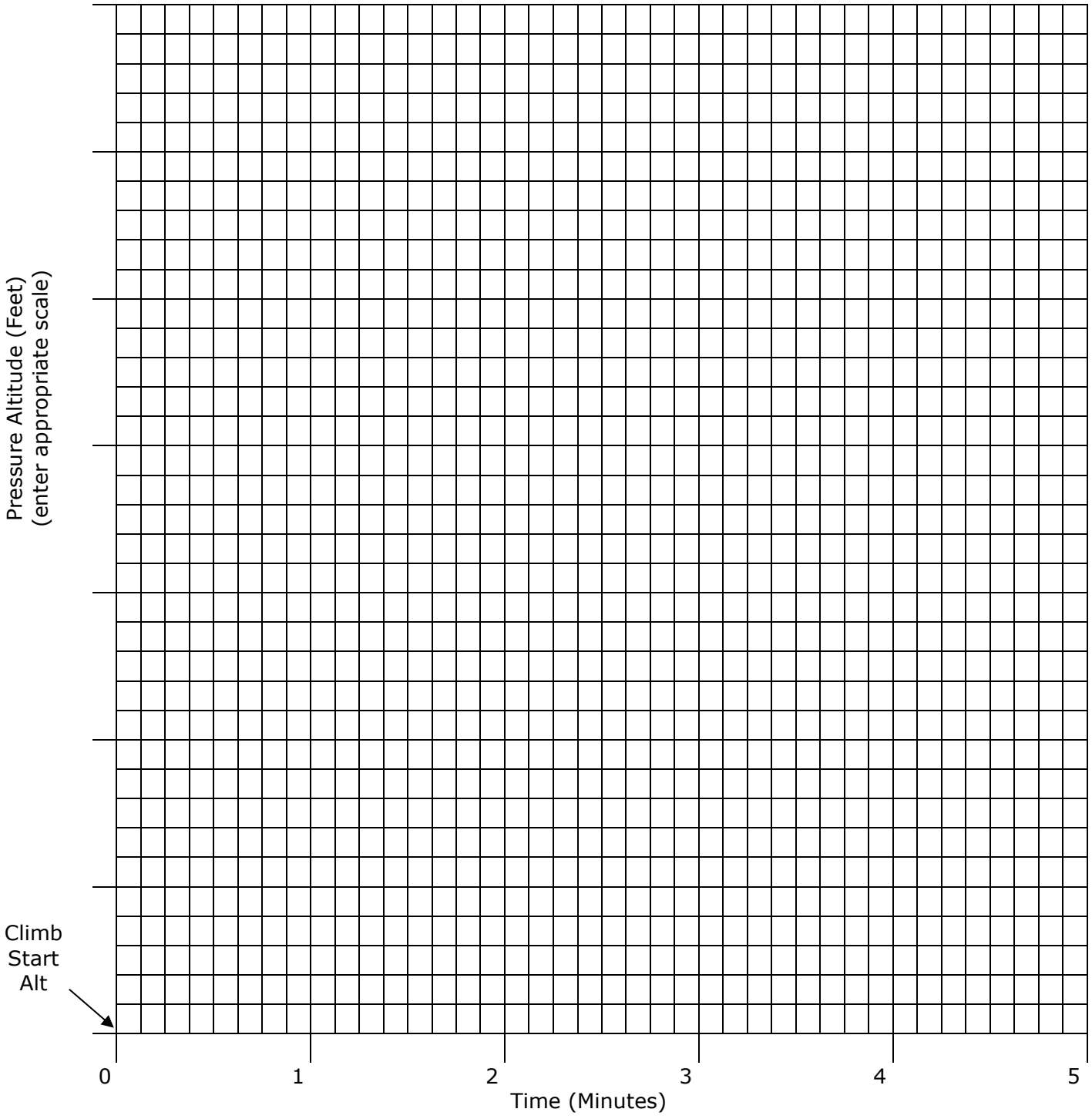
TIME (min)	ALTITUDE (FT) 1013 mb	IAS (knots)	RPM	OIL TEMP °C / °F*	OIL PRESS bar / psi*	CHT/CLNT °C / °F*	EGT °C / °F*
0							
1							
2			-	-	-	-	-
3							
4			-	-	-	-	-
5							

* *Delete as appropriate*

Enter appropriate scales on the grid below, plot climb results and draw on best fit slope then calculate the average rate of climb.

Ave ROC = _____ fpm

Climb Performance



FUNCTIONING CHECKS

When appropriate during the flight, check the following:-

Flying Controls

	Friction	Backlash	Were control forces normal?
Elevator/Stabilizer	SAT - UNSAT	SAT - UNSAT	YES - NO
Aileron	SAT – UNSAT	SAT - UNSAT	YES - NO
Rudder	SAT – UNSAT	SAT - UNSAT	YES - NO
Elevator/Stabilizer Trimmer	SAT - UNSAT N/A	SAT – UNSAT N/A	YES – NO – N/A
Aileron Trimmer	SAT – UNSAT N/A	SAT - UNSAT N/A	YES – NO – N/A
Rudder Trimmer	SAT - UNSAT N/A	SAT – UNSAT N/A	YES – NO – N/A

During normal cruise, check that the aeroplane:-

Can be trimmed to fly level	YES - NO
Has no tendency to fly one wing low	SAT - UNSAT
Flies straight with slip indicator central	YES - NO

Unpowered and Powered Wing-flaps

Confirm no roll induced when operating flaps	SAT - UNSAT
Ease of operation at flap limit speed, V_{FE} _____ kts	SAT - UNSAT

Simulated Baulked Landing. Set the aircraft in the approach configuration and record trim changes in simulated overshoot.

Trim changes	

Cruise Checks

Vibration and buffeting (CS-VLA 251)

Check for signs of vibrations or buffeting throughout the rpm range and in all phases of ground running as well as in flight. This may result if the natural frequency of vibration of the engine on its mount rubbers, or the tail surfaces or fuselage, or of the engine/reduction drive should happen to couple in an unfortunate way with the resonant frequency of the propeller blades in bending, or the aerodynamic buffet coming from the slipstream. It may also indicate that the propeller is out of track or out of balance.

SAT	UNSAT	COMMENTS:

Fast Cruise Condition in Level Flight

At a constant altitude not above 2000 feet, after the aircraft's speed has stabilised record:-

POWER SETTING	RPM	IAS (Kts)	Comment on aircraft trim and behaviour
ECONOMY CRUISE			
MAX CONT. or CRUISE			
MAX RPM or WOT*			Also, was MAX RPM achieved at less than WOT? YES - NO

* WOT - Wide Open Throttle

STALLS

Wings Level (CS-VLA 201)

To be made with propeller control fully fine and throttle closed at a safe altitude with wings level and in balance. Trim the aircraft to 1.5 x V_{S1} = _____knots.

Deceleration to stall to be at 1 knot/second until either a clear nose (and/or wing drop) occurs or until full aft stick is reached.

Wings Level Stalls	**1**	**2** (1)	**3**
Landing Gear (unless fixed) Flaps	Up Up	Up Take-Off	Down Landing
Stall warning (knots IAS)			
Type of stall warning (eg horn, lamp, natural buffet etc.)			
Stall (knots IAS)	(3)		(4)
Did control column reach back stop?			
Sequence of nose and wing drop (if any)			
Total angle of wing drop (2) (with normal use of controls)			
Other characteristics (e.g. undue pitch up)			
Height Loss (ft)			

Notes:

(1) To be made on aeroplanes where a take-off wing-flap setting is specified.

(2) Wing drop to be contained within 15° of roll (20° for microlights) - normal use of controls permitted after wing drop starts.

(3) Where at max gross weight = V_{S1}

(4) Where at max gross weight = V_{S0}

Stall behaviour where no control inputs are made at the stall break.

Wings Level Stalls	**1**	**2** (1)	**3**
Landing Gear (unless fixed) Flaps	Up Up	Up Take-Off	Down Landing
Sequence of nose and wing drop (if any)			
Total angle of wing drop (no control inputs made)			
Other characteristics (e.g. undue pitch up)			
Height Loss (ft)			

Stall Warning (CS-VLA 207)

In all cases, stall warning must begin at 5 knots to 10 knots above the measured stall speed and continue to the stall.	SATIS / UNSAT

Turning Flight Stalls (CS-VLA 203)

To be made at a safe altitude with 75% maximum continuous power, trimmed wings level to 1.5 x V_{S1} = _____knots, 30° bank angle and in balance.

Deceleration to stall to be at 1 knot/second until either a clear nose drop (and/or uncommanded roll) occurs or until full aft stick is reached.

Turning Stalls	**1 Left**	**1 Right**	**2 Left**	**2 Right**	**3 Left**	**3 Right**
Landing Gear (unless fixed) Flaps	Up Up		Up Take-Off		Down Landing	
Stall warning (knots IAS)						
Type of stall warning (eg. horn, lamp, natural buffet, etc.)						
Stall (knots IAS)						
Did control column reach back stop?						
Sequence of nose drop and uncommanded roll (if any)						
Angle of uncommanded roll (3) (Indicate direction with L or R)						
Other characteristics (e.g. undue pitch up)						
Height Loss (ft)						

Notes:

(3) Uncommanded roll at stall to be contained within 60° measured from 30° bank angle - normal use of controls permitted after roll starts.

Stall Warning (CS-VLA 207)

In all cases, stall warning must begin at 5 knots to 10 knots above the measured stall speed and continue to the stall.	SATIS / UNSAT

Accelerated Stalls (CS-VLA 203)

To be made at a safe altitude with 75% maximum continuous power, trimmed wings level to 1.5 x V_{S1} = _____knots, steady bank angle between 30° and 60° as appropriate for aircraft type (bank angle used _____°) and in balance.

Deceleration to stall to be at 3-5 knots/second until either a clear nose drop (and/or uncommanded roll) occurs or until full aft stick is reached.

Turning Stalls	**1 Left**	**1 Right**	**2 Left**	**2 Right**	**3 Left**	**3 Right**
Landing Gear (unless fixed) Flaps	Up Up		Up Take-Off		Down Landing	
Stall warning (knots IAS)						
Type of stall warning (eg horn, lamp, natural buffet etc.)						
Stall (knots IAS)						
Did control column reach back stop?						
Sequence of nose drop and uncommanded roll (if any)						
Angle of uncommanded roll (3) (Indicate direction with L or R)						
Other characteristics (e.g. undue pitch up)						
Height Loss (ft)						

Notes:

(3) Uncommanded roll at stall to be contained within 60° measured from steady bank angle bank angle - normal use of controls permitted after roll starts.

Stall Warning (CS-VLA 207)

In all cases, stall warning must begin at 5 knots to 10 knots above the measured stall speed and continue to the stall.	SATIS / UNSAT

Static Longitudinal Stability (CS-VLA 173 & 175)

Stick force must increase in the correct sense with displacement from the trimmed speed throughout the following:

Notes:

(1) Speeds that require a stick force in excess of 40lbs/18kgs/18daN need not be considered.
(2) Speeds below the minimum for steady unstalled flight need not be considered.
(3) Conduct this check only after conducting a satisfactory Dive to V_{NE} check.
(4) Do not exceed V_{NE} or maximum engine RPM.

a) Climb at recommended climb speed (_____ kts) otherwise use 1.4 x V_{S1} (_____ kts).
Configuration: Undercarriage and flaps up, set 75% continuous power, trimmed for datum speed.
Maintain trim and throttle position throughout except to avoid exceeding max engine RPM.

	Knots	Stick force (specify lbs/kg/daN)	Stick push or pull?	Stabilised speed following slow release of pitch control (kts)
Datum speed used		0	-	-
0.85 x datum speed (2)				
1.1 x V_{S1}				
1.15 x datum speed				
V_{NE} (3) (4)				

b) Cruise
Configuration: Undercarriage and flaps up, set 75% continuous power, trimmed for level flight.
Maintain trim and throttle position throughout except to avoid exceeding max engine RPM.

	Knots	Stick force (specify lbs/kg/daN)	Stick push or pull?	Stabilised speed following slow release of pitch control (kts)
Datum speed used		0	-	-
0.85 x datum speed				
1.3 x V_{S1}				
1.15 x datum speed (3)				
V_{NE} (3) (4)				

c) Approach and Landing
Configuration: Undercarriage and flaps down, idle power, trimmed for 1.3 x V_{S1}.
Maintain trim and throttle position throughout.

	Knots	Stick force (specify lbs/kg/daN)	Stick push or pull?	Stabilised speed following slow release of pitch control (kts)
Datum speed 1.3 x V_{S1}		0	-	-
1.1 x V_{S1}				
V_{FE} or if no V_{FE} 1.8 x V_{S1}				

HANDLING

Elevator Control Forces in Manoeuvres (CS-VLA 155)

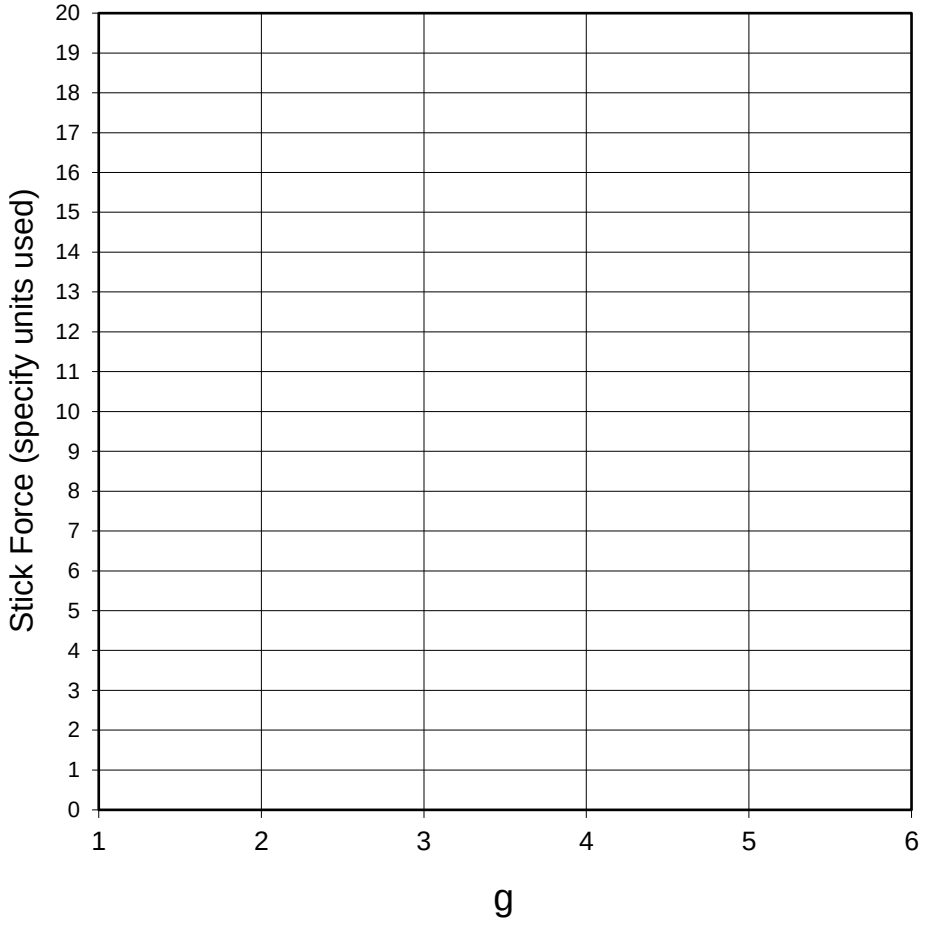
Does stick force increase with increase in load factor?	YES – NO *If* NO*, do not continue with flight test.*	
Stick force at limit load factor. (Ref. Operating Limitations or flight test authorisation). Note: Moderate extrapolation from at least 3 data points at lesser load factor is acceptable.	Limit Load Factor: _____ g	Stick Force: _____ kg/lb Measured - Extrapolated *(Delete as appropriate.)*

If not stated on the aircraft's Operating Limitations document or the flight test authorisation, verify maximum load factor with LAA Engineering before flight.

Where required, use the table below to record stick forces/g measured and plot the results on the chart then extrapolate as appropriate.

Stick forces measured.

g	Lb	Kg



Static Lateral and Directional Stability (CS-VLA 177)

Side-slips

The aircraft is to be flown power off with full flaps initially at normal approach speed. Medium rudder side-slips are to be carried out to port and starboard. The aileron and rudder controls are then to be released in turn and the tendency for the low wing to rise and the nose to swing into the turn is to be checked respectively.

Whilst maintaining aileron application, the rudder control is to be released and the ability for the nose to swing into the turn is to be checked.

	Port Sideslip (port wing low)	Stbd Sideslip (stbd wing low)	DESCRIPTION OF BEHAVIOUR
Rudder released	SAT - UNSAT	SAT - UNSAT	

Whilst maintaining rudder application, the aileron control is then to be released and the ability for the down wing to rise is to be checked.

	Port Sideslip (port wing low)	Stbd Sideslip (stbd wing low)	DESCRIPTION OF BEHAVIOUR
Ailerons released	SAT - UNSAT	SAT - UNSAT	

Reducing speed in 5 knot increments, repeat the lateral control tests (releasing aileron control) down to 5 knots above stall speed.

Static Lateral and Directional Stability (CS-VLA 177)

Turns on One Control

The aircraft is to be flown with power for level flight, flaps up and at normal approach speed.

	Ailerons only	Rudder fixed (neutral)	Rudder free
Left turn	Heading delay due to adverse yaw*	seconds	seconds
	Max Yaw angle	degrees	degrees

Right turn	Heading delay due to adverse yaw*	seconds	seconds
	Max Yaw angle	degrees	degrees

* The time taken from when aileron control input is made to when the aircraft heading passes through the initial heading in the direction of the intended turn.

	Rudder only	Ailerons fixed (neutral)	Ailerons free
Left turn	Proportion of rudder travel used		
	Yaw angle generated	degrees	degrees
	Roll response on entry		
	Roll response on recovery		
	Did the aircraft pitch up or down?		

Right turn	Proportion of rudder travel used		
	Yaw angle generated	degrees	degrees
	Roll response on entry		
	Roll response on recovery		
	Did the aircraft pitch up or down?		

Rate of Roll (CS-VLA 157)

Time to roll through 60° to reverse direction of turn from a steady 30° banked turn using coordinated rudder.

Flaps Take-off, Undercarriage retracted Engine at Max Take-off power A/C trimmed for V_{S1} x 1.2 in straight flight = _____ kts	Left roll _____ sec.	Right roll _____ sec.
Flaps Landing Undercarriage extended Engine idle A/C trimmed for V_{S1} x 1.3 in straight flight = _____ kts	_____ sec.	_____ sec.
Flaps Landing Undercarriage extended Engine at Power for Level Flight A/C trimmed for V_{S1} x 1.3 in straight flight = _____ kts	_____ sec.	_____ sec.

Dive to V_{NE} or V_{DF} (as specified in the flight test requirements)

THIS TEST MUST ONLY BE FLOWN IN SMOOTH AIR CONDITIONS

The purpose of this test is to demonstrate safe handling of the aircraft at V_{NE} (or V_{DF} if specified on the flight test authorisation) and to check this can be achieved without exceeding max permitted RPM. The V_{NE} speed is stated on the aircraft's Operating Limitations sheet.

Never exceed the V_{NE} or V_{DF}. Beware of false reading ASI – if in any doubt perform a pressure error assessment before performing any high-speed testing.

Airspeed or RPM data entered that exceeds the maximum permitted will fail the application.

It is recommended that testing to V_{DF} should be performed wearing a parachute. This is also good practice for testing to V_{NE}.

It is permitted to conduct the V_{NE} or V_{DF} dive solo

Increase speed up to V_{NE} / V_{DF} at the shallowest dive angle possible by maintaining sufficient power but keeping RPM within maximum permissible. If any unusual airframe or control vibration is felt, immediately reduce speed by closing the throttle and gradually pulling the control column back. Record:-

Scheduled V_{NE} / V_{DF} as specified by the flight test authorisation or, if not specified thereon, the Operating Limitations.	knots

Any unusual behaviour.	
Whether the control forces and responses over small angles are normal.	
Maximum IAS	knots

Regain cruising flight by closing throttle and gradually pulling the control column back.

SPINS (Applicable only to aeroplanes cleared for deliberate spinning). (CS-VLA 221)

A parachute must be worn for all spin testing.

The minimum abandonment height (agl) should be established for the class of aircraft. If there is no such guidance, minimum abandonment height should be 3000ft.

Add the height of the highest ground under the spinning zone to the minimum abandonment height, rounded up to the next 100ft and record it clearly below.

MINIMUM ABANDONMENT ALTITUDE	feet QNH.

Note that it may not be possible to conduct this item on the same flight as the other items due to loading / CG restrictions. If flown separately:

Date	A/C weight	CG

A minimum of one spin is to be made in each direction. Recovery should be initiated after two turns unless otherwise specified by LAA.

Direction of rotation.	Left	Right
Entry altitude. (feet QNH)		
Whether spin or spiral dive.		
Did spin stabilise?		
Nose attitude before recovery.		
Turns to recover.		
Total height loss. (feet)		
Describe forward stick force required.		
Amount of stick forward travel required to halt rotation.		
Any abnormality of spin or recovery? E.g. Rotation rate increase during recovery, delay between applying forward stick and rotation stopping, etc.		

<u>British Standard Spin Entry Method:</u> Close throttle, ailerons central, at 5 – 10 knots above stall speed simultaneously apply full aft stick and full rudder.
<u>British Standard Spin Recovery Method:</u> Check throttle closed and flaps up, centralise ailerons, apply full opposite rudder, pause, move stick forward progressively until spinning stops, centralise rudder, level wings and recover from dive. *Note: If the aircraft manufacturer recommends a spin recovery method that differs from the above, consult LAA Engineering prior to commencing spin testing.*

LANDING

With landing gear extended and wing-flaps in the landing position (if applicable), carry out a normal landing following an approach at the speed specified in the AFM (but should not be less than 1.3 x V_{S0} as establish for this aircraft) at the minimum power setting normal for the type and, if found to be satisfactory, carry out a landing with an approach speed 5 knots slower than normal approach speed:-

Behaviour during landings: Record any abnormal features, eg. inability to trim, unusual control forces, difficulty in flaring, 'wheelbarrowing', porpoising or nose wheel shimmy after touchdown.

	Knots	RPM	MAP (in Hg)	Was artificial stall warning triggered?	
Normal approach speed				YES	NO
COMMENTS:					
Normal approach speed – 5 knots				YES	NO
COMMENTS:					

CROSS WIND LANDING: Up to the maximum crosswind for the aircraft type. Max = _____ kts

Runway direction	degrees	Wind direction/speed	deg kts
Headwind component	knots	Crosswind component	knots
Wing flap setting	degrees	Landing speed	knots
DESCRIPTION OF BEHAVIOUR			
Behaviour using Wing Down Approach method:			
Behaviour using Crabbed Approach method:			

PILOT'S NOTES SUPPLEMENT

Recommended Speeds (knots)

	Flaps setting	Airspeed (kts)	Power Setting	
Unstick			RPM	MAP (Hg)
Climb				
Approach	0°			
Approach				

Suggested crosswind limits (knots)

Takeoff	
Landing	

FURTHER RECOMMENDATIONS:

I certify that I have flown the above aircraft and that the above checks have been carried out to my satisfaction.

Name:	Signed:	Date of Test:	Licence No.:

Once completed, send this form to LAA Engineering.

Important note: *Following conclusion of satisfactory flight test, the modified aircraft must not be flown until issue of modification final approval.*