

Testing Times

by Air Marshal Philip Rajkumar



Dassault-Dornier Alpha Jets in formation over the French countryside.

The Advanced Jet Trainer (AJT) evaluation

In the early 1980s, Air Marshal DA Lafontaine, the then Air Officer Personnel (AOP), headed a committee which was tasked to critically evaluate the flying training system being followed at IAF flying training academies at that time. This was necessitated by the fact that the de Havilland Vampire trainers (and fighters) had been retired from service in 1976 and no suitable replacement had been found to replace them at the Jet Training Wing at Hakimpet, Hyderabad. Young pilots were going from the Kiran basic jet trainer straight to the Hunter Operational Conversion Unit (OCU) and then to MiG-21 and Sukhoi Su-7 squadrons which formed bulk of the fighter fleet. It was felt that an Advanced Jet Trainer was necessary to fill the gap in performance between the Kiran and the Hunter. The Lafontaine Committee recommended that the IAF should evaluate AJTs available in the world market and induct a suitable aircraft as soon as possible into the training system. The situation worsened when the Hunters were also phased out in the late 1980s and rookie pilots were sent from Kirans straight to the MiG-21 Operational Flying Training Unit (MOFTU). This move had an adverse effect on the accident rate of the fighter fleet of the IAF.

By the end of 1985 the Plans branch at Air Headquarters had issued an Air Staff Requirement (ASR) and short listed two AJTs for evaluation. These were the Dassault/Dornier Alpha Jet from France/Germany and the Hawk from British Aerospace, UK. One of the requirements in the ASR was that the aircraft should have “good spinning and recovery characteristics”. In April 1986 a joint team consisting of two IAF test pilots, a flight test engineer, a maintenance engineer and several HAL and DRDO personnel was formed at Air Headquarters to proceed to France and the UK to evaluate the two aircraft types. HAL and DRDO personnel were involved because the chosen aircraft was to be manufactured under licence in India. Apart from the flying evaluation, a techno economic evaluation was required to find out the most cost effective option for manufacturing the aircraft in the country. The team was led by Air Commodore BD Jayal, Director Air Staff Requirements at Air Headquarters. Squadron Leader PR Sharma and I were the two test pilots from ASTE. Sqn Ldr Naresh Krishnan, also from ASTE, was the flight test engineer. Wing Commander Dasgupta of Air Headquarters was to do the maintenance evaluation. The HAL team was headed by Ganapathy,

General Manager, Aircraft Factory at HAL, Bangalore Complex. The Engines and Accessories Divisions were also represented. The DRDO reps were from the Chief Resident Engineers office which was the fore runner of today’s Centre for Military Airworthiness and Certification (CEMILAC).

The team was asked to assemble at Air Headquarters in the last week of April 1986 for briefing prior to departure. Before going to Delhi, PR Sharma and I flew a sortie in a Kiran Mk.1 and carried out a number of spins to feel comfortable in a spinning aircraft. Spinning practice is invaluable before embarking on spin evaluation in a new aircraft because one’s ability to observe spin characteristics with a critical eye is dependent on current spinning practice. When one is current in spinning it is as if many more channels of observation have opened up and situational awareness (while in the spin) is vastly improved.

The Alpha Jet

The Alpha Jet was an Advanced Jet Trainer jointly developed by Dornier of West Germany (Germany was unified only in November 1990!) and Dassault of France, in the early 1970s. It had two

tandem seats and was powered by two Snecma Larzac engines of 1400 kg thrust each. It had shoulder mounted wings with marked anhedral and had conventional powered flying controls. The aircraft was fitted with ejection seats and conventional round dialed instruments in the cockpit.

We arrived in Paris on 27 April 1986 and had a meeting with Dassault management at their St Cloud office the next day. At this meeting it was decided that PR Sharma, Naresh Krishnan and I would immediately proceed to the Dassault flight test centre at Istres, near Marseilles on the Mediterranean coast of France, to commence evaluation tests the following day. I was delighted to hear of this arrangement because Istres was where I had trained as a test pilot in 1972 and therefore knew the local flying area well. The three of us were driven to the Le Bourget airfield and flown to Istres in a Dassault Falcon executive jet. Miriam Goldstejn, a lady Dassault design engineer, accompanied us even as a smart stewardess served us a delicious meal at 40,000 feet with wine and champagne during the one hour flight but as soon as we landed we were ushered into a class room to commence our ground training!

We were explained the cockpit layout, the various systems on board, aircraft and engine limitations and flying procedures at Istres which had a lot of NATO and French Air Force aircraft flying around. Two Dassault test pilots, Patrick Experton and Jean Pus (pronounced "Poos") and a flight test engineer Jean Paul Duval came and took us to the aircraft and familiarised us with the cockpit and ran through the cockpit procedures and emergencies check list. As we would always be flying with one of the company test pilots, PR and I decided to concentrate on evaluating aircraft handling qualities and performance rather than devote too much effort in trying to remember checks and procedures. We were told that two versions of the aircraft would be offered for evaluation, the Alpha Jet NG (*Nouvelle Generation*) which was an attack version with a laser range finder, an Inertial Nav Attack System (INAS) and a Head Up Display (HUD). This aircraft had a slim pointed nose and was not cleared for spinning. The second aircraft was a standard trainer with a blunt nose which was cleared for spinning. I never knew that a small change in the shape of

the nose would have such a marked effect on spinning characteristics of an aircraft. On enquiring about this characteristic a Dassault aerodynamicist explained to me with the help of diagrams how the wake generated by the slim pointed nose of the spinning aircraft impinged on the fin and rudder and reduced its effectiveness for recovery. A blunt nose, on the other hand, generated a wake which did not hit the fin at all. It was an interesting lesson...

On 29 April 1986 at 0730 hrs Jean Pus and I got airborne from Istres in Alpha Jet NG X43-2 for Tours in the north of France where the French Air Force flying academy was located. We climbed to 40,000 feet through a complete overcast and flew without being able to see the ground beneath for almost the entire duration of 95 minutes. The flight gave me

The next day I flew a 75 minute sortie in the trainer version X-152 with Patrick Experton. We did spinning, all aerobatics, a practice flame out pattern over the airfield and some circuits and overshoots. The aircraft was a sheer delight to fly but what impressed me most was that four different types of spins could be demonstrated to pupils in perfect safety. The aircraft could be put into a normal spin, an oscillatory spin, a flat spin and an inverted spin depending upon the control inputs at entry. I was quite familiar with normal and oscillatory spins as I had experienced them in a number of aircraft. The flat and inverted spins were new to me and I was fascinated by the experience. In a flat spin the predominant motion was very fast yaw in the direction of the applied rudder with the nose of the aircraft on the horizon. The



Standing (left to right) Jean Paul Duval, PR Sharma, Patrick Experton, Philip Rajkumar, Jean Pus and a Dassault Public Relation Officer.

an opportunity to evaluate the climb and cruise performance of the aircraft as well as some functions of the INAS. PR Sharma and Patrick Experton followed in the trainer version X-152. At Tours we joined the rest of the team and were briefed about the training syllabus being followed at the academy and how extensive utilisation of simulators helped improve student performance in the air. I was impressed by the close relationship between the French Air Force and the private industry represented by Dassault. After a lunch hosted by the base commander we returned to Istres in the evening.

spin axis passed behind the cockpit and one had the feeling of being chucked forward against the straps making the eyeballs bulge out! In the inverted spin the field of view during the spin was restricted and one was hanging against the straps. The recovery action was simple and elegant for all types of spins – hands and feet off the controls and the aircraft recovered in a steep nose down attitude! Two handles provided on the cockpit frame to close and raise the canopy were called 'spin recovery handles' as all that one had to do to recover from a spin was to take the feet off the rudder pedals and grab the two handles with one's

two hands. I decided to ask for another sortie devoted exclusively to spinning.

I flew a sortie in the attack version again on 2 May 1986 with Jean Pus and he showed me the weapon delivery capabilities by executing dummy attacks on targets in the local flying area. Since the IAF was not interested in this version I did not do a strict evaluation of this aspect but concentrated more on circuits and landings. The aircraft was easy to take off and land with a good reserve of power. During this sortie PR Sharma and I met up in the air and did some close formation flying and a tail chase, both exercises having been pre-briefed on the

I managed it at the second attempt. After each spin we would recover at about 20,000 feet and climb back to the start height and enter a spin again. We did four four-turn spins in all. To enter an inverted or flat spin at will and recover easily was an unforgettable experience. We returned to the airfield and I did some approaches from the rear seat. The forward visibility was adequate but not great. Patrick asked me if I was game to try out a vertical overshoot! For this type of go around we opened full power and did a loop lowering the wheels while inverted, throttling the engines to idle, extending airbrakes, lowering full flaps and controlling the speed to about

costumed bare breasted, long legged show girls, acrobats, comedians and dancers. We left for the UK on 6 May 1986.

The Hawk

This tandem seat trainer was designed in the early 1970s and was powered by a Rolls Royce Adour Mk 861 engine producing 5000 lbs thrust. This engine was the unheated version of the Adour 811 engine which was being produced under licence at Bangalore. The Hawk was a low winged aircraft with conventional powered controls. The rear cockpit was slightly raised providing good view to the instructor over the pupil's head. The aircraft had ejection seats and conventional round dials instruments.

On arrival in the UK, we were met by BAe officials and taken to a hotel in Weybridge, Surrey. The next day we attended a meeting in the historic Hawker aircraft factory building at Kingston-upon-Thames where PR Sharma and I were introduced to the two test pilots who would be flying with us, Jim Hawkins and Chris Roberts. We went with them to the Dunsfold airfield nearby and familiarised ourselves with the front and rear cockpits of the Hawk. This was followed by systems lectures and a run through normal and emergency checks and airfield flying procedures. As in France we did not memorise any of the checks and procedures because one of the company test pilots would always be with us.

On 8 May 1986 I flew a 85 minute sortie on Hawk X-345 with Jim. We climbed to 40,000 feet and arrived over Cardiff and started doing spins over the Bristol Channel. The Hawk did not want to spin and one had to sit with pro spin controls applied for several seconds before she dipped the nose and settled into what appeared to be a steep nose down corkscrew motion. Standard application of anti spin controls ensured quick recovery. After the Alpha Jet experience this was an unimpressive spin. We then descended to about 15,000 feet and did all aerobatics and the handling qualities were good. On circuit the aircraft handled crisply with quick response to power changes. After a couple of overshoots I did a smooth touch down and the toe brakes slowed the aircraft down comfortably. Jim then invited me to join him for a quick production test flight on an aircraft meant



With BAe test pilot Jim Hawkins at Dunsfold, Surrey, May 1986.

ground before take off. PR Sharma had also flown four sorties by now and we kept comparing our impressions of the aircraft.

After this sortie I went up with Patrick Experton in the front seat of the trainer version with me at the back as I had not evaluated the instructor's seat till then. This was the spinning sortie I had asked for and it turned out to be one of the most exhilarating rides I have ever had in my career. The day was cloudless with bright sunshine and we climbed to 40,000 feet over the Mediterranean Sea to the west of the base to start spinning. It took a bit of time for me to get the control inputs right for the flat spin and the inverted spin but

130 knots. By judging the distance correctly the last part of the loop became the final approach and we landed off the loop! It was great fun as I had not done that on any other aircraft. That night Miriam, Patrick and his wife took us out to dinner on the Marseilles waterfront where we tasted the famous sea food dish called 'bouillabaisse'.

The team was shown an engine change in the hangar in 20 minutes and all the ground equipment needed for first and second line operations at a base. We went back to Paris for a round of wash up meetings. On the night before our departure we went to the famous Lido nightclub on the Champs Elysees and witnessed a spectacular show full of fabulously

for a foreign customer. We flew for 30 minutes in K-149 and while Jim in the front seat went about checking various parameters I enjoyed myself looking at the picture postcard perfect English countryside below me. Jim let me do the landing from the rear. The view from the rear was excellent and after almost 1000 sorties in the rear seat of a MiG-21 trainer the landing was laughably easy!

On 9 May 1986 we were flown in a company executive jet to the RAF Hawk training establishment at Valley in Wales. Air Commodore Brijesh Jayal flew there from Dunsfold in a Hawk and we were briefed about the training pattern followed there. We also saw how extensively the Hawk simulators were being used. The Red Arrows aerobatic team was supposed to put up a show over Valley for our benefit but bad weather did not permit it. So after lunch we flew to RAF Scampton where the Red Arrows were based and there they did a flat display for us because of the low cloud base. We spent some time talking to the team pilots and they were full of praise for their mount. The visits to Valley and Scampton were very informative.

On 12 May 1986 Jim and I practiced close formation with PR Sharma and Chris. We also did some tail chase and other air combat manoeuvres. The Hawk performed more than adequately during these exercises. The next day I flew with Chris in K-149 which had been fitted with drop tanks. We transited at height till we were over the south coast of England near the Isle of Wight when we descended to 500 feet over the sea and checked out handling with tanks fitted. There was no marked change in handling qualities with the tanks. We did a max IAS run along the Solent and then turned inland for Dunsfold. The following day I flew two more sorties with Jim in X-345. For the first sortie the aircraft was loaded with 4x1000 lbs bombs and in spite of the heavy load the performance was impressive. We had to consume fuel to quite a low level to get the landing weight to the correct figure. We used aerodynamic braking on the landing roll down to 60 knots before using brakes to avoid over heating them. During the last sortie we did two spins with in spin and out spin aileron applied. The aircraft exhibited classical behaviour in that in spin aileron application made the spin oscillatory while out spin aileron

smoothened it. On the return leg to Dunsfold the weather deteriorated and we joined up with PR Sharma's aircraft to do a radar controlled approach to the runway in close formation. We had to close in to less than one wingspan to maintain contact with the leader. In India we never did close formation in clouds and this was good fun. We broke cloud at 200 feet above ground in heavy drizzle and landed without much ado.

techno-economic assessment report. PR Sharma, Naresh Krishnan and I managed to submit our report by the due date. Air Commodore Jayal then made a presentation of the salient feature of our report to the CAS, Air Chief Marshal DA Lafontaine in mid June. Arun Singh, the Minister of State for Defence was also present. Afterwards the minister quite clearly told the CAS that he would like the contract for the chosen aircraft to be finalised by 31 March 1987.



The secondary ground/maritime attack attributes of the Hawk and Alpha Jet were well recognised even as the Indian Air Force evaluated the competing types to meet its advanced jet training requirements. The Alpha Jet (below) is seen with an anti-shiping missile plus CCMs while the Hawk (top) has air to ground rocket pods and a centre line 30mm cannon pod attached.

On the last day in the UK we had the usual wash up meetings. That night BAe hosted a grand banquet in a lovely restaurant located in a disused water mill somewhere in Surrey. I had the pleasure of meeting two famous BAe test pilots, John Farley and Andy Jones. John was well known for his breathtaking displays of the Harrier at the Farnborough air show while Andy was equally famous for his displays of the Hawk.

We returned to India on 16 May 1986. Air Commodore Brijesh Jayal wanted our flying evaluation report ready by 1 June 1986. The HAL and DRDO team members said they would take more time to write the

Unfortunately the techno-economic negotiations with Dassault and BAe could not be completed by HAL and a three month extension till 30 June 1987 was sought, to which the Ministry agreed. Then, on 17 April 1987, Chitra Subramaniam, the *Hindu* newspaper correspondent in Geneva, broke the 'Bofors story'. After that no bureaucrat or politician in Delhi would touch a defence deal with a barge pole - and the rest is history. Dassault eventually pulled out of the competition and the Hawk AJT was finally inducted into the IAF in 2006, or some 20 years after our evaluation visit!