The T-46A Program (U)

The Movement to Replace the T-37

(U) Since the 1950s, the USAF had relied upon the Cessna T-37 as its primary jet trainer. By the mid-1980s the Air Training Command operated 652 T-37s at seven different bases.[1] As the T-37 approached the age of 30, some Air Force and congressional figures called for its replacement. Those proponents of a "Next Generation Trainer" (NGT) increasingly enumerated criticisms of the venerable T-37.

(U) Critics of the T-37 called its environmental control system (ECS) "inadequate," and vowed that the NGT would also have a better all-weather capability. The T-37 had no windshield defrosting or engine inlet anti-icing systems. This limited all-weather capability hampered the training potential of the aircraft.[2] At least two of the criticisms of the T-37 dealt with safety. Deficiencies in the plane's flight characteristics, noted the critics, gave the T-37 relatively poor spin and stall recovery attributes, and the result had been "several" mishaps in the air. Too, the fuel storage arrangement of the aircraft had sometimes led to dangerously unbalanced fuel loads. The T-37 did not have a pressurized cockpit, so even though the service ceiling of the plane was listed as 39,200 feet, that altitude

was actually too uncomfortable to be used, and so a Pentagon program monitor for the NGT stated that the operational ceiling for the T-37 was 25,000 feet. Training time was reduced by a lengthy refueling time of approximately 30 minutes. The engines of the T-37 were infamous for producing a great deal of irritating noise. Finally, the aircraft did not have the easy transition potential to utilization as an attack vehicle that was claimed, for even though variations of the T-37 were used as attack planes in Vietnam, one critic wrote that the wings "had to be all but rebuilt to accept ordnance."[3]

(U) A principal argument put forward by the Air Training Command for replacing the T-37 was that the aircraft's life limitations were almost at an end. The life expectancy of the airplane was 15,000 flight hours, and by the mid-1980s the average T-37 had a total of over 11,000 hours, adding 500 more each year. Flight Test Center representatives, however, downplayed this argument in 1978, saying that it "apparently does not hold water because AFLC can extend the life of the T-37s . . . to at least 18,000 hours which would take them well into the 1990 time period in terms of training hours."[4]

(U) Finally, in a 1984 essay on the Next Generation Trainer, Air Force critics of the T-37 were quoted as censuring the plane for having a range of only 350 nautical miles. Ideally, a trainer should have a much greater range, to allow long periods

of training time in the air. However, that criticism might have been unjustified (just as the matter of the plane's total life-span may have been), for two variants of the aircraft--the T-37B and the A-37B--were listed in an earlier publication as having ranges of 950 and 1,012 miles, respectively, and a standard authority on U.S. military aircraft put the T-37B range at 870 statute miles.[5]

(U) Lengthy refueling, limited ceiling, relatively short range, poor capability for operating during inclement weather, and inconsistent spin and stall recovery characteristics--the Air Training Command (ATC) claimed that all of these negative features were true of the T-37 and impaired its ATC mission completion rate. In spite of this, some AFFTC representatives wrote that the ATC justification for replacing the T-37 was, even with all those problems, "weak unless they provide more quantitative data."[6]

The Next Generation Trainer

(U) Whatever the merits of the various criticisms of the T-37, the Air Force began taking measured steps--from the late 1970s--toward replacing the trainer. A System Program Office (SPO) for the Next Generation Trainer worked within the Aeronautical Systems Division (ASD) to bring together all the organizations that would be involved either in development

(including testing) of the NGT or in using it, to program management review meetings designed to "establish a common knowledge base and enhance early planning." AFSC asked both the AFFTC and the Air Force Test and Evaluation Center (then known as AFTEC, later AFOTEC) for testing requirements for the NGT even before either the program schedule or budget for the airplane were laid out.[7] AFFTC and AFTEC, as early as 1978, proposed similar test program requirements, each organization suggesting that six aircraft would be a good number for the testing program, and also that Air Force maintenance begin as early as possible (perhaps even with the third aircraft). The AFFTC additionally proposed that the test aircraft be produced without tooling ("handcrafted in a model shop"), after which the manufacturer would wait 15 to 24 months until the testing organizations would finish their work and give the manufacturer their approval to begin production.[8]

(U) Before the Air Force could begin to seek a manufacturer for the NGT to replace the T-37, Congress enjoined the service to consider adopting the Beech T-34C trainer currently used by the Navy. However, the T-34C was a turboprop aircraft, and Air Force officials felt that it would be better to train their pilots in jet aircraft. The Air Force also concluded that the T-34C would cost a great deal more money than a new NGT, over a 20-year lifespan, and the ATC claimed that the T-34C was "unsuitable because of its low performance." In the light of these three

arguments, the Air Force rejected the T-34C and continued efforts toward a newly-developed jet trainer.[9]

(U) Originally, seven manufacturers expressed some degree of interest in seeking the NGT contract. Only three companies fought to the finish: the Fairchild Republic Company (teamed with the Garrett Turbine Engine Company), Rockwell International (also with Garrett engines), and Cessna Aircraft (with Teledyne CAE producing the engines). Cessna's record as a producer of large numbers of aircraft at reasonable prices made it a prime contender. But, in mid-1982, the Air Force announced the selection of Fairchild Republic and Garrett as manufacturers of the aircraft and its engines. Several factors may have been prominent in the Fairchild selection. For one thing, the Fairchild Republic Company was nearing the end of production of the A-10 aircraft, and there was a logic to choosing a company with factories and trained workers that could essentially go directly from one project to another. Also in Fairchild's favor was its somewhat novel approach in constructing a 62 percent scale model of the NGT the company proposed to produce, so that Air Force contract officials could see an actual flying prototype of the plane, not merely lines and numbers on paper. The Garrett Company added another positive aspect to the Fairchild bid (as perhaps for the Rockwell bid as well), for Garrett currently manufactured the engines for the Marine Corps' OV-10 Bronco, and for some time already had been deeply involved in the research

and design of the technologies that would be crucial to engines for a Next Generation Trainer.[10]

(U) The contracts entered into between the U.S. and the two companies called for two primary test aircraft, options on 54 production aircraft, 29 of Garrett's TFE76 engines (another designation for the F109-GA-100 engine--the two designations seem to have been used interchangeably), and options for 119 more engines. Between 1982 and 1992 the government would presumably purchase a total of 650 of the trainers and 1,430 engines (including 130 spare engines). According to the agreement, Garrett would deliver the first pair of engines to Fairchild in late 1984, and Fairchild was to deliver the first NGT test aircraft to the Air Force by early 1985, its first flight that April. The earliest production aircraft were scheduled to be delivered to the Air Force in 1986. Fairchild Republic's NGT aircraft and program were both renamed T-46A in November 1982.[11]

(U) In an early Decision Coordinating Paper (DCP) on the T-46A, dated 1 February 1984, ASD planners strongly emphasized that Initial Operational Capability (IOC) for the new trainer would mean 35 aircraft in the hands of ATC by the last part of 1987. If that IOC date was not met, warned the writers of that paper, ATC would face several grave situations: continued training operations in "the dangerously congested low altitude airspace" below 20,000 feet; a continued sortie loss rate of ten

to fifteen percent because of bad weather; continued operation with a "limited" ejection seat capability; continued "susceptibility of crews to physiological stress from unpressurized flight"; continued thrust deficiencies under certain conditions; "delay in realizing potential fuel and other operating cost savings"; and an inability to cope with future increases in the numbers of pilots to be trained.[12] In other words, the longer ATC had to rely upon the T-37 trainer, the worse the training program would fare. ATC critics of the T-37 were now adding the shortcoming of relatively poor fuel economy to the other faults found in the trainer (perhaps indicating not a belated cognizance of poor fuel economy by the plane, but rather a desire to "pile up" more and more arguments against the T-37).

Development of the T-46A

(U) The T-46A originally appeared to be a sure, noncontroversial project destined for an easy path from congressional funding to its place in the Air Force inventory. In part, this was because both Fairchild Republic and Garrett were using "proven techniques and procedures," with low technological risk. Simplicity, commonality, durability, and reliability were words used often to describe portions of the airplane's design and development. The greatest technological hazard involved in the T-46A project appeared to be that of a

compressed schedule, with the air vehicle and the engine developed concurrently. As much as possible, the test and contract demonstration milestones were designed to alleviate the risks that came with that concurrency.[13]

(U) Besides the use of proven technology, Fairchild Republic officials proudly pointed to three other aspects of the development of the T-46A that seemed to promise a smooth path to success for the new aircraft. Unlike the development patterns of many airplanes, in this case the airframe contractor was given complete responsibility for the entire system. This meant that Fairchild Republic, not the Air Force, bore the burden of holding subcontractors to account for the quality, promptness, and cost of the parts they supplied. (In retrospect, this method of doing business, seemingly at the time so wise, may have placed too much responsibility upon this particular aircraft manufacturer, because of inherent weaknesses in the Fairchild Republic Company, weaknesses that were not apparent during the early stages of the process.) A second aspect of the new trainer's development that was lauded from the beginning of the T-46A project was the apparently solid level of communication and cooperation between Fairchild Republic and the Air Force. And finally, the company claimed in 1985 that when the T-46A rolled out as a finished product, it would have behind it the most complete testing--from wind-tunnel time to flights in the 62-percent scale model and tests with a computerized simulator--of any trainer aircraft

prior to its first flight.[14]

(U) The development and testing schedule laid out for the T-46A was precise, but in view of all the factors discussed above, it seemed quite feasible. This aircraft would not be burdened with costly modifications throughout development and production, for in late 1982 a Fairchild Republic executive specified October 1984 as a virtual freeze-point for such changes. The design would not be completely frozen at that time, but, "no engineering changes will be made easily after this point." "We will make changes," he promised, "only to meet the requirements. This will keep the costs down."[15]

(U) Throughout 1983 and 1984, representatives of the AFFTC were among the people who kept up a steady dialogue between the Air Force and the two major contractors of the T-46A, Fairchild Republic and Garrett. Flight Test Center personnel participated in Technical Interchange Meetings (TIMs), various Program Design Review (PDR) and Critical Design Review (CDR) meetings, Pilot Procedures/Crew Station Committee meetings, System Safety Group (SSG) meetings, and many other conferences with representatives of Fairchild Republic and Garrett, as well as with ATC, the Air Force Operational Test and Evaluation Center (AFOTEC), ASD, and occasionally other organizations. Fairchild Republic and the System Program Office each actively solicited AFFTC expertise on a variety of problems during the development of this new

airplane.[16]

(U) Almost from the start, Flight Test Center personnel found important differences in the work and demeanor of the two contractors. The Garrett Turbine Engine Company (GTEC) of Arizona favorably impressed successive groups and individuals of Air Force officers, enlisted personnel and civilians. Garrett presentations, conferences, and individual spokespersons were repeatedly described as "well-prepared" and "knowledgeable." People who worked with the Arizona firm saw it as "responsive to the specification requirements" for the F109 engines destined for the T-46A. Captain Eric P. Hansen, then the AFFTC project manager for the T-46A, explained in early 1983 that, "of about $20 million F109 money spent so far, Garrett spent about $2.5 million getting smart on dealing with the government, and it shows." Meetings organized by Garrett were brief, to-the-point, informative, and useful. Garrett presentations were termed by at least one visitor from the AFFTC as "slick," but they were persuasive. One example of that was the comment by a Flight Test Center representative to an F109 Engine Program Management Review (PMR) in early 1983: "Many people have considered the F109 engine one of the high risk aspects of the T-46A program, but after this PMR, I don't think it is."[17]

(U) The comments of Flight Test Center personnel about Fairchild Republic Company (FRC) presented a vivid contrast to

these praises for Garrett. As early as June 1984, AFFTC people involved in the T-46A project noted that Fairchild Republic had "not complied" with an ASD request, and wrote of being "strongly disappointed" with the pace of Fairchild's work. The company's "technical competence, cooperativeness, responsiveness, and company integrity" were by then "really showing deterioration," according to Maj Eric Hansen, who had become the Director of the T-46A Combined Test Force (CTF). FRC engineers sometimes displayed "misunderstanding of T-46 engineering," resulting in such situations as the revelation in October 1984 that Garrett's engines did not fit in the T-46A airframe as it was currently being developed by Fairchild. Fairchild Republic's most recent aircraft development had been with the A-10, so when FRC began to write a flight manual for the T-46A, unfortunately, the company tried to lift "much information and verbiage . . . directly" from the A-10 flight manual, only to learn that the A-10 material was entirely incorrect for the new trainer![18]

(U) When Air Force or Garrett personnel pointed out problems to Fairchild Republic, the company's responses were often less than appropriate. Major Hansen, CTF Director, in the fall of 1983 requested a change in the design of the cockpit, but was turned down, the company "claiming the drawings were already done and would take too much time and manpower to change." A year later, Fairchild asked for that same change, much to Major Hansen's disgust. In mid-1984 he summed up what he felt was the

general policy of FRC: "The company attitude seems to be to press ahead on time with hardware schedules regardless of design or analysis insufficiencies."[19]

(U) Such singlemindedness regarding production deadlines did not, however, always enable FRC to accomplish tasks promptly. Fairchild technical writers admitted in September 1984 that an interim draft flight manual they presented to the Air Force had been "thrown together the previous week." Too often, FRC's solutions for problems had been at best "band-aid fixes," according to CTF Director Major Hansen. And even those solutions were not always on time. As early in the T-46A program as September 1983, ASD found that one-third of the material FRC prepared for a Critical Design Review meeting was incomplete, and an Air Force Systems Acquisition Review Council meeting had to be postponed. The first flight of the heralded Next Generation Trainer was delayed repeatedly, to the embarrassment of the Air Force. Major Hansen wrote in December 1984 that, "FRC says they will meet an 11 February rollout date no matter what. I'm skeptical." FRC did manage to keep that date, and the company held an impressive rollout ceremony with a U.S. Senator, several high-ranking Air Force civilian officials, and other dignitaries present to view the new aircraft. But some required parts were missing from the aircraft, and other parts installed on it were "not flight worthy": the airplane was a long ways from being ready for testing. Perhaps this was again a case of FRC pushing

ahead too fast just to have a visible result, without first ironing out the internal problems that might keep the T-46A from flying properly.[20]

(U) The first flight of the T-46A was originally scheduled for 15 April 1985. By late February, the date was slipped to 30 April, a month later it had been pushed on to 23-30 May, by mid-April it had slipped again to "early summer;" in July the date was guessed at late August; and finally on 15 October, the event occurred--six months late.[21] FRC officials originally "pushed strongly" to keep the date of the first flight in April, even though there remained significant problems with the aircraft. This seemed to be another case of the company forging ahead with hardware, apparently ignoring Air Force qualms about the functional mechanisms. Blame for those first flight delays was laid primarily to Fairchild Republic's difficulties with some subcontractors.[22]

(U) The relationship between the two prime contractors for the T-46A--Fairchild Republic and Garrett Turbine Engine--seemed to deteriorate in 1984 and 1985. The Garrett people and their presentations greatly impressed Air Force personnel who worked with the T-46A project, whereas, as has been shown, Air Force people were increasingly unhappy with FRC. For example, when one Air Force officer praised the Garrett Company's handling of a Program Management Review meeting, he went on to say, " A similar

presentation would have taken Fairchild Republic three days, and it did." The two companies reduced their cooperation to a dangerous level. For example, the reason an important 1984 meeting at the Garrett headquarters in Arizona had only "limited success" was that FRC did not send its most knowledgeable representatives. And in August 1985, Air Force engineers visiting the FRC plant in Farmingdale, New York, found not only that Garrett wiring was "not compatible" with the T-46A, but also that there was no Garrett engineer on-site to help them address such problems. (Regardless of which company was at fault for having no Garrett engineer at FRC, the incident displayed the insulfficient level of interface between the companies.) Almost a year earlier--in October 1984--Garrett engineers told Air Force personnel that Garrett was tired of making "concessions" to FRC as a consequence of contract design violations on the part of Fairchild Republic. The Garrett Company had been "ahead of schedule, under budget" in February 1984, but by May, such problems as Fairchild's underestimation of bleed air requirements for the environmental control system had put Garrett's engine development approximately two months behind schedule and well over budget.[23]

(U) As mentioned earlier, AFFTC personnel began their dealings with the T-46A over four years before that first flight of the aircraft in October 1985. The T-46A Combined Test Force was quite small--approximately half a dozen people--into December

1984. Then, as more and more people began to arrive at Edwards AFB to be part of the T-46A CTF, the 6510 Civil Engineers at the same time refurbished the buildings the CTF would use. The CTF included an engineer each from Fairchild Republic and Garrett: something, as has been noted, that the two firms sometimes did not do for each other.[24]

(U) Long before flight testing of the T-46A began in the fall of 1985, CTF personnel began to express their doubts about a number of aspects of the development of the aircraft. Most of those problems and areas of concern were technical in nature, but at least one was related to the sales expectations of the Fairchild Republic Company. In late 1983, the marketing department of the company announced its intention to use one of the two test aircraft as a sales demonstration model. The idea was for FRC to modify the test aircraft with hardpoints, so as to persuade other nations to buy the plane as a light attack version of the T-46A. Both FRC test pilot Wendell Shawler and Air Force personnel of the CTF were shocked at the prospect of one test aircraft being removed from testing for a period of up to four months, for the test schedule was already painfully tight. The CTF managed to squelch this plan.[25]

T-46A Testing and Development

(U) The first test aircraft of the T-46A program arrived at

T-46A arrives at Edwards

Edwards AFB, its wings detached, in the bowels of a C-5A Galaxy on 29 August 1985. The AFFTC began flight testing of the T-46A on 15 October 1985, and brought testing to a close on 13 March 1987. FRC test pilot James Martinez flew the T-46A in that first flight at Edwards. He took the plane aloft for 72 minutes, and commented later that, "It's a very solid aircraft and flew quite well, everything performed as we expected." Two test models of the aircraft, serial numbers 84-0492 and 84-0493, along with one production model, 85-0596, were used in the flight tests at Edwards, amassing a total of 442 hours of testing over 297 flights. On one occasion, 24 February 1986, the aircraft was put through six normal test flights each lasting over an hour.[26]

(U) Possibly the single most dangerous incident in T-46A testing came on 5 May 1986, as FRC test pilot Shawler piloted the first test craft accompanied by Lt Col Michael D. Edmondson (T-46A CTF Director from March 1985). The purpose of that flight was to garner data on "wing structural dynamic response" (freedom from flutter), with two modifications resulting from previous tests. However, even before turning on the flutter excitation system, at the moment the pilot gave the right stick a lateral "rap" with his hand at 11,500 feet altitude, the aircraft began to shake quite violently. The pilot slowed the airplane, but the abnormally violent shaking continued, "with no indications of subsiding." Eventually, when the airspeed of the T-46A had dropped to 150 knots of indicated air speed (KIAS), the

vibrations ceased--"as suddenly as they began." The two men, each of whom had previously flown the T-46A many times, curtailed any further testing activities and immediately landed. The landing was normal, but Lieutenant Colonel Edmondson recommended that the aircraft be grounded until an investigation could reveal the cause of those severe vibrations. The next test flight of that particular test craft came almost a month later.[27] Whatever the cause, the aircraft did not repeat this unsettling behavior during subsequent flights, and no mention of the incident was recorded in the technical report on flight flutter evaluation.[28]

(U) Among the technical problems encountered in development of the T-46A were several that had been first discovered when Air Force and FRC engineers used a computer simulation of the aircraft yet to be built. One of the most persistent of these difficulties that remained into flight testing at Edwards was the T-46A's troublesome tendency to overrotate during takeoff. This problem was identified in the FRC engineering simulator as early as March 1983. Essentially, the difficulty was that during takeoff, the aircraft would not "rotate," or lift into a proper takeoff attitude, until the pilot had applied an abnormal amount of force to the stick for an excessive length of time. At that point, the plane would rotate, but so sharply that it seemed to be about to go into a dangerous stall, and to prevent that, the pilot had to immediately reduce the force he was applying to the stick. For an experienced pilot, especially a test pilot, such

movements might be quite easily accomplished. But a student pilot might not have the skills to know just when to make each of those quick compensatory moves to adjust to the aircraft. Major Hansen wrote, "Anything but docile takeoff and landing characteristics would be unacceptable in a primary training aircraft."[29] An engineering computer run and data from the simulator showed by September 1983 that the FRC engineers had been correct in predicting this overrotation problem. Fairchild Republic had already tried to prevent overrotation by moving the main landing gear three inches forward. Yet five months after that modification had been made, an AFFTC officer wrote that manned simulation studies indicated that the overrotation pattern was so severe that it was a major "safety concern" and made the aircraft "inadequate to perform its mission."[30] During this engineering phase, Fairchild engineers tried several other remedies, such as raising the nose of the aircraft four inches, lowering the center of gravity, and decreasing elevator deflection. AFFTC personnel in March 1984 speculated that "modeling errors in the engineering simulator are a major source of the apparent overrotation difficulties."[31]

(U) Unfortunately, however, overrotation was an actual difficulty with the T-46A, not merely an "apparent" one caused by errors in the engineering simulator. By June 1984 engineers from the AFFTC and FRC agreed that "the T-46A will not be able to rotate to a takeoff attitude at low enough airspeed to meet

spec[ifications]. . . . No one knows how to correct the situation, so project cost and/or the scheduled operational release of the airplane may be significantly affected."[32] This gloomy prediction was borne out in one test flight after another, even though some of the flights took place as much as 27 to 33 months after that assessment of the overrotation problem. Many of the flight test reports from the T-46A program included statements by pilots such as: "I attempted to rotate at 100 KIAS and could not. . . . Lift off occurred at approximately 110 KIAS." The current T-46A flight manual procedure suggested that pilots pull the aircraft up for takeoff at 90 knots of air speed, but invariably they recorded their attempts to do so futile, with the airplane finally rotating upward toward flight only "when it's ready despite [the] pilot's attempts to rotate at [the] recommended speed." The actual rotation usually took place between five and 15 knots faster than the point at which the pilot first pulled back the stick. When the aircraft did rotate, it usually overdid the motion, causing the takeoff to overshoot the climbout attitude desired by as much as 15 degrees, and frequently forcing the pilot to make a sudden, harsh overcompensation. One pilot, in his only flight in a T-46A, wrote that he originally had planned to rotate at 90 knots, but followed the advice of a pilot experienced in the craft to wait until the air speed had reached 100 knots. However, even at that speed, he got "no response" until he used "a very high stick force (approximately 20 lbs) at which time I grossly overrotated

(approximate 15+ deg.) very quickly." He termed the takeoff a "frightening excursion." This trait of late rotation followed by rapid overrotation was "undesirable from a training standpoint," for it would be "difficult for student pilots." One T-46A pilot wrote that even though all the takeoffs he knew about had been safely accomplished, they had been flown by "highly experienced" pilots, and the stick control of a student pilot might be "much less predictable." Maj Gen William T. Twinting, commander of the AFFTC, modified his generally laudatory appraisal of the T-46A by noting after flying the aircraft that "stick forces for rotation [were] way too high," with the potential for a dangerous surprise for an inexperienced pilot.[33]

(U) The statement about the T-46A taking off whenever <u>it</u> was ready was interesting, for the pilots who seemed to experience the least problem with late rotation and overrotation in the trainer were Fairchild Republic test pilot "Wendy" Shawler and CTF Director Lieutenant Colonel Edmondson, the two men who probably spent more hours in the airplane than anyone else. They made strikingly similar comments about the rotation issue. Shawler noted that he made a takeoff "using about 10 pounds of force and let[ting] the aircraft fly when ready." Lieutenant Colonel Edmondson wrote: "The initial takeoff was performed by applying about 5 lbs (very light) stick force and then 'letting' the aircraft take off with an initially constant then a decreasing force."[34] These highly proficient pilots had the

skills necessary to allow the late-rotation and overrotation characteristics of the T-46A to go their course without serious consequences, but for a student pilot it might have been a different matter. Lt Col Thomas P. Clinch, the AFOTEC representative at AFFTC, denied that this meant the pilots of the T-46 Operational Test Team were "saying the rotation characteristics are dangerous," but simply warning that a novice jet pilot would necessarily learn the unique method of taking off in a T-46A, and then have to spend more time later in "unlearning" those patterns of takeoff movements, when he or she began their training in a T-38. This would at least "increase syllabus flying hours," thus adversely affecting training.[35]

(U) Fairchild Republic, whose engineers had first anticipated the rotation question during simulator studies in the spring of 1983, did not let the problem deter it from the march toward production. The attitude of the company, as contrasted with that of the Air Force, could perhaps be seen in the differing assessments of James R. Martinez, chief test pilot for FRC, and Maj John L. Bush of the AFFTC, very early in the life of the T-46A. After flying together on 7 November 1985, the two pilots saw the matter of rotation quite differently. Major Bush wrote that "takeoff rotation forces were annoyingly high," but company pilot Martinez described the problem as minimal: "Stick forces on rotation are moderately high but are not considered by this writer to be excessive."[36]

(U) Fairchild still had not satisfactorily solved the rotation problem by June 1987. At that time, in a final technical report on the T-46A flight tests, Air Force and civilian government engineers once again described the rotation issue as a drawback for pilot training:[37]

> (U) The T-46A exhibited a very unique takeoff characteristic. . . . The nosewheel remained on the runway until 95 KIAS was reached, then the aircraft quickly rotated into the air. An abrupt stick reversal was required to stop the rapid pitch rate at the desired pitch attitude. If the experienced pilot was aware of this unique characteristic and was prepared to compensate for it, then the takeoff was easy to accomplish. . . . If, however, the pilot was inexperienced or was unaware of this characteristic, then there was a strong tendency to overshoot the desired attitude and become airborne in a nearly stalled condition.

(U) A second problem inherent in the T-46A was identified early just as was the rotation problem. This difficulty was a lack of sufficient drag to land the aircraft after a failure of the hydraulic system, without shutting down at least one engine. It was essential for any modern airplane to be so designed as to allow it to land safely should the hydraulic system fail. But the Air Training Command was reluctant to teach pilots that the only way to land the T-46A if the hydraulic system went out was to shut one engine down. As early in the program as the spring of 1983 some engineers working with the T-46A simulator saw that this "relatively low airframe drag" characteristic might cause a problem for inexperienced pilots. Lieutenant Colonel Edmondson,

then AFFTC project manager for the T-46A, wrote in January 1983: "FRC does not recognize this as a possible problem and briefed no contingencies of design to resolve it."[38]

(U) A further complicating factor was the need for the landings of the T-46A to be broken off sometimes, and for the aircraft to climb again--particularly because it was a training plane. As one Air Force officer put it: "Fairchild had the engineering dilemma of creating adequate drag for glide path control yet having a 2.7 degrees climbout capability, single engine, with gear and landing flaps extended, at 5000 feet and 100 F." The solution that Fairchild engineers offered in late 1983 was to add more speed brakes. As a result of this modification, "the overall drag improvement made landing approaches much more comfortable and quite acceptable," at least in the simulator.[39] However, even in the final weeks of flight testing, more than one pilot recorded statements such as, "more drag would be helpful slowing from 130 KIAS to 110 KIAS" on landing approaches. And a final technical report in June 1987 recommended "more effective speed brakes . . . to slow down from final turn airspeed to final approach airspeed without excessive time in idle power."[40]

(U) Several characteristics of the T-46A were labelled problems or deficiencies because the aircraft was intended for primary students in jet plane flying. This was true of the

airplane's overrotation tendency, the lack of drag during landing, and a third problem, the lack of warning as the T-46A was about to stall.

(U) Just as with many of the other difficulties involved in the development of the T-46A, the stall warning issue arose during work with the manned simulator at the FRC facilities in 1983. While pointing out that the airplane's spin characteristics seemed to be satisfactory, an AFFTC officer added: "One problem area is stall warning, presently characterized by a sharp G break." Fairchild Republic Company first experimented with leading edge stall strips to "tailor the stall warning," then later added a "stick shaker" to serve as a mechanical indicator of impending stalls at slow speeds.[41] The stick shaker eventually proved to be an adequate system for warning pilots of stalls at low altitudes, low speeds, and low G-forces. Even though the stick shaker did not function as effectively at higher levels of altitudes, speeds, or G-forces, the aircraft did exhibit a "natural warning" to alert pilots of impending stalls at those higher levels. The margin of warning was less at the lower speeds, but with the stick shaker sufficient for safety. During the closing days of testing the T-46A, Lieutenant Colonel Edmondson wrote enthusiastically of the stick shaker system that it "works great."[42]

(U) During the early months of test flights, the system on

the T-46A that provided the most dramatic problems was the trainer's hydraulic system. Even on the government acceptance flight of the second test T-46A, as well as its ferry flight from the FRC plant to Edwards, the craft suffered hydraulic failures serious enough to abbreviate the missions. In less than six months after that second test T-46A rolled out of the factory, test pilots endured four major breakdowns of its hydraulic system, any one of which could have been highly dangerous had a student been piloting the plane instead of a flyer with thousands of hours of experience.[43] In January 1987, after curtailing test flight operations for the T-46A for a pair of days, ASD engineers informed the CTF at Edwards that flights with the first test aircraft could resume. The hydraulic failures, said ASD, were essentially problems unique to the T-2 aircraft, which had a hydraulic system significantly different from that of the first test plane. Even the T-2 aircraft could quickly be put back into service, ASD told the AFFTC, after additional bracing was installed at the flow transmitter along the hydraulic line to reduce vibration. At some future date a flexible hydraulic line could be built into the T-2 aircraft as a permanent solution.[44] Less than a month later, during a flutter system flight test, the hydraulic system of the T-1 aircraft failed. The final technical report on the T-46A subsystems evaluation, published in mid-1987, found the aircraft's hydraulic system "satisfactory."[45]

(U) Several other systems and features of the T-46A were the focus of concern by Air Force engineers and test pilots during the development of the airplane. On the second test of the trainer's escape system (at Holloman AFB, New Mexico), both of the dummies used were successfully ejected clear, but one dummy suffered some burns. A problem on at least two of the escape system tests was that of the riser lines of the parachutes tangling and twisting, possibly "beyond correction during descent" of any human who might be in that situation. The T-46A was designed for use by pilots whose physical sizes would range from the first through the 99th percentile of both males and females. However, the ejection seats used in the aircraft were only designed for people of the fifth through 95th percentiles in body sizes.[46] An AFFTC engineering psychologist recommended that the ejection seats be tested with dummies of the first and 99th percentile body sizes. In spite of this engineering psychologist's strong argument that "this question will have to be addressed at some point, and why not by the first airplane designed to accommodate these sizes, one that will train every Air Force pilot for the next 20 to 30 years," the suggestion was rejected. The Fairchild Republic Company had another suggestion regarding the T-46A escape system: that it include a seat-saver mechanism. The Air Force representatives on escape system development turned back this FRC notion, for they were apprehensive about work on a seat-saver device dissipating time, money and effort from the already cramped schedule for completion

of ejection system testing at Holloman. Too, they feared the possibility of some such mechanism damaging the dummies and thus making it more difficult to ascertain the exact aspect of ejection that had been harmful to the mannequins.[47]

(U) Another problem that related to the range of dimensions among Air Force personnel was that of the weight of the refueling equipment for the T-46A. The Next Generation Trainer had been planned for accommodation of student pilots of both sexes, and its cockpit was relatively androgynous in design. However, during the development of the T-46A, some AFFTC personnel concluded that FRC was "ignoring the human factors of the maintenance activities" for the aircraft. Specifically, a Critical Design Review (CDR) in September 1983 included a single-point refueling demonstration. The person carrying out the refueling process was a woman, 5'3" tall, who had to lift a 43-pound nozzle up to a receptacle four inches above her head. She was able to accomplish the task, but "had to stop from fatigue after doing it six times in one hour." The refueling job for trainer aircraft would require that task accomplished at least 20 times in a day.[48]

(U) Many of the complaints about the overrotation takeoff characteristic of the T-46A were accompanied by comments regarding the aircraft's stick. Apparently, the FRC had planned to install a curved "goose-neck" stick in the airplane. AFFTC

opposition to that plan resulted in a traditional straight stick in the first T-46A, but the company persisted and built the T-2 trainer with the curved stick--much to the consternation of some test pilots. Maj Kim Riche wrote, "All [the] arguments we used to get a straight stick in T-1 still apply." Maj Mike Campano described the "goose-neck" stick as "awkward," and recommended, "Curve[ed] stick must go!" Lt Gen William Thurman, after a demonstration flight in the new trainer, commented favorably about most aspects of the plane, but noted that he did not like the curved stick.[49]

(U) The environmental control system (ECS) of the T-46A came under some criticism during and even before flight testing. As early as the ferry flight of the second test aircraft on its way to Edwards (only the T-1 craft was brought by C-5A), pilots noted three problems with the environmental control systems. The ECS of the T-46A was so noisy that it "interfere[d] with cockpit communications." It caused sudden variations in pressure within the airplane's cabin, sometimes by as much as several thousand feet altitude. And it did not consistently maintain comfort for the occupants of the craft, for in relatively high humidity conditions it sometimes "spit snow," and the higher the airplane climbed the less adequately the ECS kept the floor warm. (A number of pilots of the T-46A complained of their feet getting cold as they flew above 25,000 feet, and more than one told of the floor frosting over.) But at least the trainer did have air

conditioning, something that some pilots joyfully recorded as "an immense improvement" over several other kinds of aircraft they had flown--especially in the California desert during the summer.[50]

(U) Several other features of the T-46A were the source of problems during its development and testing. The Director of the CTF, however, concluded that "the greatest technical deficiency" of the aircraft was "excess drag." This excess drag--approximately 40 percent higher than had been predicted--was related to the weight of the aircraft, which was a continual problem throughout the trainer's development. The results of greater weight and drag than had been planned were frequently noted with, "performance disappointing," especially in three limitations. The first of these was the aircraft's range, described as, "very restricted." A second aspect of the performance of the T-46A that seemed disappointing to some pilots was its rate of climb. "The largest problem encountered during the mission," wrote one pilot, "was the tedious climb up to 30,000 f[ee]t (it took 20 minutes)." Another test pilot told of shortening a mission "due to slow climb rate," and yet another complained of his own "very slow climb." The third manifestation of the excess weight and drag of the airplane was a general lack of speed. A rather typical statement was that "it took forever . . . to accelerate from 130 kts to 220 kts." The CTF Director noted that the T-46A was theoretically designed to fly as fast as

400 knots and .75 Mach, "but the inordinate amount of unexpected drag made it difficult to accelerate much beyond 300 KTS without entering a dive with full power."[51]

(U) The speed of the T-46A, of itself, might not have made any difference in its usefulness as a primary jet trainer. But because that lack of speed countered an outstanding record of fuel economy to limit the range of the airplane, and because the slow climbing ability of the craft would have limited the number of training missions possible on a given day, the excess drag of the T-46A hurt its value as a trainer.

(U) The ground handling of the T-46A was another concern for some, but not all, of the pilots who spent time in the aircraft. Fairchild Republic test pilot Martinez, the first person to fly the T-46A, wrote in October 1985 that the craft's ground handling was "excellent." The other FRC test pilot who flew the T-46A, Wendell H. Shawler, in February 1986 was equally brief and commendatory: "Aircraft handles well on ground." Several Air Force pilots agreed with those assessments of the ground handling characteristics of the T-46A. Maj Mike Campano wrote, "excellent ground handling," and Lieutenant Colonel Edmondson added that it handled, "very well while taxiing . . . very responsive and . . . easy."[52] On the other hand, there were several aspects of taxiing the T-46A that raised concerns among other people. Maj Gen William T. Twinting, commander of the

AFFTC, was generally enthusiastic about the aircraft, but said that during taxiing he was forced to use his brakes more than he wished, because the idle engine thrust was "too high." Some pilots shut down one engine on the aircraft during taxiing. A number of flight reports mentioned that the taxiing difficulty increased with lighter loads, and that the brake pedal was built awkwardly. A few pilots noted that the nosewheel steering of the T-46A seemed too sensitive during medium or high speed taxiing. Lt Col Thomas P. Clinch, commander of the AFOTEC unit at the T-46A CTF, recommended that taxiing with only one engine become a "standard procedure" for the T-46A, both to conserve fuel and to reduce wear on the brakes. The final technical report in June 1987 included approximately a page of discussion about the ground handling characteristics of the T-46A, and concluded that the nose gear steering was too sensitive, the engines had a tendency to surge to a higher thrust than desireable, and the "large brake pedal deflections" made it difficult to hold the airplane at a stop when any reasonable amount of power was being applied.[53]

(U) All of these problems and issues, along with several lesser ones, slowed the design, development, production and testing of the two test prototypes and the single production model of the T-46A. As has been noted, the delivery and first flight of the original test aircraft came several months behind schedule. The same sort of delays occurred with the second test craft and the first production T-46A.[54] Air Force concern

regarding the delays was publicly indicated by May 1985, but when in August the service cut monthly progress payments to FRC in half, Pentagon spokesmen denied that the slippages in production schedules were directly tied to Air Force qualms about FRC. Rather, both at this time and in September, when the Air Force proposed to the Defense Resources Board that the T-46A program be killed, Air Force officials stated publicly that Air Force concerns were only about the company's "ability to perform and build a quality aircraft," not the delays.[55]

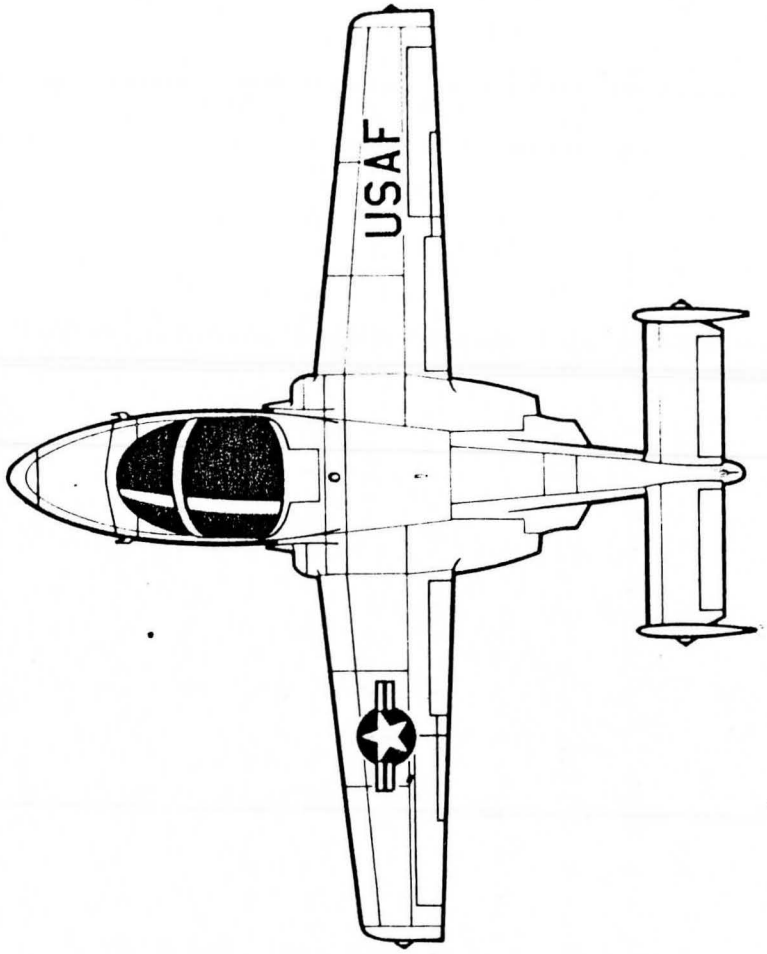
(U) Even though the T-46A was troubled with so many problems--takeoff overrotation, lack of adequate stall warning, excess weight and drag, poor high-altitude capability, and ground handling that was too sensitive at high speeds--the aircraft did have a number of strong points. Air Force engineers and test pilots expressed their appreciation of various aspects of the trainer.

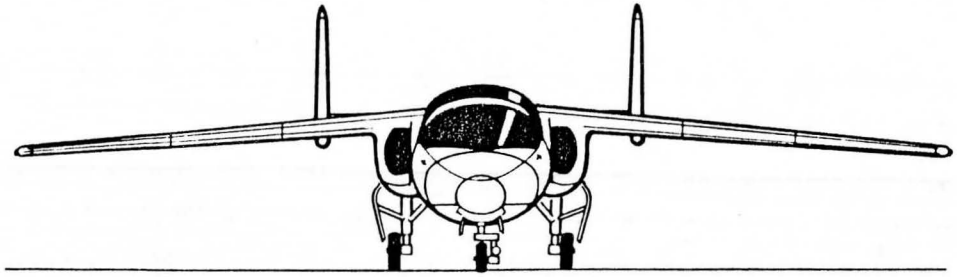
(U) Nearly every pilot who stepped into the T-46A commented favorably about the cockpit--its openness, its instrument layout, and its provisions for comfort (including air-conditioning). Many of them enjoyed the amount of view available to people in the cockpit of the T-46A. Some other features of the aircraft that were frequently praised were its easy starting system, its excellent fuel economy ("awesome," wrote one pilot), its lack of

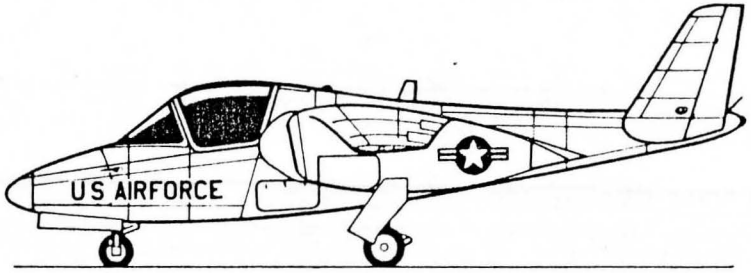
T-46A Performance Summary

(Sea Level, Standard Day, with 1000 lbs Payload)

LENGTH	29 FT 6 IN. (8.99 METERS)
SPAN	38 FT 7.8 IN. (11.78 METERS)
HEIGHT	9 FT 11.8 IN. (3.04 METERS)
WEIGHT EMPTY	5184 LBS (2351 KG)
TAKE-OFF WEIGHT	6817 LBS (3092 KG)
TAKE-OFF GROUND ROLL	1345 FT (410 METERS)
CRITICAL FIELD LENGTH	2120 FT (646 METERS)
MAXIMUM AIRSPEED	397 KN (AT 25,000 FT/ 7600 METERS)
SERVICE CEILING	46,500 FT (14,173 METERS)
SINGLE ENGINE RATE OF CLIMB	795 FT/MIN (242 METERS/MIN)







T-46A Performance Summary

Figure IV-B-1

maintenance problems (as late as May 1986 the Air Force saw eight important maintainability and reliability parameters likely to be exceeded with the plane), many of its traits during flight ("very stable platform for basic instrument work"), and its stall characteristics ("benign"). Even the most critical individuals (with a few exceptions) thought the T-46A was a definite improvement over the T-37. For example, the statement, "Bottom line: The T-46 has the same bad characteristics as the T-37 with newer avionics and systems," was part of a flight test report that contained numerous plaudits for specific aspects of the airplane. All of the "VIPs" who flew the T-46A found it easy to fly and enjoyed their experiences. "Nice classroom environment," was the comment of General Andrew P. Iosue, commander of the Air Training Command, and "Certainly will be a fine student training machine," said Brig Gen R. F. Gillis, also of ATC. (As will be seen, the only "VIPs" to offer relatively guarded statements about the T-46A were Senator Barry Goldwater and one of his aides.) A final argument in favor of the T-46A was not technical in nature, but rather dealt with the U.S. economy in its world setting. This point was that the T-46A was a potentially attractive export item that could help the American balance of trade with other nations.[56]

Increasing Difficulties

(U) For all the merits of the T-46A, Air Force personnel

continued to have grave concerns and criticisms regarding the trainer. Those concerns and criticisms were toward the problems that persisted into 1987, and also toward the reason for the longevity of those problems: the Fairchild Republic Company. When Maj Gen Michael D. Hall, commander of AFOTEC, took a demonstration flight in the T-46A, he commented that he was pleased with "the outstanding cooperation between the contractor and Air Force members."[57] In fact, however, almost from the beginning of the T-46A project, Air Force people had found it difficult to work perfectly with their FRC counterparts because those Fairchild employees frequently failed to understand some technical matter, or failed to complete a task in time, or simply displayed an attitude toward the project that was detrimental to its success. Several examples will suffice.

(U) At an Incremental Critical Design Review (CDR) meeting in 1983, the non-FRC attendees unanimously rejected as "unacceptable" two different proposals from the FRC engineers on specific technical design questions. In February 1984, an engineer from the AFFTC concluded that FRC was giving a certain important issue only "low priority" because the company operated under the assumption that "everything will be solved in flight test." He also found "no indication that FRC has even admitted this problem to [the] SPO." Five AFFTC representatives to a Technical Interchange Meeting at FRC in mid-1984 concluded that a lead engineer with the SPO for the T-46A, Bill Imfeld, "was

obviously agitated and disturbed with FRC's shortcomings," and also that the aircraft company "apparently had hoped the Air Force would forget about" an issue that needed to be dealt with at the meeting. Air Force engineers discovered in 1984 that FRC was basing some of its work upon an outdated military specification publication, and also that "numerous pieces of FRC hardware in the inlets" were "in violation" of the Interface Control Drawing (ICD). Two Air Force engineers on a trip to the FRC plant in 1985 noticed that only one electrician was working on the T-46A, and that the individual had only a "very low" level of technical expertise, "causing additional delay." Finally, Air Force representatives had planned on a joint review of a Mission Completion Success Probability Model to be submitted by FRC as the essential feature of a February 1986 meeting with FRC people at Wright-Patterson AFB, but the model was not ready. The meeting was virtually ruined because the FRC representatives were "unable to provide much assistance . . . because they had little if any idea themselves of the nature or origins of the model."[58] Thus, not only was much of FRC's work with the trainer riddled with incompetence, there was also a growing sentiment of irritation toward the company among governmental employees, both civilian and military.

(U) All of these frustrations in their dealings with the FRC made the military and civilian Air Force personnel who were involved with the T-46A dubious about the entire trainer project.

"The general feeling," reported the T-46A Project Manager, Capt Eric P. Hansen, of a 1983 meeting at Wright-Patterson AFB, "was one of backsliding from the gains and improvements made in the utility and simplicity of the aircraft for the student training mission."[59] And Air Force doubts only increased with the passage of time.

(U) The aforementioned cut in monthly progress payments from the Air Force to FRC (August 1985) followed an important critique of the manufacturer. Air Force Contract Management personnel completed a total of fifteen Contractor Operations Review (COR) studies by mid-1985. Of the first eleven companies reviewed, only Fairchild Republic received unsatisfactory ratings in all eight categories of the study format. Those eight COR components were: manufacturing, industrial materiel management, contract management system, industrial safety and fire protection, subcontract management, engineering, quality assurance, and product integrity. Fairchild Republic did several things in response to the criticisms and suggestions of this comprehensive study. A major effort was made to restructure its mid-level management--its plant supervisory personnel, organization and techniques. The company appointed a new president who was experienced in heading an aerospace company. Another step taken in 1985 by the company was to hire 535 people, many of them to work in areas where a lack of personnel had led to the problems noted in the study. In that same year, FRC employees completed

28,000 hours of training, according to company spokesmen, designed to improve production quality in every facet of the T-46A project. The company ordered several new major equipment items. FRC invested an additional $46 million in the T-46A program. Even before this, the company had taken at least one other measure to alleviate its problems with the T-46A. FRC added $21 million to its reserves during the second quarter of 1985, in order to cover the higher costs of the T-46A than it had planned.[60] Meanwhile, the Cessna Aircraft Company of Wichita, Kansas, aware of the problems with the T-46A, reportedly gave the Air Force a document arguing that it would be a far wiser move for the service to drop the T-46A and instead retool the existing T-37 trainers, including installing new engines on the aircraft.[61]

(U) The Air Force now had an alternative to the increasingly troublesome T-46A project. Alarmed at the prospect of lost jobs in their home state, both Democratic and Republican members of Congress from New York issued public statements supportive of Fairchild Republic, asking for more time for the company to rectify its deficiencies.[62]

(U) Those actions by Fairchild Republic did not dissuade the Air Force from further second thoughts about the T-46A program. When the Vice Commander of the Air Training Command, Maj Gen Charles R. Hamm, came to Edwards to fly the T-46A early in 1986,

his familiarization flight was more significant than most, for it was designed "to give the using command a quick look evaluation of the aircraft at a point which is crucial to the future of the program." General Hamm's flight went well, and he offered comments about the T-46A that were nearly all positive (of the takeoff rotation, he said, "not as bad as he expected," and that he felt even student pilots could "accommodate . . . after only a couple of takeoffs").[63] Early in 1986 Secretary of the Air Force Russell A. Rourke announced that the T-46A would not receive Lot III production funding for FY 1987, and even the FY 1986 funds for 22 aircraft of Lot II production were the source of disagreement between the two houses of Congress. By the summer of 1986 Fairchild had received only FY 1985 funds for manufacturing 10 production aircraft (and the two test planes). Lieutenant Colonel Edmondson, Director of the T-46A CTF, went to Washington at the request of the Air Staff, to meet with Congressman Nicholas Mavroules of Massachusetts, who was expected to be a strong supporter of the T-46A. In answer to the congressman's queries, Lieutenant Colonel Edmondson assured Representative Mavroules that the T-46A was a better aircraft than the T-37.[64]

(U) At that point, Congress was quite undecided about what to do regarding the T-46A. Evidence of that indecision might be seen in Senator Barry Goldwater's reaction to his "VIP flight" in the aircraft early in July 1986. Lieutenant Colonel Edmondson,

who flew alongside the venerable Arizona solon and retired AF Reserve major general, wrote afterward: "His post mission comments concerning the flight were generally favorable with specific mention that he supported the 'Chief's' (Air Force Chief of Staff) earlier decision not to produce the T-46A because that is the official Air Force position. He indicated that he could support the 'Chief' if that decision was changed by the Air Force."[65]

(U) Senator Goldwater had already supported the Air Force position very effectively in the Senate during debate in mid-May. The Arizonan put forward an amendment to another bill, which would deny all the funds appropriated for the 1986 fiscal year for the T-46 program. He told his fellow Senators about each of the technical and structural difficulties experienced with the aircraft, adding that it looked as though "it was built with a hammer." The incident when one of the test aircraft had shaked violently had occurred on 5 May 1986, and the Senator used it to point out the relatively unknown safety potential of the plane: "I am an old pilot. I quit being a bold pilot a long time ago. . . . Mr. President, this airplane, from the first one delivered, has had troubles. . . . I had every intention of going out over the Memorial Day weekend and having a flight in it. But if it is still doing these things, I will just get in the cockpit and look at it."[66]

(U) Senators Daniel Patrick Moynihan and Alfonse D'Amato of New York and Lawton Chiles of Florida came to the defense of Fairchild Republic and its airplane, claiming that killing the T-46A program would probably kill FRC as well. Senator Chiles warned that dropping the program at that time would mean "to be saddled with an out-dated, less capable Air Force trainer and new program start up costs whenever the T-46 program is recompeted not to mention costs associated with the cancellation," so that it would be "a bigger waste of money" than would continuing the program. Senator D'Amato charged that the T-46A was "performing well at Edwards. The Air Force cannot and will not deny that." So great was the prestige and influence of Senator Goldwater on any military issue before Congress that Senator Moynihan frankly admitted, "I think we know the likely outcome of any amendment offered by the distinguished, revered, and respected chairman of the Armed Services Committee." Goldwater's position was merely strengthened further by statements from Senators Robert Dole of Kansas, Strom Thurmond of South Carolina, and Phil Gramm of Texas, all arguing the case for ending the T-46 program. Moynihan was correct, for the Senate voted to deny the T-46A program the funds that had been allocated to it for 1986.[67]

(U) That was still a long ways from the end to the T-46A program. In the late summer of 1986 top Air Force officials, military and civilian, consistently made public avowals such as that of Assistant Secretary of the Air Force Thomas Cooper: "As

far as the Air Force is concerned, the program is dead." Yet Fairchild Republic fought on, using a visit to its factory to convince influential Congressman Les Aspin of Wisconsin to back the T-46A program, and claiming that "various Air Force commanders" were continuing to encourage the company to try to revive it. In August the House of Representatives voted against the amendment that Senator Goldwater had so easily shepherded through the Senate in May.[68]

Congress Agrees to End the T-46A Program

(U) Even after weeks of conference discussions on the issue between representatives of the two houses, congressional resolve of the T-46A question was held up in October 1986 by a filibuster led by Senators D'Amato and Dennis DeConcini (Arizona). The format ultimately agreed upon by Congress was to direct the Air Force to hold a new trainer competition by 1 January 1988. The competition would be among the T-46A, the T-37, an upgraded T-37 with new engines and tail (as well as electronics), and any other aircraft that could meet the Air Force training requirements. This could mean entries ranging from the new U.S. Navy T-45A "Goshawk" to inexpensive turboprop airplanes built by companies in Italy, Switzerland, or elsewhere. The fact that the USAF now owned the data package for the T-46A could mean that even if the T-46A won the flyoff, the Air Force could select a different company to produce it. (If the current situation were to ruin

the Fairchild Republic Company, as so many people had warned, it would be absolutely necessary to have a different manufacturer.) Because the language of the congressional compromise forbade Air Force money going to help any of the competing companies modify their aircraft for the flyoff, Cessna, which had perceived the woes of the T-46A program as a potential windfall for itself, was left facing an expensive gamble. Fairchild Republic, by November, was holding exploratory discussions with several other companies regarding the possibility of becoming partners in the competition, so as to limit the economic risk for either company.[69] The entire NGT issue seemed to hang in a vacuum during the closing months of 1986.

(U) Meanwhile, there remained the possibility that, no matter what aircraft would win that future competition, the Air Force would shortly receive the ten T-46As of production Lot 1. In late August Headquarters AFSC inquired of the AFFTC as to whether any of its branches could make good use of some of those ten trainers when they were produced. Perhaps, suggested one office chief at AFFTC, the T-46As could "replace the A-37s currently being used by the Test Pilot School and any other test program requiring a slow, very slow chase aircraft." A major problem would be inherent in the acceptance of any T-46As as working aircraft: the Air Force Logistics Command (AFLC) had never done anything toward obtaining spare parts for the airplane. This meant that unless the T-46A should surface as

the winner of the future trainer competition, there might never be adequate logistics support for the ten production aircraft.[70]

(U) Neither the 6510 Test Wing nor the 6512 Test Squadron expressed a desire to acquire any T-46As, although the Test Pilot School replied that it could use six of the craft to replace A-37s. Col Dale C. Holt, Commander of the 6510 Maintenance and Supply Group counselled that the only feasible manner the AFFTC could make use of T-46As would be if the contractor that had manufactured the plane supported it logistically. And finally, there was complete uncertainty as to whether the ten production aircraft would be built, had been built, or even would be available to the AFFTC if and when they were built.[71] The AFFTC did not proceed toward obtaining any more T-46A aircraft at that time.

(U) According to the contract between the Air Force and FRC, the first production T-46A was to be delivered on 30 November 1986. As late as May 1986 the company continued to declare that this date would be kept, while Air Force officials guessed that the service wouldn't see that original production aircraft until early in the next year. The Air Force acceptance flight of the first production T-46A was on 16 January 1987, and late that month the plane was ferried from the FRC facilities on Long Island to Edwards AFB, arriving on 1 February.[72]

(U) Flight testing of all three aircraft--the two test planes and the production model--ended on 13 March 1987. At that time, the first test T-46A, S/N 84-0492, had been through 185 sorties for a total of 281.5 hours, the second test plane, S/N 84-0493, had been flown 78 times for 109.1 hours, and the production aircraft, S/N 85-0596, had accumulated 34 flights for 52.0 hours: a total of 442.6 flight hours.[73]

(U) The other nine production aircraft of Lot I never were manufactured by Fairchild Republic. The Government Accounting Office (GAO) report on the T-46A program (prepared in May 1986 for Senator Dole) had pointed out that according to the contract, Fairchild Republic would have to absorb approximately $122 million in excess costs for production of Lot I. In April 1986 a Defense official had predicted that sooner or later FRC would ask the Air Force to release it from that massive obligation, by terminating the program before production of the remaining nine production T-46As.[74]

(U) The Goldwater amendment of October 1986 had stated that no funds could be obligated for procurement of a Next Generation Trainer until the Secretary of the Air Force should conduct a competition evaluating the cost and performance of various possible candidate aircraft. The competition would be financed by any funds still available from the FY 86 appropriations for the T-46A, and would include a flyoff among the airplanes.

Personnel at the Flight Test Center, knowing that the congressional plan had set 1 January 1988 as the deadline for the trainer competition, formulated in late 1986 a set of recommendations for the flyoff. Among those recommendations were that all the testing be done at Edwards AFB, that each competitor submit two aircraft, and that the flyoff be not merely a contest between the various aircraft but rather an evaluation of each aircraft in the light of specific criteria outlining the needs of the Air Force.[75] There was some early thought that the Air Force might limit the competition to aircraft that had side-by-side seating and twin turbo-jet engines. This would immediately rule out a number of aircraft from consideration, and almost guarantee a victory for the T-46A.[76]

(U) In December the Air Staff directed AFSC to prepare for the flyoff, and AFSC handed the problem over largely to ASD, from whence the task went to the T-46 System Program Office. Lieutenant Colonel Edmondson and Lieutenant Colonel Clinch attended a preliminary planning meeting for the Primary Trainer Evaluation (PTE) at Wright-Patterson AFB in January 1987. Attendees at that planning session were told to plan on the PTE being held between 1 September and 15 November 1987, with a total of five aircraft flying 20 to 30 sorties each. The trainer competition would supposedly be formally opened to all comers with a Commerce Business Daily Request for Proposal (RFP) announcement about 1 April 1987. Yet the lack of formal

direction from Washington, combined with the general perception held by many people that the Air Staff did not want this congressionally-mandated flyoff, prompted CTF Director Edmondson to write: "No one, and I mean no one, knows if this PTE is really going to actually take place." In case it should take place, he recommended a relatively simple testing process, and listed the specific steps that the AFFTC should take, both immediately and later, toward preparing for the PTE.[77]

(U) As the T-46A program lumbered to a halt in late 1986 and early 1987, many people looked in the direction that Senator Goldwater and a number of Air Force spokesmen had pointed: toward the T-37. As one writer put it, the T-37 fleet of the USAF averaged 12,000 hours in flying time, and "if most of the aircraft can be certified to 18,000, that makes the primary trainer problem about six years less urgent than it was thought to be."[78] In other words, there would be time to develop a Next Generation Trainer, as well as to obtain adequate funding for it from Congress. In the fall of 1986 the Air Force loaned a T-37 to the Cessna company for it to install the modifications package that Cessna wanted to use in the coming trainer competition. This did not commit the Air Force to using Cessna for such a modification, however, for in September 1987 the service began seeking proposals from other companies to do the job.[79]

(U) The end to the T-46A program came with a great deal of

acrimonious comment from several quarters. An instructor pilot in Arizona wrote to an aerospace magazine, detailing all the ways in which the T-37 he flew each day was inferior to the T-46A, and asking, "How can a long-lead-time program like the Fairchild T-46 trainer be allowed to continue all the way through concept, design and prototype production before it is decided that the program should be axed?"[80] As with so many public matters, the T-46A program was the subject of a number of misperceptions and fallacies. For example, the Arizona instructor pilot claimed that the three T-46A aircraft which had been manufactured were flown a total of only 60 hours, whereas the total was actually 442.6 hours in the air.[81]

(U) Another misconception about the demise of the T-46A was that Congress was "at fault" for halting funding of the development and production of a fine aircraft that filled an important need. In fact, as has been shown, the Air Force, feeling the constriction of the Gramm-Rudman Act to balance the budget of the U.S. government, decided to spend its money on other things instead of an increasingly expensive airplane built by a slow and inept contractor. The GAO pointed out in its study of the program that Fairchild Republic promised extravagant performance requirements for the T-46A--during their bid for the contract. As they designed and developed the real airplane, FRC was forced to modify and lower some of those performance expectations.[82] In defending the Air Force's effort to get

Congress to release the service from a commitment to the T-46A, Assistant Secretary of the Air Force Cooper noted: "We're not talking life-cycle costs, we're talking affordability." Leaders of the Air Force came to the conclusion--between late 1985 and early 1987--that the service simply could not afford the T-46A, no matter how many technical problems it had or how many had been cleared up by FRC. Senator Robert Dole was among those members of the Congress who agreed with the Air Force, and in October 1986 he warned that the Air Force might not even be able to afford whatever aircraft should win the future trainer flyoff.[83]