

SHARON FOSTER
O.F. TUES 1pm - 3pm
AUSTRALIAN HISTORY.

Assignment 3 - Local History Report.

RAAF Base Williamtown Environmental Impact.

With the advent of World War Two in September 1939, Australia's defence needs changed overnight. The importance of the Port of Newcastle, and its steel industry complexes highlighted the need for military forces to be in the area. In 1940, 739 acres were acquired in the small community of Williamtown and, on the 15th of February 1941 the RAAF station at Williamtown was officially formed.

RAAF base Williamtown is an important economic, physical and social development in the Port Stephens Shire. It is one of the largest local employers being second to B.H.P. The base's presence is also significant in terms of size, operations and its effect on regional planning in the area.

The principal urban settlements surrounding the RAAF base are Raymond Terrace and Medowie. Medowie, being a major growth centre in the Port Stephens Shire, alone, the population growth in the period from "1976 - 1981 was 19.5%". 1. " The RAAF base Williamtown, Raymond Terrace and Medowie each have lower unemployment rates than either the Shire or the State ". 2. during the above period also. A positive impact on Raymond Terrace, Medowie and in general the Port Stephens Shire is the dependance of defence employment with the current expansion of the RAAF base overall.

The need for the New Tactical Fighter project at RAAF Williamtown stems from future national defence. Williamtown site was selected as the home base for the N.F.T project, following a series of studies, details of which are classified and therefore with-held.

1. Gutteridge Haskins & Davey Pty Ltd., Environmental Impact Statement
The Proposed Introduction of
New Tactical Fighter F/A - 18
RAAF Base Williamtown. Vol.2.
2. Ibid.,

Direct and positive impacts of this project include increased population, employment and housing bringing both social and economic benefits to the area. Housing in all these areas has increased with demand and thus making positive community programmes possible. Child care facilities, transport facilities and additional schools were of major importance as each respective community grew.

Another direct but unwanted and negative impact on urban and regional development, resulting from the changes in higher noise exposures, that are to be expected from the F/A - 18 aircraft. These increased noise levels are expected to be the only serious adverse impact. A number of residences around the base, Salt ash weapons range, Medowie and Raymond Terrace are all affected by runway or flyover noise or both. Letters of protest regarding the higher noise levels have been strong, many concerned with the education of their children being inhibited by the noise increase over their schools.

RAAF Williamtown have taken noise control measures to ensure minimal direct noise effects emanating from the F/A-18 aircraft, by applying limitations to noise sensitive development. To combat engine run-up noise the Engine Run-up Facility will be shielded with 5M high walls. But, in practical terms, little can be done to effectively control noise exposure.

Environmental impact on land will be the loss of flora and fauna. Where possible existing trees will remain but a large area will be cleared of vegetation and the usual habitat will move to other areas or adapt to the new environment and surroundings.

Many issues were raised, by the public, about the proposed N.F.T project from the present sewerage treatment plant at Williamtown being out of date to the excessive noise levels at Salt ash and the protest of any increase in noise levels due to the F/A-18.

The Department of Defence evaluated and considered all issues raised in the proposed N.F.T project and it's enviromental impacts and where possible made alterations so as minimal inconveniences would be felt.

The introduction of the F/A-18 is a positive step for the future defence of Australia. Regional development and community input with-in the Shire of Port Stephens benefits greatly by this project being in the region.

Williamtown RAAF base has housed many aircraft since it's establishment from Wirriways, Mustangs, Mirage jets , which are in their final phase out stage after 25years of service in the defence of Australia, to the high-tech F/A-18 Hornet. The expansion and conversion of the base from Mirage to F/A-18 is an important phase of RAAF Williamtown history which when completed will be documentated and placed in the RAAF base Williamtown archives, [REDACTED]

Note - The base also caters for many civilian airline movements, through joint airfield services, making it the major civilian airport in the Hunter region.

BIBLIOGRAPHY.

GUTTERIDGE HASKINS & DAVEY
PTY., LTD.,

Environmental Impact Report
The Proposed Introduction of
New Tactical Fighter F/A - 18
RAAF Base Williamtown.
Volume's 1 & 2.

Year?

GUTTERIDGE HASKINS & DAVEY
PTY., LTD.,

Final Environmental Impact
Statement.

**TRANSCRIPT OF INTERVIEW by SHARON FOSTER
of KEITH SULLIVAN**

Keith Sullivan, I'm Sharon Foster from the Newcastle University and on behalf of the University, I would like to thank you for giving me an interview on the history of the RAAF Base, Williamton.

Prior to questiontime, could you tell me about yourself and your career in the RAAF.

Thank's Sharon. Well, I joined the Airforce in very early 1947 and after receiving technical training as an Instrument Maker, I was posted and based at Archfield which was a wartime aerodrome just outside of Brisbane. With that particular squadron, we operated Mustangs, Wirraways and Tiger Moths, in fact it was The City of Brisbane Squadron, No. 23 Squadron. I remained there until the Korean war started in July 1950 and towards the end of 1950, I was posted to Korea where I remained - or I spent half of my time between Korea and Japan on an operational basis - and after we returned to Australia in April 1952 and was posted to Williamtown.

I rose through the ranks to become a Warrant Officer and ultimately I was commissioned in the mid 60s and I retired from the permanent airforce as a Squadron Leader in 1978. In 1981 they formed at Williamtown, No. 26 Squadron which is The City of Newcastle Squadron, and I was asked to go back into uniform part time to get the squadron off the ground. I was only in 26 Squadron a short time when the Department of Defence asked me if I would look after the technical works side for the introduction of the McDonnell Douglas F-18 Fighter. I remained part time in uniform until I finally retired because of old age in the middle of 1985. So in uniform, I spent approximately about 35 years in uniform.

Keith, why was Williamtown chosen as the site for the air base?

Well, Williamtown is based very very close to the Pacific Ocean, only a couple of miles away from the beach - just 30 kilometres out of Newcastle, and being only 60 air miles to Sydney, it was a strategic place to put a fighter base to protect the ports of Sydney, Wollongong and Newcastle and in particular, during the war years, to protect B.H.P. which was our main producer of steel.

How has the base grown, developed and changed since its inception in 1941?

Well of course it was basically a sand area and very swampy. To start off with, they had to start building an airstrip, taxi ways, aircraft hangers, maintenance facilities, messes, kitchens, laundries, we've got a cinema - there was so much to be done. If I recall, it was in 1942 before the first aircraft was located at Williamtown, and that was a squadron of Beau fighters. In about 1943, it started to build up a little bit bigger and there were Wirraways flying out of Williamtown as well. In fact, during those early years, I've seen some photographs of Williamtown and even as late as towards the end of 1983, there were still a large number of tents in use on the base, so it was pretty hard living. It was about this time 1943, that Williamtown thus became the home for the RAAF fighter force.

Williamtown then in about 1945 were training pilots for operational duty overseas and at the end of the war, the squadron of Mustangs from Lavion in Borneo - North West Borneo - were posted to Japan as the occupation force. The occupation force remained in Japan until the 1st July 1950 and the RAAF were then getting ready to withdraw. In the meantime back at Williamtown, Williamtown advanced from Beau Fighters - there was a squadron of Mosquitoes - that was an English built aircraft, twin engine, made of wood actually but a very nice aircraft, were operating out of Williamtown.

In 1947 the first Mustangs, American built fighters arrived at Williamtown and these, - an additional aircraft then, Mustangs, were then built at CAC Government aircraft factory in Melbourne - that was the Australian version of the American Mustang. The first English built Vampire fighters arrived at Williamtown in late 1948. Hawker De Havilland in Sydney, Bankstown then began building the Australian Vampires and they built something like 60 to 70 aircraft. However, when the Korean war started in July 1950, we were still operating Mustangs in Korea and additional Mustangs were sent from Williamtown to Irrakeeni(?) in Japan and large scale operations then began in Korea with the RAAF using Mustangs. The Korean war lasted until about the middle of 1953 and in early 1951 we phased out the Mustang and about 40 Meteor aircraft arrived from the UK - 77 Squadron and were using the Meteor for an air to air role against the Migs and our losses were so heavy and we lost a lot of pilots - they just weren't suited for air to air role and they took the aircraft then on to ground attack role. In 1954 the squadron of Meteors arrived back at Williamtown and that then began the phasing out of the Meteor aircraft. Oddly enough, most of the Meteors were sent to Woomera where they became pilotless aircraft and were used on firing missiles at them and shooting them down - so most of the Meteors were lost in Australia and shot down during air trials.

It was then in 1955 that Australia then decided to buy the Sabre aircraft which was an American fighter aircraft and they were built again at CAC and GAF Factories in Melbourne. We first flew the Sabre in late 1955 at Williamtown and I did the first Sabre course at GAF, Avalon, Melbourne. We flew Sabres until we sent two squadrons of them to Butterworth in 1957 and 58 and the Sabre aircraft remained at Butterworth in operation until 1969. During that period, I did a tour of Butterworth in 1958-61.

Then in 1961 the Government decided that we would buy the French Mirage, the 30, and I was selected in the team to go to France to study all the facets of the aircraft. Prior to going to France, I did a seven months language course at the Academy at Point Cook and I guess by the time I got over to France I was only about 40% efficient. After I had been there about twelve months, I felt that I was about 85% efficient. There were about 40 of us went over to France and the longest period anyone stayed there for training was just a little over a year. Then we came back to Australia in 1963 and I went down to Melbourne and we put the Mirage A-31 together. We took it to Darwin for tropical trials and I was away from home for another six to seven months. I spent a fair bit away from my family in that two years.

The Mirage proved to be a great advancement in technology on the Sabre and required a build up at Williamtown in training aspects, particularly for the maintenance personnel, and this was the first time at Williamtown from the war years that it was starting to require all the old aircraft buildings, and

maintenance facilities weren't up to date for modern aircraft; so about 20% of new buildings were added plus hangers and new taxiway and new strip at Williamtown during that period. We operated the Mirage right through until 19 - oh we are still operating it now in Darwin - we are just about to phase out the Mirage in 1988; so from 1963 to 1988 we've 25 years for a fighter and that's a very good record.

In 1981, when I started with the Reserve Squadron, The City of Newcastle Squadron, Williamtown, I was then asked to look after the FA-18 new works project for the introduction of the McDonnell Douglas FA-18. I was very fortunate prior to leaving the RAAF, that I was given a ride in a FA-18. I probably did a fair bit of flying although I was an Engineer Officer and a Squadron Leader and I did a lot of back-seat riding in the Mirage; I probably got 300 hours up in the Mirage. I did a lot of flying in Meteors. Beau fighters, Mosquitoes and so forth; so my service career, I was very happy to stay with the Fighter Force and be involved with that type of aircraft. It was a little bit more - oh a little bit better I think, for the mind to be active and into something in high technology so you can keep your mind alert as you get a bit older I think.

I assume then Williamtown has changed dramatically since 1943?

Well it certainly has Sharon, particularly with the introduction of the McDonnell Douglas FA-18 aircraft, and its sophistication compared to previous fighters. The Department of Defence allocated 110 million dollars for new buildings for Williamtown; that's almost completed now, and Williamtown in size from 1943 to now, - building area size - is probably about four or five times bigger than it was in 1945 even as late as 1952. The last of the - we are getting to the stage now on the base at Williamtown, where all the old wartime buildings are being demolished and in fact, only as a matter of interest, after I retired from the airforce finally in 1985, I started a little demolition business and I've been tendering to knock down buildings on the base. I've knocked down about six aircrafts hangers and about fifty buildings, so everyone always laughs at me - I get a bit of a dig of course - they said why am I knocking the base down, and I said 'well I helped build the base, so why shouldn't I knock it down'. So it's coming along quite nicely. Williamtown - the way they've developed with new roads - anyone who went back to Williamtown now who hadn't been there for five or six years, would get lost on the base. There's re-routing on the base, new roads, new buildings etc. The base is landscaped and its going to be really something for the area. One of the things the base does which I think is very good for the community, is on a Wednesday, the base is open to civilians to go in and inspect the base - tourist buses now arriving there all day on a Wednesday and they're escorted around the base on about a 2½ hour conducted tour and there are thousands of civilians now every week, having a look over the RAAF base. That's good - its the local people and the people of Australia who put the money into the base. Its a good opportunity to go and have a look at it. I'm still a member of the Officer's mess and I'm a member and I still use the mess frequently - social functions etc. I still have close ties back at the base, living so close. Its always a bit awkward after you get out of the service and if you live 30 or 40 miles away and with the advent of the booze bus - its very difficult to go back and drink water and go home. Medowie is very very close to the base and the area suits me fine. I can honestly say that I didn't leave the airforce a very rich man but the experience and the

time I had in the airforce, I can honestly say I really enjoyed my service career and did love the airforce. There's a camaraderie amongst service people - their language is different from civilians, and we've had reunions and Anzac days and that sort of thing. Its great gathering to talk about old times and war times, peace times etc. Service people generally stick together...if I had my life over again, I'd do the same thing. You don't leave with much money but a lot of experience.

And I believe you helped compile a book on the change over from the Mirage to the FA-18?

Yes they selected about ten personnel who had had many many years associated with the Mirage and I was one of those selected to write a phase of the Mirage which I've completed - there's a copy there for you - and it will all go into one book and it will go into the RAAF archives as the History of the Mirage which I think is - we need to preserve our history and in a few years time look back on. As a matter of interest too, I started the Museum down on the base at Williamtown and its - we haven't got very much in the museum at the moment but we've just been given a grant from the Government of \$500,000 to get the museum off the ground. So you'll notice outside the main gate, we've got an old - all the old aircraft restored there and they're on display to the public. Well I would like to think that in the next three or four years we'll have a very nice museum there and then we'll see more spectators and people coming to the base. \$500,000 I guess - we're going to need an aircraft hanger with a lot of things on display - out near the main gate so its readily available to the public. It should go pretty well I think.

Thank you very much Keith, you've been really helpful.

Pleasure. I've got a lot of old ties in at the University. I knew the previous Vice-Chancellor, Auchmuty, and Professor Don George. They're both very good friends of mine - and a lot of friends and golfing compatriots, Des ...

Thank you.

...

MINUTE PAPER

File No.	20
File Ref.	
A	
D	30-31

Reference: DGAIRENG 44/1988
DGAIRENG FOLDER 7

Telephone:

DAP-AF

481SQN CO

MIRAGE PROJECT HISTORY

Enclosed for your review and comment is the second draft of the Mirage Project engineering chapter prepared by GPCAPT Greg Grantham (Retd) on the basis of a wide range of inputs. In particular, further input from retired personalities in the WLM area (as C0481SQN indicated would be available) would be appreciated.

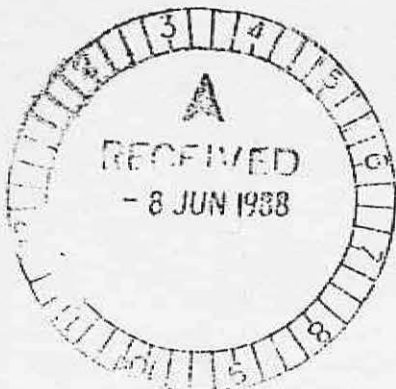


G.R. GILES
AIRCDRE
DGAIRENG-AF

6 Jun 88

Enclosure:

- Chapter on Mirage Engineering Highlights (Second Draft)



APPOINTMENT	FOR		APPROVED BY	FOR	
	ACT	INFO		ACT	INFO
OC		/			
COAIMS		/			
COAEMS					
DICAME					
DIGACT					
DICAJ					
DICAPM					
DICAP					
DICAM					
DICAPM					
SPECIAL INSTRUCTIONS					

CHAPTER ON MIRAGE ENGINEERING HIGHLIGHTS (Second Draft)

Engineer involvement with the Mirage started when the Air Staff Requirement (ASR) for a fighter aircraft to replace the Avon Sabre was issued in the late 50s. Initially, involvement was confined to examining and evaluating the technical characteristics of potential contenders as well as visiting factories and military establishments. Later, an engineer was included on the Fighter Evaluation Team which resulted in the selection of the Dassault Mirage III to meet the requirement. Although the Team recommended the Mirage III, there were areas where the aircraft did not meet the ASR fully, notably in ferry range and navigational accuracy (Darwin to Singapore non-stop), and a team was formed to go to France to determine the configuration and prepare the Technical Requirement Specification (TRS) for attachment to the contract. The TRS defined what the user wanted in terms of performance, function, equipment fit, acceptance, testing and related aspects. Members of the team were Gp Capt R.T. Susans (Air Attache Paris designate), Wg Cdr J.A. Rowland, Sqn Ldr F.W. Jordan, Flt Lt F. Howie, Flt Lt G. Grantham, Flt Off V.J. O'Brien, Mr Len Turner (DGA) and Mr Guy Darling (AROU). With the exception of Gp Capt Susans, all were either RAAF Engineer Officers or Engineers with the Dept of Air.

In its Report the Fighter Evaluation Team recommended that either the SNECMA ATAR 9c or the Rolls Royce Avon Mk 67 be installed in the Mirage, with the decision to be made after trials in France. The decision to delay engine selection was based on a belief that the Avon was a better performer than the Atar and Rolls Royce were willing to prove this point by trying the Avon in the Mirage at little or no cost to the RAAF. On 22 Nov 1960, Cabinet endorsed the selection of the Mirage III and the proposal to trial the Avon engine in a Mirage airframe. In the interval between selection of the Mirage and departure of the Specification Team for France, a number of proposals were received at Dept of Air from companies eager to have their equipment fitted to the aircraft. Apart from the Rolls Royce offer, there was a major proposal from the Hughes Company that their TARAN airborne radar (and Sparrow AA Missile) be fitted in lieu of the Cyrano / Matra RS30 AAM combination and a similar offer from Ferranti proposing the Airpass / Firestreak AAM. Terms of reference for the Team included a specific requirement to look at some of the proposals and report on any recommended changes. The Team left for France at the end of January 1961. On arrival it soon became apparent that the Mirage IIIc design would limit development of a useful ground attack capability, as well as be short on ferry range, unless equipment bay and fuel space could be increased. Fortunately, the French Air Force and GAMM had already addressed this deficiency and had designed a fighter ground attack version, the Mirage IIIe, which in simple terms was a IIIc with a fuselage extension and the more powerful ATAR 9c engine. A mockup of this aircraft was at the GAMM St Cloud factory at the time. It was the IIIe airframe and ATAR 9c engine, together with the IIIe's integrated Cyrano IIB radar/Doppler ground speed radar/navigational computer concept, that was to form the basis of the RAAF Mirage IIIo.

The period between arrival of the Team in France and signing of the contract on 30th March 1961 saw flight testing of the Avon Mirage and comparison of the performance of the Mk 67 Avon (with a 28" diam

afterburner) and Atar 9c powered versions. Evaluation of the implications of fitting the TARAN or Airpass radar, investigation into ways of improving navigational capability, analysis of proposals for 1300 and 1700 litre external fuel tanks, assessment of weapons fit and discussion on the performance of the aircraft under tropical conditions (AROU Std Tropical Atmosphere and the need for adequate water separation in the air conditioning system) were also undertaken. The French Quality Assurance System was examined by the QA representative. Visits were also made to various manufacturers to determine whether special test equipment, facilities and licence agreements were needed to undertake total repair of the aircraft and its equipment in Australia.

Although performance of the Avon Mirage was approximately equal to the Atar powered aircraft, the Avon was slightly superior at low altitude while the Atar was significantly better at high altitude. Costs associated with the proposed change and a belief that the Atar, with some projected changes such as engine "overspeed" and "surcharge" to improve performance, was a more rugged and reliable engine swung the Air Board decision in favour of the Atar. SNECMA also proposed an improved model Atar 9k which could have been fitted to the RAAF aircraft and allowed the RAAF to defer the decision between the Atar 9c and 9k until September 1961. The Atar 9c was chosen. An important factor influencing this decision (and others) was a desire by the RAAF that they should try to standardize on the French Mirage IIIe as much as possible to avoid operating an "orphan" aircraft. Similarly, costs and technical risk involved in changing the airborne radar from CSF Cyrano to Hughes TARAN, particularly in relation to testing and integration of the radar and air to air missile (AAM) combination, were too much for the project to bear, even though the Swiss Mirage was to be equipped with TARAN. Other changes were looked at by the Team and referred to Department of Air for further technical and operational consideration. Many were introduced as post-contract modifications i.e. not costed in the contract. These included fitment of the Sperry Twin Gyro Platform (TGP), provision for fitment of a Doppler ground speed radar and radar altimeter, fitment of a CDC Position Homeing Indicator (PHI 5C), provision for upgrading the radar to IIB standard (Ground Mapping and integration with PHI), provision for fitment of Sidewinder and Matra AAM's, installation of a Recording Fatigue Meter and provision for fitment of later model IFF, Radio Altimeter and TACAN equipments.

The capabilities and technology of the aircraft and its equipment were a considerable improvement on those of the Sabre. The associated mobile aircraft Flight Simulator built by LMT was also of advanced design. In engineering terms, the RAAF had acquired an aircraft with supersonic capability, a modern afterburning engine, complex and innovative flight control systems and the latest in weapons, radio, radar, instruments, electrics and support equipment. Many of the systems were integrated and, for the first time, aircraft tradesmen were required to gain an understanding of technologies across traditional trade barriers. This upgrading of technology in turn affected a wide range of engineering responsibilities including manning levels, training standards, technical skills, technical facilities and maintenance policies. Manufacture and assembly of a major part of the aircraft and engine in Australia also introduced new engineering skills and techniques to industry. The

Commonwealth Aircraft Corporation (CAC) was to be responsible for the engine, wings and fin while the Government Aircraft Factory (GAF) would make the fuselage and be responsible for final assembly and testing.

Introduction of the Mirage came at an awkward time for the RAAF Engineer Branch. A major re-organisation involving a move of policy staff to Canberra and a new Command structure was introduced in 1960-61. This made communication between policy staff in Canberra and the bulk of the engineering and maintenance staff in Melbourne more difficult at a time when new policies for Mirage maintenance, spares assessing and the division of work between Industry and the RAAF were being formulated. However, by early 1962 most major operational and technical policy decisions had been made, the aircraft was reasonably well defined and attention was being directed more towards processing aircraft and equipment modifications, and planning new technical facilities, spares assessing, training and publication needs. An added complication at this stage was the need to provide French language training and translation facilities for members training or working in France. For example, over 30 Engineer Officers and Airmen undertook French language training courses of various lengths at the RAAF School of Languages Pt Cook before leaving for France (and in some cases also the UK, USA and Canada) to undergo technical training on the Mirage and its equipments. Training encompassed various levels of maintenance up to and including Depot Level. Many other technical personnel were involved in spares assessing and publications vetting in France for varying periods.

Lack of firm technical data (including NATO codification of components) was an early problem with spares assessing and delayed the ordering process. It became evident early in the project that the French aeronautical industry had a poor appreciation of the logistics needed to provide an adequate life of type support service for the aircraft and its weapons systems. This, coupled with the language difference, made logistic planning very difficult in the early stages. Delays were also encountered in the preparation, translation and verification of technical publications. Fortunately, such valuable data was obtained unofficially by officers and technicians during their training and this allowed maintenance to proceed in the absence of officially approved publications. The presence of Field Service Engineers from French companies also helped to compensate for the initial lack of technical data. Nevertheless, most major publications were received by the end of 1965 and arrangements for the continuing update of drawings and associated data had been covered in contractual documents.

When Phase 1 of Mirage spares assessing started late in 1961, overhaul times for many of the major items were low and failure rates unknown due to insufficient or non-existent data. Further, production design of many items, including the engine, was not frozen until late 1962 thus aggravating the difficulties. The Atar engine entered service with a life of 225 hours and a "P" inspection at 75 hours. Major airframe servicing was set at 600 hours for an "E" inspection. Of course some items were not given a "life" as such, instead they were repaired or overhauled "on condition". Comprehensive servicing data for the Mirage was given in one of the first "Servicing Plans", now Technical Maintenance Plans (TMPs), compiled by the Engineer Branch. Maintenance

philosophy for the Mirage favoured total on-site maintenance responsibility, given the name of Intermediate I Level Maintenance (ILMI), in order to reduce turn-around times and pipeline requirements for high cost items and so control costs. This philosophy applied particularly to CSF Cyrang, radio and instrument items. Major engine overhaul and modification work was done by DAC at Fisherman's Bend, while the Maintenance Squadrons undertook most of the airframe servicing work. GAF also carried out airframe inspection and modification at various times when RAAF capacity was over-extended.

Many of the technical facilities at the Williamstown fighter base were of World War II vintage and inadequate for Mirages. Facilities at Butterworth also needed upgrading. Additional facilities were necessary at both bases. These were major tasks which in 1961 were planned for completion by early 1963 (in the case of Williamstown). However, the first aircraft delivery to the RAAF (AG-1), which was initially projected for January 1963 in Australia, was delayed until April 1963 in France and November 1963 in Australia and allowed more time for design and construction of the buildings. The Butterworth requirement, which was to be met in the main by installing transportable cabins, was not so extensive and would not be needed until 1967. New technical works for Williamstown included a large air conditioned Fire Control and Instrument Workshop, Engine Workshop and Storage Building, Radio, Safety Equipment and Electrical Workshop, Simulator Building, "E" Servicing Hangar, engine run-up facilities, hardstanding and enlarged domestic works to accommodate additional technical personnel. Later, a combined Matra RSSO and new Instrument Workshop was added. Lack of installation data on large test benches, particularly size, cooling and power requirements, hampered design of some of the technical facilities but, in general, most were completed on time. Early commissioning of some of the maintenance facilities was essential as the RAAF had total responsibility for maintenance of many items and supplied CSF Radars to GAF for installation on the aircraft, as well as providing maintenance for certain items found unserviceable during production eg. Bezu Output Multiplier Box (BOMS), Air Data Computer (ADC), IFF, TACAN, PHI etc.

An important engineering aspect of the early life of the Mirage was the involvement of Quality Assurance staff in production, testing and acceptance of the aircraft and locally made components. In conjunction with the Resident Technical Officer, QA staff were responsible for oversight of RAAF interests. QA engineers were located in France and in Australian factories such as GAF, CAC, H de H, Dunlop and NIC. Lack of detailed knowledge on the French QA system and its associated documentation was an early difficulty but was eventually overcome. While there were a number of QA problems during production, corrosion of raw materials imported from France was probably the most contentious for a time and brought about more stringent inspection requirements both in Australia and France. Rivets and skin were most affected.

Another interesting area was local manufacture or assembly of selected items. Results were mixed. Delays and cost increases caused abandonment of local manufacture of the Noelle Starter. Other items such as tyres and rubber fuel tanks, wheel and brakes, brake parachutes, standby compass, standby AH and rate of climb indicator were successful.

However, some of the items had difficulty in initially meeting French Specifications and Standards eg. NIC had difficulty in calibrating the ROC to meet Type Test requirements at other than ambient temperatures, and the first cockpit canopies made by GAF were also marginal. Later, DAC unsuccessfully attempted to manufacture the RPX 10 Combined Tank/Boom Carrier, failure being due to an inability to produce the main alloy casting without flaws. Notwithstanding these specific difficulties, production of major aircraft assemblies and the Atar engine proceeded satisfactorily.

At Williamstown, 481(M) Sqn started to prepare for the Mirage from the latter half of 1961 onwards. Planning for new technical facilities needed a strong unit input and a close watch on building progress was essential if schedules were to be met. Technical training preparations required a new approach as the Mirage was much more complex than the Sabre, and more formal and on-the job training would be needed. The concept of Field Training was introduced into the RAAF for the Mirage ie. technicians were required to undergo special unit run courses before being allowed to work on the aircraft or its equipment. In the long term, 481 Sqn would be responsible for all technical training on Mirage, including rotation of trained personnel to Butterworth, and permanent training facilities were included in the building programme for Williamstown. Personnel trained in France formed the cadre of instructors needed for Williamstown courses and, during the early years, specialist French Field Service Representatives (FSR's) provided a higher level of expertise in selected areas.

Three Mirage were instrumented for test flying, A3-1, A3-2 and A3-26. All the aircraft were built and flown in France, and used at different times to test and prove modifications, new equipment and systems, before being disassembled and flown out to Australia. A3-1 was handed over to the RAAF at Villaroche on the 9th April 1963 and after some flights in France was disassembled and flown to Avalon in a RAAF Hercules. After reassembly at SAF Avalon by a detachment of French trained RAAF Technicians from 481(M) Sqn, the aircraft flew again on the 30th November 1963. The detachment remained at Avalon to service A3-1 (and A3-3 prior to official handover to the RAAF) before most members left with ARDU, on the 4th February 1964, for tropical trials of A3-1 at Darwin. The trials ended in April 1964 and the Williamstown personnel returned home in May after having undertaken French language training at Pt Cook, a year in France and six months at Avalon and Darwin with ARDU - all unaccompanied. Later in 1964, A3-1 had the dubious distinction of being the first RAAF Mirage to crash - this occurred during a test programme at ARDU.

On the 26th January 1964, the first Australian assembled Mirage (A3-3) was formally handed over to the RAAF at an official ceremony at Avalon Victoria. This aircraft was flown to Williamstown about 6 Feb 1964 by Wg Cdr F W Barnes. By the end of June 1965 there were 13 aircraft at 81 Wing and hours flown exceeded 2500 with one aircraft, A3-3, having flown over 400 hours. In July 1964, the first mobile Mirage Flight Simulator was commissioned at Williamstown while 12 months later the Mirage Flight Control Training Aid was installed to assist in training pilots and fitters and also help in the diagnosis of system faults. Once in service, the Mirage followed a normal maintenance and repair pattern even

though many of the support concepts were new and innovative. Some of the newly designed equipments such as the CSF Cyrano, Sperry TSP, PHI, ADC, BOMB, UHF radios, Auxilec Constant Speed Alternator and SFENA Auto Comande had teething problems and suffered higher failure rates than expected and repair facilities were extended to the limit. Complete units and breakdown spares were in short supply as a consequence of earlier delays in spares assessing and ordering, coupled with production bottlenecks in French factories. During 1965/66 there was considerable engineering activity at both 481 (N) Sqn and HQSC as attempts were made to overcome defects and shortages.

Of particular interest was an intermittent fault in the TSP brush assembly which caused errors in the Bezu Ball indication - a most disconcerting and dangerous fault for the pilot. An exhaustive engineering examination eventually discovered that a foreign substance was contaminating the brush and slip-ring assembly and causing intermittent open circuits with consequent erratic Bezu Ball (AH) behaviour. Investigation of this phenomenon was protracted and it was some years before MTBF rates improved. Rate Gyros in the Cyrano Radar also gave trouble and had to be replaced with more reliable UK built versions of the same item. Other items with poor reliability included the Auxilec Alternator and Trap 21/22 UHF Radios.

In the air defence role, Mirage was armed with a short range infra-red seeking missile (Sidewinder AIM9-B), a medium range semi-active radar guided missile Matra R530K and a 30mm gun system. Mirage was first armed with the AIM9-B originally bought for the Sabre in 1962. With the selection of the Matra R530K in 1963 there was a requirement for high altitude trials of this weapon at Woomera against Jindavik targets. At Williamstown, aircraft were fitted with Matra computers, launchers and harmonization units as they became available from mid-1965 and the trials were held late in 1965. An interesting improvement in capability was the purchase of a number of nose cones designed to take the KA 36 Panoramic Reconnaissance Camera. A few aircraft at each location were modified to accept this equipment.

During the latter half of 1966, Mirage maintenance effort at Williamstown was extended to include the Mirage IIID (A) variant and the Mirage IIID Trainer aircraft now coming off the production line. The introduction of these aircraft added a number of new items to the Maintenance Plan including special IIID items as well as the APN 153 Doppler Radar, Radio Altimeter, Cyrano Ground Mapping and integration of the navigation/weapons system. Planning started for the retrofit programme to modify existing Mirage IIID (F) to the (A) version at GAF Avalon. Also introduced at this time was the GANO 2 Servicing Vehicle, a variant of a French Air Force unit designed to provide power and cooling for aircraft and crews on air defence alert. This vehicle could not be made to operate properly under local conditions and was an expensive failure.

In May 1967, 75 Sqn deployed to Butterworth with Mirage aircraft. Additional facilities, mainly in the form of transportable cabins, were provided to supplement existing buildings at the base - particularly for Operational Level Maintenance. The deeper level maintenance activities undertaken by 478 (N) Sqn necessitated extensive refurbishment of

existing facilities and provision of some new workshops. Although it took some time before these facilities were operating efficiently, the base was fortunate in that only fully trained and experienced Mirage technicians were posted to the squadrons. In mid February 1969, 3 Sqn deployed to Butterworth with Mirage aircraft. The Sqn flew via Townsville, Darwin, Djuanda and Tengah, staying at Tengah for 4 months while the Butterworth airstrip was re-surfaced. At Butterworth, both 3 Sqn and 75 Sqn maintained short term deployment capabilities independent of support from the maintenance squadron and exercised these capabilities regularly.

77Sqn returned to Australia in 1969 and re-equipped with Mirage soon after arrival. With four squadrons and the QCU operating at two major bases there were chronic shortages of both spares and support equipment at Squadron level - a situation that continued until 76Sqn was disbanded in 1972 ?? . Six additional Mirage IIID aircraft were ordered in 1973.

Early in 1973, an AMTS Working Party was formed to review factors affecting Mirage Life of Type (LOT) to 1980/1990 and look at technical aspects of improving capability in line with Air Staff Requirements. The WP identified a number of factors affecting LOT and made some interesting observations concerning the reliability of existing items in the Mirage. In their summary the WP noted that there were no engineering reasons to preclude the Mirage being supported to LOT of 1980. While some systems were costly to maintain, at the time only replacement of the Auxilec Alternator would have been cost-effective. For a LOT to 1990, the WP concluded that either the wing or wing spar would have to be replaced about 1980, and that support for the existing Sidewinder and Matra missiles would become difficult and more expensive. The WP also assessed that support for other items could be maintained until the late 80's without much difficulty. Replacement of the Alternator would probably become a more attractive proposition at this time, but replacement of unreliable equipments such as the Radio Altimeter, Dual UHF and TACAN could not be supported on engineering grounds alone.

Recording of fatigue data is a normal engineering activity undertaken to monitor the effect of service life on structural fatigue of an aircraft. A recording accelerometer or fatigue meter was fitted to each Mirage and flight data sent, with comments as appropriate, to the Director of Aircraft Engineering and the Aeronautical Research Laboratories (ARL) at Fishermans Bend. Analysis of the data, together with fatigue testing of major structural components, allowed predictions of fatigue life to be verified. The Mirage was initially assessed as having a safe fatigue life of 4000 hours which meant that barring unforeseen circumstances, no structural components, except those requiring normal repair or maintenance, would need replacement before about 1980. The wing and frame 26 were assessed as the most likely problem areas. A collaborative fatigue test was undertaken in Switzerland during the late 70's which resulted in abandonment of the safe life fatigue philosophy in favour of a fly-by-inspection philosophy. Using results from the fatigue test, numbers 1 and 2 bolt holes in the wing spar were regularly examined. During 1979, cracks in the lower wing skin panel were discovered emanating from the fuel decant hole. In most cases this cracking was either prevented or arrested by the application of a Boron

Fibre reinforcement patch as suggested by ARL. Subsequently more cracks were discovered in the wing main spar in the lower skin attachment holes near the wing attachment point. This led to a fleetwide wing replacement programme which extended from late 1990 through to 1994 and became known as the Life of Type Extension (LOTEX) programme.

The decision to undertake the LOTEX Programme was a direct consequence of the deferral of the decision on selection of the replacement tactical fighter and Project Air 5050 was raised to authorize the LOT extension and replace some equipment that was becoming difficult to support. Major elements of the LOTEX programme were the purchase of some replacement wings, repair of salvageable wings, refurbishment of the Matra R530K AAM and acquisition/installation of the Matra R550 'Magic' AAM to replace the Sidewinder AIM-9B. The Matra R550 upgrade required structural reinforcement of the wing hardpoint and some additional wiring. The R550 part of the programme started late in 1983 and took almost 15 months to finish.

Mirage weapons were very effective even though some weapons suffered significant engineering problems. The Sidewinder AIM-9B was carried on Aero 3B Launchers fitted to the outer wing stations. Integration of this weapon with the Mirage system posed difficulties, some of which remained through to the R550 conversion in 1994 eg. missile preheat circuitry. The only major AIM-9B related problem encountered in 20 years was training missile IR seeker dome glass erosion and this was resolved by a RAAF modification adding a brass protection cover to the seeker dome. The R530K AAM was carried on a single Type 14 Launcher on the centreline station and even though properly integrated with the aircraft, the weapon had some significant problems including premature detonation of the PJE2 proximity fuze, warhead degradation and life expiry of the rocket motor. Both warhead and rocket motor were replaced with Australian produced and assembled components and performance was improved. Premature detonation of the PJE2 fuze was not solved until 1985 when DSTO and the RAAF found a design fault in the fuze amplification circuit. However, withdrawal of the R530K missile in 1985 prevented full operational evaluation of the modification. The Sidewinder was withdrawn from service in 1984 and replaced by the short range IR Matra 550 'Magic' missile. Although easily integrated into the Mirage system and initially successful, the missile encountered problems later with premature detonation and breakup of the rocket motor in flight but the aircraft was phased out before these problems could be resolved.

Originally the Mirage was equipped with the type 552 30mm Defa Cannon but this was replaced, for HE ammunition, in the late 70's by the type 552A. The cannon and gunpack system remained operationally effective throughout the life of the Mirage. Minor engineering problems were encountered with malfunctioning electronic firing units, cracked breech cylinder housings and gunpack feed chute gauging errors. However, over-all the Defa gun system proved highly reliable. A unique engineering feature of the Defa system was the left and right hand configuration of the guns and corresponding left and right linked ammunition. This feature required ground crews to be continually alert during firing exercises, and particularly so for practice ammunition firings, where colour tipping of ball rounds on left and right hand ammunition belts required additional

care and coordination.

Like most fighter aircraft, the Mirage had a predictable attrition rate. However, between 1976 and 1984, five Category 5 accidents (write-off) and one Category 2 accident, as well as several air incidents, occurred as a result of pilots being unable to obtain locked indications for either the port or starboard undercarriage. Even though the exact cause of these accidents remained obscure, all malfunctions were attributed to the lateral jack not being properly locked mechanically although fully extended. A major engineering investigation started by HQSC in May 1984 as the result of an accident earlier in the year soon found that the RAAF was the only Mirage operator experiencing this problem. Furthermore, while the lateral jacks were all fully modified they did have two extra RAAF unique modifications, one of which was a bearing introduced in 1974-76 to combat corrosion. After sifting through over 20 potential causes, attention was focussed on the four most likely as being wear, corrosion of the jack ram, misalignment of the RAAF introduced bearing and overtightening of the locking claw. A significant factor which emerged from the investigation was the poor control being exercised over technical data which had allowed errors to creep into maintenance publications, particularly in relation to accuracy of translation, content and currency, and this in turn had led to faulty maintenance practices and procedures - a problem not confined to Mirage.

75 Sqn was withdrawn from Butterworth in 1983 and redeployed to Darwin. Transportable buildings were installed there to augment base facilities for the squadron and 481 (M) Sqn Williamstown provided deeper levels of maintenance support. 478 (M) Sqn was disbanded at Butterworth in October 1983 and the maintenance capability of 3 Sqn was enhanced to include deeper levels of servicing.

As the Mirage was phased out and the FA18 brought into service, 77 Sqn was given an increased maintenance capability and took over OCU and 478 (M) Sqn roles. By May 1988, the last Mirages had left Butterworth and during May 1988, the last Mirages had left Darwin. Of the original 100 Mirage IIID and 16 Mirage IIID aircraft purchased only 52 ? remain.

Mirage maintenance was largely performed by 478 (M) Sqn (until Oct 1983) and 3 Sqn (post Oct 1983) at Butterworth and 481 (M) Sqn at Williamstown. They carried out the majority of D and E Servicing on the aircraft (now known as R3 and R4 Servicing), P Servicing on the engine and were responsible for maintenance of many major Radio, Instrument, Electrical, Armament and Safety Equipment items. During 1980, the RAAF Analytical Maintenance Programme (RAMP) was applied to the Mirage. The aim of the programme was to examine all aspects of maintenance to ensure that all unnecessary activities were eliminated and servicing periods more closely aligned with predictable failure rates and wear patterns. By the time the Mirage was phased out of service, the high time aircraft A3-17, had accumulated 4544 Flying Hours. Many aircraft had exceeded 4000 Hours. The Atar 9C engine had proved reliable and ended its RAAF service life at a Time Between Overhaul (TBO) of 630 Hours, while the major airframe servicing period (formerly E then R4) was 960 Hours. Throughout the life of the Mirage, strong engineering links were retained with the French through RAAF engineering staff at the Australian Embassy, Paris.

APPROXIMATELY 6000 WORDS ARE REQUIRED FOR THIS CHAPTER. NO DOUBT THERE WILL BE SOME DUPLICATION BETWEEN THE CHAPTERS RECEIVED BY MARTY SUSANS, SO TO BE ON THE SAFE SIDE I AM AIMING FOR AT LEAST 6500 WORDS. THIS DRAFT IS ABOUT 5500 WORDS.

THE ABOVE OUTLINE NEEDS TO BE EXPANDED AND MISSING EVENTS INSERTED, ESPECIALLY AROUND THE 65/70 PERIOD. FROM MEMORY, ONLY I110(A) AND I110 AIRCRAFT WERE DEPLOYED NORTH AND MOST REMAINED THERE. 479 (M) SON PERFORMED ALL 'E'S' ALTHOUGH SOME MAY HAVE BEEN SHIPPED BACK TO REDUCE WORKLOAD. SOME CORRECTIONS AND ADDITIONS ARE NEEDED. ALSO REQUIRED IS AN OUTLINE OF THE LAST FEW YEARS ENGINEERING ACTIVITIES TO ROUND OFF THE CHAPTER. FOR EXAMPLE, THE WIND-UP AT BUTTERWORTH, DARWIN OPERATIONS, ANY CHANGES AT WILLIAMTOWN WHEN THE MIRAGES WENT TO DARWIN AND FA 18s CAME, ENGINEERING OR MAINTENANCE PROBLEMS, CONDITION ON DISPOSAL, DISPOSAL ETC. ARE ANY MIRAGE BEING KEPT AND WHAT ARE THE TECHNICAL IMPLICATIONS ?.

2.11D ?

SUMMARY OF TRANSCRIPT - RAAF BASE WILLIAMTOWN.

Keith Sullivan joined the Airforce in 1947 and began technical training as an Instrument Maker. He maintained aircraft such as Mustangs, Wirraways and Tiger Moths, out of the wartime aerodrome of Archfield, The City of Brisbane Squadron, No. 23. Three years later he was posted to Korea on operational basis and returned to Australia, April, 1952 and was posted to Williamtown.

Keith rose through the ranks to become a Warrant Officer and ultimately retired from the permanent Airforce as a Squadron Leader in 1978. The City of Newcastle Squadron No. 26 was introduced in 1981 and Keith was commissioned to go back into uniform part-time to get the squadron off the ground.

The Department of Defence needed an expert to look after the technical works side of the New Tactical Fighter F/A-18 project and after a short time in Squadron No. 26, Keith was commissioned for this project also. After approximately 35 years in uniform, Keith retired from the Airforce mid 1985.

The Williamtown site was chosen because of its ideal position to protect Eastern Ports of Sydney, Newcastle and Wollongong. During the war years in particular, RAAF base Williamtown was to protect B.H.P - the main producer of steel.

Over the years Williamtown has developed and grown, new buildings are in the process of construction for the introduction of the McDonnell Douglas F/A-18 Fighter Aircraft, the Base in area covering much of the Williamtown district.

Williamtown has seen many aircraft in its hangers since its establishment, among them, Mosquitoes, Mustangs, Vampires, Meteors, Sabre and the Mirage which is in the final phase out period after 25 years of service.

Keith was one of ten personnel, who has many many years associated with the Mirage fighters selected to write a phase of the Mirage history for the RAAF archives. He is also involved in developing a RAAF History Museum.

Keith has devoted half of his lifetime to the Airforce and to Australia and his rewards for his many years of service have been issued - a Government Grant of \$500,000.00 to build and furnish his Museum. A Museum that will preserve the History of RAAF Airbase Williamtown.