PILOT COMMENTS

Flight No. 1-32-53

Pilot: Neil Armstrong

July 26, 1962

Armstrong: I can say with truthfulness that this flight was like going back to the horse and buggy control system. Before launch, the only pecularities were the low hydraulic pressure indication on the No. 1 system and the inertial velocity and altitude oscillation which I had not seen before.

Launch and light up were normal. It was somewhat easier to fly constant g in the airplane than it is in the simulator. Roundup was also quite a bit easier. It was a little harder, however, to stop right at 30° pitch angle than it was on the simulator...there seemed to be a little more oscillation in pitch. My pushover point was about a second and a half ahead of NASA 1, so I was at zero g at the time they called 37 seconds.

When they called "you're going a little bit low on profile", I checked and I was at -0.5°α so I went to 0.5°α and seemed to be picking up slowly. I went to 2°α and I was right back on profile, so I went back down to between zero and 1°α. I think I ended up just a little bit low, although the altitude NASA 1 called out was perhaps 5,000 feet lower than my inertial indication.

At burnout I indicated about 5,650 or maybe 5,750 ft/sec inertial velocity, and got some of the bangs that are peculiar to the No. 1 and No. 2 airplanes.

I went to yaw damper off (6-6-0, Yar on) and there was a little airplane transient directionally when the yaw damper was disengaged. I got up to 10°α indicated, and could not check the stabilizer position, because the headbumper was down and I just couldn't see the indicator. I did a lateral pulse and did get directional oscillations although not very large. I put the speed brakes out and just as in the simulator, the true angle of attack dropped about 3° and was about 7°α for that stabilizer position. I retrimmed to 10°α and put in some lateral pulses. From that time on the airplane was pretty squirrely. The airplane did indeed oscillate more in sideslip and roll than in the simulator at the same condition. The trim setting went down and I increased back stick trim. I feel I got to full back-stick trim at about 4,700 ft/sec but the angle of attack was not above 10° or 11.5°α, something like that, after which it went down. (Data shows the measured stabilizer setting averaged -16° δ_h in spite of a full back trim command.)

The airplane control system was such that I had to put in a good deal more roll control to change bank angle, than I had expected, and also, the roll effectiveness was very poor at this flight condition, even though sideslip maintained a small value about zero. In other words, the low control effectiveness was real and was not fighting sideslip.

I was not called upon to use the $\dot{\beta}$ technique to maintain wings level position, although the airplane was oscillating. I think I called about up to ±4° in sideslip. Maximum bank angles were between 45° and 60°.

As I came through about 3,200 ft/sec indicated I re-engaged yaw damper, had the field in sight, and picked up my $\bar{q}$, such that I would be in a fair position to get Saltzman's pushover. I did get this at precisely 1.6 Mach number. Mach number at the end was perhaps 1.45 with probably 10 seconds of zero g, or within ±0.5°α of zero g. After that, I got the subsonic pushdown, pull-up starting just below 0.9 Mach number, but I didn't notice precisely the Mach number at the end of the maneuver.

The airplane was equipped with a new trim button, a beep trim on the sidestick which paralleled the function of the center stick beep trim. This did not work as well in flight as I had expected from working on the simulator. The reason is that the stick forces are sufficiently high in this airplane so that you are reluctant to move your hand to a position where you can operate the trim while holding the amount of force it takes to control the airplane. I would like to repeat that statement. You are reluctant to release force on the stick to get at the trim button because during that time period you are afraid the airplane will deviate farther from the flight path. I found this to be quite disconcerting in the pattern, and I did complete the approach and touchdown on the side stick, although I was tempted a couple of times to go to the center stick. I do not like the trim button as it now exists in the No. 1 airplane. Also compared with No. 3 airplane I felt that roll effectiveness at the pattern speeds were such as to require excessive force.

I did get a pitch SAS tripout which may have been in the pattern, but the first time I noted it was during the rollout, so it either occurred during the final approach or during the touchdown.

Concerning the damper-off flight conditions, I feel I wouldn't want to go to any higher angles of attack using the same technique. The type of airplane motions I observed didn't seem to lend themselves or require the β control technique. Perhaps, if you had to hold a

highe higher angle of attack you would have to go to $\dot{\beta}$. Using the kind of techniques I was using, however, I would not want to go to any higher angles of attack than I saw. Also, I seemed to be limited by the amount of stick that I could put in. Actually, I was putting in sizeable stick deflections without getting very much airplane response in roll.

NA:dmo
Typed: 8-2-62

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