APPENDIX A- INDEPENDENT FLIGHT TEST REPORT.

BERKUT G-REDX
REPORT ON FLIGHT MADE ON 17 MAY 1999

INTRODUCTION

The recently completed Berkut G-REDX built to a very high standard by the owner pilot Mr Glenn Waters required flight test verification to enable the PFA to recommend the necessary flight clearances. To this end Mr Dave Ronneburg, the aircraft designer and qualified pilot, had been invited to carry out initial flight checks. As a preliminary to the PFA requirements the undersigned flew the aircraft with Mr Ronneburg to evaluate the rear seat operation and to establish general handling criteria.

CONDITION OF THE AIRCRAFT RELATIVE TO THE TESTS

The aircraft was loaded to a maximum all up weight of 2000 lbs and a C of G of 99.49 ins AOD. The rear cockpit was not fully equipped and in particular lacked rudder and wheel brake controls, although provided with side-stick elevator and aileron control and power lever. Only the instruments visible over the shoulder of the front seat occupant could be addressed.

TESTS CARRIED OUT

The flight was flown from Norwich Airport in clear conditions, 4/8 Cu base 3000ft and tops 6000ft, wind 060/22kts, QFE 1018, QNH 1022. R/W in use was 09

Take off and Climb The nose wheel was raised at 70 KIAS and the aircraft lifted off smoothly almost immediately. A climb at full power followed at 120 KIAS to 6000ft. A sustained climb from 4000ft to 10000ft was accomplished in 6 mins 42 secs at 120 KIAS, max CHT 398dg F/max oil temp 184 dg and 2350 rpm.

Dive to VNE A shallow dive at slowly increasing air speed was made to confirm the VNE of 218 KTS. To approve this limit the air speed was then increased to a maximum of 240 KTS with no adverse factors noted. rpm was kept to below max limits by throttling back.

Slow Speed Handling The speed was reduced to minimum control speed which resulted in a typical canard "nod" in the 68 to 66 kt range. No evidence or roll off or other incipient loss of control indications were noted. The same symptoms were displayed in turning flight where "nodding" effects occurred between 67 and 65 KIAS. At minimum control speed, power off, the aircraft built up quite a high rate of descent which was easily controlled with the application of power.

Stability Checks The short period damping in all axes was high, the long period phugoid was well damped as was the dutch roll which lasted between two and four cycles at cruising speeds. Side-slips at 100, 90, 80, 78 and 74 KIAS in each direction all produced positive restorative responses.

Emergency Lowering of Undercarriage By isolating the electrically driven hydraulic pump it was possible to investigate the emergency undercarriage lowering system. When the emergency handle was operated at approximately 120 kts the wheels immediately began to lower and the main wheels locked down readily but it was found necessary to reduce speed to about 70kts to obtain a nose wheel green. By re-energising the hydraulic pump the system was immediately returned to normal. Prior to retracting the undercarriage in was possible to check

that the nose wheel door was open by means of a small clear-view inspection panel.

SOME GENERAL OBSERVATIONS

The side stick control with "coolie hat" trimmer was well positioned and roll pitch harmony felt good although the spring forces encountered for maximum deflection felt heavy, this did not detract from ease and comfort in manoeuvring. The view from the rear cockpit was excellent and the available shoulder and leg room was better that average for this type of aircraft. Some useful storage space was also available in the wing roots. The lack of rudder and wheel brake controls made landing from the rear seat unacceptable for normal use although some useful control was available for check ride purposes. Cockpit noise was fairly high especially at full power. The use of high quality noise attenuating head-sets reduced cockpit noise to a very comfortable level. When flying in moderate turbulence a fairly "choppy" ride resulted which gave the impression of a relatively stiff aircraft structure.

REPORT ON EVALUATION/ACCEPTANCE TEST FLIGHT MADE ON 27 MAY 1999

INTRODUCTION

Following the introductory rear seat evaluation of Berkut G-REDX on 17 May 1999 the aircraft was flown from the front seat by the undersigned with Mr J Tempest of the PFA occupying the rear seat as flight test observer. The object of the flight was to evaluate the aircraft with a view to a recommendation for the award of a P to F. Quantitive data is contained in the attached PFA Flight Test Schedule. The data that follows is supplementary and includes qualitative information

CONDITION OF THE AIRCRAFT RELEVANT TO THE TESTS MADE

Other than necessary ground checks and inspections no rectification was required since the flight referred to above. The ability to change the C of G is limited given the very small moment change resulting from pilot (s) and storage area locations. On this occasion the take off weight was 1984lbs at a C of G of 99.38ins aft of datum. The front seat flying controls were conveniently located although the rudder pedals were not adjustable and had been fixed at an optimum position for the owner/pilot. As with some other canard aircraft each pedal acted independently on the corresponding wing tip rudder. Further depression of the pedal beyond full rudder position progressively activated the corresponding wheel brake. There was no parking brake but a ground activated facility enabled the nose leg to be retracted and so "kneel" the aircraft to help anchor the machine when parked into wind. The view from the cockpit was excellent. The additional navigation equipment was on a lavish scale for this category of aircraft. Most of the engine and fuel data was electronically presented. A direct reading fuel gauge incorporated in each wing tank was provided but was not easy to monitor as it involved looking over the appropriate shoulder. The fuel selector was ingeniously designed to prevent inadvertent shut off movement. There was a coarse manual pitch trim with electrically actuated fine pitch and roll trim available via a "coolie" hat on the side stick controller.

STARTING AND TAXYING

The 180hp Lycoming IO-360 engine driving a fixed (91ins) pitch, 68ins diameter Klaus propeller has a conventional magneto paired with an indendependent Klaus electronic ignition system and proved a ready starter. The aircraft was easy to hold on the brakes up to full power. Control in ground manoeuvring was good (max cross wind when taxying was approximately 10kts).

TAKE OFF AND INITIAL CLIMB

The aircraft was flown from Norwich Airport in clear conditions temp + 22dgC QNH 1017. wind 110/10, R/W in use 09. No attempt was made to raise the nose wheel early and a back pressure of about 5llb raised the nose at 60KIAS. An attitude was held with the nose wheel just off the ground until the aircraft became airborne at 90KIAS. When clear of the ground the undercarriage was raised with no detectable trim change and the climb continued at 120KIAS. Engine rpm increased with speed to about 2350 in the climb at full throttle. During the climb the opportunity was taken to become familiar with the general control responses which were found to be normal and pleasantly harmonised.

LOW SPEED HANDLING

The aircraft was then flown at circuit speeds and it was found that at under 100KIAS it was necessary to co-ordinate turns with rudder as the typical canard low speed adverse yaw was present It was also found to be relatively difficult to trim the aircraft accurately in pitch but this is probably a matter of practise in using the coarse manual trim in conjunction with the electrically operated fine trim. This did not make flying the aircraft difficult as the control forces remained light and responsive. When the nose is lowered speed builds up quite rapidly so it is a matter of reducing speed to a low figure early in the circuit to be able to maintain a good approach speed in a descent. As with other light canards when speed is reduced little buffet occurred before minimum flying speed. The familiar canard "nod" occurred between 68 and 66 KIAS although 64 KIAS was seen on the first excursion. With the stick held at the back stop the "nod" continued with loss of height but no tendency to roll off as the foreplane dipped in and out of the stall. Applying power arrested the rate of descent in about 60 to 80 ft on the altimeter. Holding some 2000 rpm with full aft stick changed the "nodding" speed initially to 68-65 then a steady 68-66. In turning flight with 40dg angle of bank "nodding" speeds were 78-76 and with 60dg angle of bank the corresponding speeds were 98-95 still maintaining approximately 2000rpm. In the approach configuration power off (undercarriage down, landing brake out) the "nodding" speeds were 68-64 but with a rate of descent about 300 fpm.

HIGH SPEED HANDLING

Although the VNE + 10% check had been made during the previous evaluation flight a confirmatory dive to 218 KIAS was made after level flight at 2500rpm and 153 KIAS. By the time VNE was reached the power lever had been reduced to about 10% of travel to maintain 2500 rpm. All control responses at VNE were satisfactory. Over 200 KIAS the main wheel doors closed lights were extinguished but relit as soon as the speed was reduced below 200 KIAS. No undercarriage red lights illuminated. At FL 55 with 2000 rpm set the cruising speed was in the order

of 130 KIAS (OAT + 16dg C)

STABILITY AND CONTROL
These checks were made between FL 50 and 60. Stick and rudder jerks were applied with the following results:

	100 KIAS	120KIAS	160KIAS
Elevator damped in	3 cycles	2-3 cycles	2-3 cycles
Aileron damped in	1.5 cycles	1.5 cycles	1.5 cycles
Rudder damped in	----------dead beat----------		

A dutch roll induced at 150 KIAS damped out in 3 cycles. At 150 KIAS spiral stability was stable to the left, neutral to the right. At 110 KIAS spiral stability was slightly divergent to the left, stable to the right. Side slip checks revealed positive stability. The side slips were aileron limited at 100 and 110 KIAS at 120 KIAS aileron limited to the right and aileron and rudder coincident to the left. At 150 KIAS the side slips were rudder limited in each direction.
Rates of Roll The rate of roll was measured at 150 KIAS from 60dg to 60dg angle of bank with the following results: Aileron only from right to left took 2.4 secs and from left to right 5 secs which included an initial hesitation. The corresponding rudder assisted rates were right to left 2 secs. left to right 2.6 secs. At lower speeds the adverse yaw hesitation without rudder assistance was more pronounced.
Stick Force per G The stick force per g was assessed in 150 KIAS (power for level flight) wind-up turns. As no suitable force gauge was available the results are only estimated. The stick force per g appeared to increase from about 5lbs for the first excess g to at least double that amount at the maximum of + 4 g attempted. Around 3.8 to 4 g at 150 KIAS the canard "nod" was beginning to be triggered.

OUT OF TRIM FORCES
The out of trim forces were checked at take off and landing speeds and it was found that full trim applied in either direction could be held without difficulty.

RATE OF CLIMB
The rate of climb was measured over 5 mins with the results recorded as attached. No problems were encountered.

APPROACH AND LANDING
The aircraft being reluctant to lose speed and height, the circuit was entered at undercarriage lowering speed. The wheels locked down in 8.5 secs with no discernible trim change. The landing brake also produced no pitch change on deployment although some buffet and airflow noise confirmed that it was down. A go-around was flown with no attendant problems. The wheels locked up in 9.5 secs. The approach was flown to cross the fence at 90 KIAS with power off during the final 100-200 ft of height loss. No attempt was made to achieve a minimum

touch down speed and the aircraft settled comfortably on the main wheels at around 75-80 KIAS. The nose wheel was allowed to touch the runway by relaxing back pressure before gentle brakeing brought the aircraft to a comfortable standstill prior to back-tracking the runway. With experience it is felt that the conservative speeds used on the approach and landing could be reduced considerably but care must be exercised to avoid inadvertent high hold off and subsequent high rate of descent. During the 1hr 35min test flight a total of 54 litres of fuel was consumed. .

CONCLUSIONS AND RECOMMENDATIONS

This aircraft performed very well and no dangerous of unexpected characteristics were noted. It is intrinsically safe in the right hands. It must be stated however that it is not a beginners aeroplane in that it has some fairly complex systems and a comparatively large flight envelope which could be wilfully exceeded. It follows therefore that careful briefing and scrutiny of experience would be a wise precaution before a pilot is permitted to fly a Berkut. Particular emphasis must be placed on explaining canard characteristics. A good check list is available for this aircraft but it would be advisable to compile a set of Pilots Notes/Flight Manual with special emphasis on the operation of the aircraft systems for future reference and information. This particular aircraft has been built to a meticulously high standard and could well provide a yard stick by which any subsequent UK built Berkut might be judged.

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3 June 1999