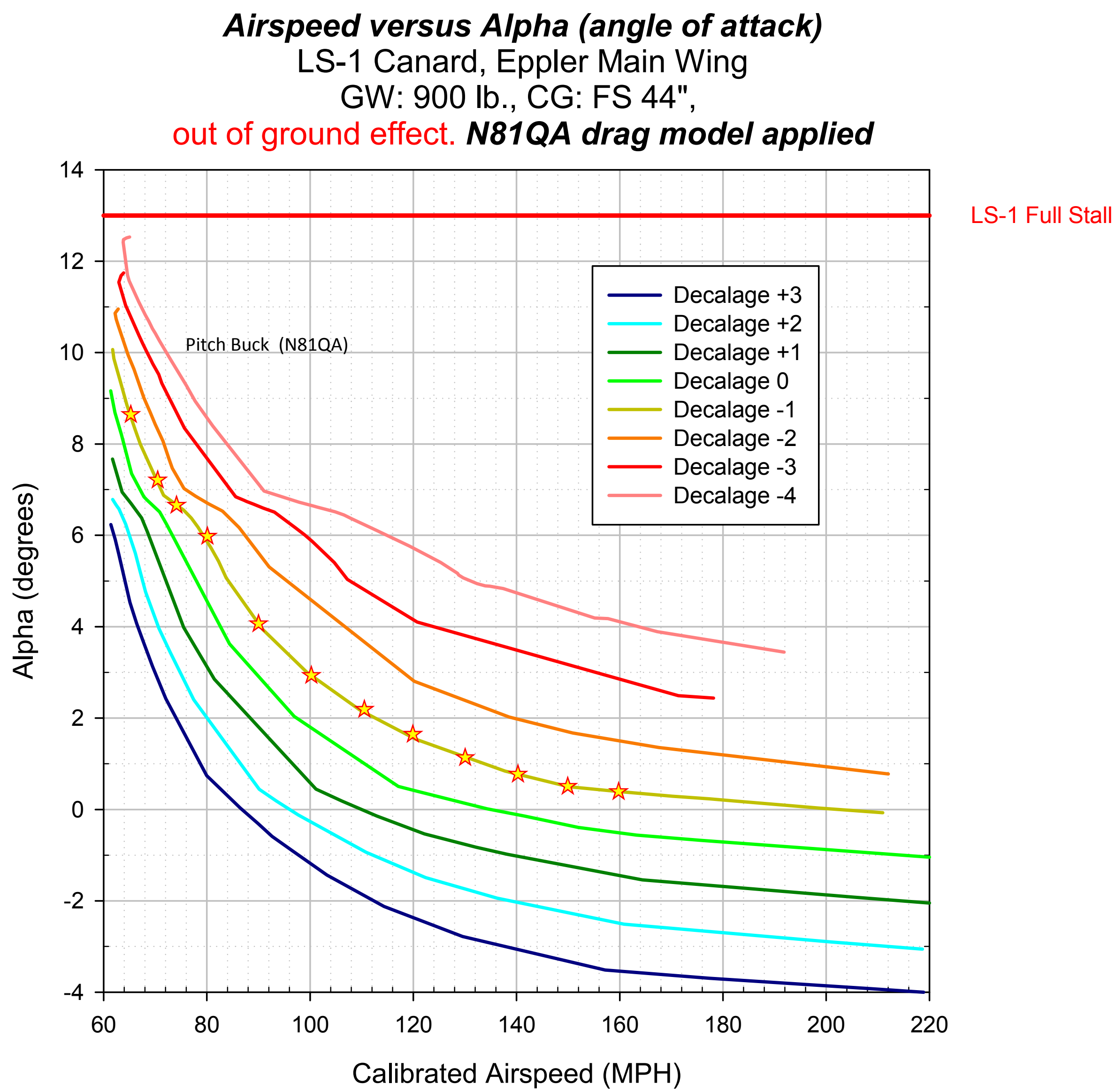


Figure 1. *Airspeed versus alpha data.. The colored curves are for equilibrium flight in the Q-200 at 900 pounds GW and CG @ FS 44". The results are for flight out of ground effect. The yellow stars represent actual flight test measurements from the QAC Q-200 prototype N81QA.*

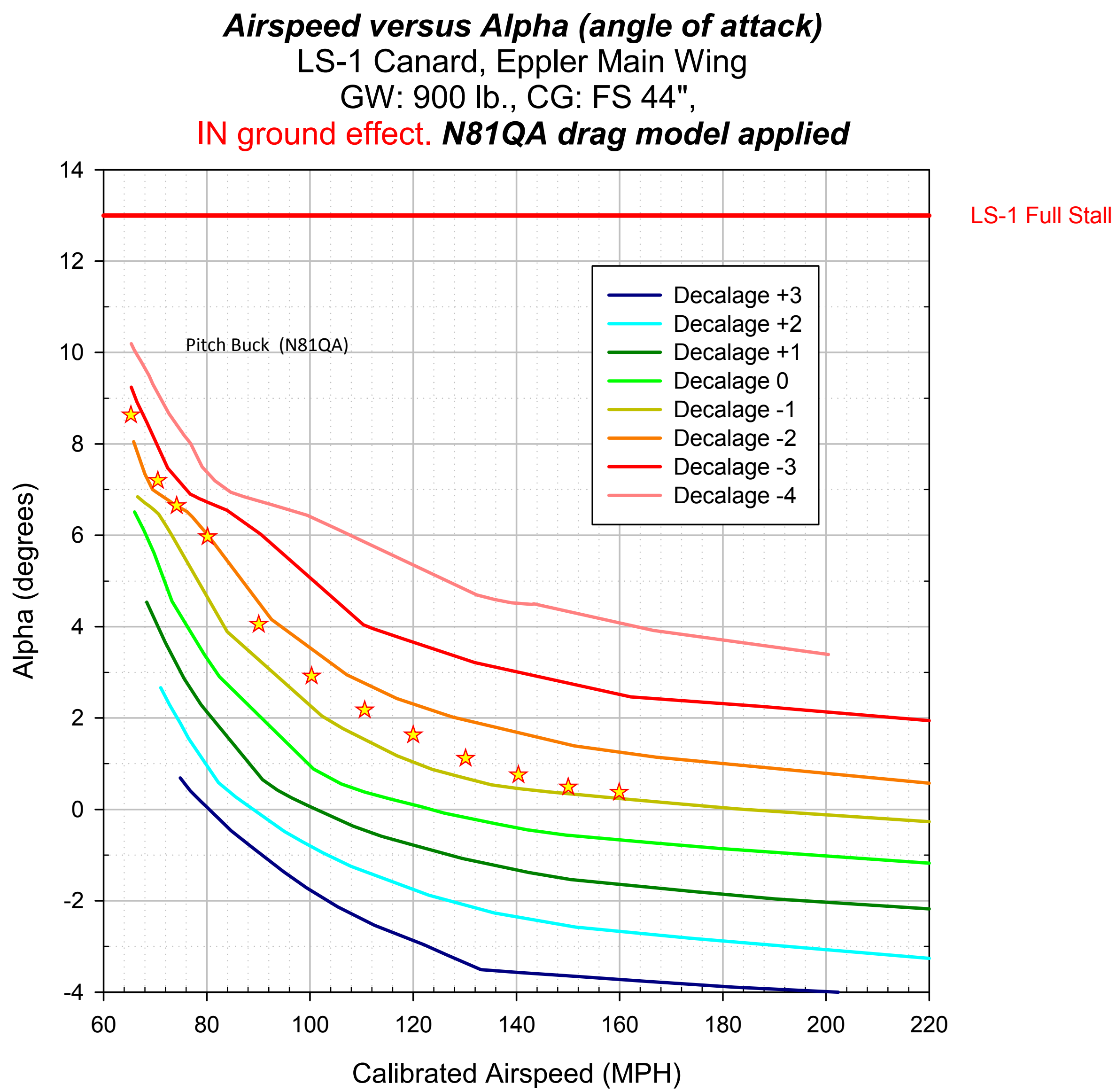


Figure 2. *Airspeed versus alpha data.. The colored curves are for equilibrium flight in the Q-200 at 900 pounds GW and CG @ FS 44". The results are for flight out of ground effect. The yellow stars represent actual flight test measurements from the QAC Q-200 prototype N81QA.*

Mike Dwyer’s Q-200 (N3QP)

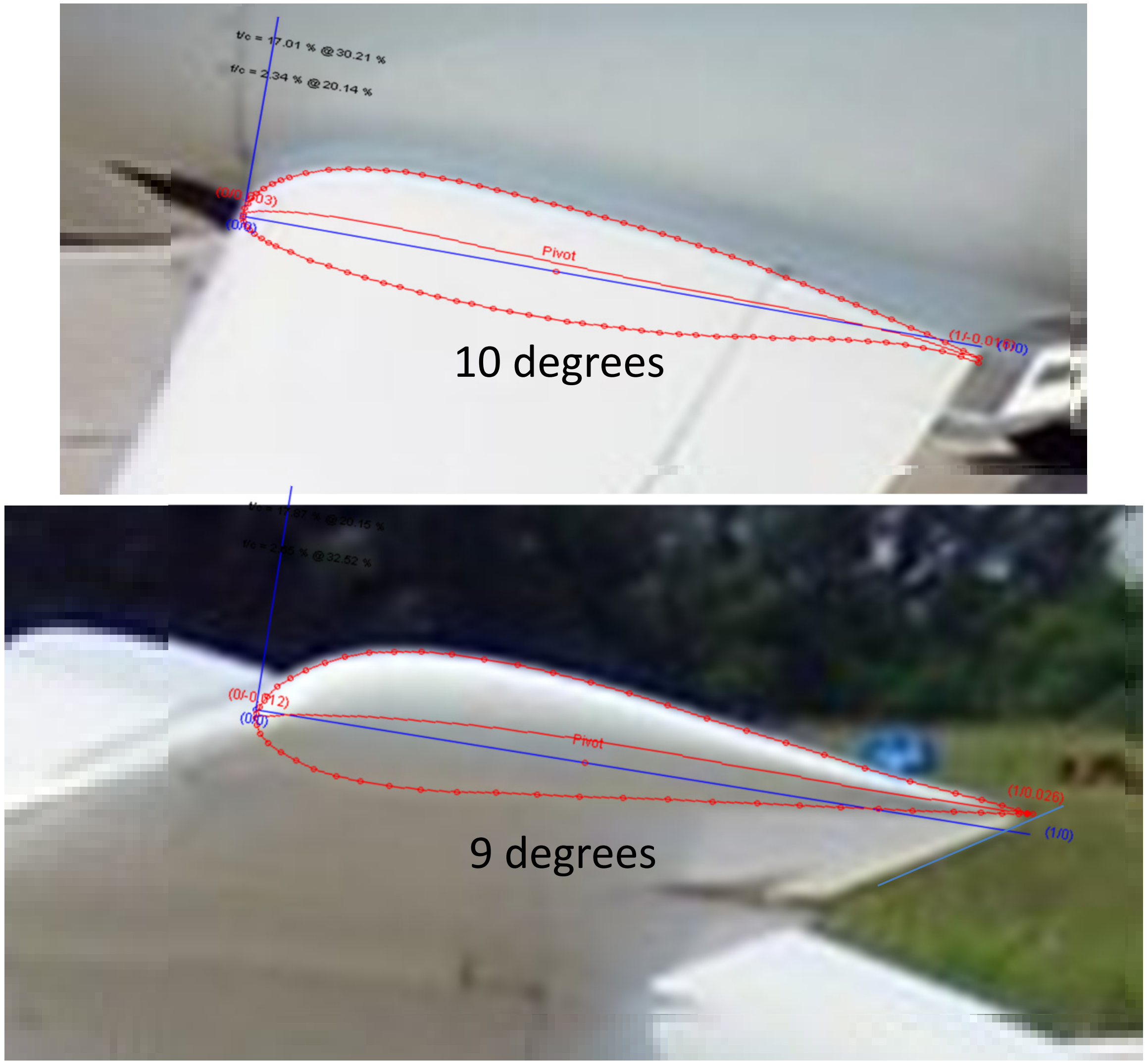


Figure 3. *Angles of canard (upper photo) and main wing (lower photo) overlain with QAC plans airfoil templates, which are rotated to align with the actual airfoil. The unloaded angle of the canard is 10 degrees, and the wing is 9 degrees indicating that this aircraft has a decalage angle of minus 1. When loaded (see subsequent analysis), it appears that the loaded/taxi angle of the canard is around 7 degrees, so loading to a normal cg with pilot and fuel causes a 3 degree reduction of the alpha due to deflection of the canard*

Q-200 N3QP

65 CAS Alpha = 7 degrees

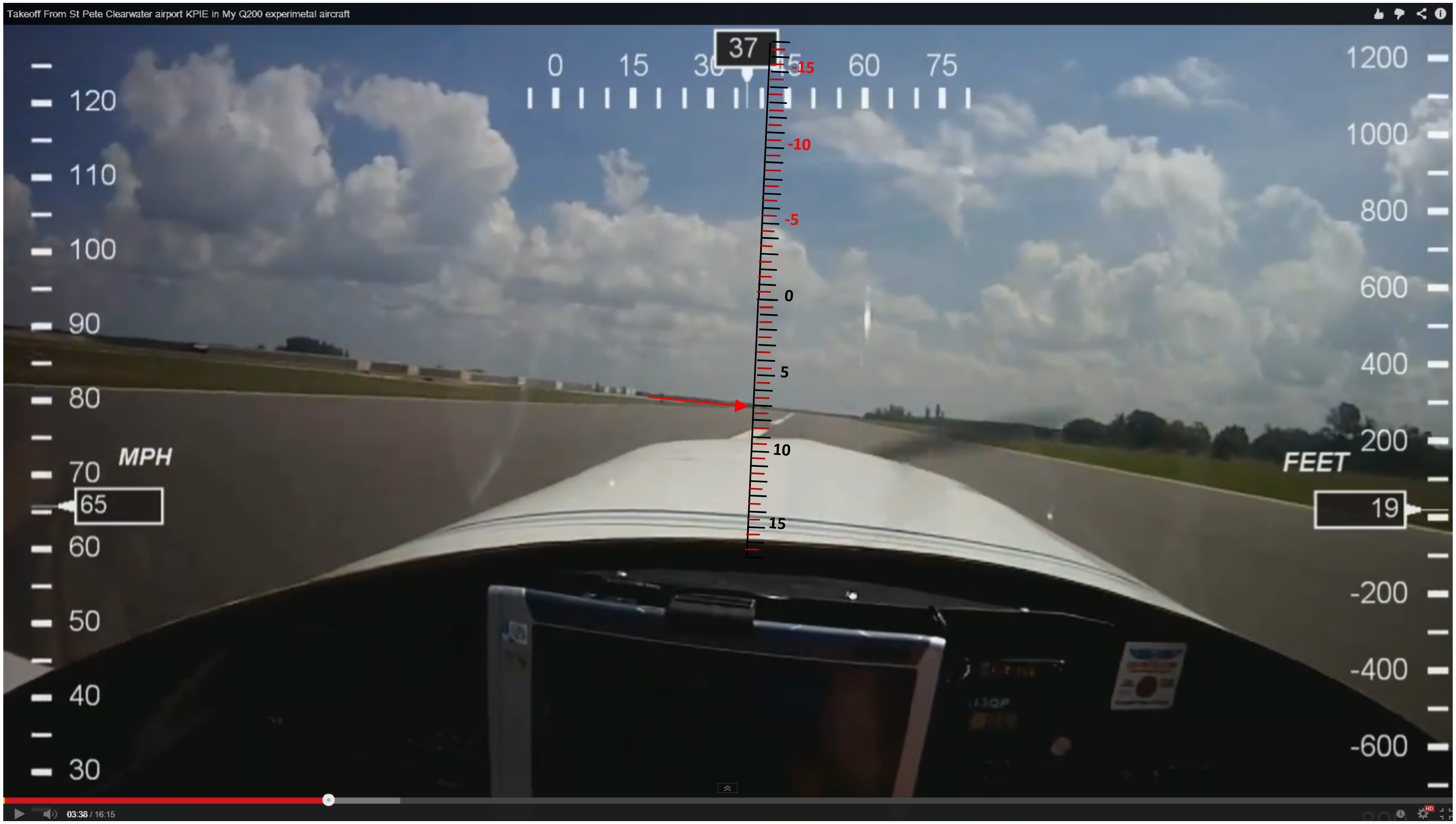
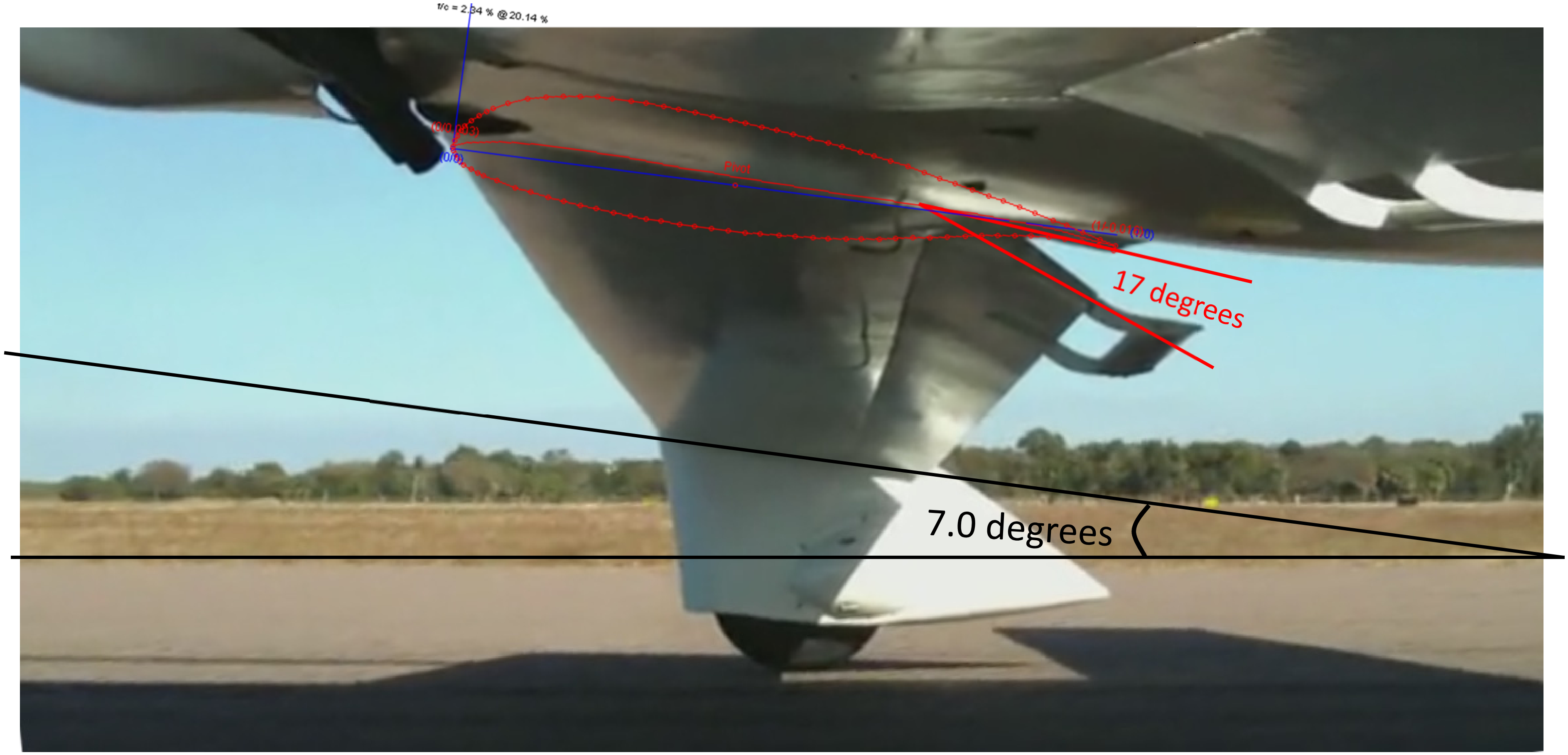


Figure 4. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view shows the takeoff roll while still in a three point stance, just prior to lifting off at an alpha of 7 degrees.*

Mike Dwyer's Q-200 (N3QP) just before take-off

From Vimeo upload: "**Q200 Elevator Cam 2-23-2010 1080P**" (http://vimeo.com/9691833)



Based on other videos of N3QP from the cockpit with "Dashware" scales displayed, shows his ground speed to be ~68 MPH (calm winds @ SL so G/S ≈ CAS)

Figure 5. *A wing camera view of the underside of the canard. This view is at the point of take-off and shows alpha is 7 degrees, based on matching the QAC canard template for BL 15 positioned to match the canard and comparing this line to the horizon. This view also indicates that the elevator deflection is 17 degrees down.*

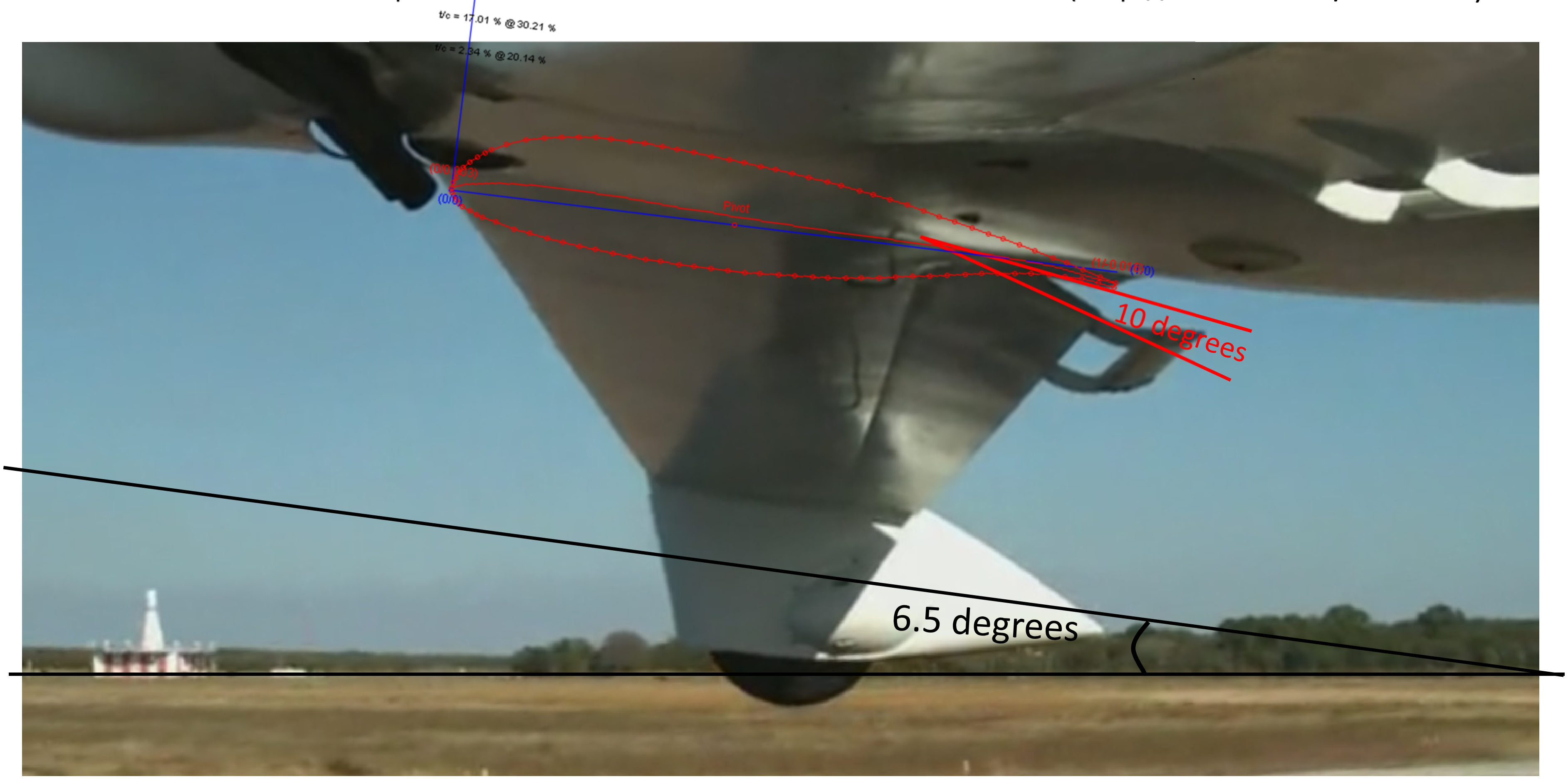
Q-200 N3QP

74 CAS Alpha = 6.5 degrees just off the ground in ground effect

Figure 6. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view is immediately after takeoff (74 mph) at an alpha of 6.5 degrees.*

Mike Dwyer's Q-200 after take-off, still in ground effect

From Mike's Vimeo upload: "**Q200 Elevator Cam 2-23-2010 1080P**" (http://vimeo.com/9691833)



Based on other videos of N3QP from the cockpit with "Dashware" scales displayed, his ground speed at this point is ~74 MPH (calm winds? @ SeaLevel so G/S ≈ CAS)

Figure 7. *A wing camera view of the underside of the canard. This view is soon after take-off and shows alpha is 6.5 degrees, based on matching the QAC canard template for BL 15 positioned to match the canard and comparing this line to the horizon. This view also indicates that the elevator deflection is 10 degrees down.*

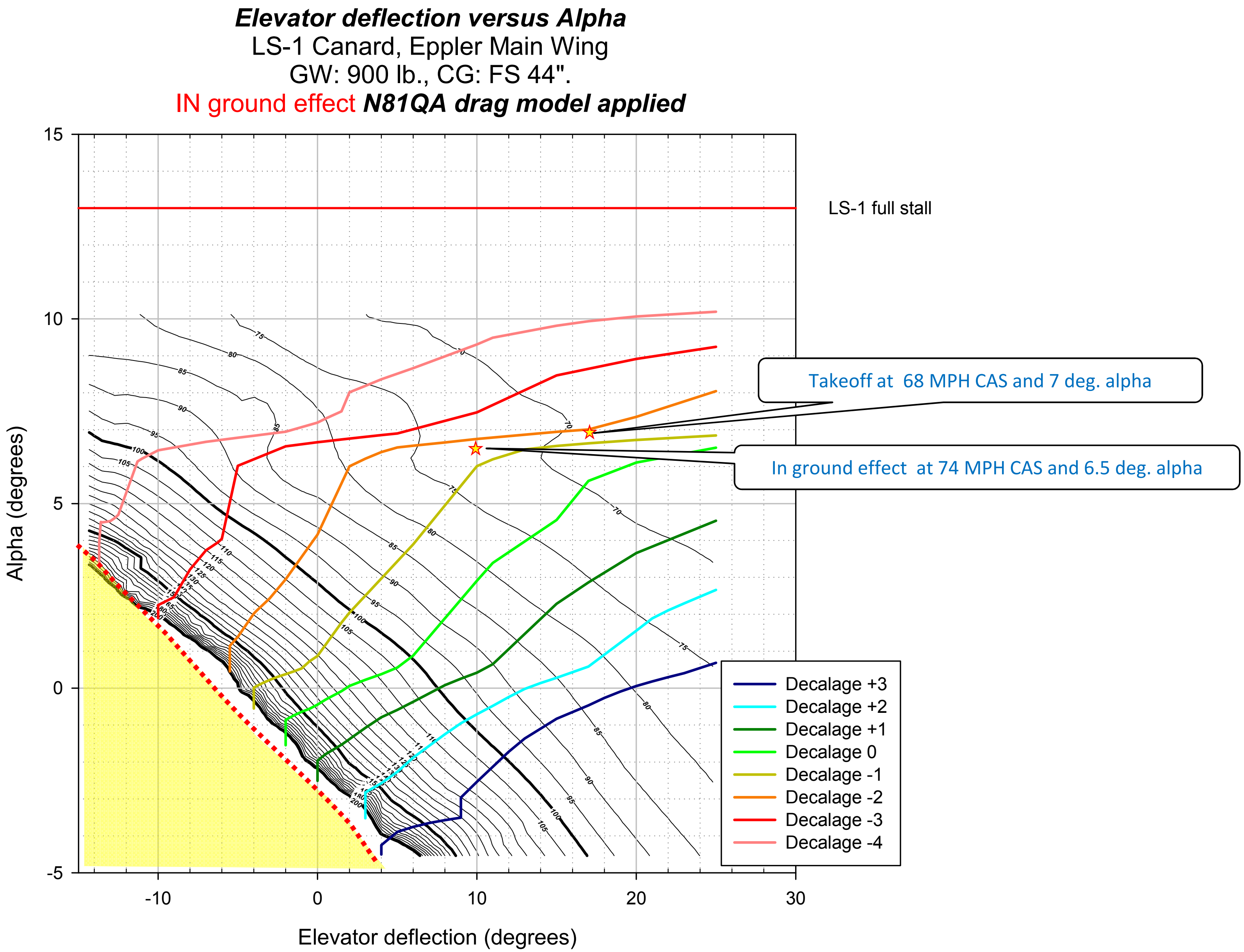


Figure 8. *Flight configuration curves from model for equilibrium flight in a Q-200 at 900 pounds GW and CG @ FS 44" in ground effect. Each colored curve represents allowable points for level flight for each decalage value. The yellow stars represent the two situations depicted for N3PQ in Figures 4 through 7. The depition of N3PQ in Figure 1 indicates a decalage of minus 1. The stars indicate that the aircraft appears to fly as if it has a decalage of minus 1.5 degrees.*

Q-200 N3QP

91 CAS Alpha = 4.2 degrees level accelerating, partial ground effect

Figure 9. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view is climbing out of ground effect after takeoff (91 mph) at an alpha of 4.2 degrees. No confirmation of elevator deflection is possible at this point in flight.*

Q-200 N3QP
101 CAS Alpha = 3.1 degrees, level accelerating, partial ground effect

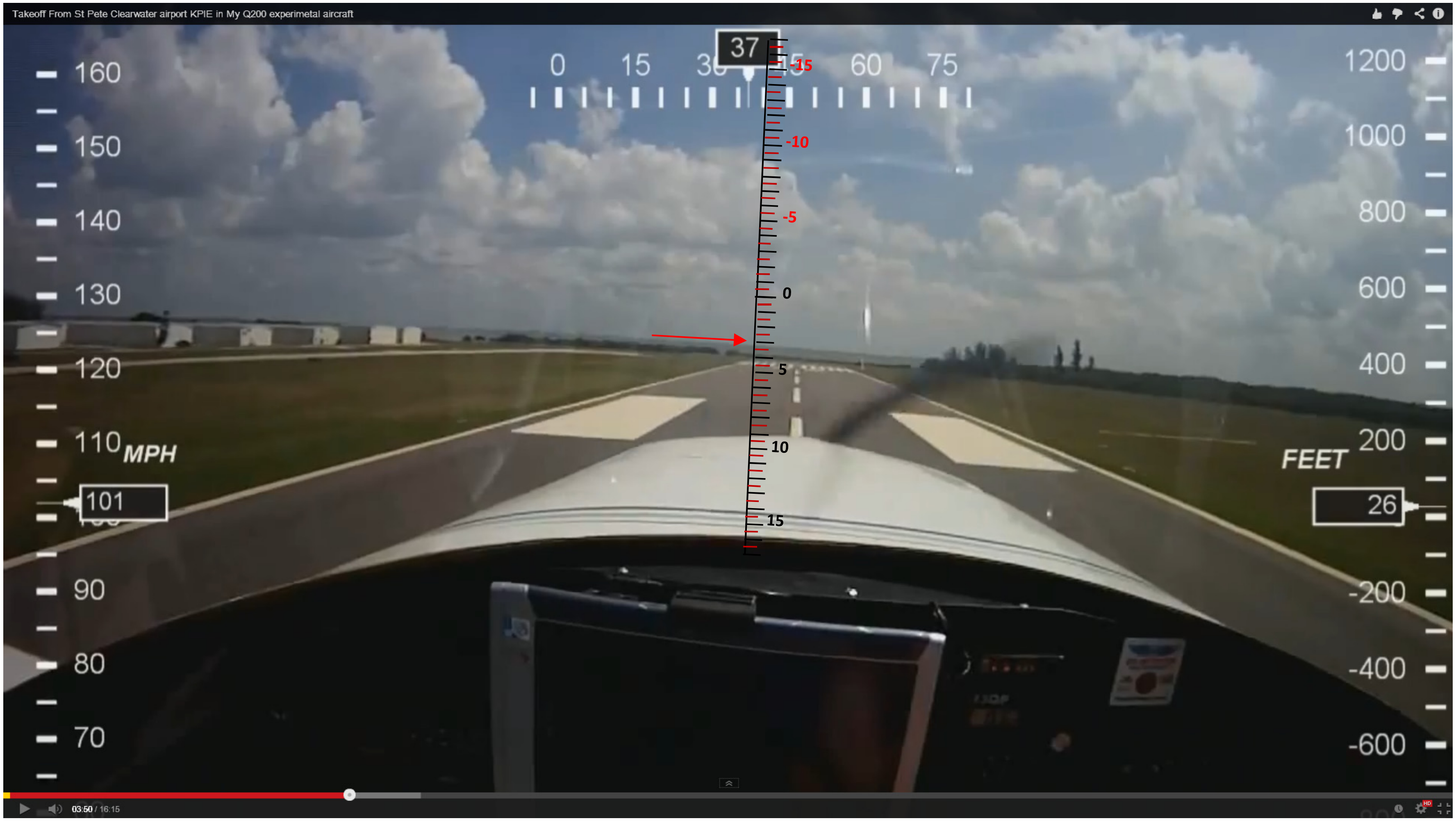


Figure 10. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view is climbing out of ground effect after takeoff (101 mph) at an alpha of 3.1 degrees. No confirmation of elevator deflection is possible at this point in flight.*

Q-200 N3QP

162 CAS Alpha = 0.9 degrees, level approaching max cruise, out of ground effect

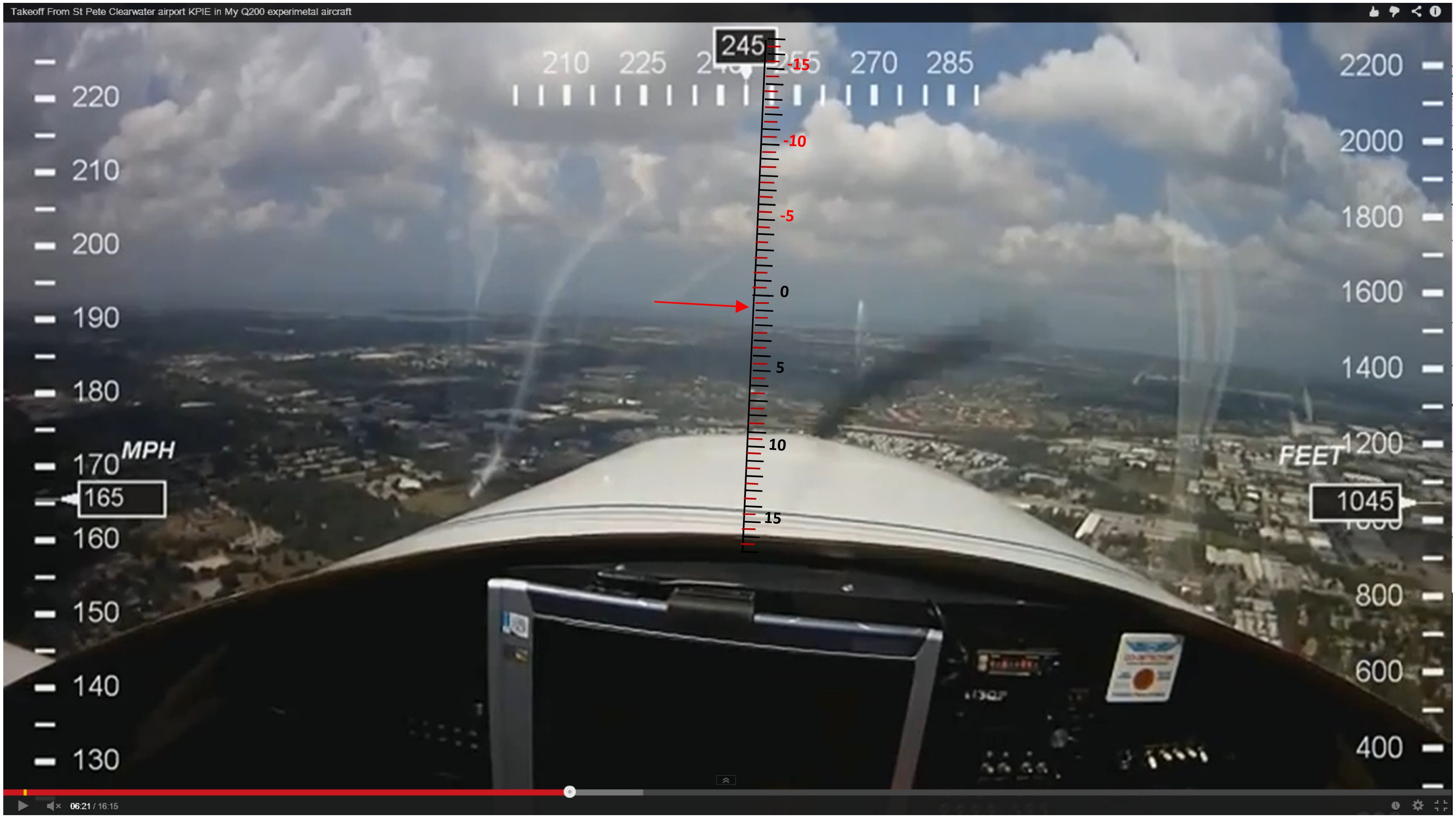


Figure 11. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view is level, over 1000 feet MSL altitude and approaching max cruise (165 mph) at an alpha of 0.9 degrees. No confirmation of elevator deflection is possible at this point in flight.*

Mike Dwyer's Q-200
172 CAS Alpha = -0.2 degrees, max cruise, out of ground effect

Figure 12. *View from camera mounted on the seatback bulkhead. The vertical scale in the middle of the image is an angular scale that is calibrated to fixed points on the aircraft. The other scales (from Dashware) are: altitude (right), speed (left), and heading (top). This view is level, over 1000 feet MSL altitude and at max cruise (176 mph) at an alpha of -0.2 degrees. No confirmation of elevator deflection is possible at this point in flight.*

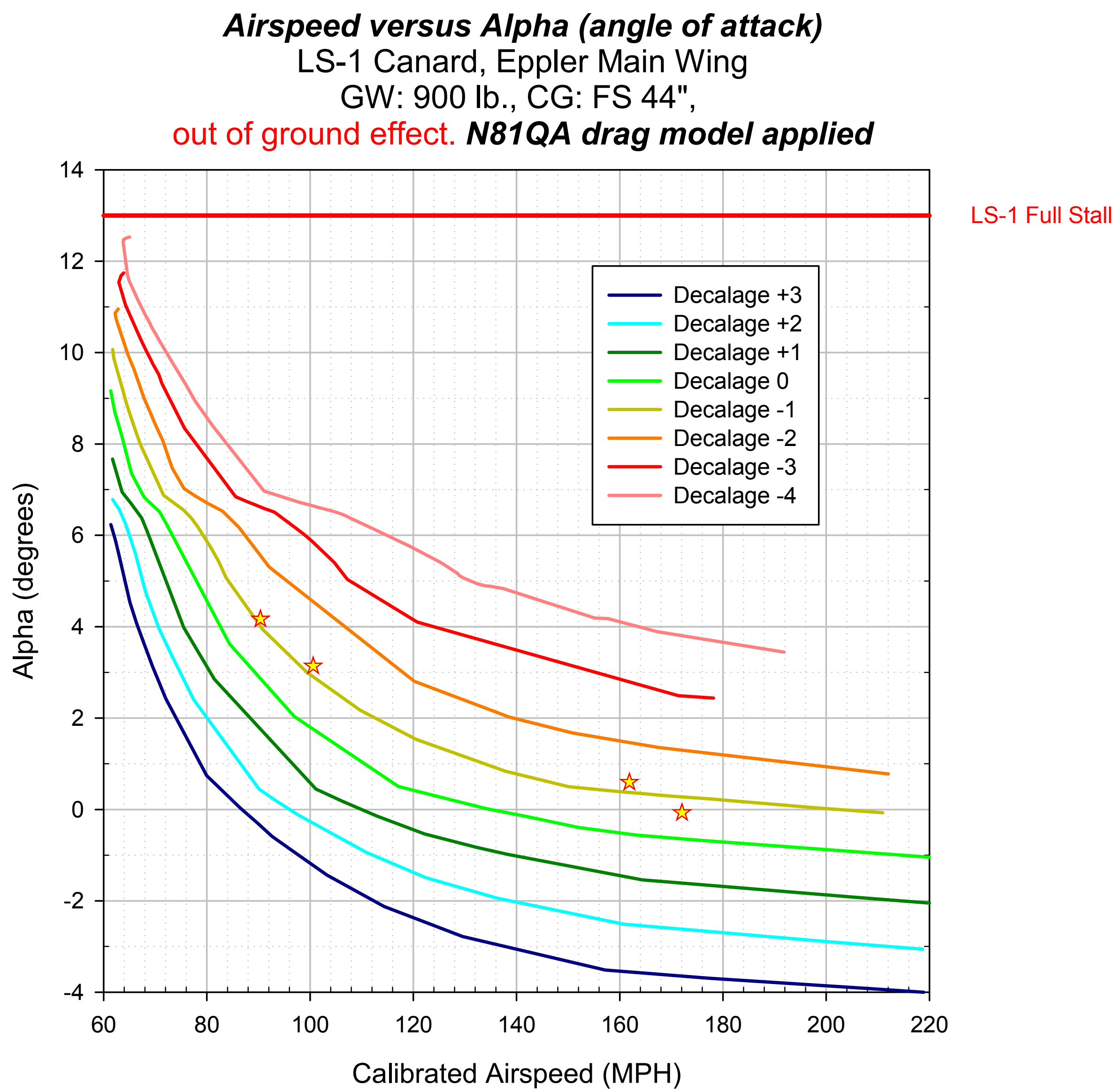


Figure 13. *Airspeed versus alpha data.. The colored curves are for equilibrium flight in a Q-200 at 900 pounds GW and CG @ FS 44". The results are for flight out of ground effect. The yellow stars represent the flight measurements from video screen captures of N3PQ which are shown in Figures 9-12. The N3PQ data plots very close to the decalage curve for minus 1. This is consistent with the confirmation of decalage measured in Figure 1.*

Q-200 N102SD

Slow taxi roll: alpha 6.0 degrees. Est. CAS 3 mph

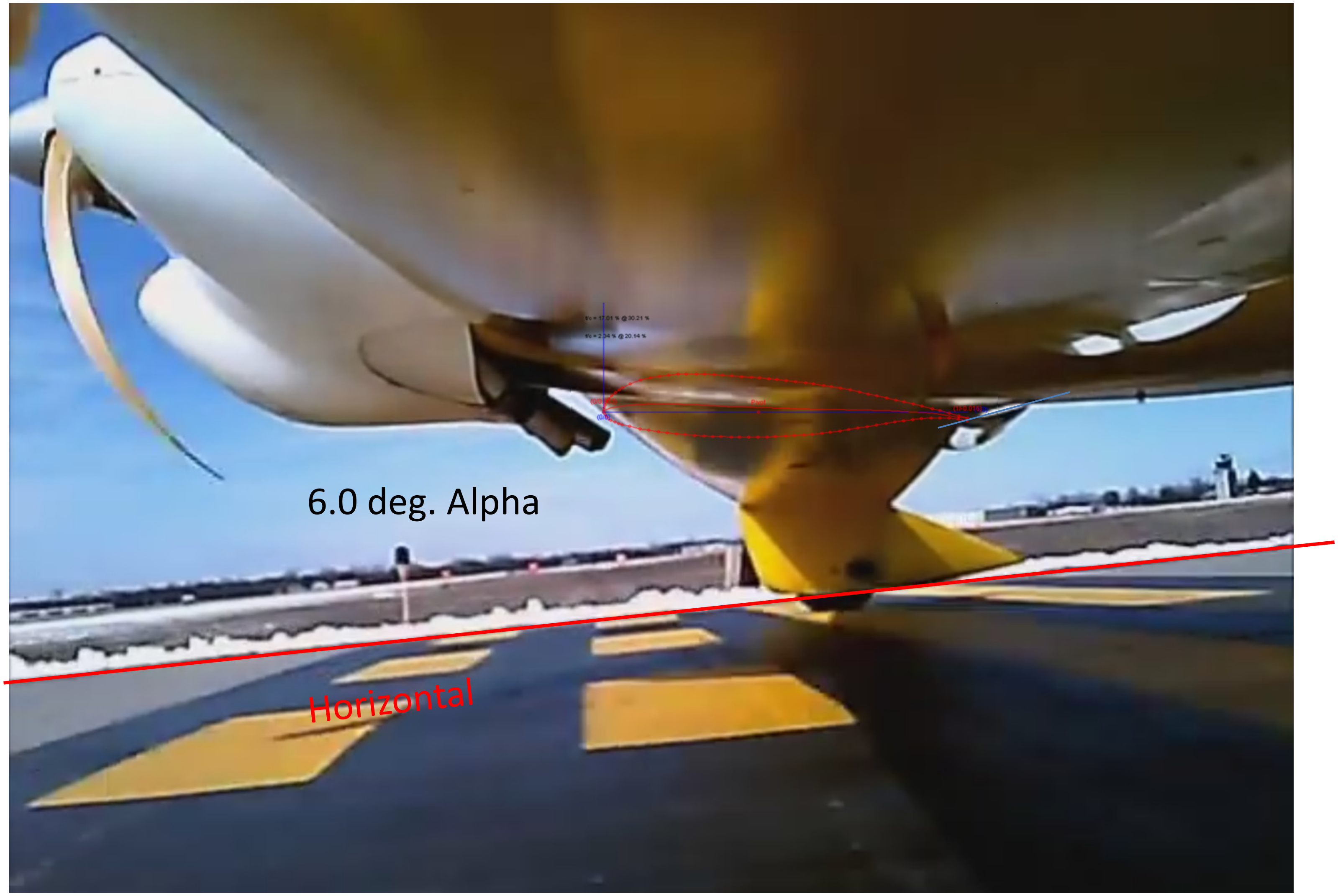


Figure 14.

Q-200 N102SD

Take off roll, prior to rotation: alpha 6.1 degrees. Est. CAS 65 mph

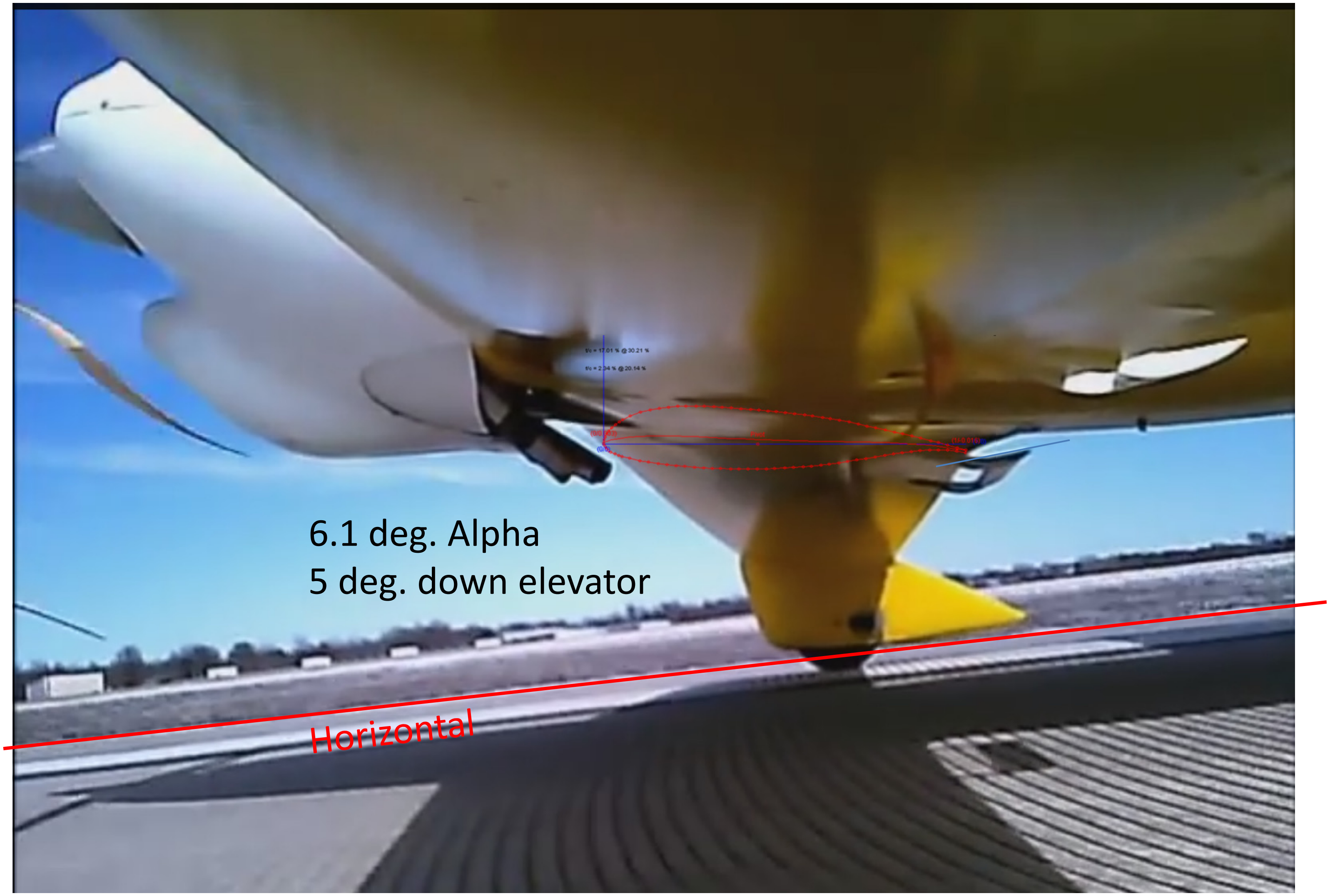


Figure 15.

Q-200 N102SD

Rotate at take off: alpha 7.5 degrees. Est CAS 73 mph

Figure 16.

Q-200 N102SD

Accelerating in ground effect: alpha 5.8 degrees Est. CAS 78 mph

Figure 17.

Q-200 N102SD
Level cruise: alpha 0.5 degrees. Est. CAS 140 mph

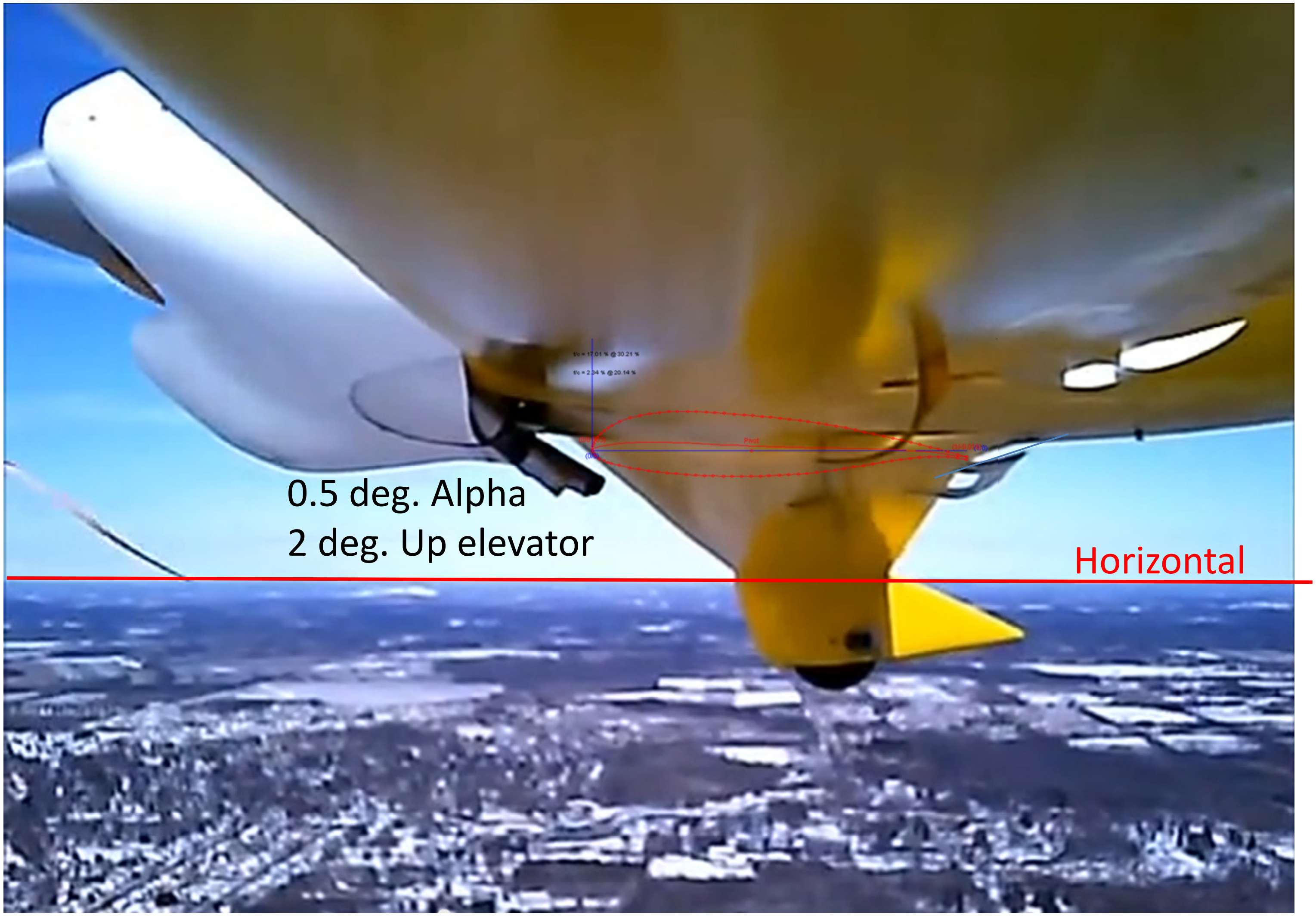


Figure 18.

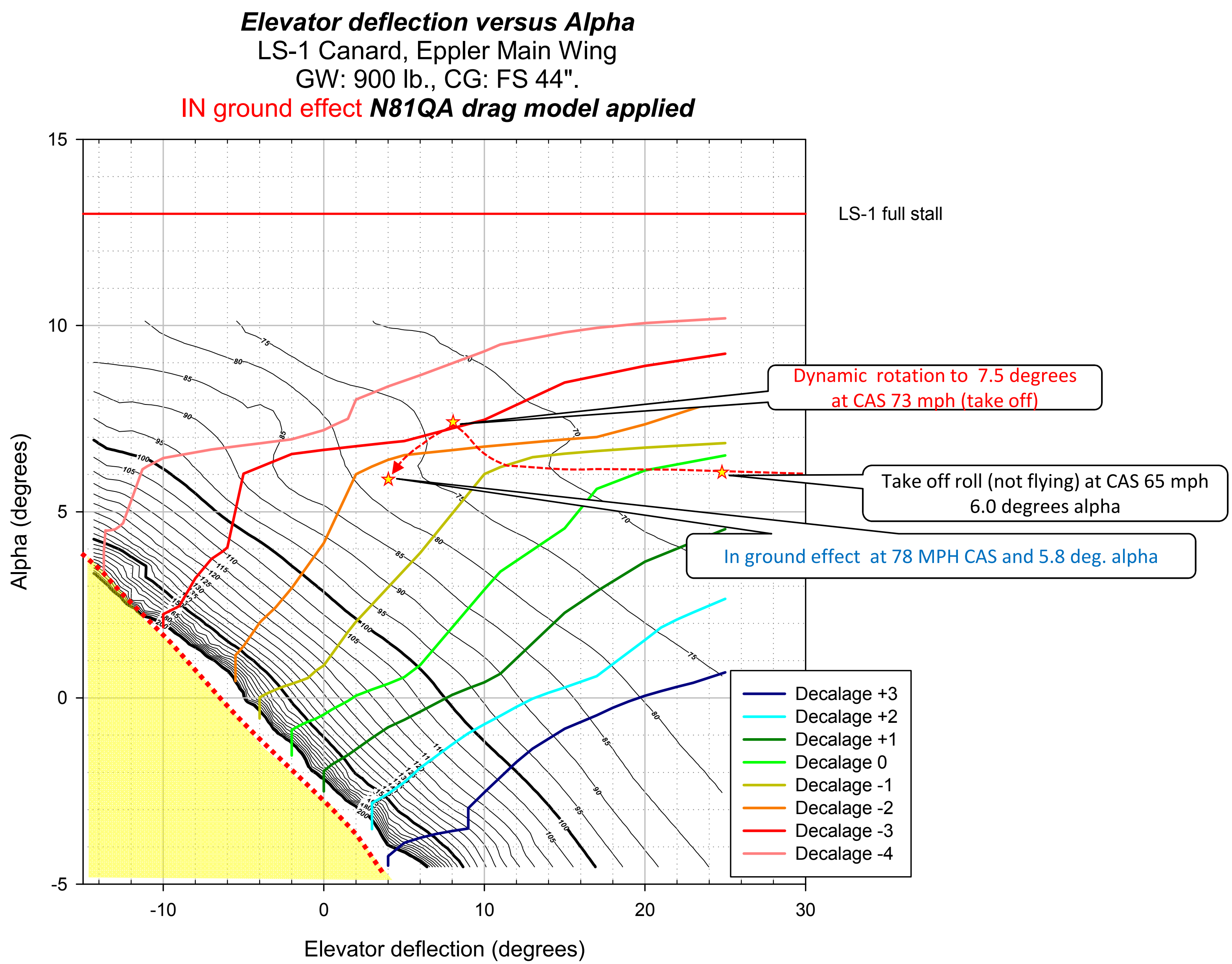


Figure 19. *Flight configuration curves from model for equilibrium flight in a Q-200 at 900 pounds GW and CG @ FS 44" in ground effect. Each colored curve represents allowable points for level flight for each decalage value. The yellow stars represent the three scenarios shown in Figures 15, 16 and 17. The stars indicate that N102SD takes off as if it has a decalage of approximately minus 2 degrees.*

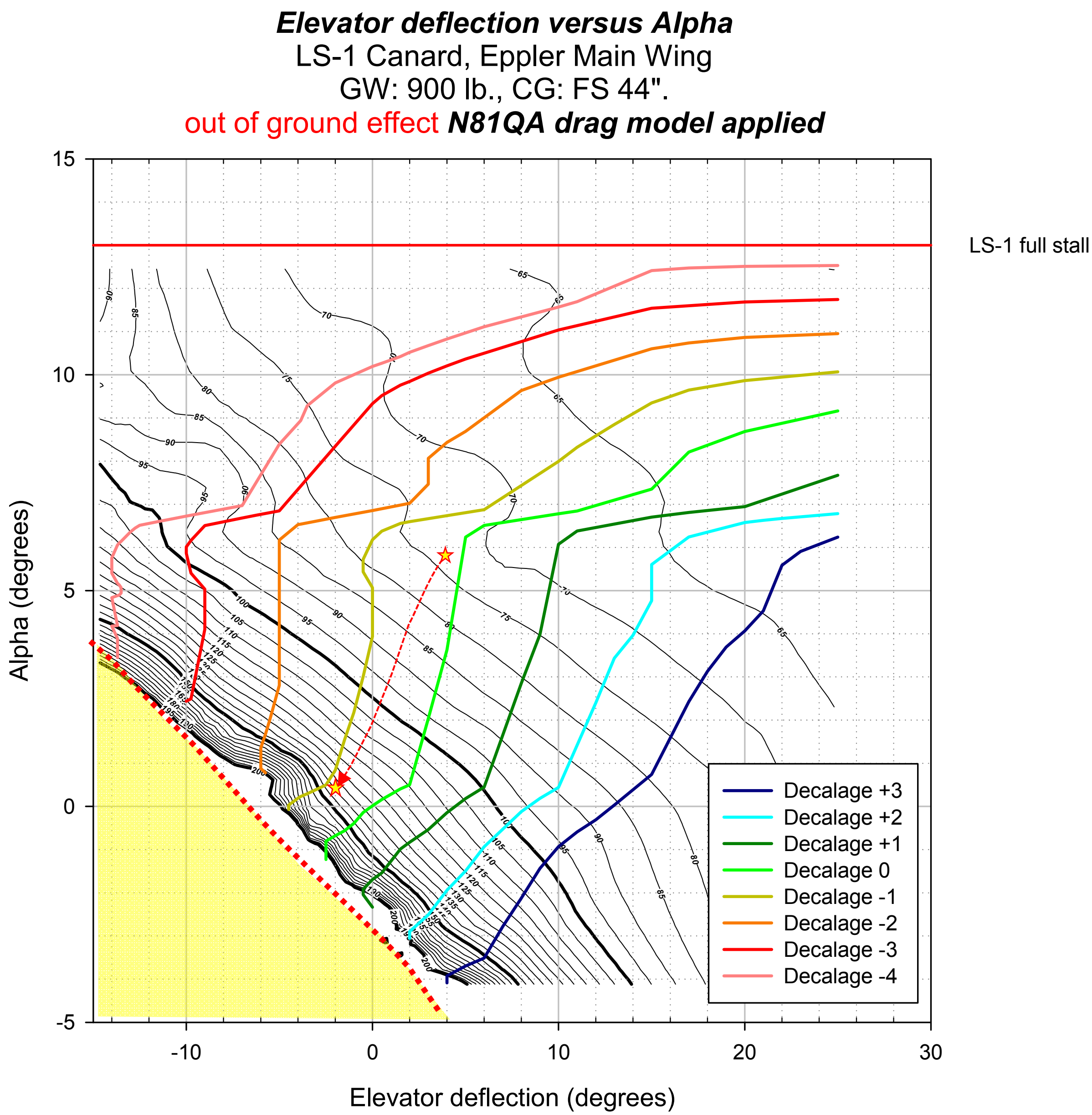


Figure 20. *Flight configuration curves from model for equilibrium flight in a Q-200 at 900 pounds GW and CG @ FS 44" out of ground effect. Each colored curve represents allowable points for level flight for each decalage value. The yellow star represents the cruise scenario shown in Figures 18. This star indicates that N102SD cruises as if it has a decalage of approximately minus 1 degree.*

Q-200 N102SD

Taxi: alpha 6.0

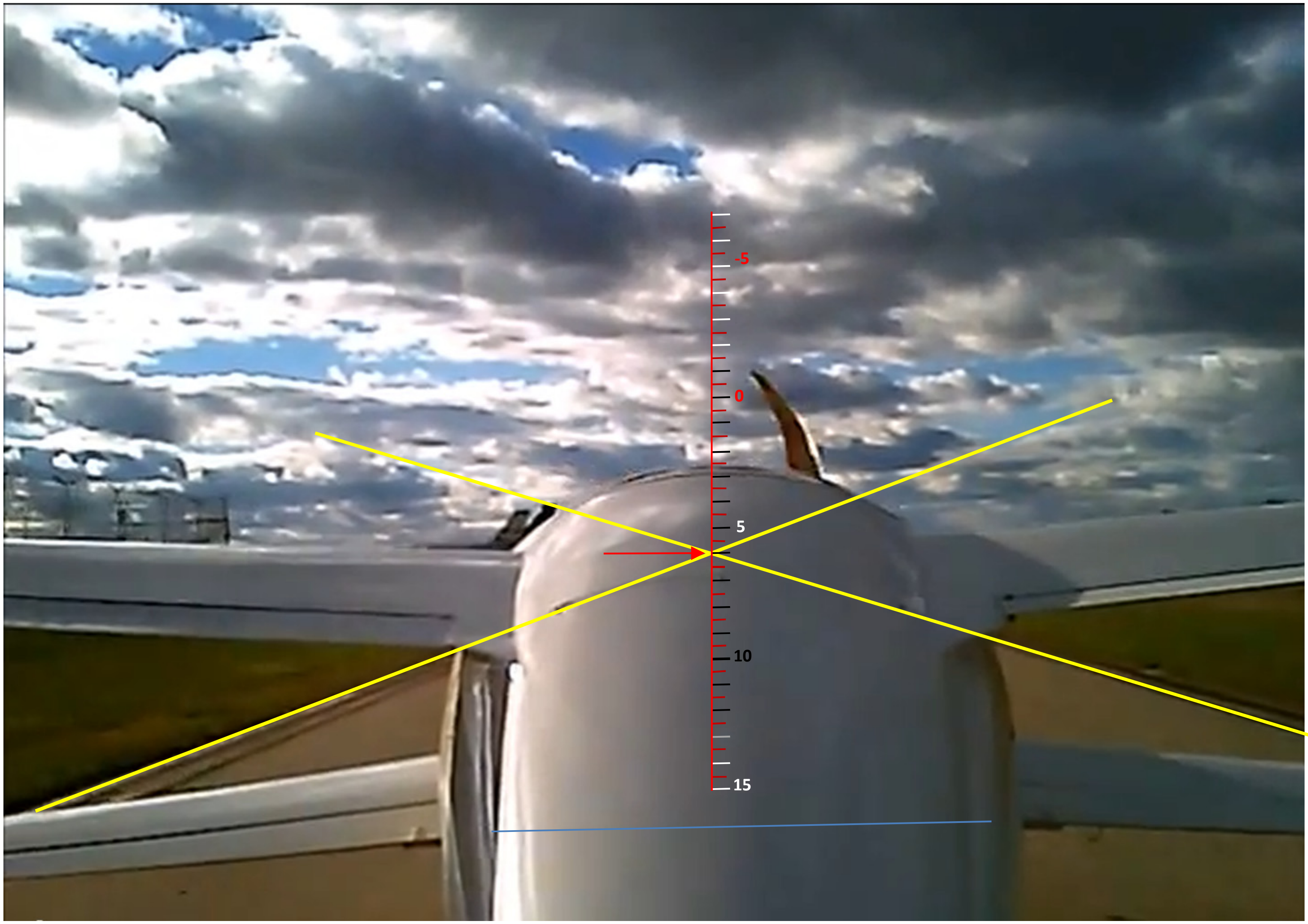


Figure 21.

Q-200 N102SD

Early takeoff roll: alpha 6.5 degrees Est. CAS 40 mph

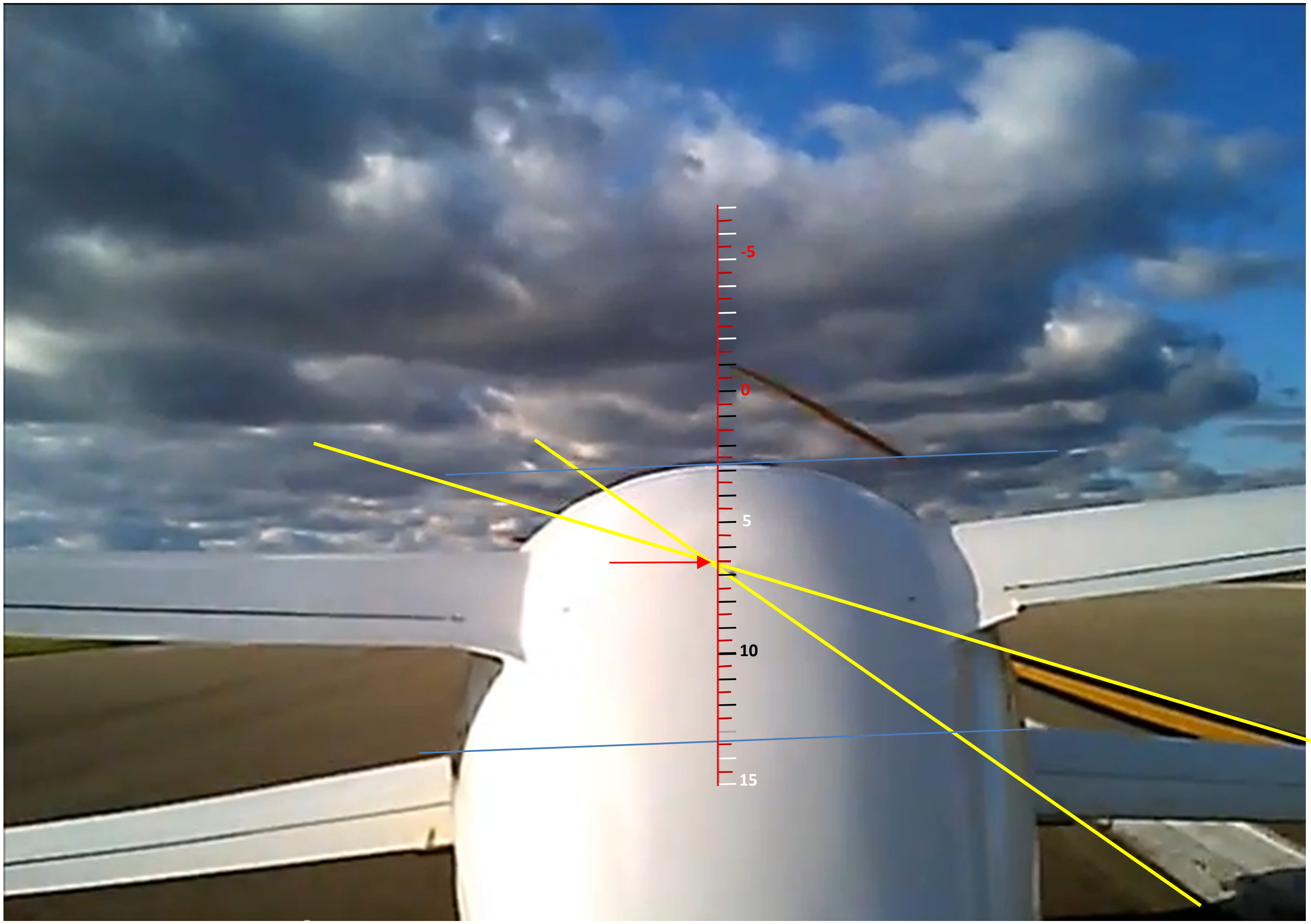


Figure 22.

Q-200 N102SD

Intermediate takeoff roll : alpha 6.7 degrees. Est. CAS 60 mph

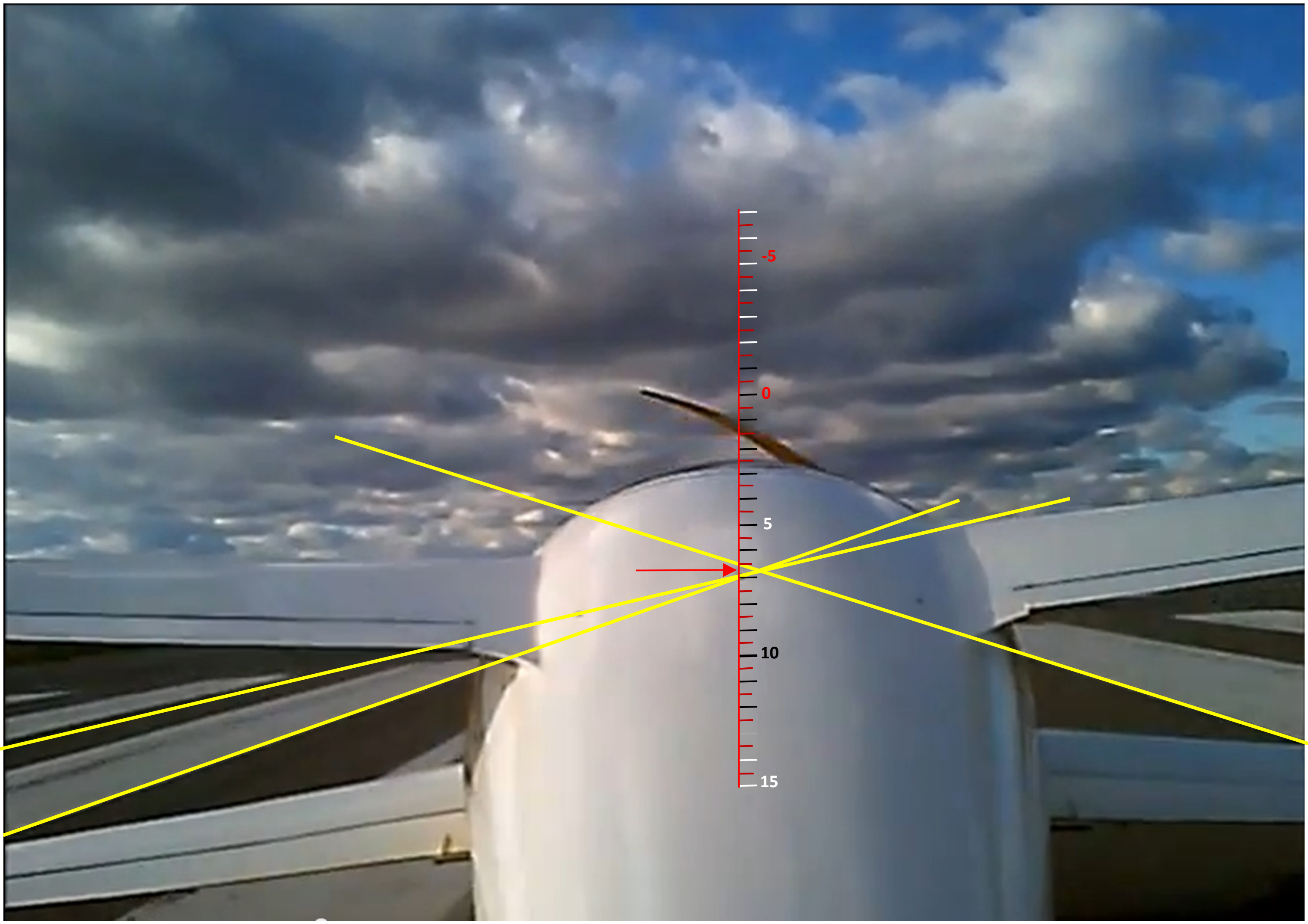


Figure 23.

Q-200 N102SD

Just prior to rotate: alpha 6.9 degrees. Est CAS 70 mph

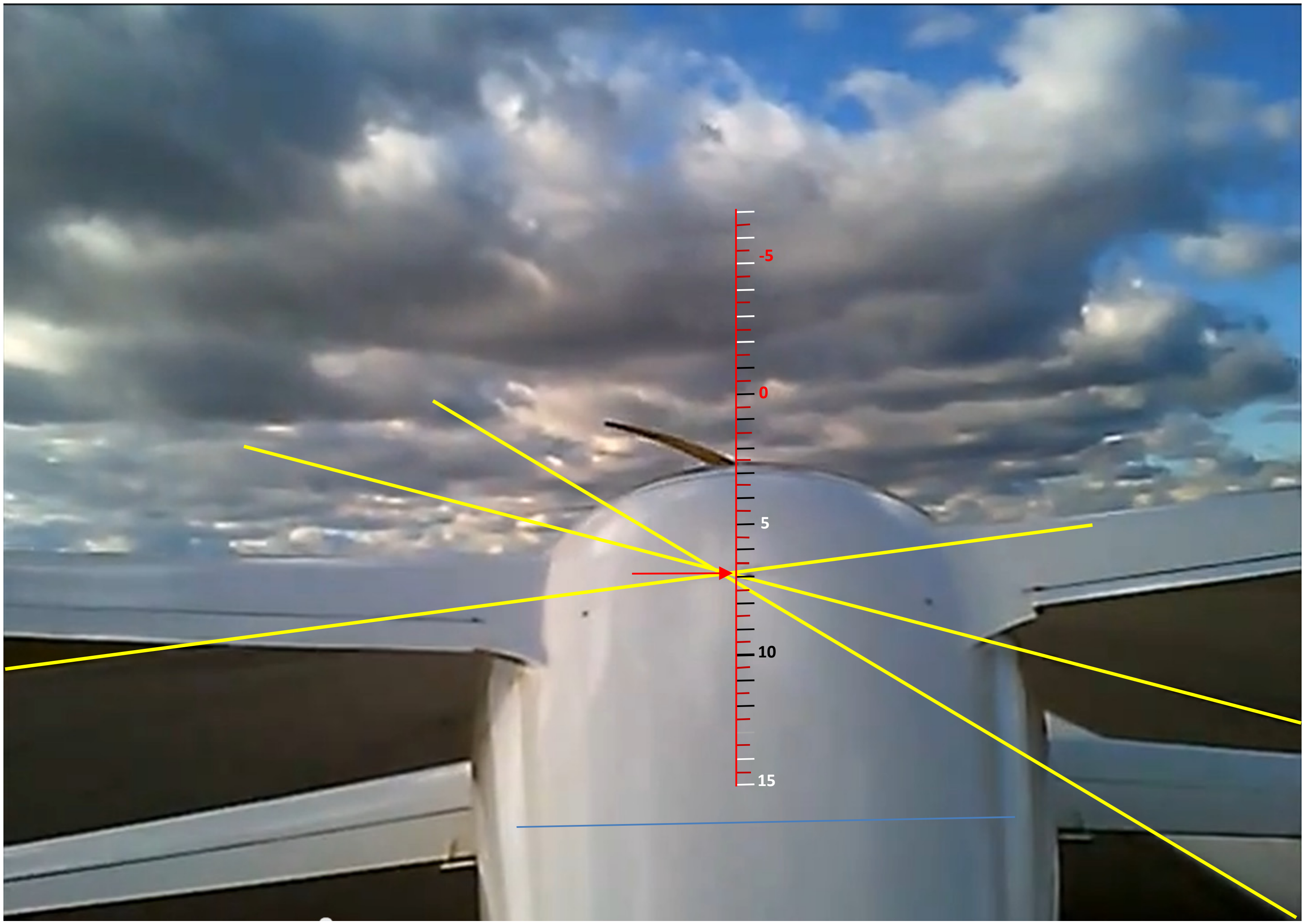


Figure 24.

Q-200 N102SD

Rapid dynamic rotation: alpha 8.7 degrees. Est. CAS 75 mph

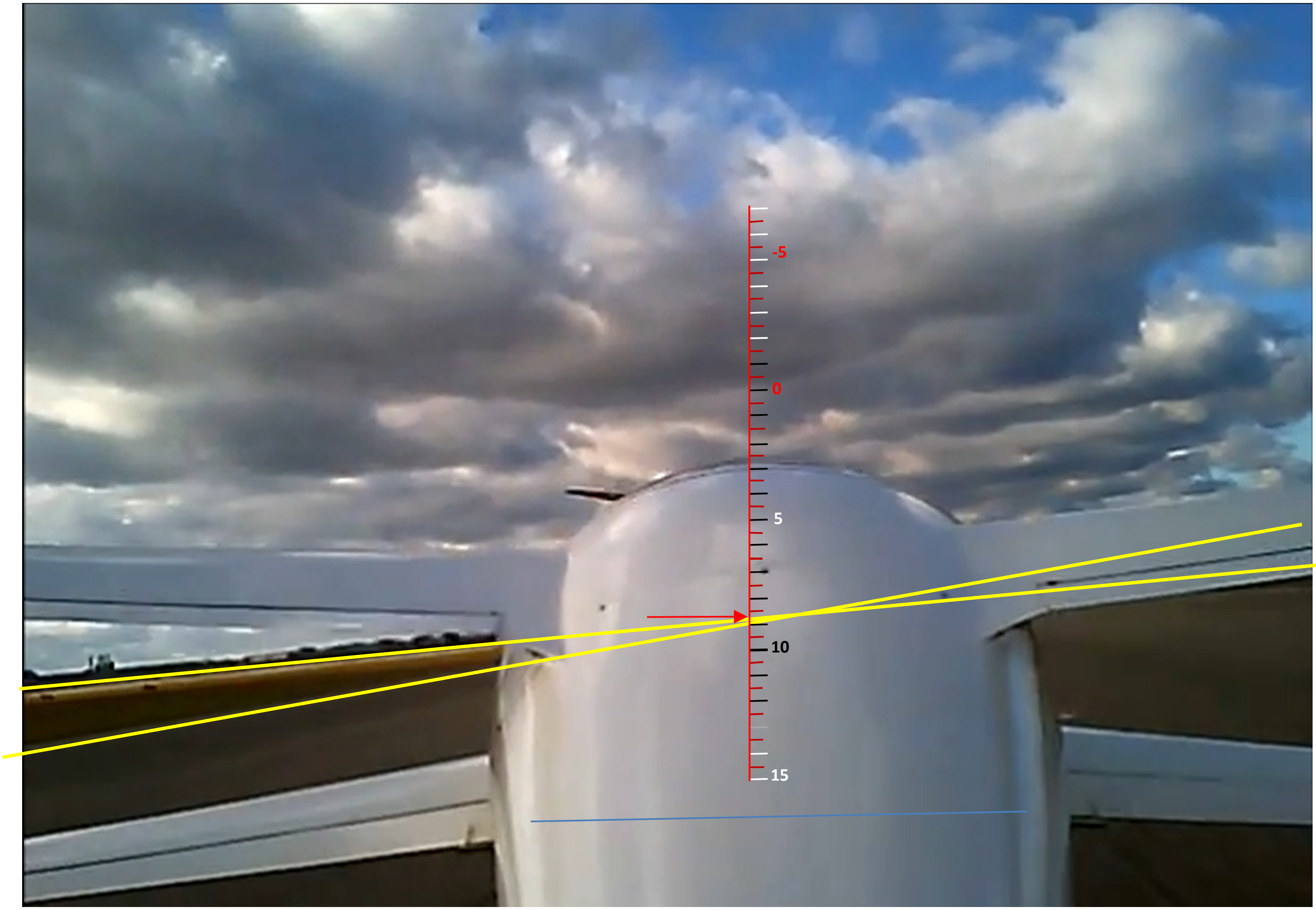


Figure 25.

Q-200 N102SD

Settle back and accelerate in ground effect: alpha 5.4 degrees. Est CAS 85 mph

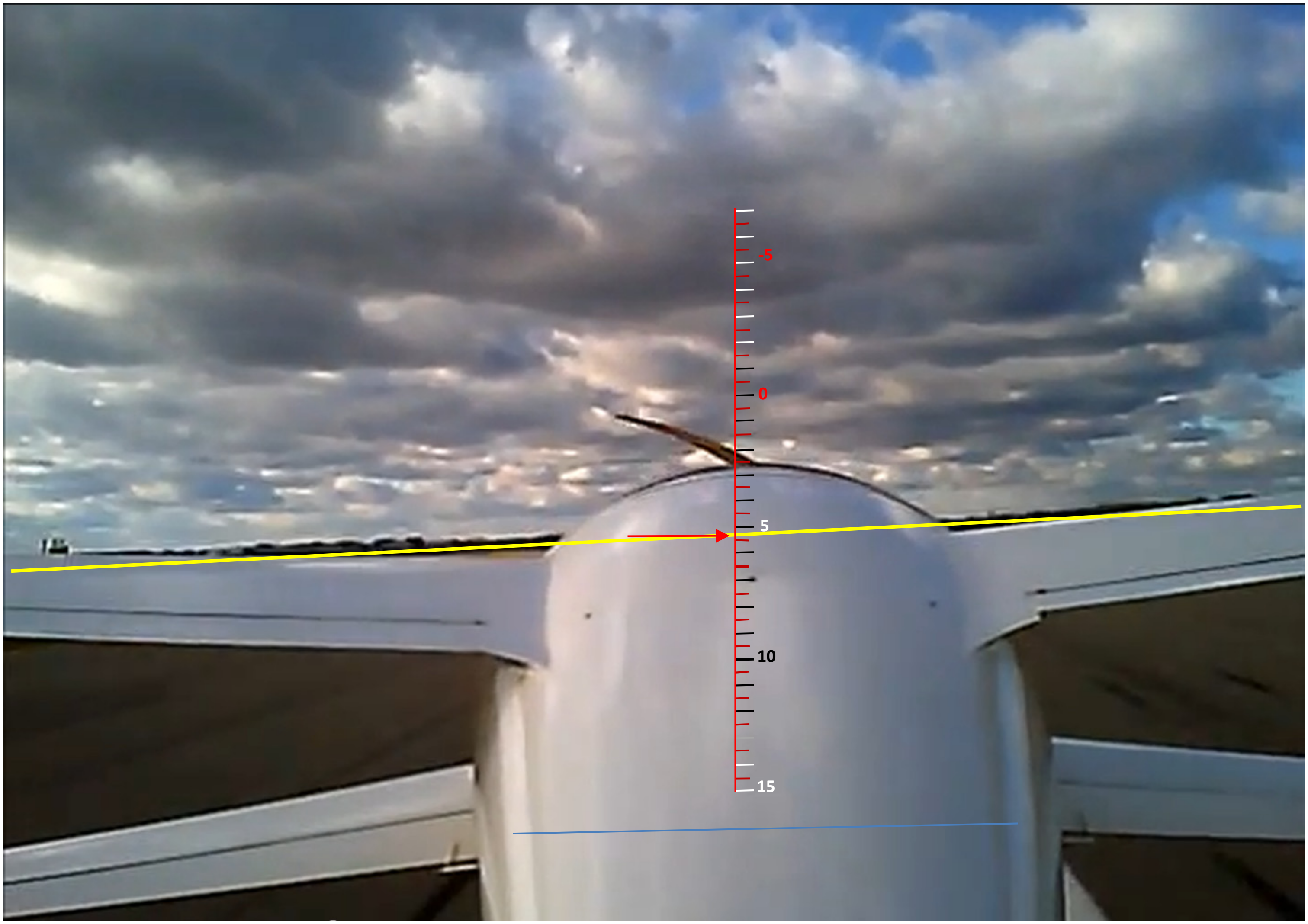


Figure 26.

Q-200 N102SD

Level high-speed cruise: alpha 0.5 degrees. Est CAS 140 mph

Figure 27.

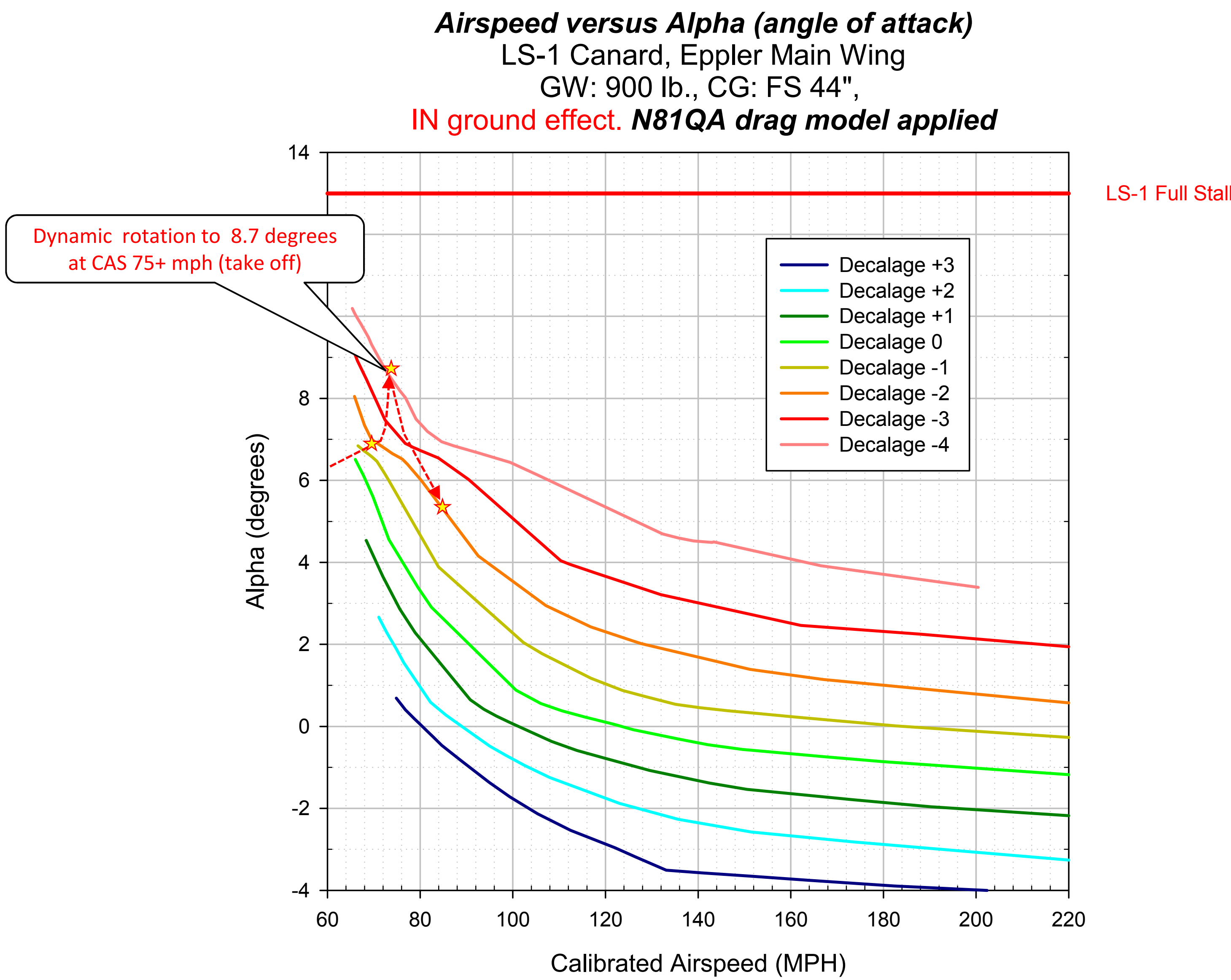


Figure 28. *Airspeed versus alpha data.. The colored curves are for equilibrium flight in the Q-200 at 900 pounds GW and CG @ FS 44". The results are for flight in ground effect. The yellow stars represent the flight scenarios observed in Figures 24, 25, and 26 for N102SD.*

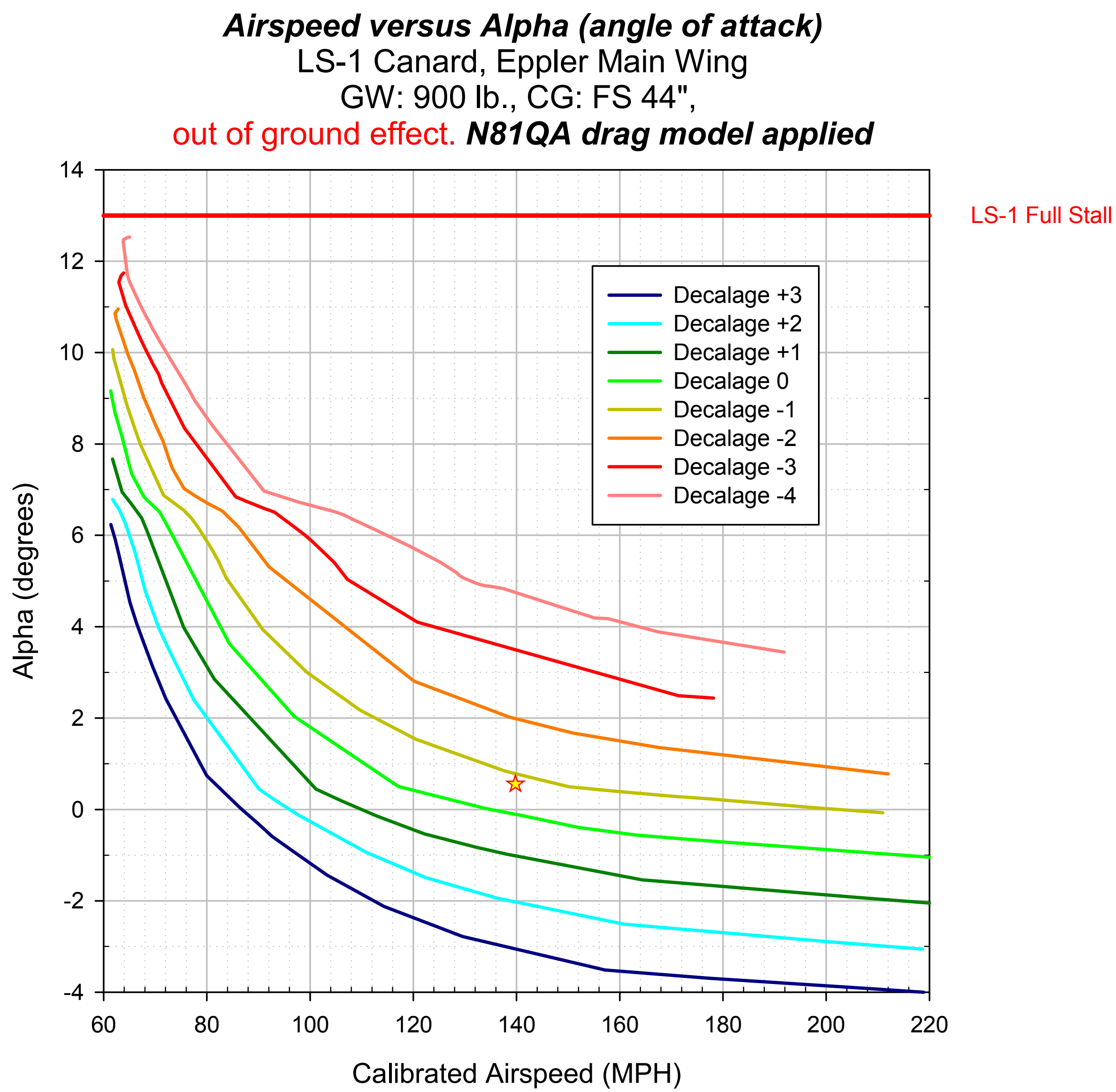


Figure 29. *Airspeed versus alpha data.. The colored curves are for equilibrium flight in the Q-200 at 900 pounds GW and CG @ FS 44". The results are for flight out of ground effect. The yellow star represents the cruise flight scenario observed in Figure 27 for N102SD.*

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Jerry Marstall's Tri-Q200 (N625JM)

Taxi Alpha = 4.5 degrees, aircraft is stationary

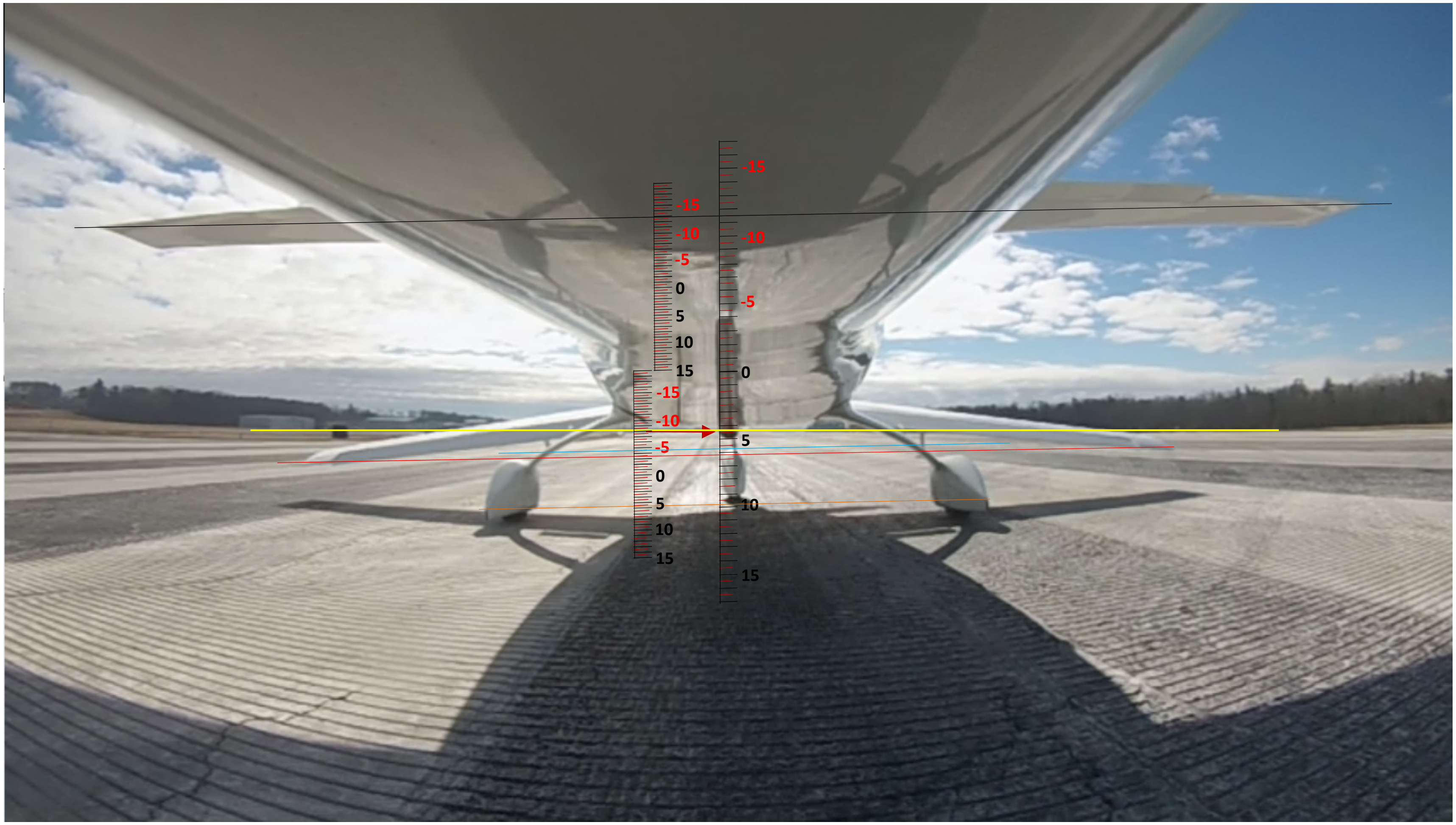


Figure 30.

Tri-Q200 (N625JM)

Alpha = 3.0 degrees, accelerating on takeoff roll. Est. CAS 65 mph

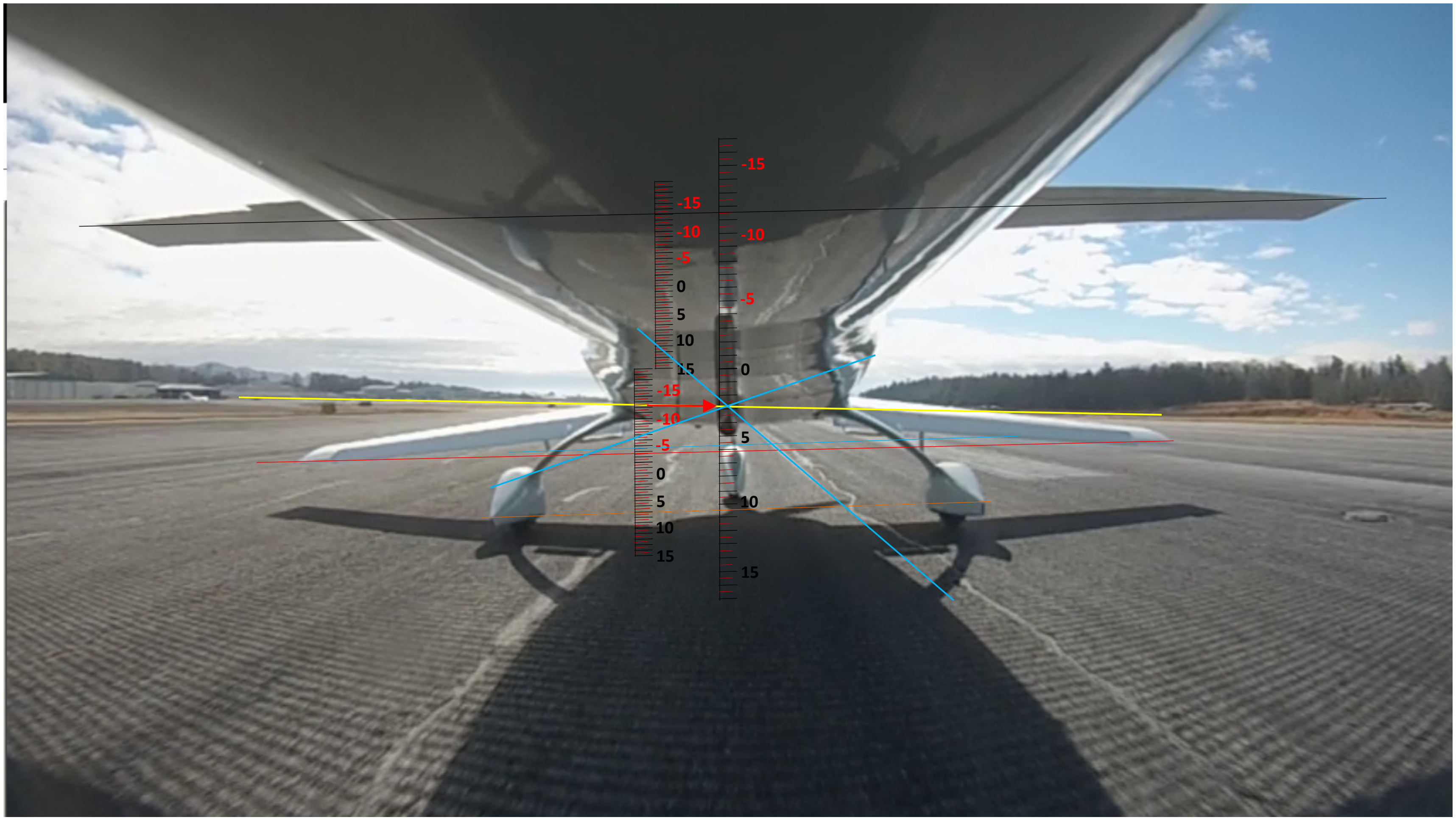


Figure 31.

Tri-Q200 (N625JM)

Estimated 70 MPH CAS

Alpha = 3.1 degrees, main gear is unloading, nose wheel is firmly on the runway

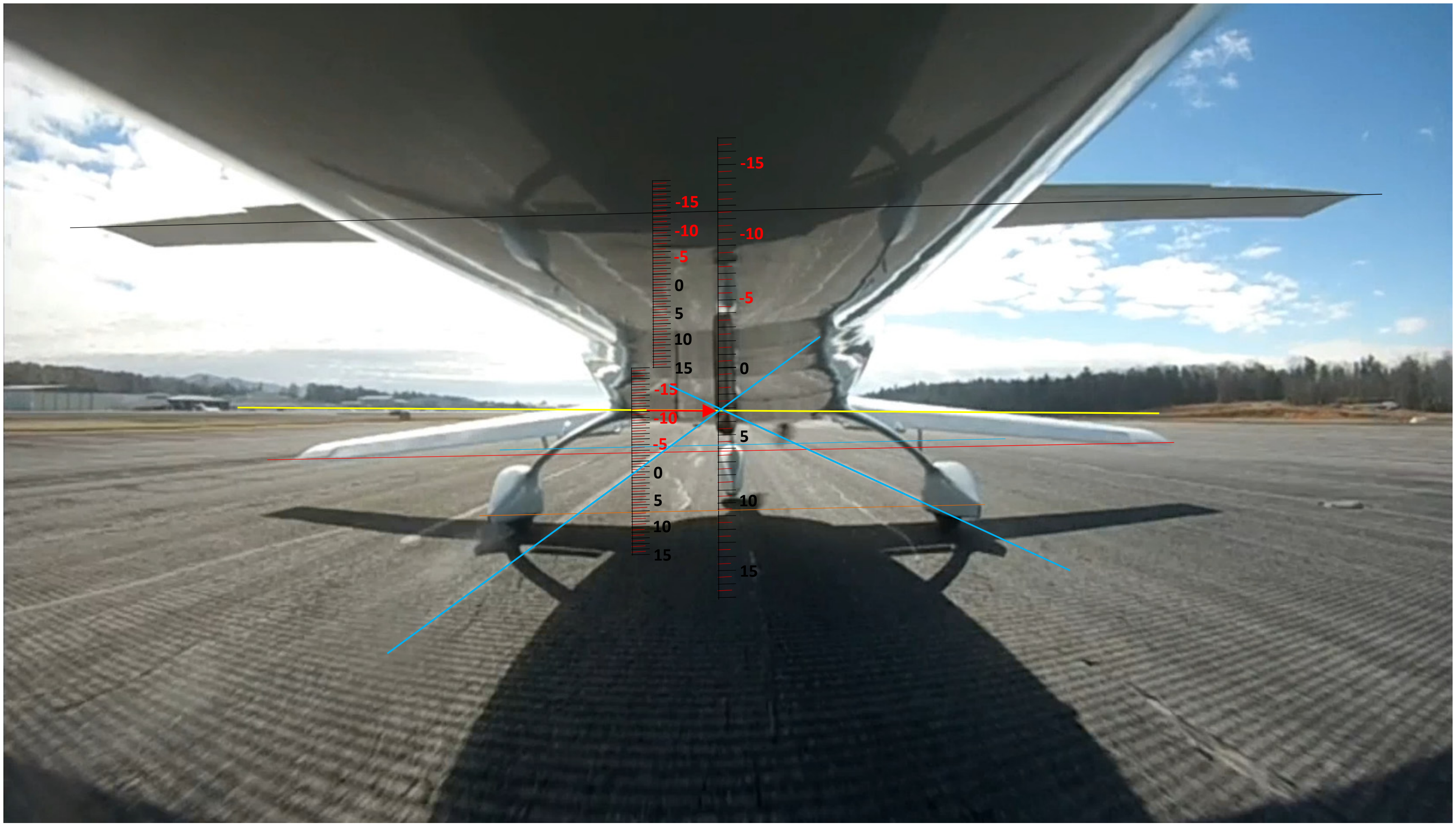


Figure 32.

Tri-Q200 (N625JM)

Estimated 74 MPH CAS

Alpha = 3.3 degrees. Main gear is unloaded, nose gear is still in contact with runway

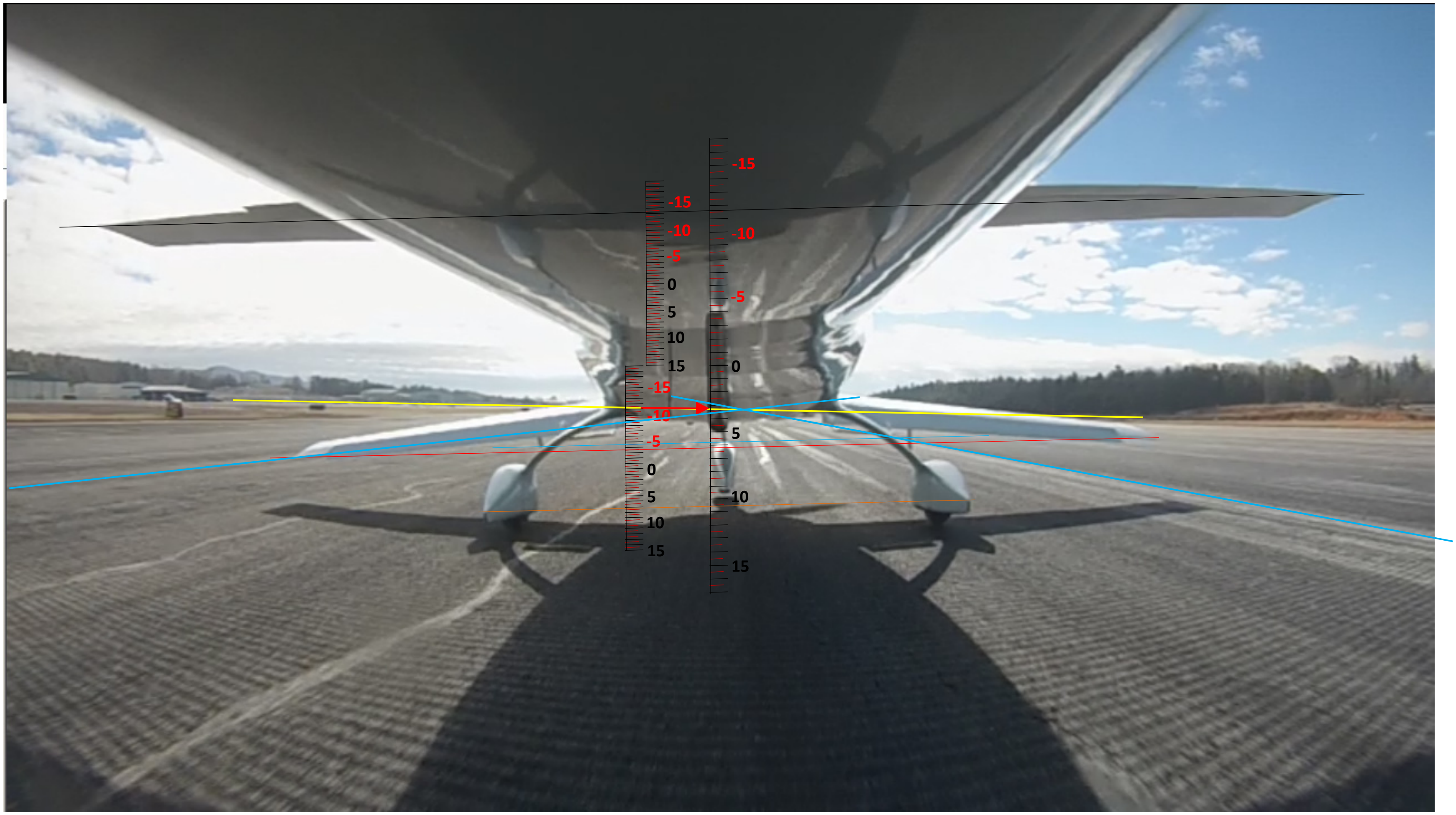


Figure 33.

Tri-Q200 (N625JM)

Alpha = 6.5 degrees. 78 mph CAS. Rotation and lift off of all wheels

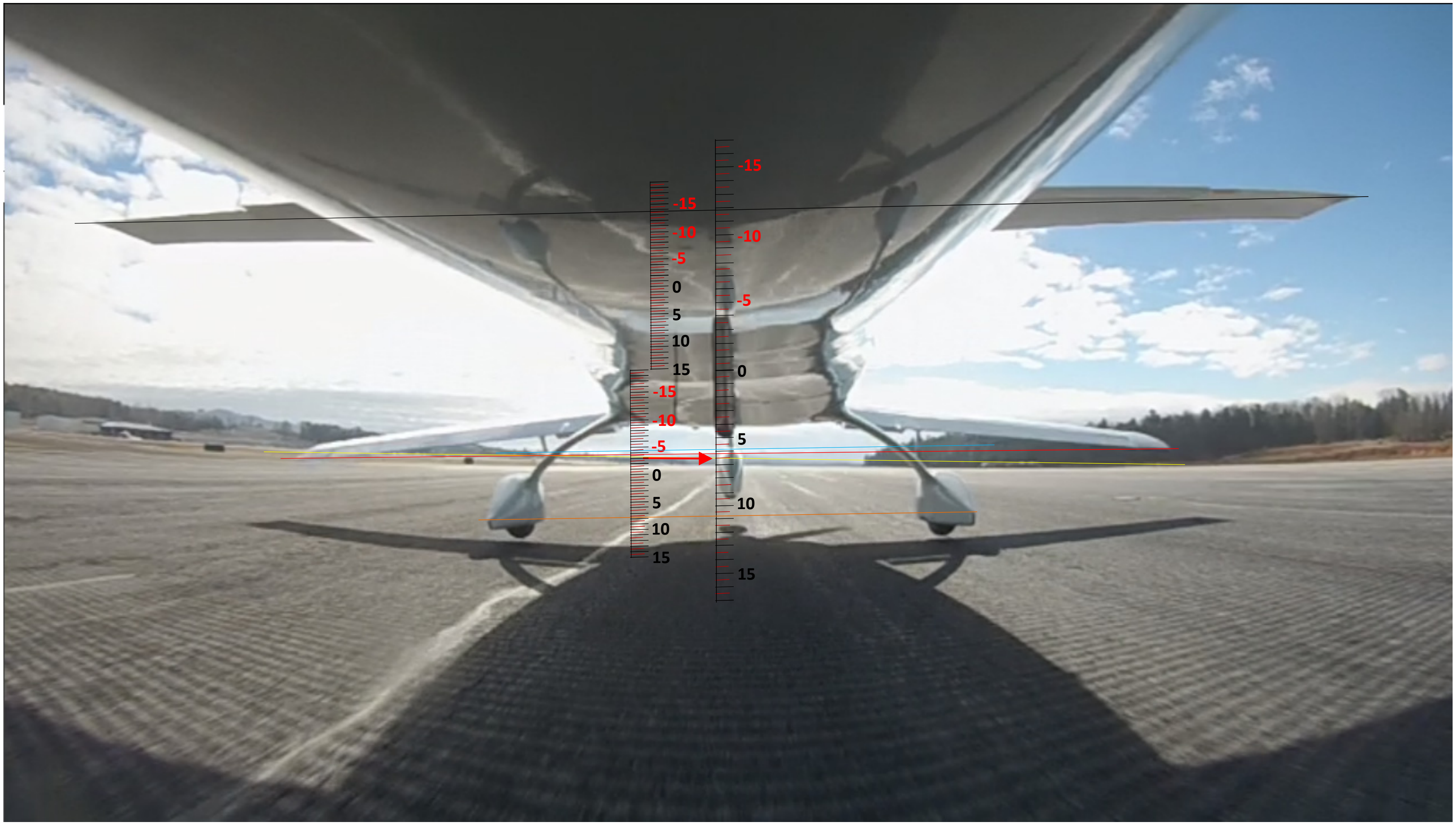


Figure 34.

Tri-Q200 (N625JM)

Alpha = 2.8 degrees, CAS 90 mph. Settle back and accelerate in ground effect

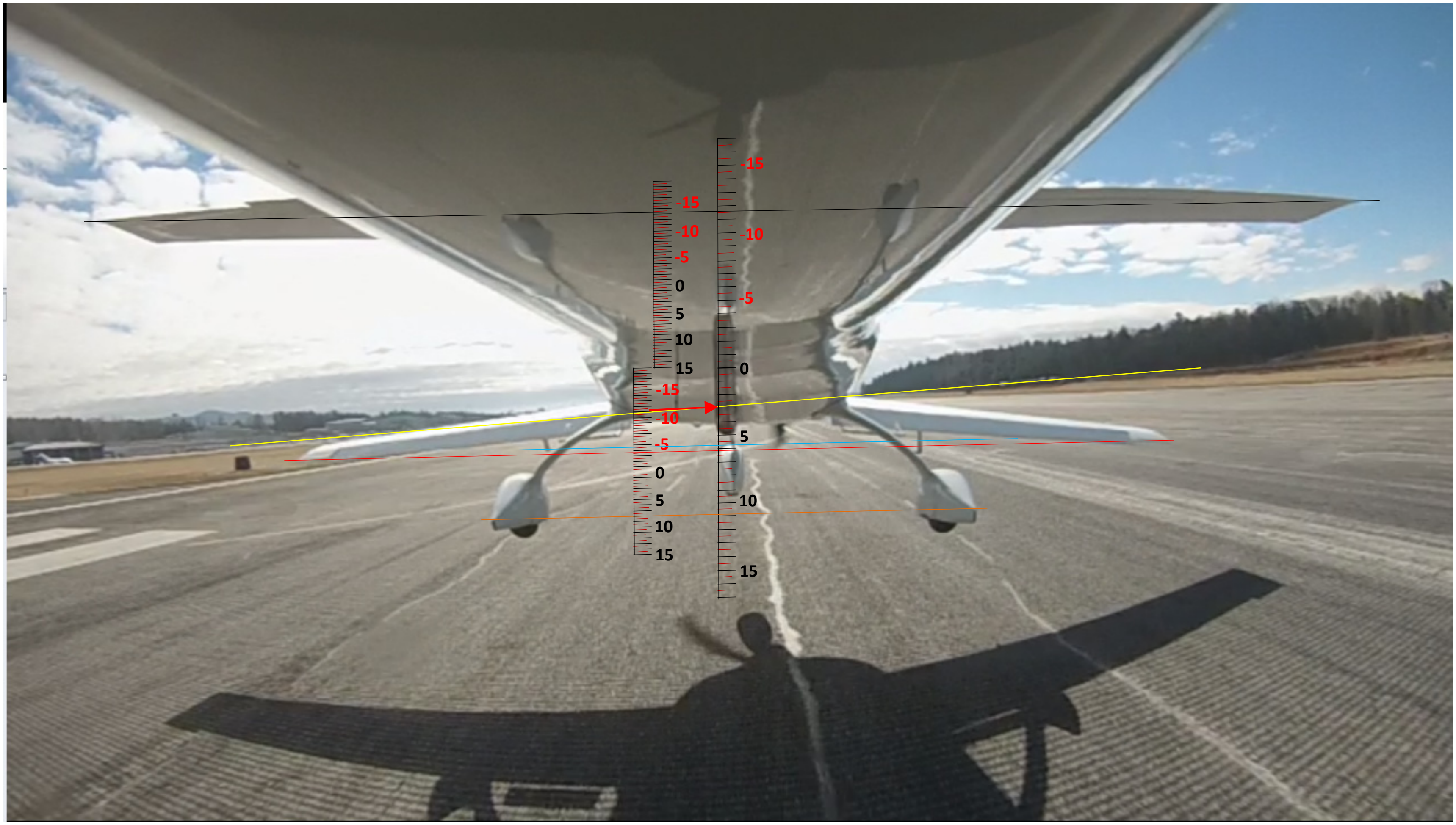


Figure 35.

Tri-Q200 (N625JM)

Alpha = 3.5 degrees, 100 mph CAS. Accelerating out of ground effect

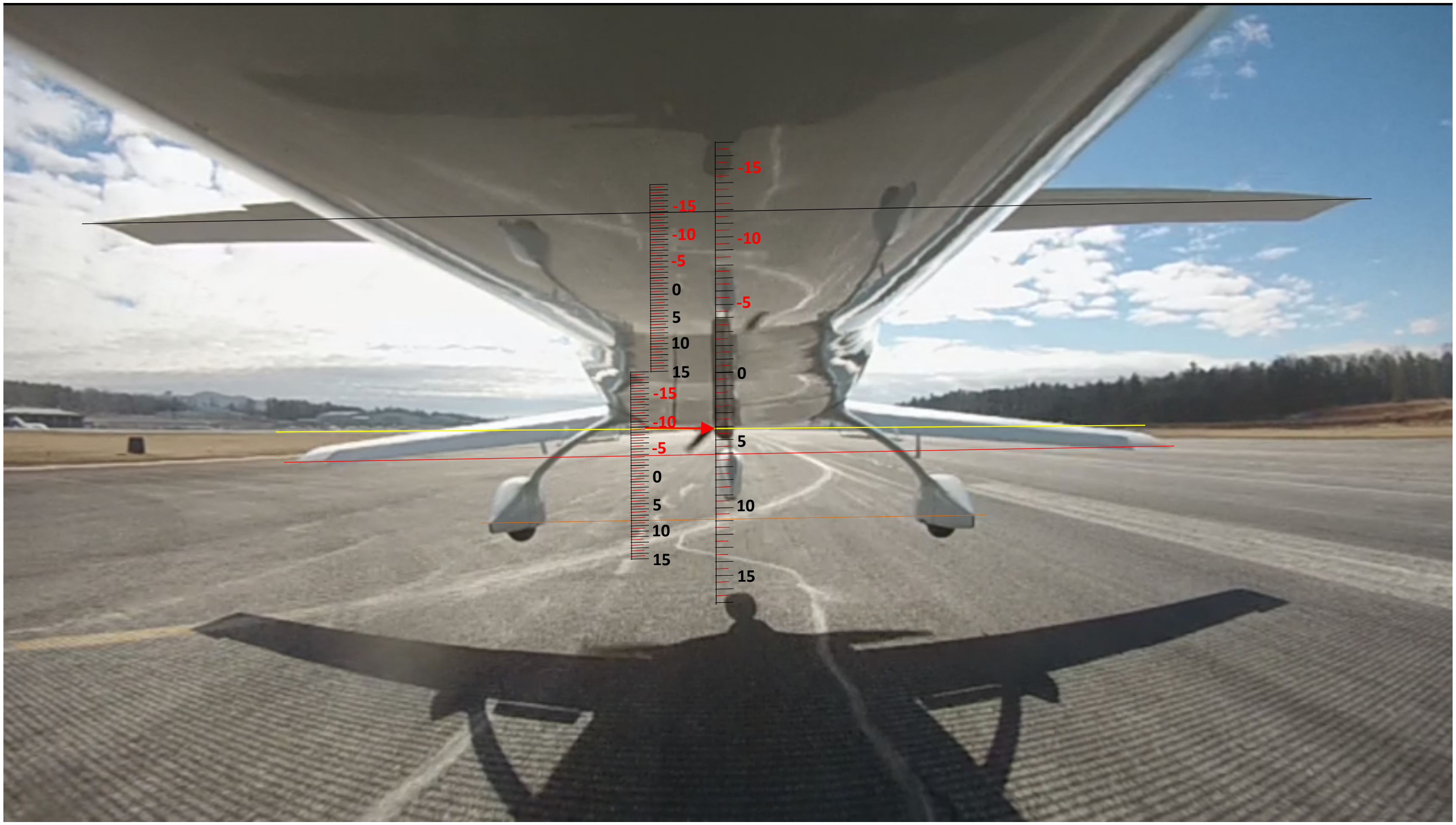
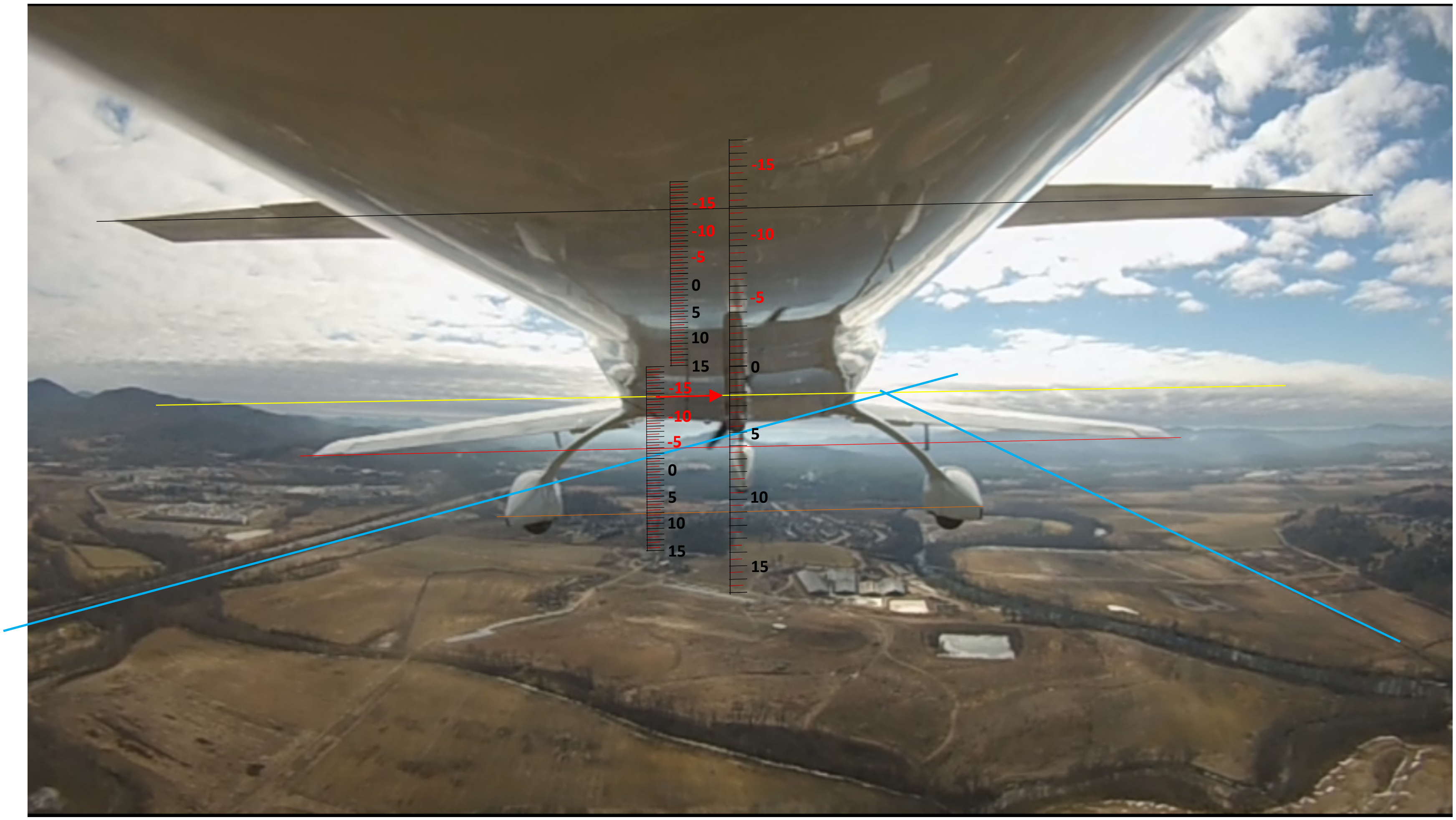


Figure 36.

Tri-Q200 (N625JM)

Alpha = 2.2 degrees, Est. CAS 135 mph in level cruise



Small positive elevator deflection

Figure 37.

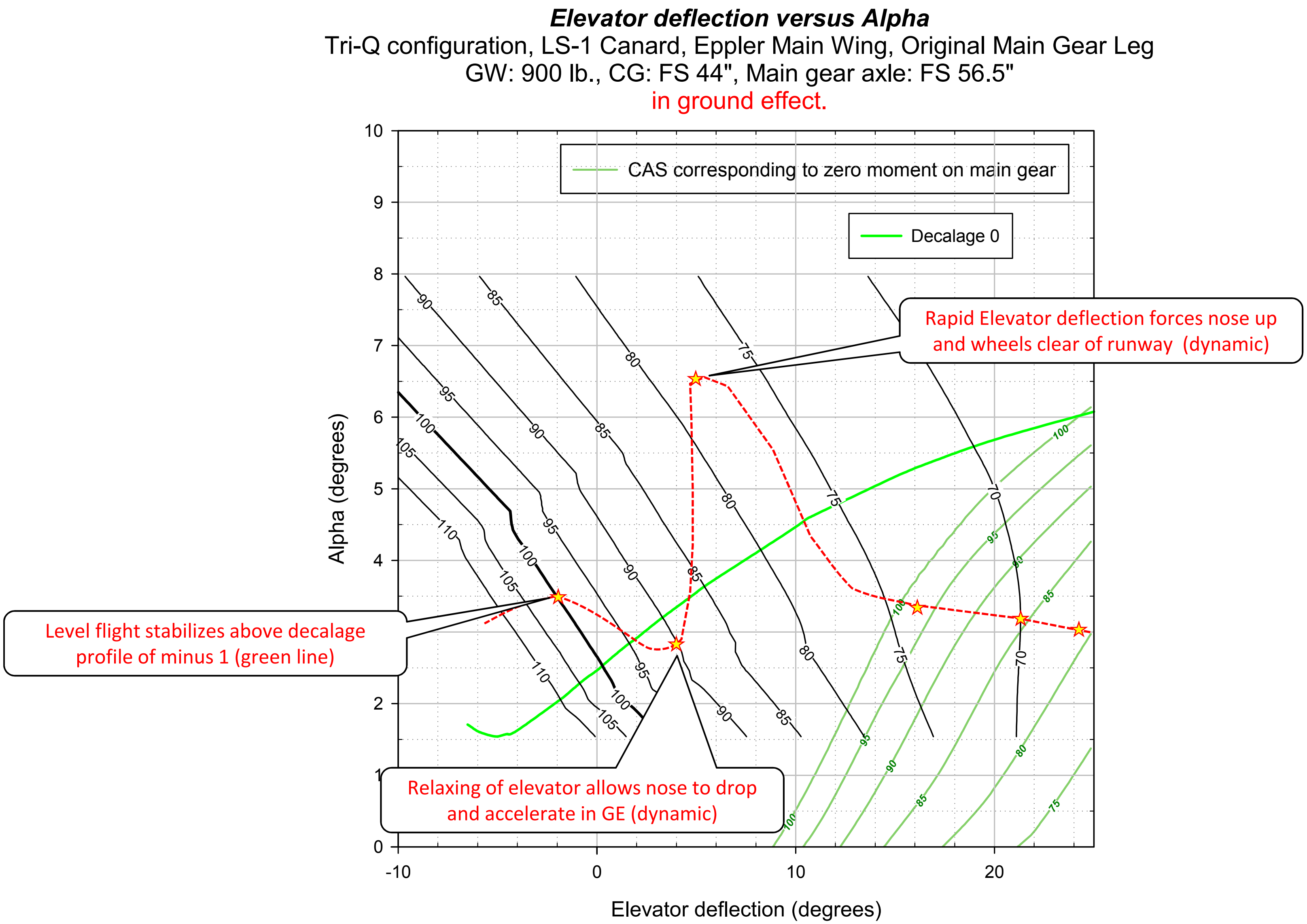


Figure 38. *Take off relationships for model Tri-Q200 (decalage zero). The light green curve represents equilibrium flight configurations. The black contours represent CAS for each configuration. The dark green lines are labeled with CAS which will result in zero weight on the nose wheel (rotation condition). For example, if CAS is constant , increasing elevator deflection will cause the alpha to follow the green curve labeled with that CAS. The yellow stars represent the takeoff sequence for N635JM as shown in figures 31-36.*

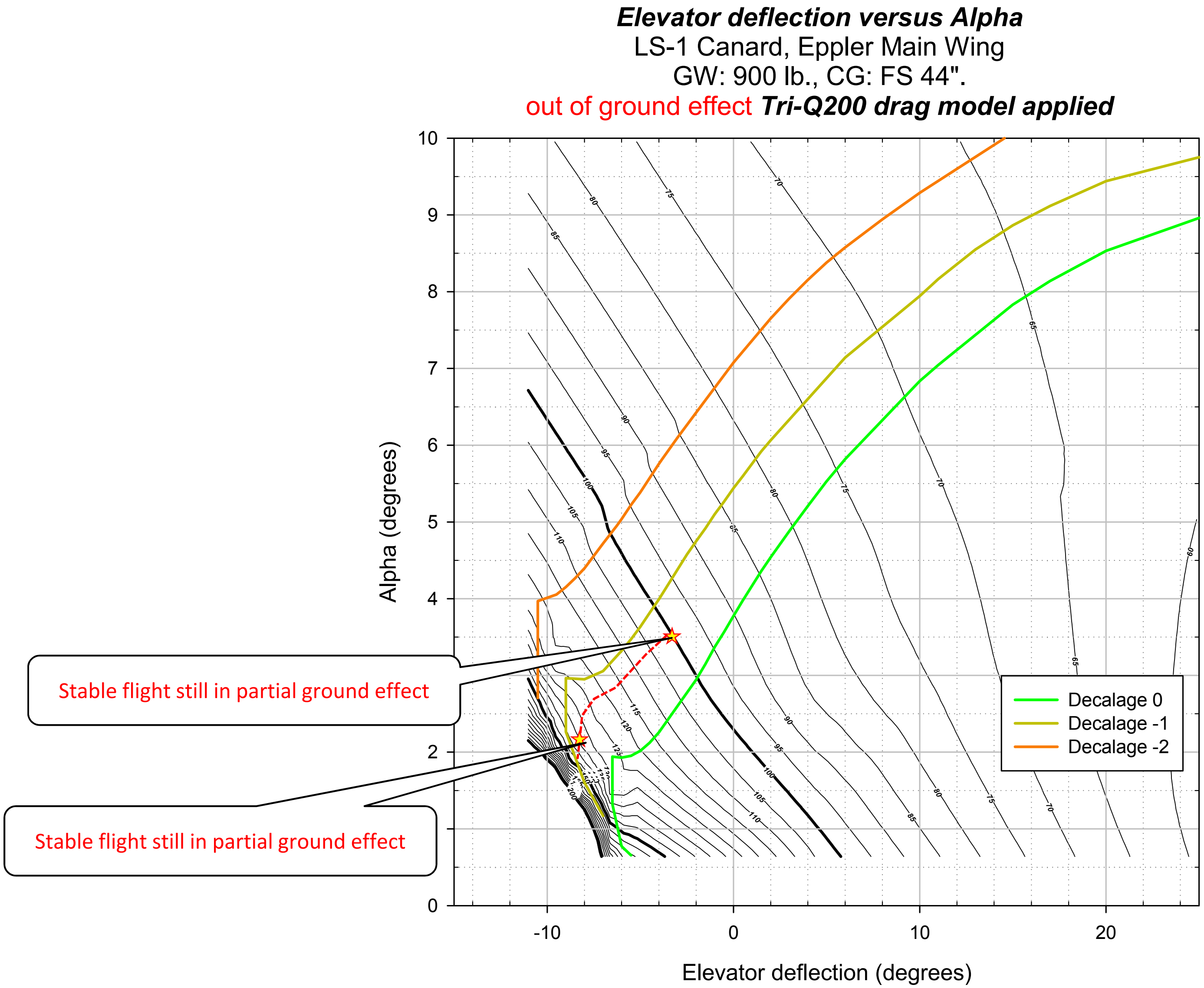


Figure 39. *Flight configurations out of ground effect for Tri-Q200 (decalage zero). Colored curves represents equilibrium flight configurations for various decalage values. The black contours represent CAS for each configuration. The yellow stars represent two flight data points for N625JM, one in partial ground effect and the other in level cruise flight. N625JM appears to respond as if it has a decalage of approximately -0.75. The measured decalage is +0.85, but according to Jerry, it is flown with up reflexor, so as to push the response towards a more negative decalage behavior as reflected above.*

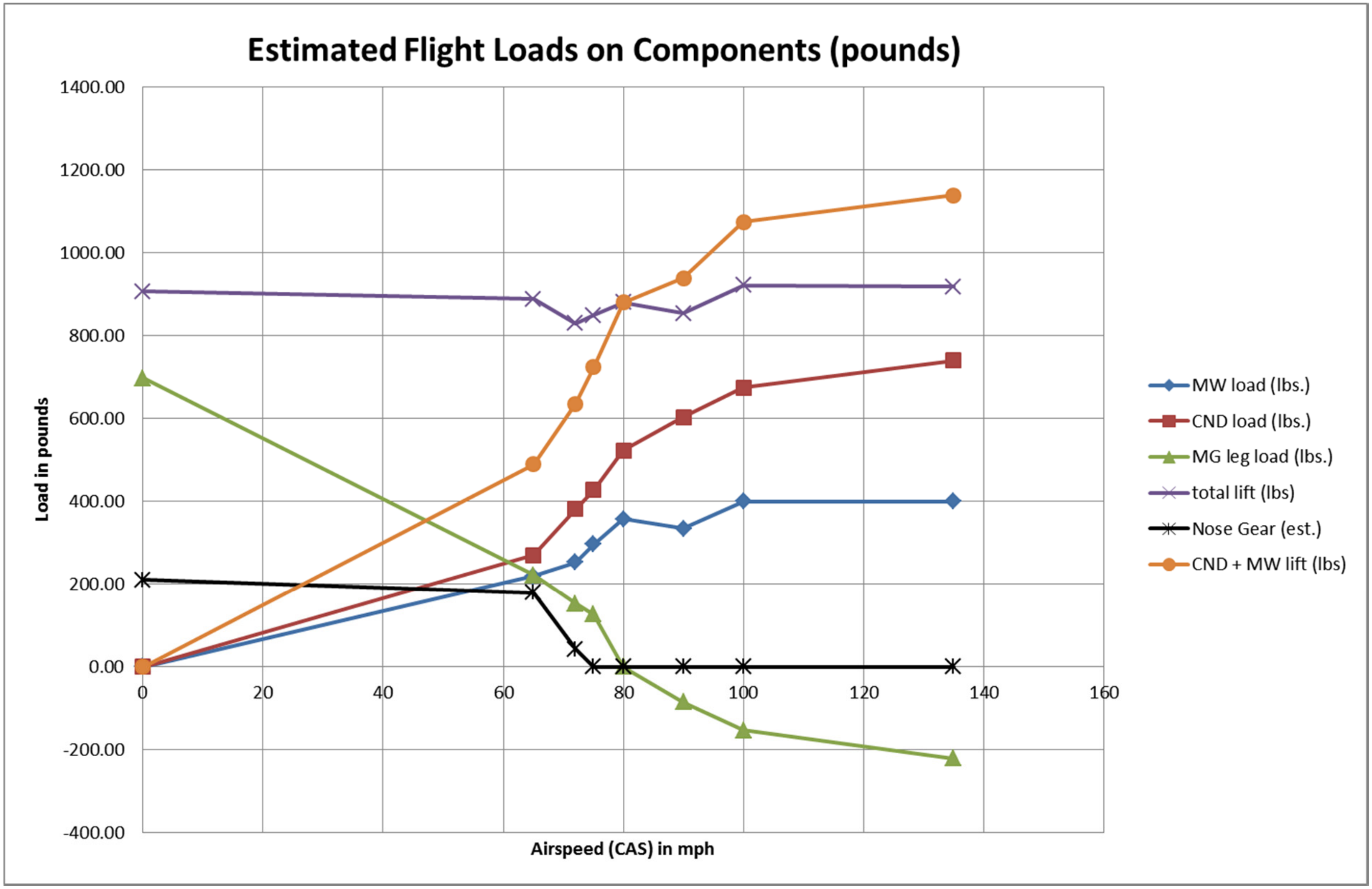


Figure 40. *Estimated light loads on various Tri-Q200 components. These are estimated by measuring the deflection of the component at various airspeeds, calibrating a spring constant for each component, such that the load on all components matches the gross weight and CG of the aircraft. Each component has a unique curve. Some components are combined for discussion, such as Canard plus Main Wing: orange curve, and all component loads combined: purple curve . See text for explanation.*

Jean Paul Chevallier's Tri-Q200 (N585SY)

Stationary: alpha = 2.0 degrees

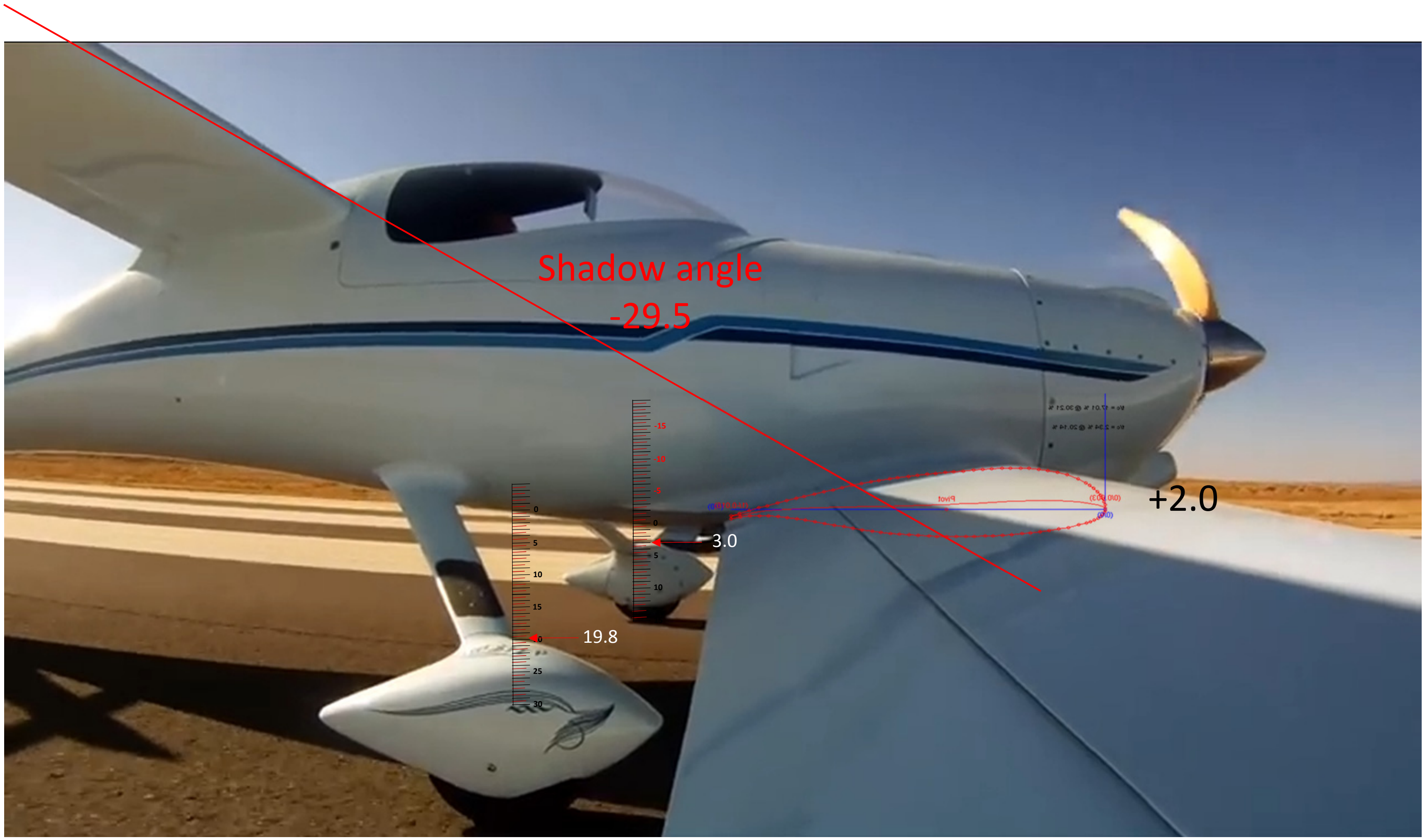


Figure 41.

Tri-Q200 (N585SY)

Takeoff, partial ground-effect: alpha = 6.0 degrees

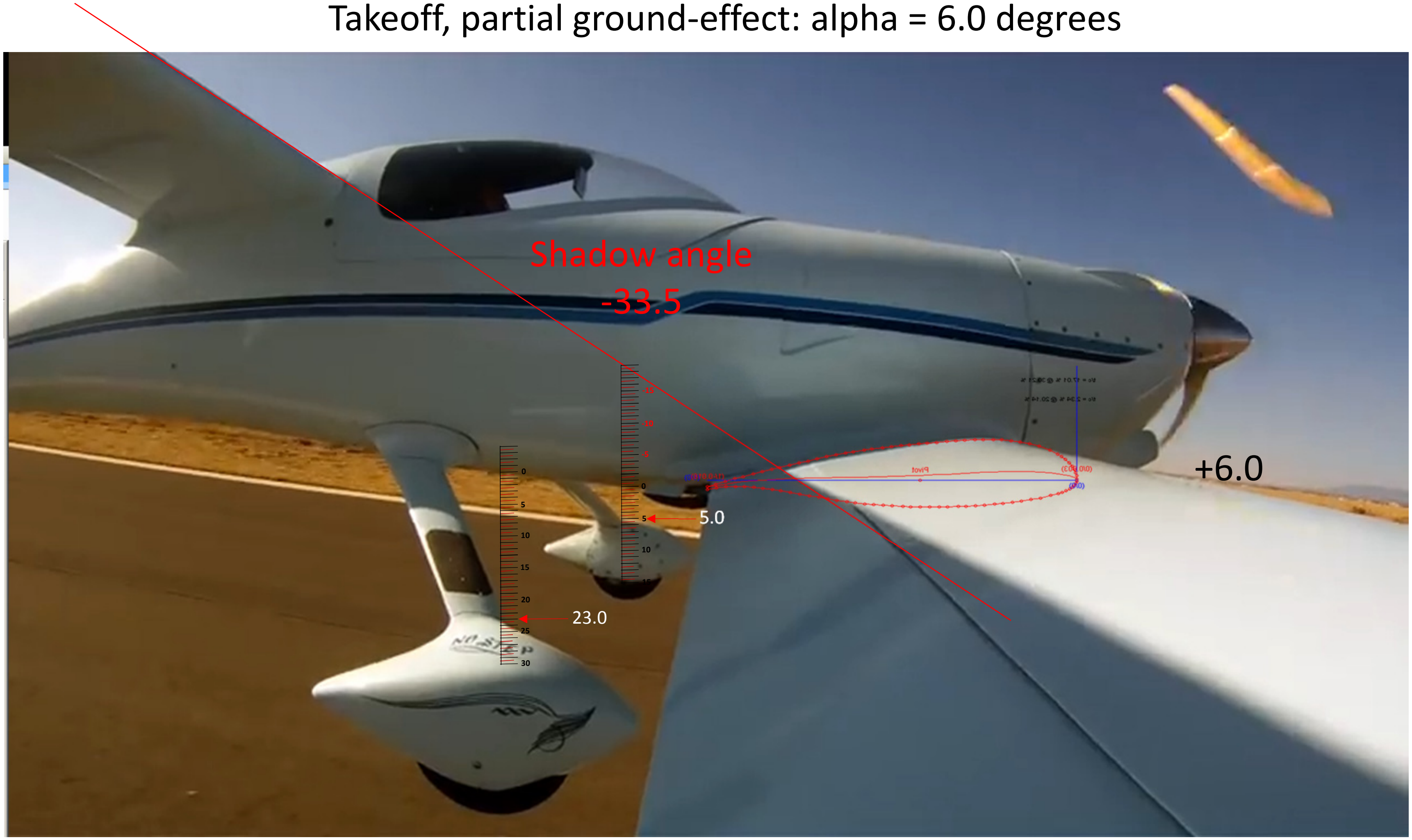


Figure 42.

Tri-Q200 (N585SY)

At cruise speed and altitude. Estimated alpha 2.5 degrees

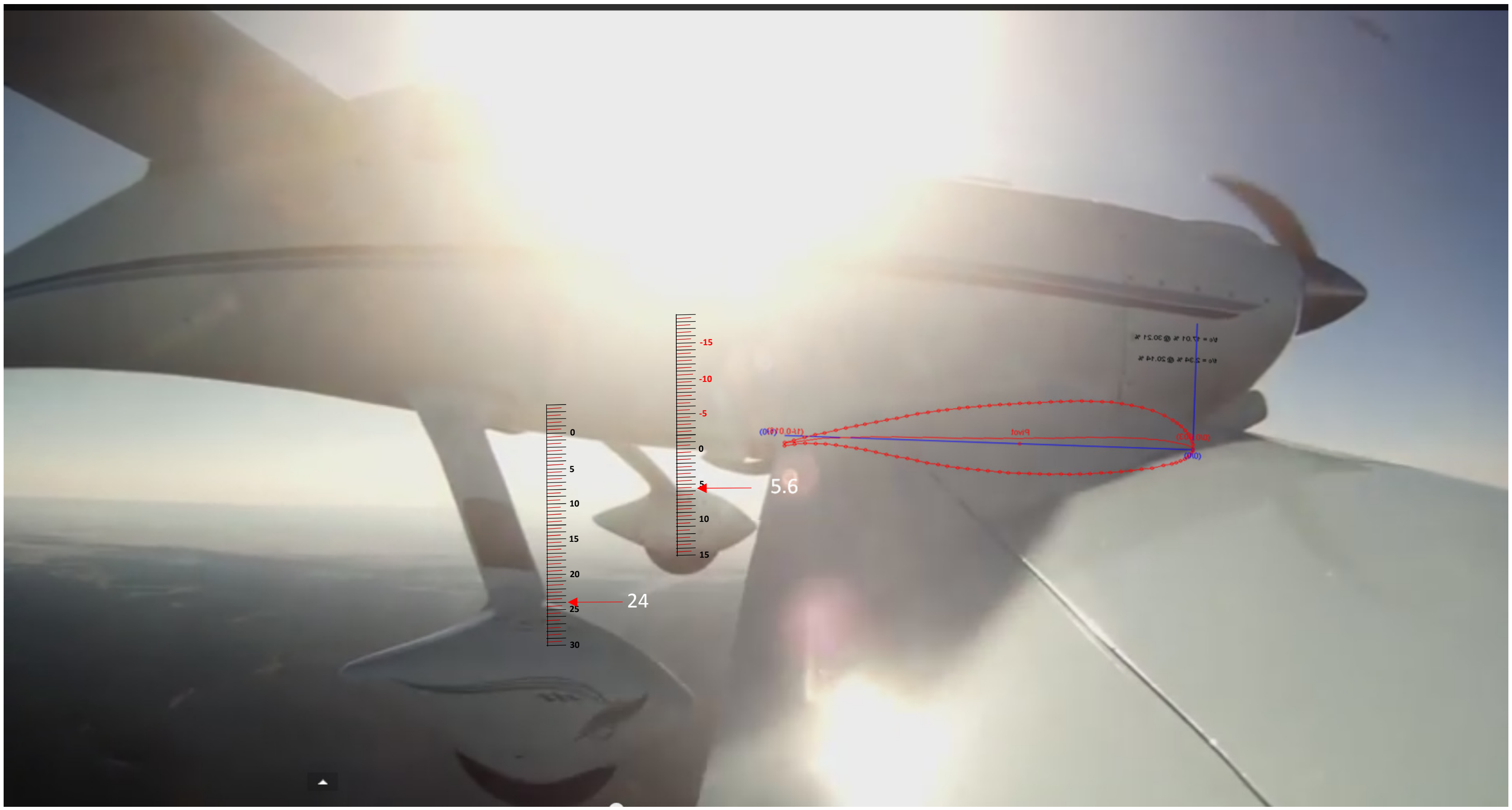


Figure 43.

Tri-Q200 (N585SY)
CAS 5 mph
Alpha=2.0 degrees, start of takeoff roll

Figure 44.

Tri-Q200 (N585SY)
CAS 70 mph
Full rotation Alpha=8.2 degrees in ground effect (dynamic)

Figure 45.

Tri-Q200 (N585SY)
CAS 80 mph
Back to equilibrium alpha=5.5 degrees. Nearly out of ground effect

Figure 46.

Tri-Q200 (N585SY)

CAS 100 mph, accelerating. Out of ground effect
Alpha=3.3 degrees

Figure 47.

Tri-Q200 (N585SY)
Level cruise ~10,000 MSL

Estimated CAS 125 MPH, Alpha=2.3 degrees

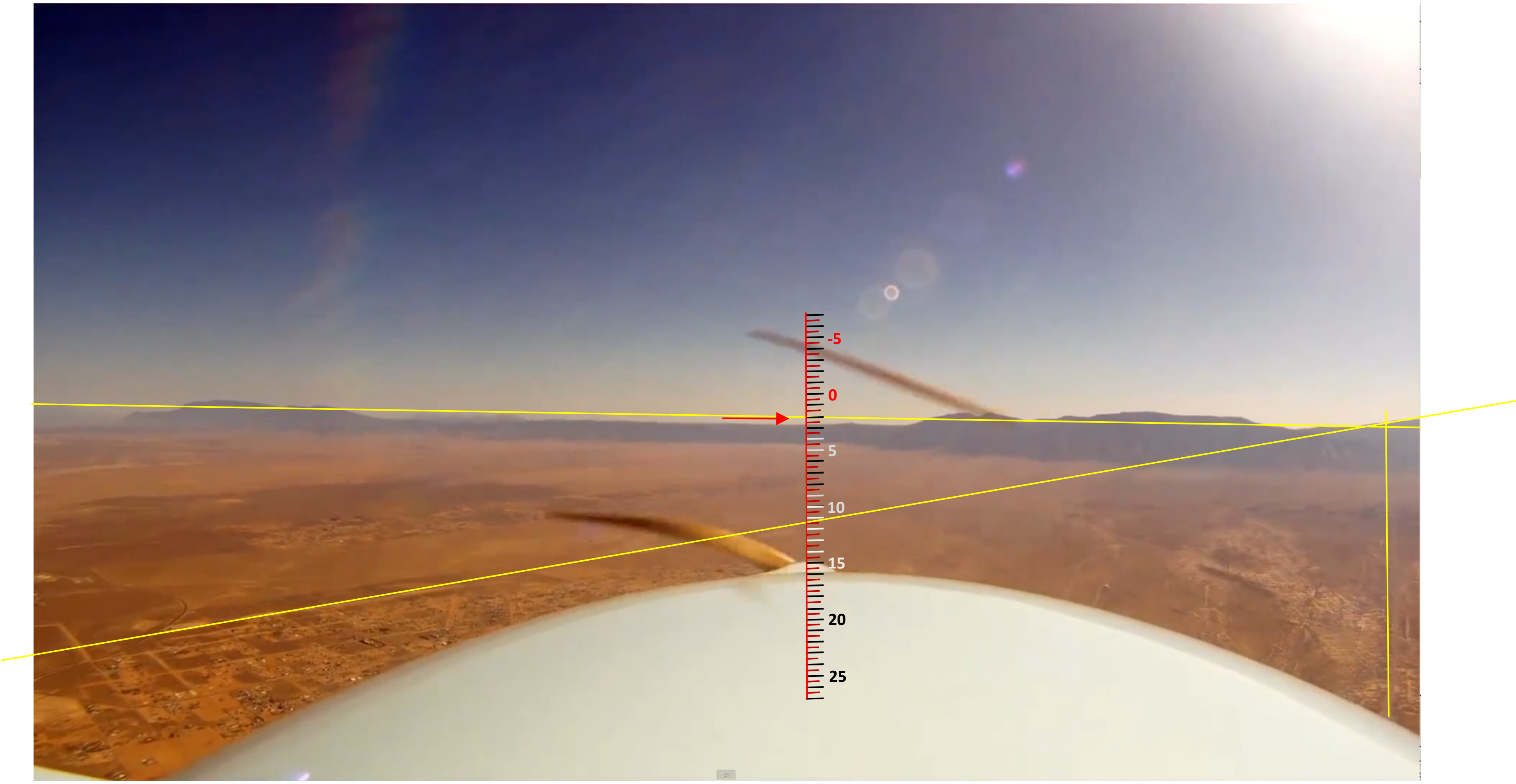


Figure 48.

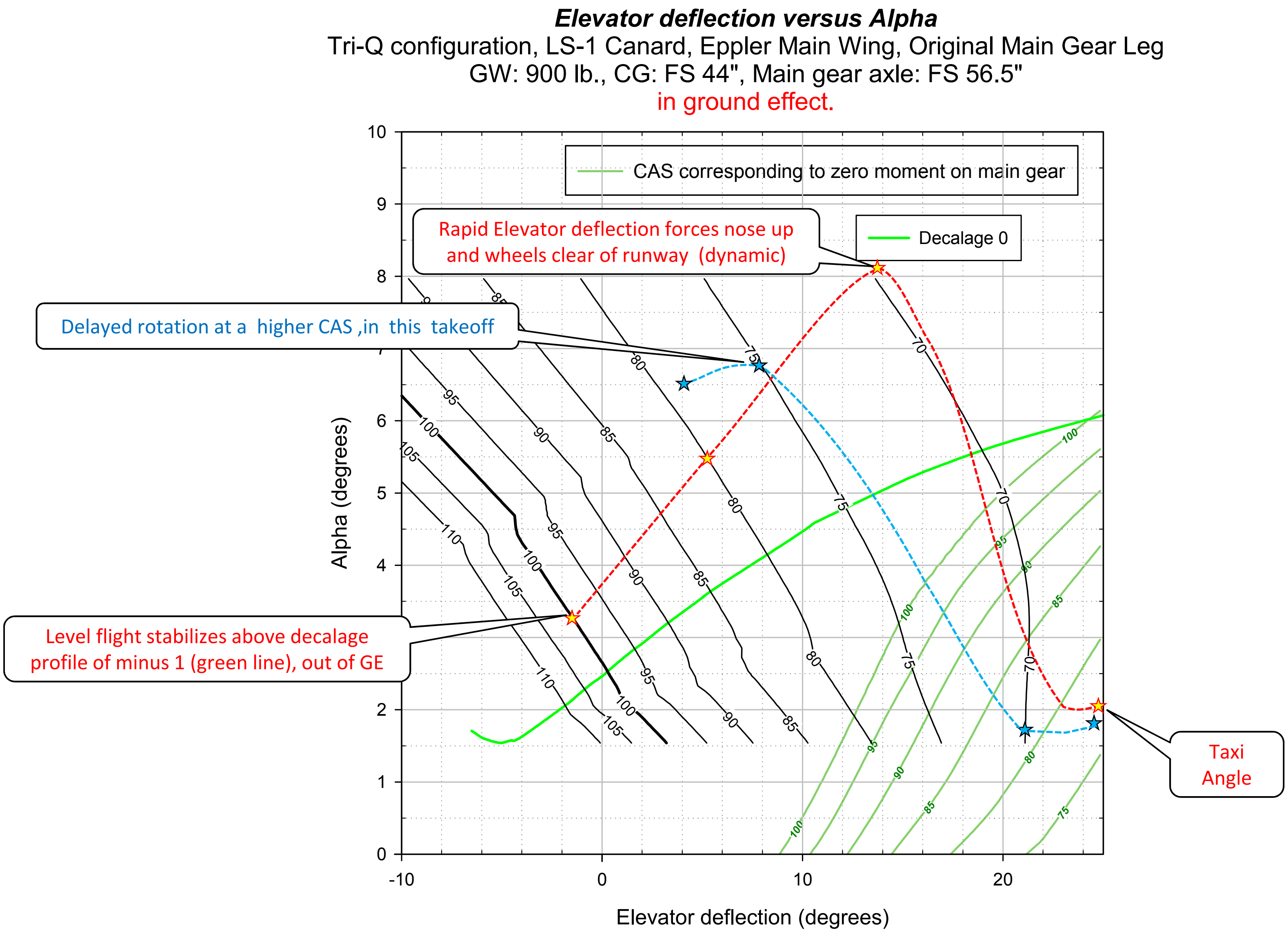


Figure 49. *Take off relationships for model Tri-Q200 (decalage zero). The light green curve represents equilibrium flight configurations. The black contours represent CAS for each configuration. The dark green lines are labeled with CAS which will result in zero weight on the nose wheel (rotation condition). For example, if CAS is constant , increasing elevator deflection will cause the alpha to follow the green curve labeled with that CAS. The yellow stars and red dashed path represent the takeoff sequence for N585SY as shown in figures 31-36. The blue stars and blue dashed path represent the takeoff sequence shown in figures 51-56.*

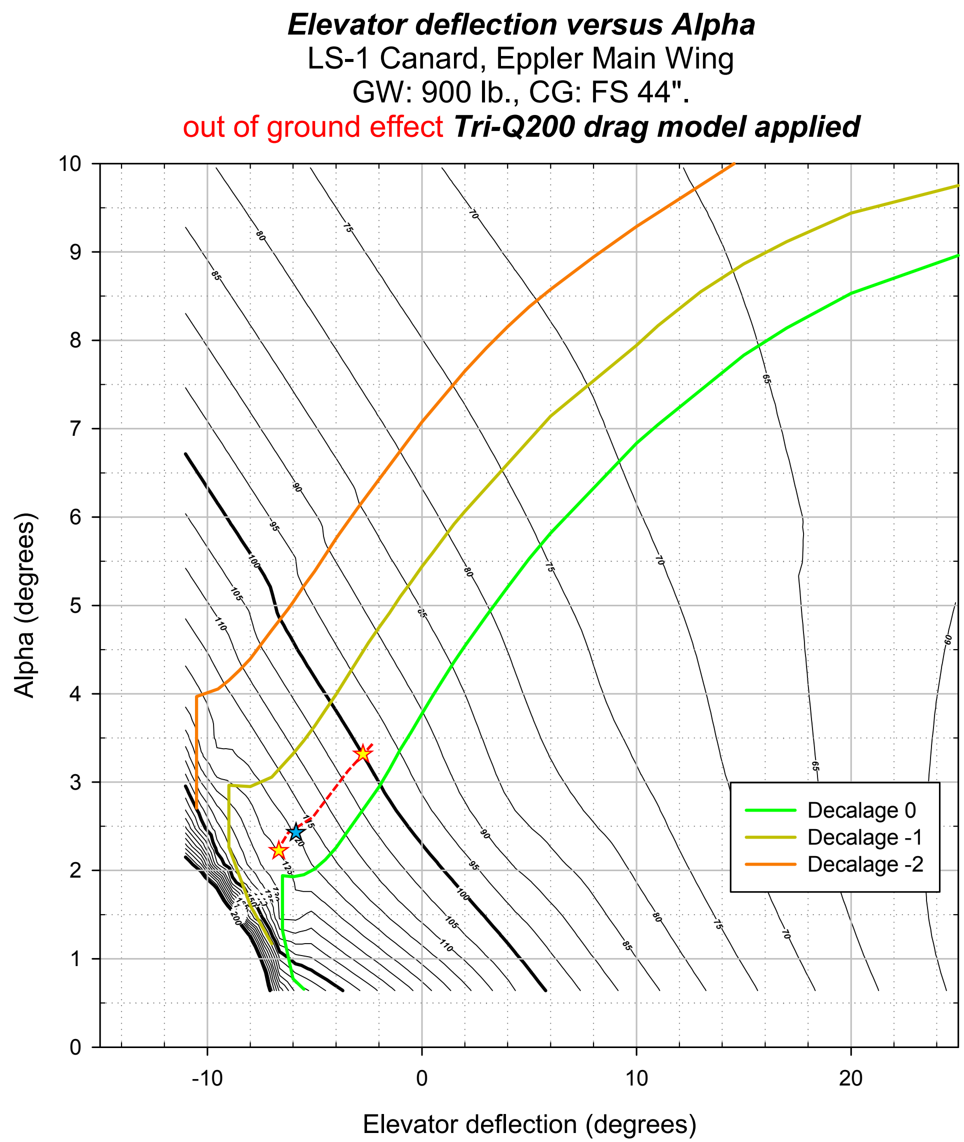


Figure 50. *Flight configurations out of ground effect for model of Tri-Q200. Colored curves represents equilibrium flight configurations for various decalage values. The black contours represent CAS for each configuration. The yellow and blue stars represent two flight data points for N585SY (yellow stars are from Figures 47-48, and the blue star is from Figure 57) . N585SY compares favorably to model of a decalage of approximately -0.4. The measured decalage for N585SY is -0.4, and matches the model when out of ground effect on two separate flights.*

Tri-Q200 (N585SY)

5 MPH CAS: alpha 2.0 degrees

Figure 51.

Tri-Q200 (N585SY)

60 MPH CAS: alpha 1.9 degrees

Figure 52.

Tri-Q200 (N585SY)

65 MPH CAS: alpha 1.7 degrees

Figure 53.

Tri-Q200 (N585SY)

70 MPH CAS: alpha 1.7 degrees

Figure 54.

Tri-Q200 (N585SY)

75 MPH CAS rotation: alpha 6.8 degrees

Figure 55.

Tri-Q200 (N585SY)

80 MPH CAS climbing out in ground effect : alpha 6.5 degrees

Figure 56.

Tri-Q200 (N585SY)

120 MPH CAS level flight: alpha estimated at 2.8 degrees

Figure 57.