PILOT QUESTIONNAIRE

Flight No. 1-32-53

July 26, 1962

Pilot: Neil Armstrong

Resume' of Flight

1. Launch, light engine, increase to 100%T. Rotate until 2g is attained. SAS 6-6-8, ASAS "armed".

2. Maintain 2g until $\theta = 30°$ - maintain $\theta = 30°$.

3. Pushover to 0 "g".

4. Burnout - Set SAS 6-6-0 - pullup to $\alpha \approx 10°$. Perform δ_a pulse.

5. Extend speed brakes. Perform δ_a pulse.

6. (Peak alt.) Pullup to $\alpha \approx 15°$. Perform δ_a pulse at pilot's discretion. Trim to $\delta_h = -25°$.

7. Pushover to $\alpha \approx 5°$. Reset SAS 6-6-8.

8. Retract speed brakes - Perform pushover-pullup maneuver ($\alpha \approx 5°$, $0°$, $10°$).

9. Vector to high key for landing.

I. Launch

A. Comment on any non-routine events which occurred at launch or during the initial climbout rotation.

P.C.: There weren't any non-routine events.

B. Could the decrease in pitch damping (SAS 6-6-8) be detected from airplane transient response at launch?

P.C.: No.

C. Was control system limit cycle noted during the roundout?

P.C.: No.

D. Describe and rate the pilot control task to affect the roundout into the climb attitude. θ 2.5, ϕ 2.5, ψ 1.5.

II. Climb

A. Note differences between the planned and flight climb profiles.

P.C.: I don't know what the differences will turn out to be between the planned and actual flight profiles, but the ones

I observed from the cockpit were that my pushover occurred 1.5 seconds earlier than that requested by NASA 1, since there was about a second and a half difference in our clocks. At an early part of the zero-g portion I was approximately 1°α low and at about 75,000 feet it was noted that I was going slightly low, after which I increased the angle of attack to +1°, +2°, back to +1°, and burned out at approximately +1° at approximately 100,000 feet inertial altitude.

B. Rate the pilot task to fly the climb profile from pushover to shutdown. θ 1.5, Ø 2, ψ 1.5.

P.C.: The pilot ratings are for the zero g acceleration.

III. Deceleration

A. Discuss fully the airplane handling characteristics using simulated ASAS damping (6-6-0, Yar ON) with speed brakes closed. α = 10°, θ 2, Ø 3, ψ 2.5.

P.C.: First I'll talk about α = 0°. There were no maneuvers performed at zero α with the exception of the disengagement of the yaw damper which resulted in a slight yaw transient and sideslip oscillation less than 2°, or probably more like 1°β, and there was no pilot attempt to damp this oscillation. As previously determined, I did not stop at 5°α but rotated immediately to 10° and put in an aileron pulse. The sideslip oscillations were small here, approximately ±1° or ±1.5°β. I noted there wasn't very much difficulty in flying the airplane here, but 15°α was not reached. I don't have any way of giving ratings at zero α because I didn't maneuver the airplane to determine ratings.

B. Rate the pilot control task with speed brakes out (SAS 6-6-0). Yar On. θ 2.5, Ø 5, ψ 5 at α = 10°.

P.C.: Now with the speed brakes out, and first I will reiterate that the pitch change with speed brakes was as expected, namely 3° nose down -- that is, speed brake extension changed angle of attack from 10° to 7°α. It took some more trim to get back up to 10°α after putting the brakes out. On the simulator this had appeared to me to be a little bit easier to control with the brakes out, than with the brakes closed. In flight, however, control seemed to be a little bit harder. The oscillations were a little larger in roll, a little more severe, and the directional oscillations varied approximately ±3°, 4 each way from zero with bank angles of possibly more than 35°.

It is somewhat difficult to separate lateral and directional pilot ratings in these kind of maneuvers. I am not going to separate the modes, but cumulatively they are a pilot rating of 5 laterally and directionally.

P.C.: I would like to add some additional impressions concerning the lateral-directional oscillations. At Mach 5 to 3.5 with speed brakes extended my feeling was that the phasing and magnitude between sideslip and roll was not the same as I had observed on the simulator. I couldn't pin it down, but I think perhaps a comparison of the flight records with simulator runs are in order. And in the cockpit, of course, I had side forces and accelerations that you don't have on the simulator, but still in all the flight didn't look quite the same.

C. Rate the overall pilot control task to perform the pullup-pushover maneuvers. θ 2 , ϕ 1.5, ψ 1.5.

P.C.: The pullup-pushover maneuvers, both supersonic and subsonic, are rated as shown. I think angle of attack probably varied from 11° at 4600 ft/sec to 8° to 9°α at 3200 ft/sec, and I would say there was not an appreciable difference in the controllability during this time. Perhaps the control task got a little easier below Mach 3.5.

IV. Glide to High Key

A. Discuss adequacy of ground guidance and energy available during the terminal portion of the flight.

P.C.: The flight seemed to go just exactly like the simulator from a performance standpoint. I think the performance of the simulator was very close.

B. Rate the pilot' control task during this time (IV.A.).
θ 2 , ϕ 2 , ψ1.5.

V. Landing

A. Discuss any unforeseen control problems, and rate the pilot control task during the landing approach and flare.
Approach θ 3.5, ϕ 2 , ψ1.5.
Landing θ 3.5, ϕ 2 , ψ 1.5.

P.C.: The unforeseen control problems during the approach were the result of the operation of the new type trim tab that we had installed on the sidestick. I found operation of this tab was difficult due to the fact that I was reluctant to take the forces off the stick when necessary to move the trim tab.

B. Was a spot landing attempted?

P.C.: A spot landing was attempted.

NA:dmo
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