TEXT FOR POWER POINT SLIDESHOW

1. FORTY YEARS OF AIR SUPREMACY—We're now celebrating the 40th anniversary of the F-15 first flight of 27 July 1972. Of course, the real beginnings were a decade earlier with defining the requirements for providing the USAF with the best Air Superiority fighter in the world. Several contractors conducted studies about how best to fulfill those requirements. By early 1969, the competition had narrowed to just three airframers (McDonnell, North American, and Fairchild-Hiller) and two engine manufacturers (General Electric and Pratt & Whitney). McDonnell's proposal configuration of July 1969 is shown on this slide. McDonnell won the airframe contract in December 1969. P&W won the engine contract a few weeks later. This presentation begins at the end of the proposal period through Contract Award in January 1970, and covers specifically the first three years of flight testing—both the contractor Category I as well as the USAF Category II tests through August 1975.

2. SPEEDBRAKE EVOLUTION BEFORE FLIGHT—A little bit of background information is required. After proposal submittal, preliminary design effort continued. The speedbrake got moved around as if every designer was saying, "not in my neighborhood!"—from below the wings as on the F-4 Phantom, to above the inlet nacelles, and finally to the centerline aft of the canopy. Deceleration requirements for the speedbrake were unprecedented—we had to be able to create about ½ g force eyeballs-out expressed in terms of deceleration time as well as rate of descent. Up to now, all jet fighters with one exception had had independent speedbrakes; in those days, using other control surfaces as deceleration devices was not an option. The speedbrake size and deflection satisfying the requirements was one of 23 square feet area deflected some 66 degrees.

3. VERTICAL TAILS AND VENTRALS EVOLUTION—The vertical tails and ventral fins evolved as well from the time of the proposal up to April 1971. We learned that we had directional stability problems in the late summer of 1969. After a lot of test and analysis, the tall tail shown here became part of the configuration while the ventrals were eliminated. We had learned that the ventrals weren't very effective at supersonic speeds with the Sparrow missiles installed.

4. F-15 ROLLOUT CEREMONY—With the appropriate amount of fanfare, the Rollout Ceremony occurred on 26 June 1972. Soon thereafter, the airplane was dismantled and shipped to Edwards AFB as cargo in a C-5A. By the time the airplane was reassembled at Edwards, transplanted personnel from St. Louis had become established more or less and were ready for the real work to begin.

5. FIRST FLIGHT—27 JULY 1972—31 MONTHS AFTER ATP—After several engine runs and four high speed taxi tests, it was time for the Eagle to take wing. The day started early. All who were directly involved in the first flight activities were on duty at 0500, well before the heat of the day. None of the engineers had slept well the previous night. Irv Burrows, the test pilot, no doubt slept less. Eight or ten engineers were in the Control/Telemetry room manning the brush recorders of various telemetered parameters. Another five or six in a company van escorted the airplane from the ramp to the runway. It seemed like a long time between engine start and the beginning of the takeoff roll, but it was only 25 minutes. Takeoff was on R/W 04 over the lakebed in case of an emergency (remember, not only was it a new airplane, but it was also a new engine). The families of the McDonnell personnel and a few VIPs were taken by bus to a small hillside near the predicted takeoff point to witness the maiden flight (as well as the landing). The flight went well except for a couple problems—the main gear doors refused to close which required reverting to a different flight plan. And, there was objectionable buffeting emanating from the airflow from the speedbrake hitting the vertical tails. The gear doors were easily fixed by re-rigging the mechanism. The speedbrake problem took a little longer. It should be mentioned that first flight occurred just 31 months after contract award (ATP=Authority to Proceed). Contrast that with the 73 months for the F-22 and 62 months for the F-35, both of which had been preceded by a "prototype" fly-off.

6. FIRST FLIGHT CELEBRATION--In spite of these relatively minor problems (as well as an afternoon confrontation by a telephone conference call with Washington (someone in the Pentagon) where attempts were made to answer some adversarial questions from a disenchanted senator) the First Flight celebration was a good one. Distinguished attendees of course included Test Pilot Irv Burrows, Don Malvern (program manager, later president of the company), General Bellis (SPO director), Bud Anderson (MCAIR Facility

Manager and WW2 fighter ace), and "Pancho" Barnes, the early aviatrix and proprietress of the "Happy Bottom Riding Club." Irv received the traditional dunking in the swimming pool.

7. SPEEDBRAKE INDUCED BUFFET—Back to work. The speedbrake induced buffet got a lot of attention with wind tunnel tests in St. Louis of many different concepts. 12 different configurations of different sizes, shapes, and porosity were tested. This was probably the most vexing and expensive problem to solve. Finally a configuration was accepted—a 4x8 sheet of plywood sized surface at 45 degrees deflection.

8. RAPID FLIGHT TEST PACE—Flight testing proceeded at a brisk pace. Aircraft #1 accumulated more than 60 flights in two months, sometimes flying three flights per day. After two months, Aircraft #2 joined us. At the end of three months, the team had flown some 93 sorties averaging 1 ½ sorties per work day. A dozen airplanes were tested at Edwards, and one at Eglin with the tasks as outlined in general on this chart.

9. HORIZONTAL STABILATOR SNAG LEADING EDGE—The snag stabilator leading edge was incorporated after the flight test program had begun but not because of anything learned during the flight tests. Instead, wind tunnel testing during the summer of 1972 discovered a potential for flutter, so the tail was modified by removing part of the inboard leading edge to change the balance characteristics.

10. HEAVY AIRFRAME BUFFET IN HEART OF COMBAT MANEUVERING ENVELOPE—During normal envelope expansion, it was discovered that there was objectionable airframe buffeting right in the very heart of the combat maneuvering envelope at M~0.9, 4 ½ to 5 gs, 30,000 ft altitude. To solve this problem, programs were run at both Edwards and St. Louis. The St. Louis testing arrived at a configuration incorporating strakes along the sides of the nacelle "gun bumps" in conjunction with wing fences—this was a solution to the buffeting, but there was concern with the potential of creating high drag. The root cause of the problem was determined to be shock induced flow separation on the outer wing panels which excited the 1st fuselage bending vibration mode. In the dark of night at Edwards, part of the wing tips were sawed off, and the ragged edges were smoothed with duct tape—this solved the buffet problem as well as reducing some excess wing loads at M~1.02, 20K.

11. CROSS-WIND LANDINGS PROBLEM: TRACKING CENTERLINE—One of the specification requirements was to be able to operate in 30 kt cross-winds (although there's a slim chance of ever encountering such a condition). But it was learned that even at winds of 10 to 15 knots, the pilots had trouble keeping the airplane between the fences. It took a long time to home in on the cause of the problem of the poor directional control during cross-wind landings. After various modifications made to control system schedules, it was finally learned that the main gears were acting like skate boards—the airplane would turn into the wind during the ground roll (that's good while in flight, but not good on the ground). Several changes to the gear load-stroke characteristics were tested to get a better understanding of the problem. A modification incorporating a dual chamber strut solved the problem. With the gear modification, a rearward shift in the axle of 3 ½ inches was also incorporated—this to improve the tip back characteristics at aft centers of gravity.

12. HIGH ANGLE OF ATTACK, STALL, SPIN TESTS—The high angle of attack, stall, and spin program was the last of the Cat I/II tests. This testing began rather auspiciously with an inadvertent spin in ship #1 caused primarily by an excessively large left/right wing fuel asymmetry. Although this spin was broken with normal anti-spin controls, the event guaranteed that there would be a full-blown spin program. Ship #8 was the designated spin test airplane. It was outfitted with a spin recovery parachute and an emergency power unit in the event of dual engine failure and the resulting loss of all power. The EPU used hydrazine, but there were all kinds of leakage problems—one time while being ground tested, the airplane wound up with about an inch of hydrazine on the cockpit floor. Hydrazine is bad stuff. The program was delayed while a change to a battery power backup system was made. The test pilots got in a lot of spin experience after it was finally learned how to enter them. Spin entry required a high energy wind-up turn to high g followed immediately by dumping the stick forward while maintaining full side deflection. This maneuver was called the "ARI Defeat" technique because it defeated the mechanical aileron-rudder interconnect. There are three upright spin modes and one inverted spin mode (although since the inverted spin requires the maintenance of pro-spin controls, it's debatable whether that can really be termed a

"spin"). Category I and II testing ended in August 1975. It's important to point out that for the first time ever, a complete fighter airplane test program was accomplished without the loss of a single airplane.

13. THE EVOLUTION CONTINUES—There have been several other 1st Flights of improved versions of the airplane as noted on this chart. The F-15 is in the service of six nations. More improved versions are on the way. After 40 years, the F-15 Eagle is still Master of the Sky.