



RECREATIONAL AVIATION AUSTRALIA INC

FLIGHT TEST
GUIDE FOR
AMATEUR BUILT
RECREATIONAL
AIRCRAFT

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FLIGHT TEST GUIDE FOR AMATEUR BUILT RECREATIONAL AIRCRAFT

PART 1 - BASIC AIRCRAFT OPERATION TESTING

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INTRODUCTION

PURPOSE

This Guide provides a step by step series of flight tests and reports to be used as a guidance for certification of PART 19 Amateur Builts. Please note that this Guide is neither mandatory nor regulatory in nature and does not constitute a regulation or order. However, compliance with the Recreational Aviation Australia (RA-Aus) Technical Manual section 3.3 and CAO 95.55 is mandatory and therefore must be satisfactorily demonstrated to the RAA that the aircraft meets these requirements.

This Guide is one method, but not the only method, of achieving standardisation for Amateur Builts. It is intended as a ready reference for both builders and test pilots alike.

SCOPE

This guide covers flight test items of interest in the approval of amateur built designs. It is intended to cover the full range of aircraft types, from first of type "unproven" designs, to proven designs which have already demonstrated a satisfactory service history.

This guide attempts to cover the full range of amateur built aircraft types so some sections may not apply to individual aircraft.

Before commencing any flight test program, the builder and/or test pilot should ensure that all requirements of Section 3.3 of the Recreational Aviation Australia (RA-Aus) Technical Manual have been complied with and the Pre-flight Final Inspection has been completed and signed by an Recreational Aviation Australia (RA-Aus) Approved Person.

REFERENCES

The FAA AC-90-89 Flight Testing Handbook is the major source of the information in this Guide and therefore should be read in conjunction to assist in establishing a flight test program. Copies may be obtained from the Recreational Aviation Australia (RA-Aus) head office.

FAA AC-90-89 recommends that some 36 hours flying take place prior to any attempts to expand the envelope of the aircraft. The total time required to gather the data for the Aircraft Operating Data Page is usually between 10 and 15 hours, leaving plenty of time during the flight test period, to carry out the "Fun Factor" part of flight testing. (within reason)

PROCEDURES

As mentioned before this guide is designed to assist in gathering the relevant flight data for the Aircraft Operating Data Page, it is not the "be all and end all" of your flight test program. It is recommended that you spend the first couple of flying hours testing the basic handling and rigging of the aircraft before "charging in" and filling out the test data. Refer to AC-90-89, chapters 1 to 4, for guidance on these first flights.

Most of the procedures for completing each section are self-explanatory. For those sections that are more complex, the basic flight test procedure is at the beginning of that section. Most pilots should have enough understanding of the principles of flight and use of a flight computer to complete this Guide. If you are unsure, most flight instructors should be more than happy to assist.

Also note that some sections, due to the nature of the test (flutter tests etc) it would be highly recommended that the test pilot wear an approved parachute, or the aircraft have a B.R.S fitted. Most skydiving centres (for a carton or two) will probably help you out here.

After each section has been completed, the relevant flight data obtained can then be entered on the Aircraft Operating Data Page, section 1, of this Guide. Then at the completion of the flight testing period, a copy of both the Aircraft Operating Data Page and Flight Test Log page should be sent to the RA-AUS for entry on their files. This data can then be accessed (with permission of course) to assist any future builder with their projects. This is also an undisputable way of ensuring your aircraft conforms with the regulatory requirements.

TEST PILOTS

GENERAL

Ideally, you as the amateur builder should be competent in an aircraft of general configuration and performance as the one being tested. The costs involved in maintaining pilot competence should be budgeted for, along with the cost of the plans and materials that go into building the project. Although there are no specific requirements for RA-AUS test pilots, the following is a good common sense guide.

A test pilot should have at least the following qualifications:

1. **Physically Fit.** Test flying can be a stressful and strenuous occupation.
2. **No alcohol** in the last eight hours, or under the influence of alcohol or drugs.
3. **Rated, current and competent** in the same category and class as the aircraft being tested.
4. **Current financial member** of the RA-AUS.

Note: The following suggested number of flight hours are only an indication of pilot skill, not of competence. Each test pilot must honestly determine if their own level of performance is adequate or if additional flight training is necessary.

1. **At least 50 hours in command** for test flying an aircraft of "proven" design.
2. **At least 100 hours in command** for test flying an aircraft of "unproven" design.
3. **At least 10 hours of tailwheel aircraft time** if the aircraft to be tested is a tailwheel.

The test pilot should:

1. Be familiar with the airport and the emergency fields nearby.
2. Talk with and, ideally, fly with a pilot in the same kind of aircraft.
3. Fly a similar aircraft with like flight characteristics. EG: if your aircraft is of a high drag design, get dual instruction in a similar certified aircraft such as a Thruster or Drifter. If your aircraft is higher performance, instruction in a Jabiru or similar aircraft is recommended.
4. Study the emergency procedures developed for the aircraft.
5. Have practised recovery from unusual attitudes within 30 days of the first flight test.
6. Study the performance characteristics of the aircraft. Refer to the manufacturer's instructions, articles written by builders of the same make and model aircraft, watch actual or video tape demonstrations of the aircraft.
7. Review the accident reports for the same make and model aircraft to learn what problems others have had with the aircraft.
8. Memorise the cockpit flight controls, switches, and instruments so, in time of emergency, your workload will be reduced

PART 1
BASIC AIRCRAFT OPERATION
TESTING

SECTION 1.1 - AIRCRAFT OPERATING DATA (Copy to be sent to RA-Aus)

1. Make: _____
Model: _____
Registration: _____ Serial No: _____

2. Owner/Builder: _____
Phone: _____
Address: _____

3. Test Pilot: _____
Phone: _____

4. Weight and CG Limitations:
MTOW _____ kg Location of CG Datum _____
Most forward CG Limit _____ (mm from datum)
Most rearward CG Limit _____ (mm from datum)

5. Airspeed Limits: KIAS
Never Exceed Speed, V_{NE} _____
Manoeuvring Speed, V_A _____
Stall Speed (clean)*, V_{S1} _____
Stall Speed (landing)*, V_{S0} _____
Flaps Extended Speed, V_{FE} _____
Best Glide Speed, V_G _____
Best Rate of Climb Speed, V_Y _____
Best Angle of Climb Speed, V_X _____

*Note: Stall speeds listed are to be at full forward CG, engine idling
Maximum Demonstrated Crosswind Velocity _____ knots

6. Airframe Data:
Construction Material _____ Approx Build Hrs _____
No of seats _____ Wing span _____ Length _____

7. Powerplant Data:
Manufacturer _____
Model _____
Serial _____ No _____
T.B.O _____
Fuel Grade _____ Oil Grade _____
Max RPM _____ Max Continuous RPM _____
Max CHT _____ Max Oil Temp _____

8. Propeller Data:
Manufacturer _____
Model _____
Number of blades _____ Material _____
Diameter _____
Pitch _____
What is the full throttle static RPM? _____

9. Performance:
Max Level Speed _____ Cruising Speed _____
Fuel Capacity _____ Range (approx) _____
Distance to Take-off and climb to 50 feet _____
Distance to Land over 50ft obstacle and stop _____

Structural Limits + ____ G - ____ G

SECTION 1.2 - EQUIPMENT AND FLIGHT OPERATIONS

CONTROL SYSTEMS:

1. Do all controls operate easily, smoothly and positively enough to allow proper performance of their function? YES NO
2. Are all the controls arranged and identified to provide for convenience in operation and to prevent the possibility of confusion and subsequent inadvertent operation? YES NO
3. Does each control system have stops that positively limit the range of motion of the pilot's controls? YES NO
4. Are proper precautions taken to prevent inadvertent, improper or abrupt trim tab operation? YES NO
5. Is there means near the trim control to indicate to the pilot the direction of trim control movement relative to aircraft motion? YES NO
6. In addition, is there a means to indicate to the pilot the position of the trim device with respect to the range of the adjustment and are the means visible to the pilot, located and designed to prevent confusion? YES NO
7. Are provisions made to prevent passengers, cargo or loose objects from jamming, chafing or interfering with the control system? YES NO
8. Are there means in the cockpit to prevent the entry of foreign objects into places where they would jam the control system? YES NO
9. Is the design of wing flap system such that the wing flaps will not move from the set position unless the control is adjusted? YES NO
10. Does the rate of flap movement and the resulting pilot forces impair the controllability of the aircraft? YES NO
11. Is there a position indicator or other means to indicate the flaps are extended, retracted and in any other position required for performance compliance? YES NO

PILOT COMPARTMENT AND CABIN:

1. Is the cockpit and cabin designed so as to give each occupant every reasonable chance of escaping serious injury in a crash? YES NO
2. Is there a storage area for the aircraft manual? YES NO
3. Does the pilot compartment and it's equipment allow each pilot to perform his duties without unreasonable concentration or fatigue? YES NO
4. Is the pilot compartment free from glare and reflections that would interfere with the pilot's vision and designed so that the pilot's view is sufficiently extensive, clear and undistorted, for safe operation? YES NO

COCKPIT CONTROLS:

1. Is each cockpit control located and (except where it's function is obvious), identified to provide convenient operation and to prevent inadvertent operation? YES NO
2. Are the controls located so that the pilot, has full and unrestricted movement of each control without interference from either his clothing or the cockpit structure? YES NO
3. If the aircraft has dual controls, can each of the following secondary controls be operated from each of the pilots seats?
 - . throttle
 - . wing flaps
 - . trim
 - . opening device for canopyYES NO
4. Do the power plant and other secondary controls maintain any necessary position without a tendency to creep due to control loads or vibration? YES NO
5. Do the fuel shutoff valves have guards against inadvertent operations and allow appropriate flight crew members to re-open each valve rapidly after it has been closed? YES NO
6. Are the fuel valves provided with either positive stops or detents in the "on" "off" position? YES NO

MARKINGS:

- | | |
|--|--------|
| 1. Are all emergency controls (if fitted) coloured red? | YES NO |
| 2. Are flight and engine instruments colour coded to show maximum and safe operating limits? | YES NO |

EMERGENCY EXIT:

- | | |
|--|--------|
| 1. Is it possible to make a rapid and unimpeded escape from the cockpit in an emergency? | YES NO |
| 2. If the cockpit is enclosed, is the opening system designed so that it can be operated easily by each occupant when strapped in? | YES NO |
| 3. Can the opening system be operated from outside the aircraft? | YES NO |
| 4. If NO, is there an external placard advising emergency access to cockpit? EG: "Emergency Exit - Break Canopy" | YES NO |

COMMENTS - EQUIPMENT AND FLIGHT OPERATIONS:

SECTION 1.3 - GROUND RUN CHECKLIST

PRE START: OAT _____ °C Pressure Ht _____ ft

STARTING:

Ease of starting

Choke functioning

Oil pressure @ idle _____

Vibration level

AFTER WARM UP:

CHT _____ Oil Press _____ Oil Temp _____
Time for Engine to warm up to Take-off condition _____ mins

ENGINE RUN-UP @ _____ RPM:

Left ignition check, Max Drop _____ RPM
Right ignition check, Max Drop _____ RPM
Carb Heat function, Max Drop _____ RPM

MAXIMUM STATIC RPM _____

Vibration level

IDLE RPM _____

CONTROLLABILITY ON TAXI

BRAKES OPERATION

SHUTDOWN FREE OF DETONATION

GENERAL COMMENTS:

SECTION 1.4 - GENERAL FLIGHT CHARACTERISTICS AND RELIABILITY

1. FLIGHT TEST CONDITIONS:

Date _____ Wind _____ Location _____
 Time _____ Temp _____ Weather _____

2. LOADING:

ITEM	WEIGHT	ARM	MOMENT
AIRCRAFT EMPTY WEIGHT			
PILOT			
FUEL			
BAGGAGE			
TOTALS			

LOAD TO WITHIN CG LIMITS

3. ENGINE GROUND RUN TEST

4. PRE TAKE-OFF CHECKS

5. TAXI:

Brakes operational
 Tail/Nose Wheel steering
 Controllability

6. TAKE-OFF AND CLIMB @ _____ KIAS

Controllability
 Control rigging - (comments)
 Pitch _____
 Roll _____
 Yaw _____

Engine RPM _____

7. CLIMB TO APPROX 2500FT:

Engine Parameters -
 Oil Temp _____
 Oil Press _____
 CHT _____
 EGT _____

8. LEVEL FLIGHT:

Pressure Alt _____ ft OAT _____
Cruise @ _____ RPM Speed _____ KIAS
Full Power _____ RPM Speed _____ KIAS
Controllability
Control rigging - (comments)
Pitch _____
Roll _____
Yaw _____

Engine Functioning Smoothly

9. SLOW FLIGHT: (approx 5kts above stall)

Controllability
Control rigging - (comments)
Pitch _____
Roll _____
Yaw _____

Flap operation (no assymetric roll)

10. IDLE DESCENT:

Controllability
Control rigging - (comments)
Pitch _____
Roll _____
Yaw _____

Engine Functioning Smoothly

11. COMMENTS ON FLIGHT CHARACTERISTICS , RELIABILITY
AND ANY ITEMS REQUIRING ATTENTION.

SECTION 1.6 - STALL SPEEDS AND CHARACTERISTICS

1ST FLIGHT TEST CONDITIONS:

Weight _____ Kg (Max Take-off Weight)
 CG _____ mm (Preferably midrange CG)

PROCEDURE:

Trim aircraft power-off at 1.5 anticipated stall speed, then reduce speed by 1 Kt/sec until stall occurs.

Carry out 3 runs in each configuration to find average Stall speed.

Configurations for Test-

CRUISE, Flaps _____, Gear Up (if retractable)

TAKE-OFF, Flaps _____, Gear Down

LANDING, Flaps _____, Gear Down

Note: If aircraft has no flaps and has fixed undercarriage, results will be in CRUISE configuration only.

STALL SPEEDS:

Attitude	No Power (Idle)			Full Power		
	Cruise	Take-off	Landing	Cruise	Take-off	Landing
Configuration						
KIAS (test 1)						
KIAS (test 2)						
KIAS (test 3)						
Average KIAS						

STALL CHARACTERISTICS:

Controllability and Recovery – Comments

Straight Stall Power Off _____

Straight Stall Power On _____

20° Bank Stall Power Off _____

20° Bank Stall Power On _____

Is it possible to correct roll and yaw with unreversed use of aileron and rudder up until the stall? Yes No

Is there adequate Stall Warning (Buffet)? Yes No

SECTION 1.7 - BEST CLIMB AND GLIDE TESTS

FLIGHT TEST CONDITIONS:

Conduct in smooth air, free from thermal activity.
 Weight _____ kg (Max Take-off Weight), CG within limits

PROCEDURE CLIMB TEST:

Select an altitude (eg. 1000ft) as a BASE altitude.
 Begin Full throttle climb well below BASE altitude and stabilise climb speed to approx 15kts above predicted best rate of climb speed.
 As aircraft climbs through the BASE altitude, begin a 1 minute time check.
 At the end of 1 minute, record altitude gained on CLIMB TABLE below.
 Repeat test at 5kt decreasing intervals, to approx 10kts above stall.

PROCEDURE GLIDE TEST: (Can be carried out at same time as climb test)

Select an altitude (eg. 2000ft) as TOP altitude.
 Begin Idle decent well above TOP altitude and stabilise.
 At TOP altitude begin 1 minute time check.
 At the end of 1 minute, record altitude lost on GLIDE TABLE below.
 Use same speed intervals as used in climb tests.

FLIGHT DATA:

CLIMB TEST (BASE ALT _____ FT)	
KIAS	ALT GAIN

Plot Glide figures on GLIDE CHART on page 18.

Plot Climb figures on CLIMB CHART on page 17.

GLIDE TEST (TOP ALT _____ FT)	
KIAS	ALT LOST

TO FIND BEST RATE OF CLIMB

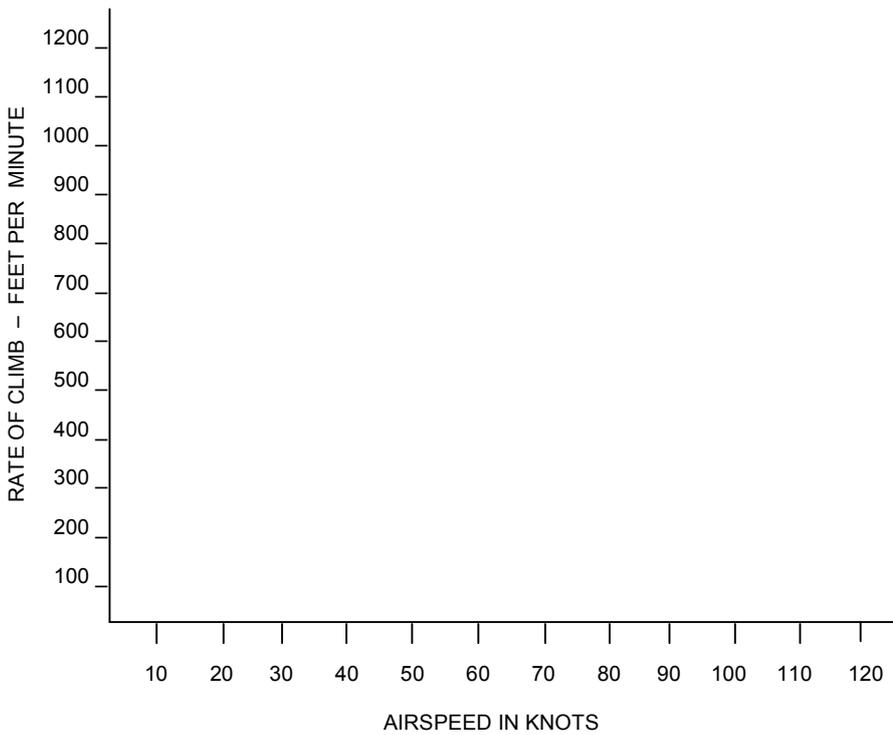
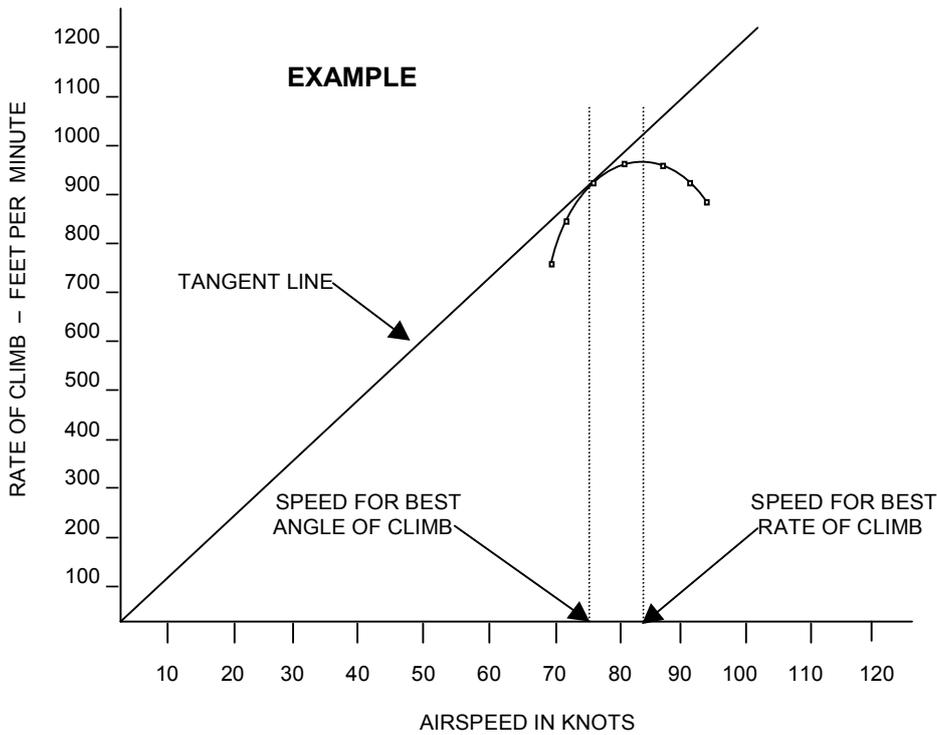
After plotting climb figures on chart join the points to form a climb curve.

The airspeed that shows the greatest gain in altitude is the aircraft best rate of climb speed (Vy)

TO FIND BEST ANGLE OF CLIMB

Draw a line (tangent) to the point on the climb curve where it just touches the curve. From this point draw a line straight down to the airspeed scale.

The airspeed that the line intersects is the best angle of climb speed.



BEST RATE OF CLIMB.....KIAS

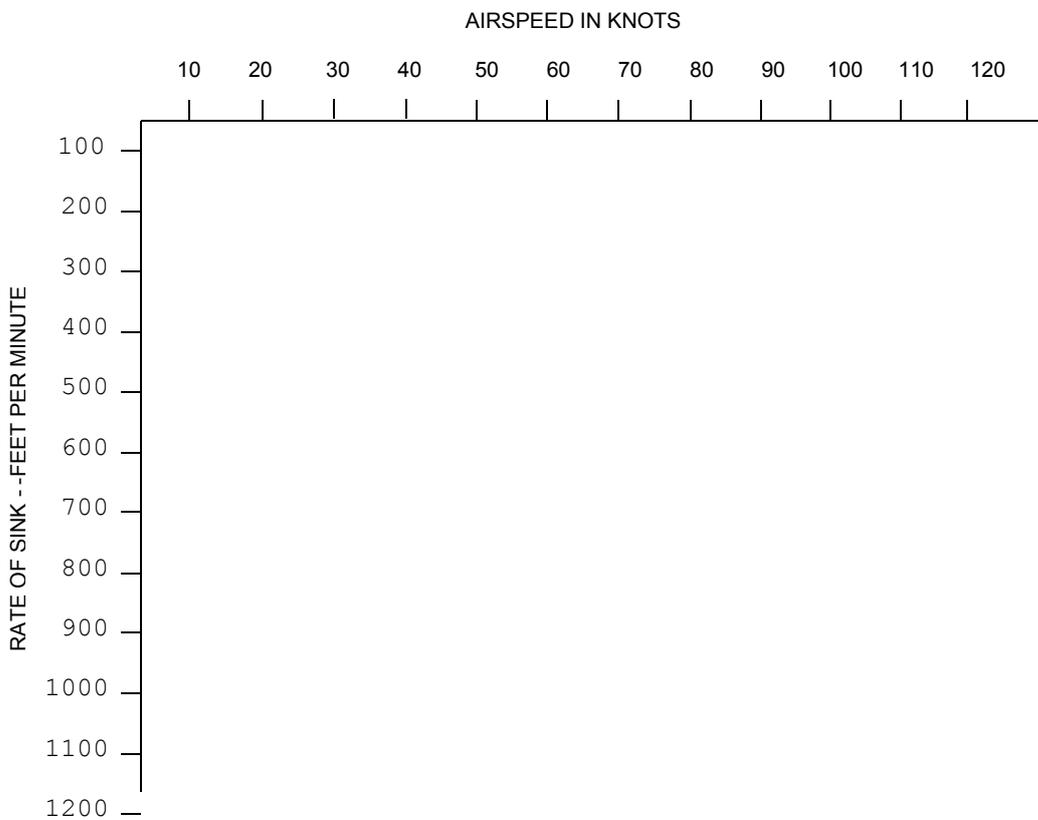
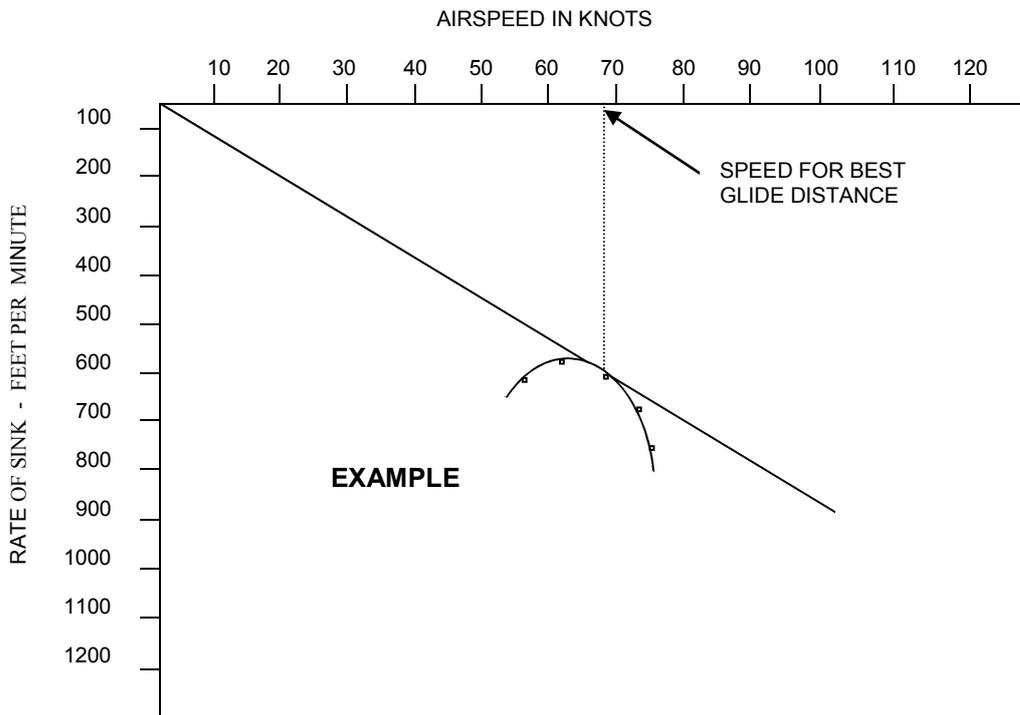
BEST ANGLE OF CLIMB.....KIAS

TO FIND BEST GLIDE SPEED

After plotting glide figures on chart join the points to form a glide curve.

Draw a line (tangent) to the point on the glide curve where it just touches the curve.

From this point draw a line straight up to the airspeed scale. The airspeed that the line intersects is the best distance of glide speed.



BEST GLIDE SPEED..... KIAS

SECTION 1.8 - STABILITY TEST

GENERAL REQUIREMENTS:

The aircraft should show suitable positive stability and control "feel" in all three axes of the aircraft.

STATIC LONGITUDINAL STABILITY:

PROCEDURE

This test should be conducted with the aircraft in the forward of center CG. Climb to a safe altitude (approx 3000ft AGL) and trim the aircraft for zero stick force in straight and level flight at low cruising speed.

(Note: Do not retrim the aircraft once the test has begun)

Apply a light "pull" force and stabilise at an airspeed about 10% less than the trim speed. It should require a "pull" force to maintain this slower speed.

If it requires a "pull" force, pull a little further back on the stick and stabilise the airspeed at approx 20% less than the initial trim speed. If it requires a still greater "pull" force to maintain this airspeed, the aircraft has POSITIVE STATIC LONGITUDINAL STABILITY.

If at either test points, no "pull" force is required to maintain the reduced airspeeds, the aircraft has NEUTRAL STATIC LONGITUDINAL STABILITY.

If either of these test points require a "push" force to maintain the reduced airspeeds, the aircraft has NEGATIVE STATIC LONGITUDINAL STABILITY.

Repeat the test this time using a "push" force on the control stick to stabilise the airspeed at approx 10% above the initial trim speed. It should require a "push" force to maintain this airspeed. If a "pull" force is required, the aircraft has NEGATIVE STATIC LONGITUDINAL STABILITY.

***WARNING: If the aircraft exhibits
Negative static longitudinal stability,
seek professional advise on correcting
the problem before further flight.***

STATIC LONGITUDINAL STABILITY:

Weight _____ kg (Max Take-off Weight)
 CG _____ mm (Forward of centre CG)

Cruise configuration, Power as required.

Test Speeds	KIAS	Stick Force (push - pull)	Stability
Trim Speed		Zero	N/A
Trim Speed Less 10%			"Pull" force = POSITIVE Stability "Zero" force = NEUTRAL Stability "Push" force = NEGATIVE Stability
Trim Speed Less 20%			"Pull" force = POSITIVE Stability "Zero" force = NEUTRAL Stability "Push" force = NEGATIVE Stability
Trim Speed Plus 10%			"Push" force = POSITIVE Stability "Zero" force = NEUTRAL Stability "Pull" force = NEGATIVE Stability

ADDITIONAL COMMENTS ON STATIC LONGITUDINAL STABILITY:

DYNAMIC LONGITUDINAL STABILITY:

PROCEDURE TEST 1

This test is to check the aircraft for POSITIVE DYNAMIC LONGITUDINAL STABILITY (short period). First, trim the aircraft to fly straight and level at normal cruise speed. With a smooth, but rapid motion, push the nose down a few degrees. Quickly reverse the input to nose up to bring the pitch attitude back to the trim attitude. As the attitude reaches level, release the stick (but guard it). An aircraft with POSITIVE DYNAMIC LONGITUDINAL STABILITY will oscillate briefly about level before stopping at the original trim attitude.

PROCEDURE TEST 2

To test the aircraft for POSITIVE DYNAMIC LONGITUDINAL STABILITY (long period), begin from trimmed straight and level flight. Without re-trimming pull (or push) the stick to a speed approx 5 Kts off trim and release the stick.

The aircraft should oscillate about the trim airspeed before the motion dampens out.

If the oscillations increase with time, the aircraft has NEGATIVE DYNAMIC LONGITUDINAL STABILITY.

If the aircraft continues to oscillate about the trim speed and never returns to the original trim airspeed, the aircraft has NEUTRAL DYNAMIC LONGITUDINAL STABILITY.

NOTE: If the aircraft has NEGATIVE or NEUTRAL DYNAMIC LONGITUDINAL STABILITY, this is not necessarily dangerous as long as the rate of divergence is not too great. It does mean, however, the aircraft will be difficult to trim and will require frequent pilot attention.

Is the DYNAMIC LONGITUDINAL STABILITY of the aircraft POSITIVE, NEUTRAL or NEGATIVE?

ADDITIONAL COMMENTS ON DYNAMIC LONGITUDINAL STABILITY:

STATIC DIRECTIONAL AND LATERAL STABILITY:

PROCEDURE

The aircraft should be trimmed for level flight at a low cruise setting and at a safe altitude (approx 3000ft AGL). Slowly enter a sideslip by maintaining the aircraft's heading with rudder and ailerons. The aircraft should be able to hold a heading with rudder at a bank angle of 10° or the bank angle appropriate for full rudder deflection. The control forces and deflection should increase steadily until either the rudder or the ailerons reach full deflection or the maximum sideslip angle is reached.

At no time should there be a tendency toward a force reversal, which could lead to an overbalance condition or rudder lock.

Release the ailerons while still holding full rudder. When the ailerons are released, the low wing should return, unassisted, to the level position.

Is there a tendency to raise the low wing in a sideslip? YES NO

Do rudder and aileron forces increase steadily with sideslip angle? YES NO

Do rudder forces reverse with full deflection (rudder lock)? YES NO

To check static directional stability, trim the aircraft for level flight at a low cruise setting and at a safe altitude (approx 3000ft AGL). Slowly yaw the aircraft left and right whilst holding the wings level with ailerons.

When the rudder is released, the aircraft should tend to return to straight flight.

Is there a tendency to recover from a skid after rudder is released? YES NO

ADDITIONAL COMMENTS ON STATIC DIRECTIONAL AND LATERAL STABILITY:

SECTION 1.9 - TAKE-OFF DISTANCE

REQUIREMENTS:

The take-off distance shall be established for a short dry grass surface. It is the distance required to reach a height of 50 feet from a standing start under the following conditions:

- (a) the engine operating within maximum take-off power limitations;
- (b) the aircraft reaching a height of 50 feet at an airspeed not less than the take-off safety speed; (see note)
- (c) the aircraft in the take-off configuration throughout;
- (d) maximum take-off weight and CG forward; and
- (e) calm conditions.

Note: The take-off safety speed shall be an airspeed not less than $1.2 V_{S1}$ or V_{S1} plus 10 knots whichever is the greater at which adequate control is available in the event of sudden complete engine failure.

PROCEDURE:

Take-off distance tests should be conducted in steady wind conditions, preferably nil wind. Gusty conditions will produce inconsistent results. Tests should also be conducted on a short dry grass runway (preferably level).

Suitable measuring techniques should be employed to measure the total take-off distance from a standing start to a height of 50 feet. The air and ground run segments of the take-off distance should also be recorded for inclusion in the flight manual.

At least 5 take-off tests should be conducted with the final distance being the average of the measured distances.

TEST CONDITIONS:

Weight _____ kg (Max Take-off Weight)
 CG _____ mm (Foward of centre)
 Power _____ RPM (Max Take-off Power)
 Flaps _____⁰ (Take-off Position)
 Speed _____ KIAS (Take-off Safety Speed)

SURFACE CONDITIONS:

SHORT DRY GRASS OTHER _____
 SLOPE (UP/LEVEL/DOWN) _____

TEST DATA:

Test Number	1	2	3	4	5
Pressure Alt					
OAT					
Density Alt					
Wind Direction/Knots					
Wind Component along runway					
KIAS at Lift-off					
Measured Ground Run					
KIAS at 50ft					
Measured Air Distance to 50ft					
Measured Total Distance to 50ft					

RESULTS:

Distance required for Take-off ground roll is _____ metres.

Total distance required to Take-off and Climb to a height of 50ft at Maximum Take-off Weight is _____ metres.

SECTION 1.10 - LANDING DISTANCE

REQUIREMENTS:

The landing distance shall be established for a short dry grass surface. It is the distance required to bring the aircraft at maximum take-off weight to rest from a height of 50 feet above the runway surface. The aircraft shall reach the height of 50 feet at an airspeed not less than the landing approach speed, (see note) following a steady approach at that speed with the flaps in the landing position. The landing should be made without tendency to bounce, nose over or ground loop.

Note: The landing approach speed shall be an airspeed not less than $1.3 V_{SO}$ or V_{SO} plus 10 knots whichever is the greater.

PROCEDURE:

Landing distance tests should be conducted in steady wind conditions, preferably nil wind. Gusty conditions will produce inconsistent results. Tests should also be conducted on a short dry grass runway (preferably level).

The landing approach should be stabilised on target speed, power and the aircraft in the landing configuration prior to reaching a height of 50 feet to assure stabilised conditions when the aircraft passes through the reference height. A smooth flare should be made to the touchdown point. The landing roll should be as straight as possible and the aircraft brought to a complete stop for each landing test.

Suitable measuring techniques should be employed to measure the total landing distance from a height of 50 feet. The air and ground run segments of the landing distance should also be recorded for inclusion in the flight manual.

At least 5 landing tests should be conducted with the final distance being the average of the measured distances.

TEST CONDITIONS:

Weight _____ kg (Max Take-off Weight)
 CG _____ mm (Forward of centre)
 Power _____ RPM (As required for steady approach)
 Flaps _____ ° (Landing Position)
 Speed _____ KIAS (Landing Approach Speed)

SURFACE CONDITIONS:

SHORT DRY GRASS OTHER _____
 SLOPE (UP/LEVEL/DOWN) _____

TEST DATA:

Test Number	1	2	3	4	5
Pressure Alt					
OAT					
Density Alt					
Wind Direction/Knots					
Wind Component along runway					
KIAS at 50ft					
Measured Air Distance					
KIAS at touchdown					
Measured Ground Run					
Measured Total Distance from 50ft					

RESULTS:

Distance required for landing ground roll is _____ metres.

Total distance required to Land from a height of 50ft at Maximum Take-off Weight is _____ metres.

PART 2

ADVANCED AIRCRAFT OPERATION

TESTING

SECTION 2.1 STALL CHARACTERISTICS

2ND FLIGHT TEST CONDITIONS:

Weight _____ Kg (Max Take-off Weight)
CG _____ mm (Most Aft CG)

PROCEDURE:

Same procedure as first test.

Stall speeds in this configuration need not be noted, main reason for Aft CG test is to determine characteristics and recovery.

STALL CHARACTERISTICS:

Controllability and Recovery - (comments)

Straight Stall Power Off	_____

Straight Stall Power On	_____

Straight Stall Power Off (Landing configuration)	_____

Straight Stall Power On (Landing configuration)	_____

20 Bank Stall Power Off	_____

20 Bank Stall Power On	_____

Is it possible to correct roll and yaw with unreversed use of aileron and rudder up until the stall? Yes No

Is there adequate Stall Warning (Buffet)? Yes No

Is there any delay in recovery that would be of concern to pilots? Yes No

ADDITIONAL COMMENTS ON STALL SPEEDS AND CHARACTERISTICS:

SECTION 2.2 - CONTROLLABILITY AND MANOEUVRABILITY

GENERAL REQUIREMENTS:

The aircraft must be safely controllable and manoeuvrable during:

- (a) Take-off at maximum take-off power;
- (b) Climb;
- (c) Level flight;
- (d) Descent;
- (e) Landing, power on and off; and
- (f) In the event of sudden engine failure.

It must be possible to make a smooth transition from one flight condition to another (including turns and slips) without exceptional piloting skill, strength or alertness and without danger of exceeding the limit load factor. The effects of power changes and sudden engine failure must also be considered.

LONGITUDINAL CONTROL:

PROCEDURE

This area requires a series of manoeuvres to determine the longitudinal controllability during, flap extension and retraction, during speed and power variations, and push-overs from take-off safety speed. The prime determinations to be made by the test pilot are whether or not there is sufficient elevator power to perform the required manoeuvres and that the control forces are not excessive. The minimum pitch control force during manoeuvre requirement is intended to prevent the pilot inadvertently exceeding the flight load limits.

A qualitative determination by the test pilot will suffice unless control force limits are considered marginal. In this case a spring scale can be used as a force gauge to accurately measure control forces while flying the required manoeuvres.

LONGITUDINAL CONTROL AT MOST FORWARD CG:

Weight _____ kg (Max Take-off Weight)
 CG _____ mm (Most Forward CG)

Configuration	Trim Speed KIAS	Does it require excessive pitch control force to accomplish the following?
Idle Power Cruise Configuration	1.4 V_{S1} _____	Extend landing flap rapidly while maintaining trim speed. YES NO
Idle Power Landing Configuration	1.4 V_{S0} _____	Retract flaps rapidly while maintaining trim speed. YES NO
Max Continuous Power Landing Configuration	1.4 V_{S0} _____	Retract flaps rapidly while maintaining trim speed. YES NO
Idle Power Cruise Configuration	1.4 V_{S1} _____	Apply take-off power while maintaining trim speed. YES NO
Idle Power Landing Configuration	1.4 V_{S0} _____	Apply take-off power while maintaining trim speed. YES NO

NOTE: Trim should be left at its initial setting throughout the tests.

Is it possible to raise the nose at V_{NE} without excessive control force? YES NO

LONGITUDINAL CONTROL AT MOST AFT CG:

Weight _____ kg (Max Take-off Weight)

CG _____ mm (Most Aft CG)

Configuration	Trim Speed KIAS	Does it require excessive pitch control force to accomplish the following?
Idle Power Cruise Configuration	1.4 V_{S1} _____	Extend landing flap rapidly while maintaining trim speed. YES NO
Idle Power Landing Configuration	1.4 V_{S0} _____	Retract flaps rapidly while maintaining trim speed. YES NO
Max Continuous Power Landing Configuration	1.4 V_{S0} _____	Retract flaps rapidly while maintaining trim speed. YES NO
Idle Power Cruise Configuration	1.4 V_{S1} _____	Apply take-off power while maintaining trim speed. YES NO
Idle Power Landing Configuration	1.4 V_{S0} _____	Apply take-off power while maintaining trim speed. YES NO

NOTE: Trim should be left at its initial setting throughout the tests.

Is it possible to raise the nose at high speeds without excessive control force? YES NO

Is it possible to lower the nose to maintain a safe flying speed when power is suddenly reduced to idle when climbing at the Take-Off Safety Speed? YES NO

LATERAL AND DIRECTIONAL CONTROL:

PROCEDURE

Using the appropriate combination of controls it should be possible to reverse the direction of a turn with a 30° bank in the opposite direction within 5 seconds when the turns are made at a speed of 1.3 V_{S1} in all configurations without significant slip or skid.
Test is carried out at most Aft CG.

Weight _____ kg (Max Take-off Weight)
CG _____ mm (Most Aft CG)

Is it possible to reverse the direction of a 30° banked turn to a 30° banked turn in the opposite direction within 5 seconds under the following conditions?

Configuration	Speed KIAS	Result	
Take-off	1.3 V_{S1} _____	YES	NO
Cruise	1.3 V_{S1} _____	YES	NO
Landing	1.3 V_{S1} _____	YES	NO

GENERAL CONTROLLABILITY AND MANOEUVRABILITY:

Is the aircraft satisfactorily controllable and manoeuvrable about all axes during take-off climb, level flight and landing with power on and off?

YES NO

Is it possible to make smooth transitions from one flight condition to another without requiring exceptional skill or strength by the pilot and without danger of overloading the airframe?

YES NO

ADDITIONAL COMMENTS ON CONTROLLABILITY AND MANOEUVRABILITY:

SECTION 2.3 - TRIM TEST

GENERAL REQUIREMENT:

This test is ensure that the aircraft can be trimmed to maintain a speed somewhere between 1.3 VS1 and 2.0 VS1 at all engine powers and at the extreme CG positions.

The trim requirements ensure the aircraft will not require exceptional pilot skill, strength or alertness to maintain a steady flight condition. The tests require the aircraft to be trimmed for hands off flight for the conditions specified.

Trim is only required to be shown at a single speed for each configuration, so ground adjustable tabs are acceptable.

TRIM TEST AT MOST FORWARD CG: (test should be conducted in smooth air)

Weight _____ kg (Max Take-off Weight)

CG _____ mm (Most Forward)

Configuration	Power	Trim Speed KIAS	Is it possible to achieve trim at a speed between 1.3 and 2.0 times stall speed?	
Take-off	Max Continuous		YES	NO
Cruise	Max Continuous		YES	NO
Landing	Idle		YES	NO

TRIM TEST AT MOST AFT CG: (test should be conducted in smooth air)

Weight _____ kg (Max Take-off Weight)

CG _____ mm (Most Aft)

Configuration	Power	Trim Speed KIAS	Is it possible to achieve trim at a speed between 1.3 and 2.0 times stall speed?	
Take-off	Max Continuous		YES	NO
Cruise	Max Continuous		YES	NO
Landing	Idle		YES	NO

ADDITIONAL COMMENTS ON TRIM:

SECTION 2.4 - VIBRATION AND BUFFETING

NEVER EXCEED SPEED, V_{NE} : (Cruise Configuration)

KIAS _____ Idle RPM _____ (not to exceed max RPM)

Was any excessive vibration or buffeting experienced up to V_{NE} Yes No

MAXIMUM FLAP SPEED, V_{FE} : (Landing Configuration)

KIAS _____ Idle RPM _____ (not to exceed max RPM)

Was any excessive vibration or buffeting experienced up to V_{FE} Yes No

FLUTTER TEST: (For aircraft with Cruise in excess of 100 KIAS)

Note: Pilot parachute and/or BRS highly recommended and test should be conducted at a safe altitude and in smooth conditions.

IT IS ALSO RECOMMENDED THAT OWNERS WITH AIRCRAFT IN THIS CATEGORY SEEK PROFESSIONAL ADVICE.

Start a shallow dive, gradually accelerating to V_{NE} .

During the acceleration bump the control column sharply, but not so hard you change the flight path. Bump it to the side and also fore and aft. Also pulse the rudder slightly.

These control "inputs" should be done at least every 5Kts up to V_{NE} .

If you notice any vibration or shaking, CLOSE THROTTLE immediately and ease out of dive to slow down. Do not continue any testing until problem rectified and aircraft has passed a thorough inspection.

Was there any vibration or shaking experienced after control input Yes No

If Yes, at what speed _____ KIAS

ADDITIONAL COMMENTS ON VIBRATION AND BUFFETING: