# Takeoff and Landing Data (TOLD) and Performance data for the Europa XS

By Bud Yerly

In updating my personal checklist, I realized I was missing my performance data, TOLD and my equipment operating instructions that were sometimes needed for flight calculations. Most civilian pilots have a small book known as the POH or Pilot Operations Handbook that came with the aircraft. The book has the charts and information needed to preflight, start, and operate the aircraft, emergency procedures, performance data, weight and balance and TOLD. In my past life I had my Dash-1 Checklist, and an Inflight Guide for operational information. Everything you needed at hand was in these two checklists. I've published my personal checklist before but omitted the extra information on performance data and TOLD.

This paper is on how I developed more information on my 914 powered Europa's performance data and the TOLD. Flight test is the best way to determine the performance and TOLD information. However, to develop a checklist you need some place to start. I started with research as I didn't have 50 foot measured obstacles, soft fields of grass, hard grass, runways at my disposal. Nor did I have a crew of people and surveyors to assist me. Instead, I did more research. From my previous training I had books on aircraft performance. All I needed to do was a lot of calculations. However, we know that some flight data is essential to check the assumptions of the equations are approximately correct.

I relied on Aircraft Performance by Domash and "Forces on an Aircraft in Take-off or Landing" By Grey. I also compared my data to aircraft of similar performance. In the following pages I will print off my data and its format. Below is my initial condensed takeoff and landing data:

**Europa N12AY Takeoff and Landing Data (Calculated).**

**Takeoff 914 with CS Prop**

| | | | |
|---|---|---|---|
| | **Gross TO Wt.** | **1300** | **1450** |
| Std Day | Min Roll TO Hard | 490 | 825 |
| | Normal TO Hard | 600 | 1000 |
| | Soft Field | 625 | 1050 |
| | Over 50 Ft. | 1150 | 1710 |

POH says 490 Feet

Add 125% for standard firm long turf.

3 sec 1250fpm over 50' at 110 fps Accel from 45-65 is 3 sec. 660

**Density Alt. Effects**

| | | | |
|---|---|---|---|
| +10C | Add 10% | +10% | +10% |
| +5000'DA | Add 50% | 1000 | 2175 |

**Head and Tailwind Effects**

| | | | |
|---|---|---|---|
| HW | | | |
| 10 | Based on Min Roll | 325 | 550 |
| 15 | | 250 | 420 |
| TW | | | |
| 10 | Based on Min Roll | 675 | 1120 |
| 15 | | 750 | 1250 |

TO 50, HW 10 ratio 10/50=.2 standard is 35% decrease in TO roll.

15Kts is 50% Chg.

**Landing Roll 914 with CS Prop EW 955 Idle 1800*****

| | | | |
|---|---|---|---|
| | **Gross Lnd Wt.** | **1300** | **1370** |
| Std Day | Min Roll Land Hard* | 660 | 725 |
| | Normal Lndg Hard** | 800 | 900 |
| | Soft Field | 825 | 910 |
| | Over 50 Ft. 3 deg App | 1760 | 1825 |
| | Over 50 Ft. 5 deg App | 1335 | 1400 |

50'@3degree to Touchdown = 1000 +100 ft transition=1100 Add 1100'

50'@5degree to Touchdown= 575+100=675 Add 675'

*45Kt Touchdown With Max Braking

**50 Kt Touchdown With Max Braking

***Calculated data is from point of touchdown.

Approach Changes: 60 kt approach, 55 kt across threshold, yields a float of 500 feet, which must be added to the landing distances.

**Density Alt. Effects**

| | | | |
|---|---|---|---|
| +10C | Add 10% | +10% | +10% |
| +5000'DA | Add 50% | 1000 | 2175 |

**Head and Tailwind Effects**

| | | | | |
|---|---|---|---|---|
| HW | | | | |
| 10 | Based on Min Roll | 430 | 475 | 35% |
| 15 | | 330 | 362 | 50% |
| TW | | | | |
| 10 | Based on Min Roll | 900 | 980 | |
| 15 | | 990 | 1100 | |

The equations were omitted from the spreadsheet/checklist, and I compared the data to the CT aircraft and Pipistrel data. I know from experience the hard surface TOLD is accurate. The spreadsheet above is a bit large for inflight data. What do we really need? I don't do soft field takeoffs as I'll tear up my wheel pants. So perhaps I can condense this down even more and stick it on my Local Airports Page as I didn't want another full page added to my checklist. A bit of squishing of data and I feel I can use this in flight if I must divert and I must compare my performance and the runway length in real time. Here is what I condensed it to:

| **Pilot Abbreviated Checklist- Europa N12AY** | | | | | | |
|---|---|---|---|---|---|---|
| **Local Airports and Navigation Aids** | | | | | | |
| **ICAO** | **Airport** | **Rwy** | **Length** | **Unicom** | **T/Ap** | **AWOS** |
| | Elevation/Pattern Direction | | | | | |
| **PCM** | **Plant City** | **10-28** | **3950** | **123.050** | **AWOS** | **120.025** |
| | 153' LP | | | | **Apch** | **119.65** |
| **VDF** | **Tampa Exec** | **05-23** | **5000** | **122.700** | **AWOS** | **121.125** |
| | (Vandenburg) | **18-36** | **3219** | | **Apch** | **119.1** |
| | 22' LP | | | | | |
| **X39** | **Tampa North** | **14-32** | **3541** | **123.050** | | **None** |
| | 68' RP Rwy 14 | | | | | |
| **TPF** | **Peter O Knight** | **04-22** | **3405** | **122.725** | **AWOS** | **118.925** |
| | 08' RP Rwy 4,36 | **18-36** | **2688** | | | |
| | 08' LP Rwy 18,22 | | | | | |
| **LAL** | **Lakeland** | **05-23** | **5000** | **Twr/Gnd** | **124.5 / 121.4** | |
| | 142' | **09-27** | **8000** | | **ATIS** | **118.025** |
| **GIF** | **Winterhaven** | **05-23** | **5000** | **123.05** | | |
| | 145' | **11-29** | **4000** | | **AWOS** | **133.675** |
| **X49** | **South Lakeland** | **14-23** | **2400** | **122.9** | | |
| | 110' RP Rwy 14 | | | | | |
| **ZPH** | **Zephyrhills** | **04-22rp** | **5001** | **123.075** | | |
| | 90' RP Rwy 19 23 | **19-01** | **5067** | | **AWOS** | **118.975** |

| **TAKEOFF AND LANDING DATA:** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gross TO Wt.** | **1300** | **1450** | **Notes:** | | | | |
| Normal TO Hard | 600 | 1000 | +10C | Add 10% | HW 10 Kts | Decr 30% | |
| Over 50 Ft. | 1150 | 1710 | +5000'DA | Add 50% | TW 10 Kts | Add 30% | |
| Normal Lndg Hard** | 800 | 900 | | **GW** | **1300 lbs** | **1450 lbs** | |
| *45Kt Touchdow n With Max Braking | | | Over 50 Ft. 5 deg GP | | 1335 | 1400 | |
| **50 Kt Touchdow n With Max Braking | | | | | | | 11 |
| Personal checklist of Alan K. Yerly, not endorsed by Europa Aircraft or FAA. | | | | | | | |
| This card is not a replacement for the kit manufactures operations manuals. | | | | | | | |

The performance data fit nicely on my weight and balance checklist page. I have this data in hard copy but frankly I have the full information in my cell phone/PDA if I need it. Again, the data is simply condensed to only what a pilot needs for basic cross-country planning. This data is from actual flight test data based on no flap takeoff and a 914 with constant speed prop. I'm disappointed in my landing data as I am hard pressed with the Sensenich Two blade AP420 in stopping in 800 feet from the contact point. There is a lot of residual thrust in the AP420/Sensenich combination. The AP332/Whirlwind landing distance is much better.

On the next page is how I condensed my Wt. and Bal. and my cruise performance information:

## Pilot Abbreviated Checklist- Europa N12AY

### Weight and Balance and Operational Loading Preplanned

| G limit | Positive | Negative | GW |
|---|---|---|---|
| Normal | +3.8 | -1.9 | 1370lbs |
| MTOW | +3.5 | -1.5 | 1450lbs |

| G Limit | Forward | Aft | GW |
|---|---|---|---|
| Normal | 58.0 | 62.5 | 1370lbs |
| OverGros | 59.0 | 62.5 | 1450lbs |

Maximum Takeoff Weight is 1450 Pounds

Maximum Landing Weight is 1370 Pounds IAW Europa Aircaft

**Any landing above 1400 Pounds requires a hard landing inspection.**

### Typical Cross Country Loading

| Item | Weight | Arm | Moment |
|---|---|---|---|
| APS | 955 | 59.07 | 56414.1 |
| Pilot | 180 | 56 | 10080 |
| Pax | 165 | 56 | 9240 |
| Baggage | 50 | 88 | 4400 |
| Fuel | 100 | 76 | 7600 |
| | | | |
| Max TO* | 1450 | 60.15 | 87734.1 |

Note 1: Best handling characteristics are when flying at 60 inches CG

Note 2: Datum is second joggle at cowl line plus 29.25 inches

Equipment list is included in the POH as is Wt. and Bal.

* See alternate G limitations as perscribed by CFC, Inc.

### Typical Cross Country Flight Planning Perfomanc Information

| Altitude | Power | FF | IAS/TAS |
|---|---|---|---|
| 5000 | 5500/35 | 6.7 | 140/154 |
| | 5200/32 | 6 | 129/143 |
| | 5000/31.5 | 5.6 | 128/141 |
| | 4800/28 | 4.6 | 122/134 |

| Altitude | Power | FF | IAS/TAS |
|---|---|---|---|
| 10000 | 5500/35 | 6.8 | 136/163 |
| | 5200/32 | 6 | 130/155 |
| | 5000/31.5 | 5.6 | 123/146 |
| | 4800/28 | 5 | 111/132 |

All data flight tested and verified for non LSA version. 10

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I believe as the builder of an experimental aircraft I am responsible for documenting my aircraft operating procedures and its performance. Because I am old and forgetful, the normal operations, performance, Wt. and Balance, and TOLD information is included in my hand held checklist because I may find my PDA may fail and I have to use a chart, pencil and paper to plan. OH MY!

Most prefer to input their TOLD and Weight and Balance into their PFD. I too am looking into inputting the checklist into my PFD checklist page but I know personally, I'll never use it as I have a hand held checklist. Since my Flight Bag program known as Avare, has flight planning, Weight and balance, navigation, flight plan and filing with a weather brief, I must admit these "we have an app for that" devices are handy. Foreflight, Navair, and others are similar.

Now that the performance info is in my checklist, I've added some of my systems operation into my checklist as well. I forget sometimes how to set up my fuel totalizer for a partial refill, input a multi-leg flight plan into my Mini GA PFD, get the ADS-B Wi-Fi to show traffic on Avare….etc.

| **Pilot Abbreviated Checklist- Europa N12AY** |
|---|
| **N12AY Installed Equipment Operation Checklists** |
| **FP-5 Fuel Totalizer displays fuel remain on power up:** |
| Note: Tank holds 18.0 (15.5 Main 2.5 Reserve) |
| **To set full fuel after a top off:** |
| Select REM. Hold both buttons, display shows 15 Gal. *Main side Only*. |
| Exit by pushing both program buttons to set fuel remaining at 15 gal. |
| **To set number of gallons remaining if not fully fueled:** |
| Select REM. Push both program buttons, displays "ADD" |
| Step Switch: Left PRG **button** selects left number, RT - Right |
| Move **step** switch to change digits. |
| To finish always push both PRG buttons to set. |
| **Low fuel alarm reset (Normal is 5 gal first warn, 3 gallons second):** |
| Select "USED". Push both buttons. |
| Upper left bar is first warn, lower left is second. |
| Step Switch: Left changes hi/lo, Right changes digit select. |
| PRG buttons work as above, Step Switch changes digits |
| Exit by pushing both program buttons. |
| **Intercom Flightcom 403c Switches:** |
| **Volume and Squelch Standard.** |
| **403 All and Isolate:** Isolate cuts out PAX and Music from Pilot headset. |
| **Switch to right cuts ICS only during radio reception as indicated below.** |
| **ICS:** Radio Cuts out Pax ICS ONLY |
| **ICS Music**: Both ICS and Radio heard by all |
| **Music:** Radio cuts out Music ONLY |
| **Power Distribution Notes: All CBs are as marked except below:** |
| **INST:** Oil T,Oil P, CHT, EGT, Tach, Hobbs, Fuel TOT/Gauge, |
| **SPARE:** CS Prop if installed and USB Plug |
| **GPS:** Panel Power Plug 8 |
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A personal checklist is a memory jogger, and I use mine each flight to keep myself up to speed in the cockpit and the checklist is under constant review and revision for ease of use. Since I fly with others not familiar with the Europa, they review the checklist along with me and appreciate the review of procedures. Punching buttons on a PFD or iPad to find something is not as usable for me as the printed checklist format. I find the PFD, PDA or boob tube pad is not very in flight friendly causing more heads down time than I like for a quick checklist review. Don't get me wrong, I like the SA (Situational Awareness) the PDA, phone, iPad flight map gives me at a quick glance. I just don't like pushing buttons and staring at the thing to find, then read a checklist or procedure. Nor do I like a huge boob tube sitting in front of my passenger's face blocking their view. My Droid phone is enough for me on a local flight.

Food for thought.