

# 發動機熄火飄降介紹

## 以 Van's RV-9A 為例

航務科 科長

黃忠盛

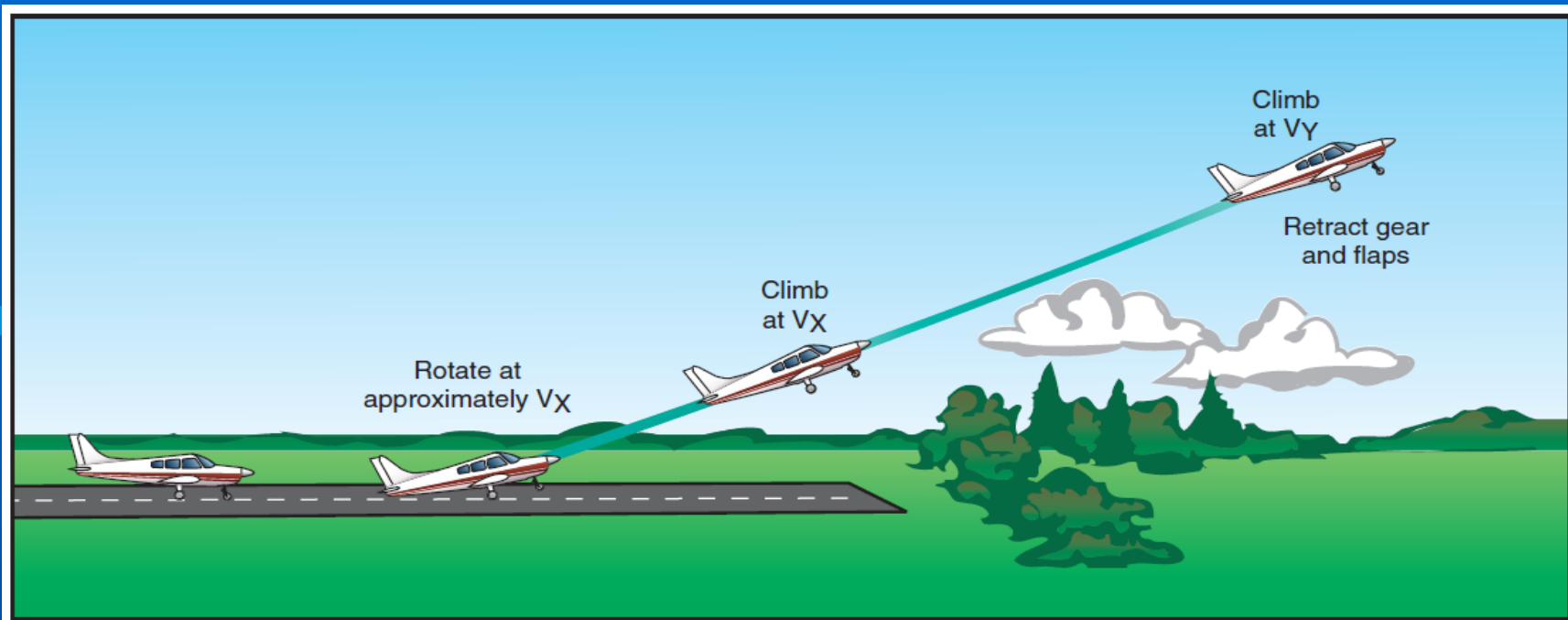
[function@mail.caa.gov.tw](mailto:function@mail.caa.gov.tw)

02-23496076

# 大陸的問題不知是否為我們的問題？ 老百姓在思考，爲啥玩不過政府呢？

1. 你和他講道理，他和你耍流氓；
2. 你和他耍流氓，他和你講法制；
3. 你和他講法制，他和你講政治；
4. 你和他講政治，他和你講國情；
5. 你和他講國情，他和你講接軌；
6. 你和他講接軌，他和你講文化；
7. 你和他講文化，他和你講孔子；
8. 你和他講孔子，他和你講老子；
9. 你和他講老子，他給你裝孫子！





The speed for  $V_X$  is that which will result in the greatest gain in altitude for a given distance over the ground. It is usually slightly less than  $V_Y$  which provides the greatest gain in altitude per unit of time. The specific speeds to be used for a given airplane are stated in the FAA-approved AFM/POH. It should



## V<sub>x</sub>/V<sub>y</sub> Test

- 最佳爬升率速度測試：V<sub>y</sub>  
(Best Rate of Climb Speed Tests)  
最少時間內爬升最多高度
- 最大爬升角速度測試：V<sub>x</sub>  
(Best Angle of Climb Speed Tests)  
最少距離內爬升最多高度

Co-pilot Bill Bourns operated the flight recorders on data flight #1.



## CAFE MEASURED PERFORMANCE, N129RV

Vmax, TAS, 8509.7 ' dens.alt., 1703 lb, 23.7", 2605 RPM, 9.7 gph	192.7 mph
Stall speed, CAS, 1758 lb, 12" M.P., 1800 RPM, full flaps, mph	49.08 mph
Max climb rate, 5500' dens.alt., 1732 lb, 26", 2703 RPM, 10.8 gph	1348.9 fpm
T.O. distance, 1731' dens.alt., 1747.9 lb, 5 kt. wind, T 23° DP 12°	385 feet
Vy, speed for best climb rate, CAS, 5500' dens.alt., @103 mph TAS	95 mph
Vx, speed for best climb angle, CAS, 5500' dens., @88.3 mph TAS	81.6 mph
Liftoff speed, CAS, (panel IAS= 74), 1300' dens., full flaps, 1744 lb	66.0 mph
Touchdown speed, CAS, (panel IAS= 68), 1520' dens., 1715.8 lb	59.1 mph
Min. sink rate, idle power, coarse pitch, 1725 lb, 81.7 mph TAS	664.2 fpm
Best glide ratio, idle power, coarse pitch, 1738 lb, 95 mph CAS	12 to 1
Noise levels, gliding at idle power/max climb/high cruise, dB	82/99/100
Peak oil temp. in climb, 10,500' dens., 95 mph CAS, OAT 62° F	228° F
Max. cowl exit air temp., 60 mph CAS, full flaps, 2000 RPM, 15"	168° F
Empty weight per CAFE Scales, including headsets and oil	1078.05 lb

## DESIGNER'S INFORMATION

Cost of QuickBuild kit without engine or prop	\$25,025
Cost of engine/cost of prop, each new	\$21,330/ \$5,100
RV-9/9A kits completed to date	68
Estimated hours to build, QuickBuild	500-800 hrs
RV-9A, N129RV ser #2, prototype first flew, date	June 15, 2000
Normal empty weight per factory, 160 BHP	1057 lb
Design gross weight, per factory	1750 lb
Recommended engine:	Lycoming 118 - 160 BHP
Advice to builders:	Keep it light, use the recommended engines

## SPECIFICATIONS, N129RV

Wingspan	27 ft 11 in
Wing chord, root/tip	53.375 in/ 53.375 in
Wing area	123.67 sq ft
Wing loading dl	14.11 lb/sq ft
Power loading	10.94 lb/BHP
Span loading	62.7 lb/ft
Wetted area fuselage/wing/hor./vert./total	na
Airfoil, main wing, CL max.	2.3
Airfoil, design lift coefficient	.35
Airfoil, thickness to chord ratio	15%
Aspect ratio, span <sup>2</sup> /sq ft of wing area	6.34
Wing incidence	0.66°
Thrust line incidence, crankshaft	0.0° nose down
Wing dihedral	3.5° per side
Wing taper ratio, root to tip	1.0
Wing twist or washout	none
Wing sweep	0
Steering	castering nose wheel
Landing gear	tricycle, steel spring
Horizontal stab: span/area	10 ft 4.375 in/ 29.4 sq ft
Horizontal stab: chord, root/tip	34 in/ 34 in
Elevator: total span/area	57 in/ 5.84 sq ft
Elevator chord: root/tip	14.75 in
Vertical stab: section/area incl. rudder	42.875 in/ 6.1 sq ft
Vertical stabilizer chord: average	20.5 in
Rudder: ave. span/area	56 in/ 7.5 sq ft
Rudder: chord, average	19.25 in
Ailerons: span/average chord, each	48 in/ 11.625 in
Flaps: span/chord, each	81.5 in/ 9.875 in
Flaps: max deflection angle, up/down	na
Tail incidence	0.0°
Total length	20 ft 8.75 in
Height, static with full fuel	7 ft 10 in
Minimum turning circle on ramp	16 ft 5.5 in
Main gear track	84 in
Wheelbase, nosewheel to main gear	57.44 in
Acceleration limits	+3.8 and (-)1.5 at GW +4.4 and (-) 2.2 at < 1650 lb

### AIRSPEDS AS MEASURED BY CAFE: smph/kts, CAS

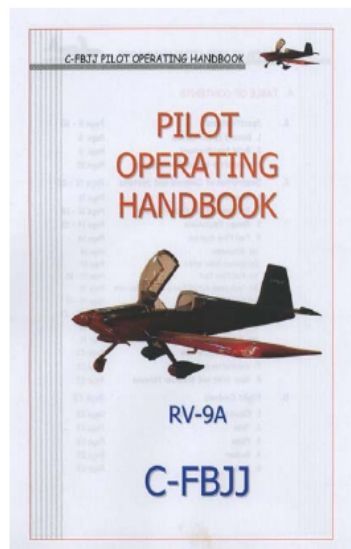
Best rate of climb, V <sub>y</sub>	95 smph/82.5 kt
Best angle of climb, V <sub>x</sub>	82 smph/71.2 kt
Stall, clean, 1759 lb, V <sub>st</sub>	58.16 smph/50.5 kt
Stall, full flaps, 1758 lb, V <sub>st</sub>	49.08 smph/42.6 kt
CL max, at 49.08 mph stall	2.3
AIRSPEEDS PER OWNER'S P.O.H., smph, Panel IAS	
Never exceed, V <sub>ne</sub>	210 smph/182.3 kt
Maneuvering, V <sub>a</sub>	118 smph/102.4 kt
Flap extension speed, V <sub>f</sub>	90 smph/78.1 kt
Gear operation/extension, V <sub>ge</sub>	na

# Putting it All Together: Pilots Operating Handbook (POH)



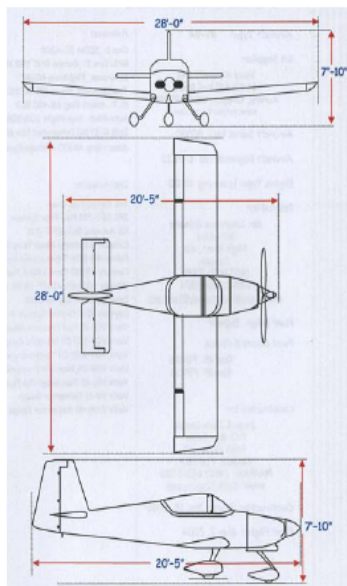
Over the last several months, we have investigated the flight envelope of our RV-9A, C-FBJJ. Although a Pilot Operating Handbook is not compulsory for a Canadian amateur-built aircraft, I can't understand how any pilot would not insist on having and using one as a simple guide and checklist for planned flights.

So let's put it all together. This column summarizes the information resulting from our various test flights into a useful format; a POH, that stays in the aircraft together with the Journey Log and the various documents that are required to be carried onboard for every flight.



## Aircraft:

Type: RV-9A  
 Kit Supplier: Van's Aircraft Inc., Aurora, OR.  
 Serial No. 90020  
 Registration: C-FBJJ (Canadian)  
 Builder: Jean & Jack Dueck  
 Construction Start: January 15, 2000  
 First Flight: May 7, 2004



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# Pilots Operating Handbook, Cont'd

(Continued from page 6)

## Basic Specification List

Engine: Lycoming O-320 E02, 160 BHP  
 Propeller: Sensenich 70 cm 759-0-79  
 Height: 7 ft. – 10 in.  
 Length: 20 ft. – 5 in.  
 Wing Span: 28 ft. – 0 in.  
 Wing Loading: 14.1 psf  
 Empty Weight: 1145 lbs.  
 Maximum Gross Weight: 1750 lbs.  
 Fuel Grade: 100 LL  
 Fuel Capacity: Left Tank: 18 US Gal.  
 Right Tank: 18 US Gal.  
 Unusable Fuel: Left Tank .5 US Gal.  
 Right Tank: .5 US Gal.  
 Oil Capacity: 7 US Qts.  
 Baggage Allowance: 100 lbs.

## Performance Specifications:

**Pitot Static and Indicated Airspeed Test**  
 (See Test Report – August 2007)

KIAS	Error	KCAS
60	+5	65
70	+4	74
80	+3	83
90	+1	91
100	-2	98
110	-5	105
120	-8	112
130	-9	121
140	-11	129

**Best Rate of Climb (Vy), Best Angle of Climb (Vx)** (See Test Report, September, 2007)

Best Rate of Climb (Vy), Flaps up	68 KIAS
Best Angle of Climb (Vx), Flaps up	82 KIAS

**Best Glide Speed:** (See Test Report – October, Revised, November, 2007)

Best Glide Speed, Flaps up	80.5 KIAS
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## Stalls

Power-off, Flaps up	44 MPH (38 KIAS)
Power-off, Take-off Flaps	40 MPH (35 KIAS)
Power-off, Full Flaps	37 MPH (32 KIAS)
Power-on, MTOW, Flaps up	38 MPH (33 KIAS)
Power-on, MTOW, Take-off Flaps	25 KIAS (estimated)
Power-on, MTOW, Full Flaps	unreadable

*In next month's column, we'll expand this POH to include Checklists and Emergency Procedures.*

*Jack Dueck, EAA HAC, TC, FA.*



# Tech' Desk, The 180 Degree Turn



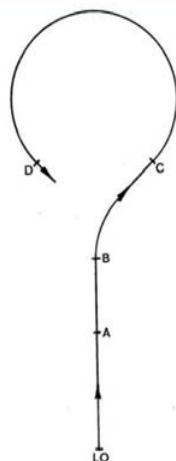
*Every year we hear of serious accidents when pilots attempt to turn back to the runway after engine failure, with too little altitude. So let's take a look at this maneuver. How much altitude is enough and how do we make the most of what we have when the engine dies?*

The object is (although under too much pressure and too little time for planning and execution) to get the aircraft back to the runway or take-off strip, near the point of lift-off, but going in the opposite direction. Consequently, a simple 180-degree turn will not do this for you. It will get you going in the opposite direction, but not in line with your take-off run, and unless you are fortunate to have a brisk headwind right down the runway, it will leave you well short of reaching the runway.

In the diagram (right), assume your lift off point is LO. If your engine quits at point A, you will continue on the same heading for the duration of your reaction time, (somewhere between  $\frac{3}{4}$  and 2 seconds or even longer). At this time (point B) your nose will be coming down in your effort to maintain flight, and you will be mentally reviewing your options. Aviate, Navigate, Communicate! By now you will have used up about 15 seconds and possibly 100 ft. of altitude, depending on your climb-out airspeed. Time to act!

*On our RV-9A, our flight test for the 'Best Glide Speed' turned out to be 80.5 KIAS, and our altitude loss for each minute at that airspeed was 520 feet. These are important numbers to establish, and remember.*

To execute, (at point B), check for traffic and turn right 45 degrees setting up your best glide speed. Note your new heading on your DG, (point C). Then, again checking for traffic, immediately roll out to the left, maintaining a rate-one turn for 270



degrees, (to point D). This will theoretically put you on a 45 degree intercept to your original take-off heading.

That's the theory. If your take-off was into a breeze you will have an advantage of distance, since now your approach is downwind. The important thing to realize and remember is that from the time of your emergency, you will require about two minutes to execute all of the above. If your sink rate is around 520 FPM this means you will need a good 1200 feet of altitude with no obstructions to make it, and all of it under immense pressure.

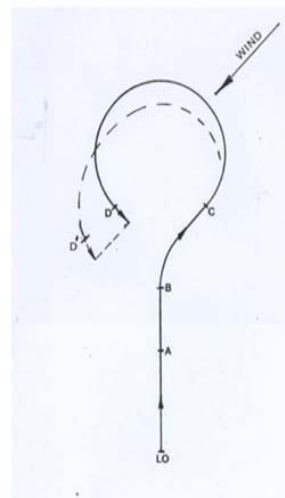
During our numerous tests, we set up the aircraft at gross weight, and climbed to 4000 feet AGL. We cleared for traffic, and then went through the procedure outlined above. Our altitude loss for the 6 or 7 tests was always very near the 1100 to 1200 ft. mark. And knowing what our best glide speed and altitude loss per minute of glide, these numbers would be expected.

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# Tech' Desk, The 180 Degree Turn, Cont'd

*(Continued from page 4)*

What was not expected was the effect of a 45 degree cross-wind. If you look at the revised diagram



gram, you can see the effect of this cross-wind. If you fly the procedure precisely, your final location will be displaced by the effect of the wind during the time of your maneuver as shown at D'.

Another point that became obvious to us was, that even if we could complete the 180 degree turn in the above prescribed procedure, we would still end up a long way short of the runway. Simply put, if we use our  $V_x$  of 68 KIAS, with a climb rate of 840 feet per minute, in order to reach the 1200 foot AGL altitude at which we could enact the 180 turn, we would have flown a forward distance of nearly 9837 feet, or 1.86 miles.  $(68/60 \times 1200/840 \times 6076 = 9837)$  That's a very long way to stretch a glide!

So what can we learn from this flight test?

**Know your Numbers:** Our best glide speed is 80.5 KIAS, at which speed, and on a standard day, we will lose 520 feet of altitude and travel forward a distance of 8152 feet, or 1.54 miles per minute.  $(80.5/60 \times 6076 = 8152)$

**Know your Glide Ratio:** for each 1000 ft. of altitude loss, we will travel a distance of 15,677 feet or 2.97 miles, a glide ratio of 1 to 15.6.  $(1000/520 \times 8152 = 15,677)$

## TO SUMMARIZE:

To complete a 180 degree turn-back, we will need at least 1200 plus feet of altitude, on a day with no wind or with a wind directly on our initial flight path.

If we do turn back, we will still most likely not be in a position to reach the point of departure. We may be able to reach a cross runway or taxiway that gives us the advantage of distance.

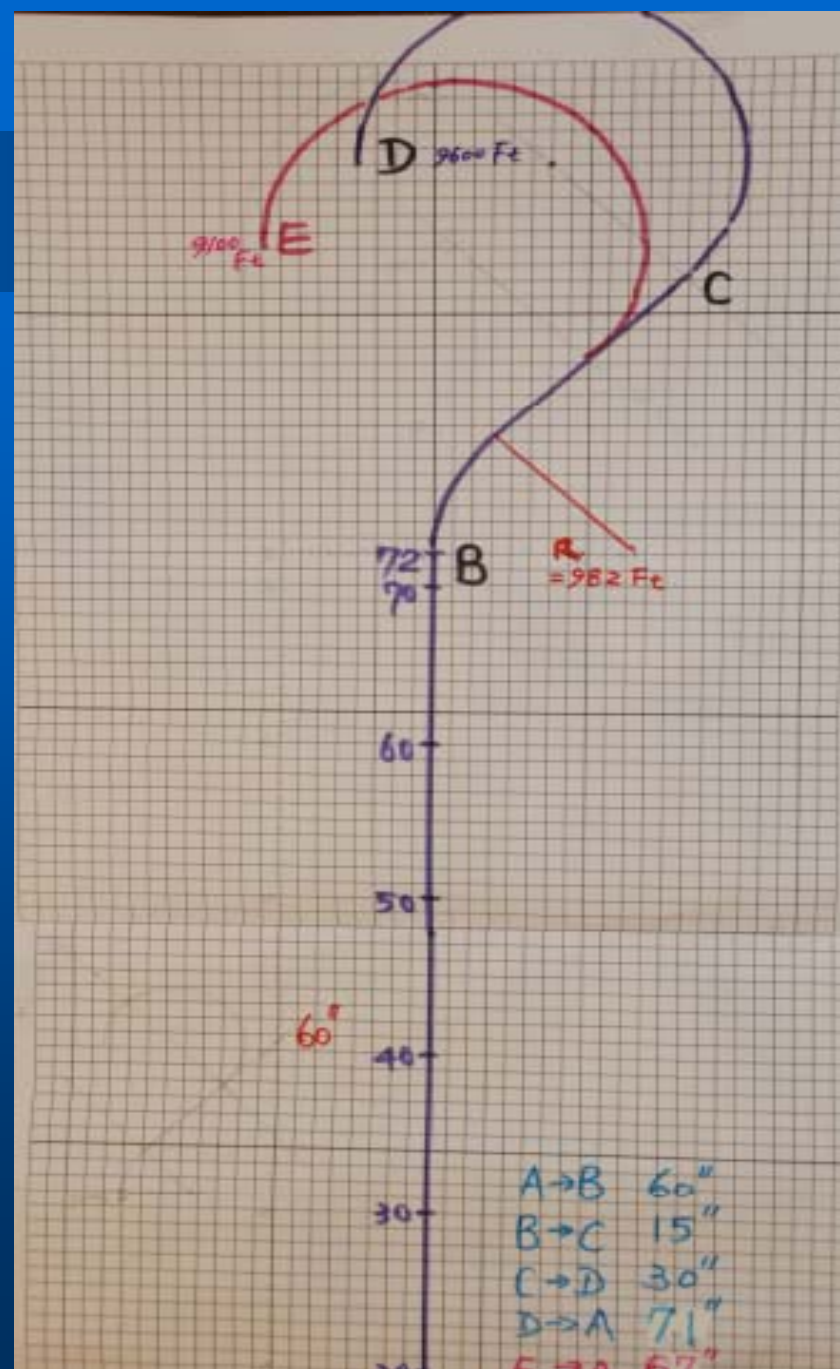
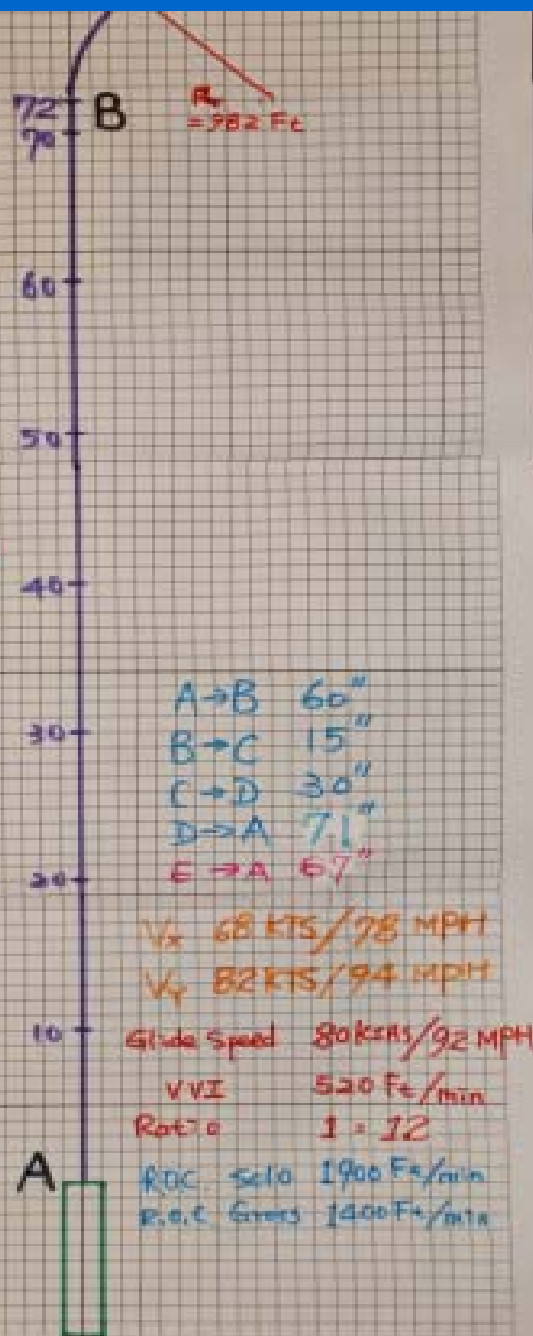
If our altimeter reads less than the 1200 feet AGL, we must land ahead with limited ability to turn to either side. Our ability to reach a suitable off-field landing site straight ahead or to either side will depend entirely on our altitude AGL, our glide ratio, and how the distance-to-the-landing site fits within these two parameters.

If you have experienced an engine failure, with the resultant pucker factors, you will know that rational thought becomes very difficult and only training and preparation for the eventuality carry the day. As we think about these issues it becomes very clear, that with an engine failure on climb-out, the altitude AGL shown on our altimeter is our guide as to which maneuvers are available to us. We cannot stretch a glide, and only a stall or stall-spin will be the result if we try.

Jack Dueck, EAA HAC, TC, FA





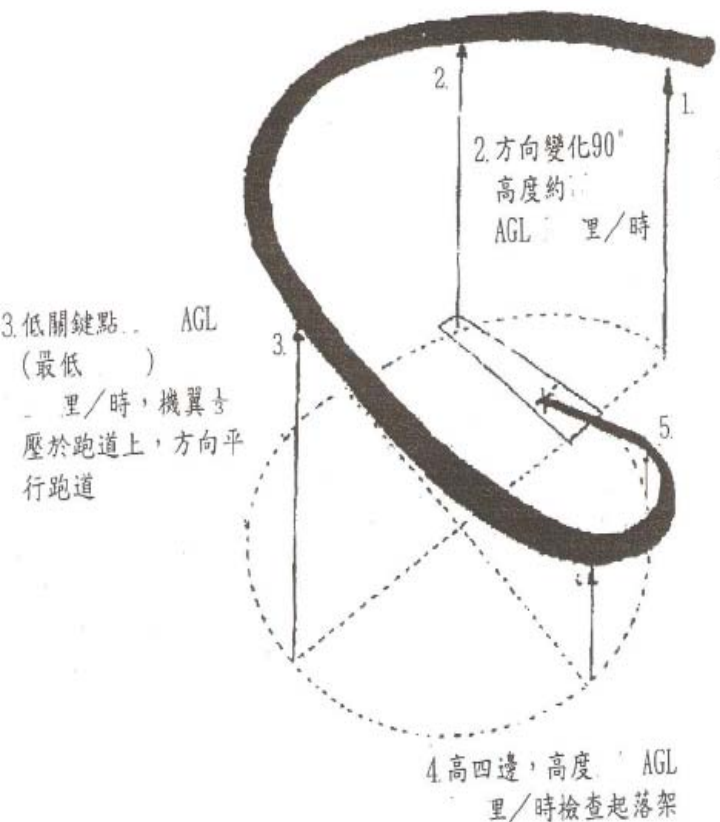


### 三、場面情況：

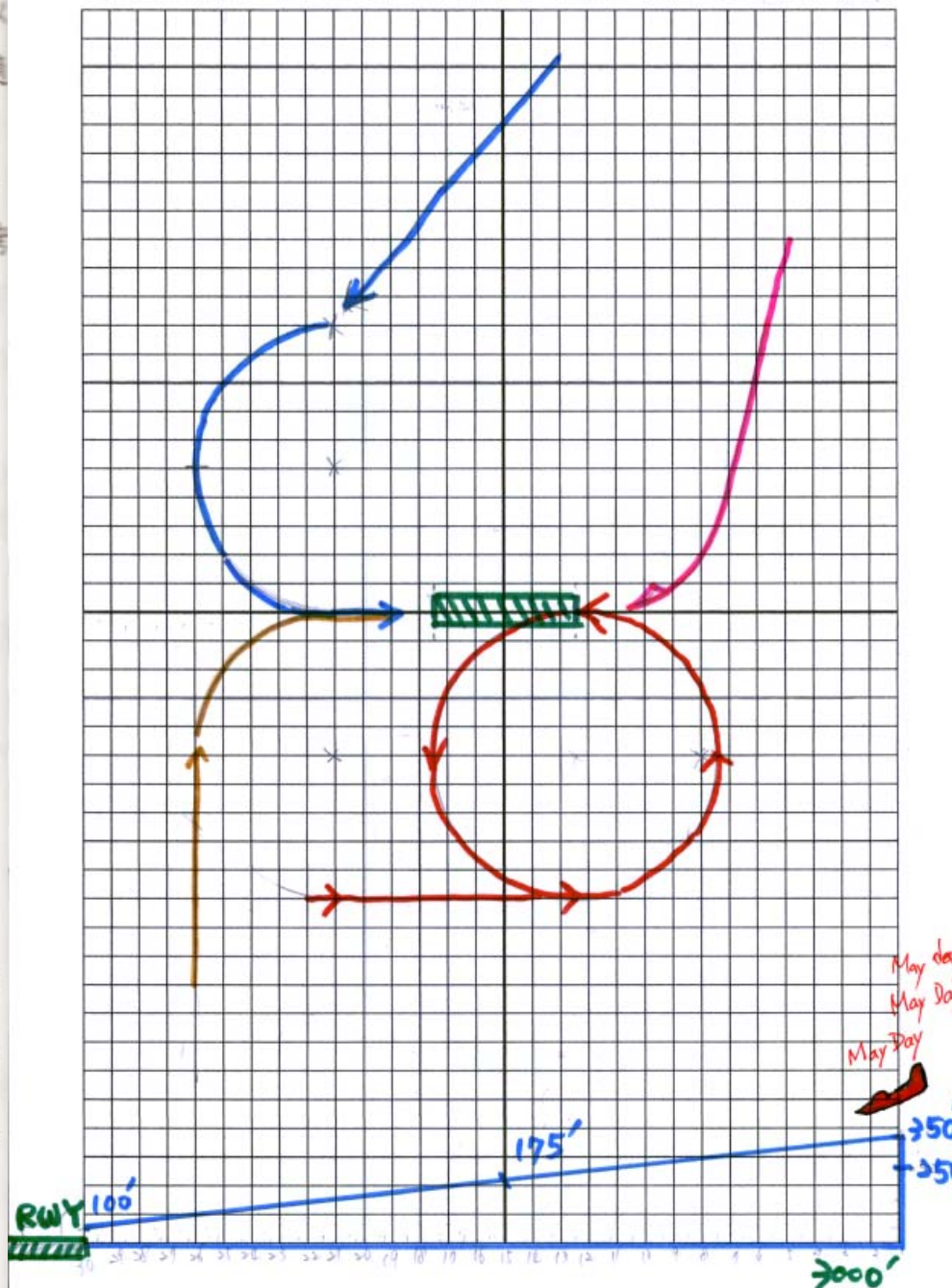
場面選擇以草地或海邊沙灘為佳，但因目前空域限制，根據以往經驗以甘蔗田、沙河或無田埂之農地為佳，上坡較下坡適宜。

### 四、場地環境：

- (一)場地四週之障礙物如建築物、樹林及電力設施等應列入考慮，並應避開人口稠密區。
- (二)平常飛行時應多觀察並熟悉環境。



- 1. 高關鍵點...  
AGL 里/時  
機翼壓於跑道上  
航向同進場方向，起落架放下  
(如高度低於...則視情況延遲伸放)。
- 5. 五邊，距跑道頭  
空速  
哩/時瞄準處，襟翼視需要，如場外迫降，座艙罩緊急開啟，電瓶電門關。





## CAA的經驗和建議

- ◆ CAA和超輕的愛好者應該是合作互進的角色，就如同FAA/EAA/USUA。
- ◆ 在申請檢驗前資料的準備，普遍上，都顯示不足的情形。
- ◆ 協會的角色和約束力，應可以再加強。
- ◆ 對於國外較先進而完備的超輕參考資料及文件，應更加重視並妥善運用。
- ◆ 超輕的未來，都在你我的努力中。