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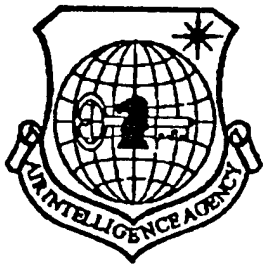

THE "HYBRID" OF TAIWAN'S AIRSPACE--
CLOSE UP ON TAIWAN'S IDF FIGHTER

by

Daoming Si An

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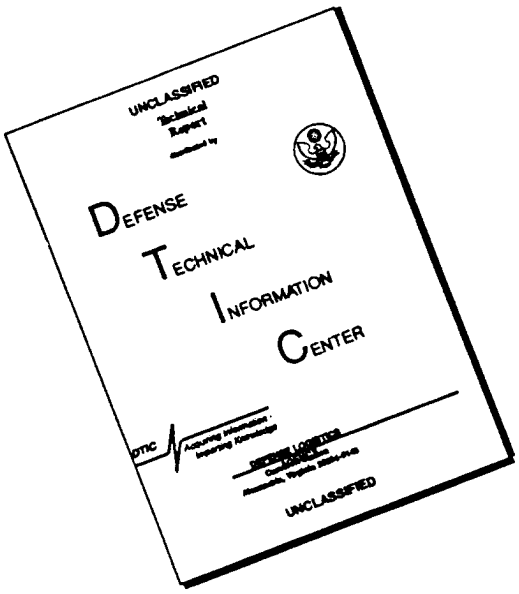

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NAIC-ID(RS)T-0093-96 4 April 1996

MICROFICHE NR: 96C000306

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English pages: 15

Source: Hangkong Zhishi (Aerospace Knowledge), Nr. 2, 1995; pp. 40-45

Country of origin: China
Translated by: SCITRAN
F33657-84-D-0165
Requester: NAIC/TAAW/Dominique Mercurio
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On the basis of introductions in the recent Taiwan press, the 8th flight squadron of the Taizhong Qingquangang KMT air force base held a delivery ceremony on 28 December 1994 for the first batch of 20 IDF fighters. Beginning New Year's Day 1995, they begin formal utilization to carry out combat readiness missions.

As far as the Taiwan air force IDF, that is, in English--Indigenous Defense Fighter, as it is abbreviated--is concerned, it was developed by the Taiwan Zhongshan Science Institute's aviation industry development center. It is a type of supersonic multiple use fighter. The prototype model has already been named the "Jingguo". The local press has called it one of the Taiwan air forces four types of second generation combat aircraft. The other three types are the F-16A/BMLU (a middle life improved model), the Mirage 2000-5 fighter, and the E2-T aerial early warning aircraft.

Based on the analyses of relevent personages, it goes without saying that IDF fighters--from exterior shape to internal equipment--have, in all cases, integrated and applied good amounts of designs and equipment associated with other fighters and can be said to be a "hybrid". Its appearance gave rise to interest from a number of readers. For this reason, we will here make a preliminary introduction with regard to such things as its development background and design requirements, development processes and applied technologies, primary characteristics, as well as future utilization, and so on, in order to provide a reference.

DEVELOPMENT BACKGROUND AND DESIGN REQUIREMENTS

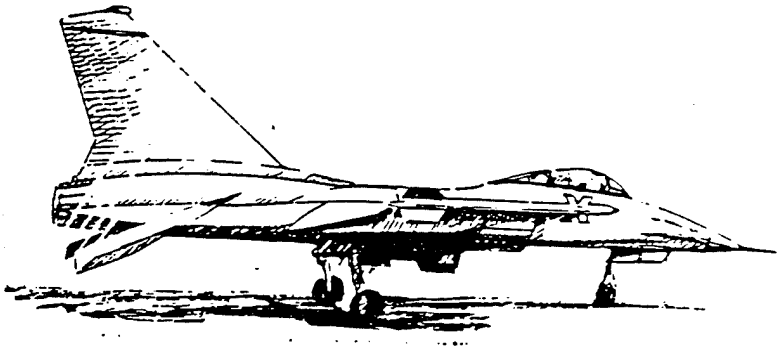
There are news reports that early on in 1978 Taiwan thought about introducing from elsewhere or procuring new fighters with higher performance in order to replace obsolete types of aircraft. In June of 1980, vice president Luni (phonetic) of the U.S. Northrup Co. and vice president Shitaer (phonetic) of the General Dymanics Co. respectively led high technology personnel delegations in visits to Taiwan, making detailed introductions to the Taiwan air force of technical materials associated with F-5G and F-16/J79 (generally designated FX) fighters, hoping to get a very considerable amount of business at one stroke.

The F-5G was the Northrup Co.'s medium performance multiple use fighter specially developed for export on the basis of the F-5 series fighters--later designated the F-20 "Tigershark". In 1982, the maiden flight was successful. The company itself took the risk of investing a billion U.S. dollars. After going through over 1000 sorties of test flights, the company believed that it was the combat aircraft with the fastest scramble and the greatest accuracy in ground attack in the world at that time. However, due to the fact that, out of 4 prototypes, two crashed, and chief test pilot Kenaier (phonetic) was killed during a promotional flight demonstration--added to other reasons--the F-20 in the end could not get an order and it was announced to be discontinued at the end of 1986.

The F-16/J79 is also a type of medium performance fighter. It was specially developed by the General Dynamics Co. for export. Because no one every ordered it, development was stopped in 1981. In 1984, the company in question also put forward the F-16C. At that time, the F-16/J79 had already halted development. The F-16A/B then changed into fighters that could be exported.

From this it can be seen that the Northrup and General Dynamics Co.'s are still not resigned and are looking to be sellers of the F-20 and F-16/J79 as before. Moreover, Taiwan needs to have new fighters in order to replace air force equipment. The activites of Luni (phonetic) and Shitaer (phonetic) in this instance basically hold a lot of hope for both sides. Unexpectedly, on 11 January 1982, the U.S. State Department announced in its daily routine news conference that the U.S. government opposed the sale of FX fighters to Taiwan.

Through an unforseen event, on 24 June 1988, U.S. United International announced the news that Taiwanese engineers had learned to design high performance fighters on the site of a General Dynamics F-16 aircraft manufacturing plant--Fort Worth, Texas. In August of the same year, the Taiwanese magazine "Cutting Edge Technology" took the lead in carrying an independent story entitled "Formal Exposure of Yingyang Fighters". In September, the Taiwanese "Foresight Magazine" published an article on a special visit to the Taiwan Zhongshan science institute, and, in conjunction with that, made public photographs of "Yingyang" /41 fighters (that is, IDF fighters). In October, the relevent Taiwan



Frontal Side View Photograph of IDF Fighter on the Ground

news media again announced the TFE1042 engine. This engine is the IDF propulsion system. On 10 December 1988, Taiwan's indigenous defense fighter (IDF) finally appeared at the Taizhong Qingquangang air force base.

In design thinking, the new Taiwanese developed fighter plane stressed fast reaction defense capabilities. In conjunction with this, there was no requirement for combat radii or ranges that were too large. Besides this, Taiwan is not capable of equiping fighter aircraft in complete model types and large numbers. Therefore, the main IDF design targets required by the military were to possess capabilities for intercept beyond visual range and good aerial dog fight capabilities. At the same time, attention was also paid to requirements associated with many areas such as countering warships. In reality, what the Taiwan air force needed was a type of multiple use fighter.

DEVELOPMENT PROCESSES AND TECHNOLOGIES APPLIED

From 1978 to the December 1988 public appearance of the IDF fighter, it was a full 10 years. Up to the December 1994 delivery to unit of the first batch of production models, it should be 16 years. In order to develop IDF fighters, Taiwan mobilized the entire strength of the aviation industry, drawing up what is called an "Undisturbed Circling (Anxiang) Project". Below that, there were also divided up four subprograms, that is, the "Outstanding (Yingyang) Project", the "Milky Way (Yunhan) Project", the "Celestial Thunder (Tianlei) Project", and the "Heavenly Sword (Tianjian) Project". They respectively take responsibility for the aerodynamics of exterior forms and fuselage structure, engines, flight controls and avionics equipment, as well as the design of on board weapons.

"The Falcon Circles (Yingxiang) Project" ---- Aerodynamic Forms and Structural Design

In the illustrations inserted in this article, we can see that the IDF fighter in its final form opts for the use of a two engine one tail synthetic lay out blending into the fuselage and a bubble cockpit cover. The trapazoidal wings are variable curvature designs, that is, they are equiped with motor driven flaps. As far as binary exterior compression model air inflow channels are concerned, air intake ports present an elliptical shape and are positioned under the side strips on the two sides of the fuselage. The tail is composed of full motion horizontal stabilizers capable of differential movement and a vertical stabilizer of a type similar to a cut down MIG-29 wing tip. With regard to landing gear, option is made for the use of a three point type, each with a single wheel.

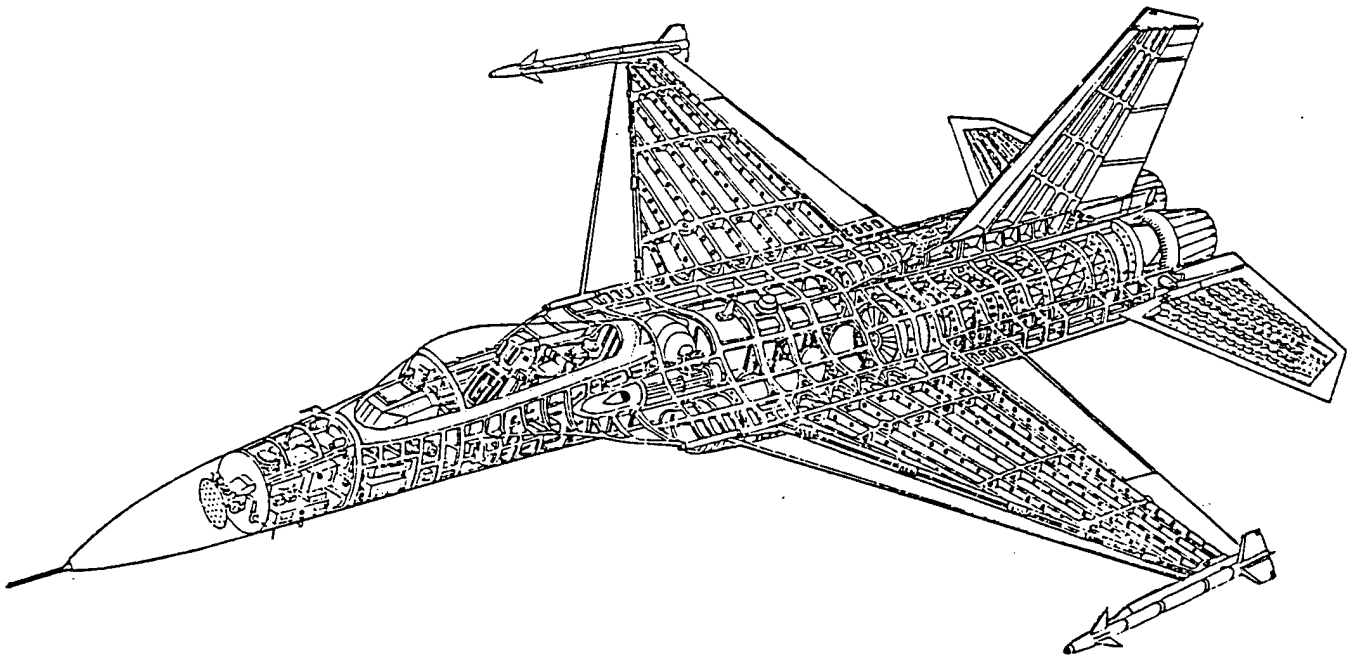
Seen from the outside, many parts of IDF fighters seem to have been met with before. The nose is very similar to the F-20 fighter. The fuselage, wings, and vertical stabilzer are not much different from the F-16 fighter. Moreover, the cockpit cover, the shape of the tip of the vertical tail, as well as the air intake ports of the two engines also resemble the French "Zhenfeng (Wind Gust)" fighter, and so on.

Facts also verify that, during the development process, IDF drew lessons from many types of other fighter designs. When the first IDF prototype came out of the plant, the Taiwan aviation industry development center also announced that design stages had been considered for four IDF design plans from A to D. Among these, IDF-A opted for the use of arrow shaped wings similar to the wings of the F-16XL. The U.S. NASA began to develop this type of wing in the early 1970's, having done a great deal of testing. Taiwan news media also acknowledge that it is believed there was a lot that came from their "suggestions" as associated with the plans in question for designs from that time. IDF-A was figured to be equiped with the U.S. F404 engine, opting for the use of a single engine, single vertical tail, belly air intake design. Seen from the side, it is very similar to the F-16. Later, because the U.S.

side believed that the technological level of the engine was relatively high, it refused to sell it to Taiwan, discontinuing development.

The IDF-B design is a two engine, delta wing, canard type lay out. It is very similar to the French Mirage 4000 fighter that already began test flights in 1979 (later, development was discontinued). The configuration of the air intake channel intake ports on the two sides is also not much different from the Swedish JAS39 fighter. It seems as though, at that time, the Taiwan aviation industry development center was trying to follow the fashion. The reason was that new models of fighter such as the EFA, which was developed in combination by the four nations of the U.K., Germany, Italy, and Spain, the French "Zhenfeng (Wind Gust)", the Swedish JAS39 "Grippen", and the Israeli Lavi types all opted without a single exception for the use of no tail (flat tail) delta wing set ups. However, Taiwan lacked the technological foundation and had no way to get clear the advantages and disadvantages of delta wing designs all at once. Beginning research from scratch was a waste of time and money. Moreover, the risks were great. There was no choice but to abandon the IDF-B design.

The IDF-C is a type of design basically similar to the U.S. F-18 "Hornet" fighter. It opts for the use of a two engine, twin tail design. Engine air intake channels are positioned under side strips on the leading edges of wing tabs. Intake ports are two semicircle shapes. Inside them there are adjustable central spikes. The structure is very similar to such designs as the F-104 and the Mirage 2000 fighter. It was also because Taiwan lacked research on air intake spikes--plus there being no way to obtain high performance engines--that IDF-C designs had thus still not yet had wind tunnel tests carried out on them and then came to a premature end.



THREE DIMENSIONAL CROSS SECTION VIEW STRUCTURAL DIAGRAM OF IDF FIGHTER

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Speaking in general terms of the IDF-D design, the forward fuselage resembled the F/A-18. The rear fuselage was similar to the F-14. Moreover, the back of the aircraft had a large model speed reduction panel. Option was made for the use of square shaped lower air intake ports which also resembled the MIG-29. However, air intake channel structure was relatively simple. After wind tunnel models of this design were announced, it began to draw peoples attention. For a time, there were people who believed that the IDF-D would be Taiwan's indigenously developed second generation fighter. However, the Taiwan media believe that, although the IDF-D has absorbed a great many advantages of advanced fighters--such as, good field of view cockpit design, trapazoidal wings associated with twin tails possessing good stability as well as operating flexibility, and so on--speaking in general about its exterior design, however, it still remains at a 1980's level. In particular, opting for the use of large vertical twin tails is a very strong radar echo source, not suiting the low detection characteristic requirements associated with future fighters. As a result, it is not seen as very likely to be able to become Taiwan's indigenously developed second generation fighter. These also seem to be the facts.

After going through the development associated with the various types of design plans discussed above, the final IDF fighter opts for the use of a design which synthesizes wings and fuselage--a single wing in a trapazoid shape back swept with a medium spread to chord ratio. Large side strips on the front of the wing tabs extend all the way forward to the two sides of the

cockpit. The forward and trailing edges of the wings are equiped with full wing spread flaps or flap ailerons (trailing edge outside). As far as tails are concerned, option is made for the use of full motion horizontal tails carrying a downward longitudinal dihedral angle and a vertical tail with a large back sweep angle and a cut tip. With regard to the two turbofan type engines, they are installed parallel to each other in the rear fuselage. Elliptical shaped air intakes are stuck close on the two sides of the fuselage under the wing tabs. The prototype cockpit cover opened up and back (like the F-16). It was later altered to open to one side (similar to the MIG-21). The landing gear is a forward three point type. All are single wheels. The forward wheel can be taken up frontward into the fuselage. The main landing gear is taken inward into the air intake channels on the sides.

The structural design can be refered to in the structural diagram. The IDF fighter opts for the use of a fusion synthesis design of wing and fuselage having advantages in all cases with regard to such things as improving aerodynamic characteristics, increasing structural strength, as well as adding to the internal volume within the body of the aircraft, and so on. As far as the vertical tail is concerned, option is made for the use of cut tip designs. They are not only capable of reducing structural weight. They can also prevent vibration and increase structural life. However, whether or not IDF structural design is rational must still wait for a period of testing. In June 1991, the second prototype (No.10002) had an accident and crashed in the sea. The pilot died. On the basis of an accident investigation report that was published later, the aircraft in question was in low altitude transsonic flight. Buffeting vibration gave rise to horizontal tail resonance, creating destruction of the aircraft structure. With a view to this lesson, production model IDF have carried out improvements with regard to the horizontal tails, adding downward longitudinal dihedral.

"Milky Way Project"----the Story of the TFE1042-70 Engine

Engines are the "heart" of aircraft. The quality of their performance directly influences the giving of full rein to aircraft flight characteristics and combat capabilities. Originally, IDF fighters were figured to directly mount one U.S. F404 engine. When their introduction did not turn out, the best that could be done was to opt for the use of two TFE1042-70 model turbofan engines. This also has a winding story to it.

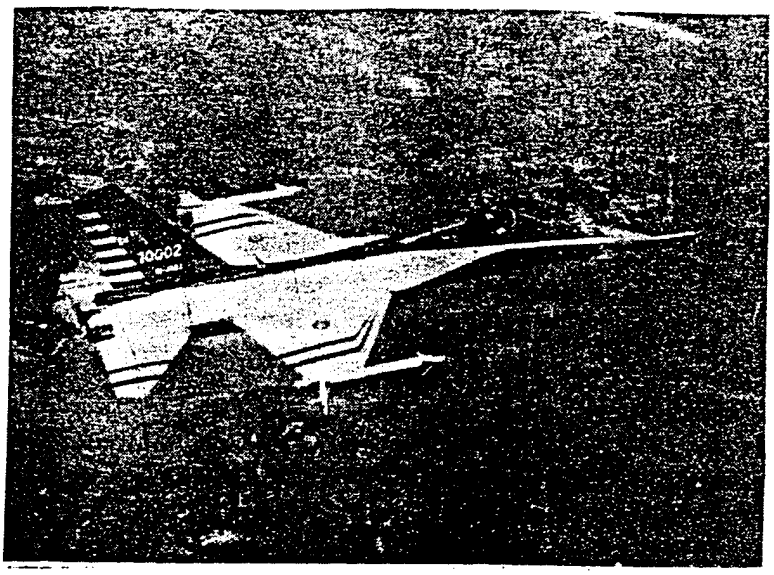
With regard to the life of the TFE1042-70 engine, it can be traced back to 1978. At that time, in order to capture the world military aviation engine market, the U.S. Allied Signal Co., the Jialeite (phonetic) branch coporation, and the Swedish Woerfu (phonetic) Co. together developed the TFE1042 military engine on the foundation of the civilian TFE731 engine. The hope was that this engine would be capable of participating in the competition associated with the propulsion systems for new model fighters such as the Swedish JAS39. It achieved nothing for all the effort. The TFE1042 engine could do nothing but sit ignored.

After going through several years of no news, the Jialeite (phonetic) Co. and the Woerfu (phonetic) Co. split up, changing over to full aggressive development of a new fighter plane in cooperation with Taiwan. In 1982, the Jialeite (phonetic) Co. and the Taiwan aviation industry development center cooperated to set up an international turbine engine company. In the same year, the U.S. State Department sanctioned this cooperative project. Development of TFE1042-70 engines then began with this.

Compared to TFE1042 engines, TFE1042-70 ducting ratios go down to 0.45 from the original 0.66. This specific value clearly shows that the engines in question are striving to get close to the propulsion systems of aerial combat fighters. However, there are still disparities with the F404 and new generation fighter engines (for example, M88 and EJ200). The engines in question also opt for the use of modularized design. There are a total of 8 component parts. After the 1950's, many fighter engines were already not opting for the use of centrifugal type compressors. However, the Jialeite (phonetic) Co. still made use of centrifugal type compressors in TFE731 engines. Up to the TFE1042-70, it was still like this (there was one level). This is the only point of similarity between the two. The remaining characteristics of the TFE731 were already not seen very much. The Jialeite (phonetic) Co. still asserted that this type of design was capable of avoiding distortions, making compressors bring maximum efficiencies into play.

TFE1042-70 engines opt for the use of digital type control systems. It is said that their operation is very sensitive. From slow to maximum afterburner thrust only requires 5 seconds. Moreover, from slow to maximum thrust (no afterburner) only needs 4 seconds. Besides this, they also possess the characteristics of convenient monitoring and maintenance.

How about actual situations? According to the introduction in Jane's yearbook, TFE1042-70 engine diameter is 0.605m. Length is 3.404 m. Single unit afterburner thrust is 42.95 kilonewtons. The engine thrust to weight ratio is 6.95. There are also materials introducing afterburner thrust as 37.81 kilonewtons and the engine thrust to weight ratio as 6.53. Even the former relatively large values are still very far from modern fighter engines such as the derivative RM-12 and F110-GE-129 models associated with the General Electric Company F-404 as well as the Puhui (phonetic) Company's F100-PW-229, and so on.



IDF Fighter Prototype in Flight

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Looking from a vertical view, the IDF and the F-16 fighter are very similar. Yet, it only has the rough engine thrust of the F-20 fighter. Taiwan has planned to retrofit engines with larger thrusts--for example, the Jialeite (phonetic) Company's F125X or the General Electric Company's J101/SF. However, the development prospects for these two types of engines are not clear. In addition, the numbers of IDF equiped will be reduced to a large extent (reduced from 250 planes to 130 planes). Engine retrofit plans have been temporarily canceled.

"The Tianlei (Celestial Thunder) Project"----Flight Control Systems and Avionics Equipment

In the last 30 years, the development of avionics technology has been extremely rapid. Avionics equipment has already become an important factor influencing fighter combat capabilities. In particular, the good or bad reliability of airborne avionics equipment will directly influence the bringing into full play of fighter rates of readiness and combat capabilities. Although the development of Taiwan's civilian electronics industry has been rapid, in the area of military avionics, however, improvements have not been great. As a result, as far as the airborne equipment of the IDF fighter is concerned, there has basically been an option for the use of ready made U.S. products. Below, we respectively discuss the important parts of flight control systems, airborne radar, as well as cockpit equipment.

1. Electrical Transmission Flight Control Systems

IDF opts for the use of triple redundancy digital type electrically transmited flight control systems similar to those

associated with the Swedish JAS39 fighter. The products are manufactured by the U.S. Lier (phonetic) Company. Although the Lier (phonetic) Company is not a large firm, it can still be figured as an outstanding one in U.S. electronic transmission flight control technology today. The world renowned F-16 and F-15E, the Israeli "Lavi" type (development already canceled), and the F-22, representative of the fourth generation of supersonic fighters, have all already been equiped or are in the midst of evaluations and preparation to be equiped with this company's electrical transmission flight control systems.

On the basis of briefings, IDF fighter electronic transmission flight control systems apply the newest semiconductor technology. Dimensions are very small. The whole system is composed of modules that can be replaced from the outside. The total weight is only 20 kilograms. The average malfunction interval time period can reach 2000 hours.

2. Airborne Radar

IDF fighter airborne radar takes the name "Golden Dragon"-53. It basically opts for the use of APG-67 radar design that was originally mounted on the F-20 fighter. Only a few small modifications were made.

APG-67 model radar was developed by the U.S. General Electric Company. It is a kind of digital type programmable modernized airborne radar. It opts for the use of common phase pulse Doppler technology. It operates in the X wave band. It has 15 types of operational modes (among these, 8 types are air to air, 7 types are air to ground). At the same time, it possesses three types of different pulse repetition frequencies--high, medium, and low. It possesses look up, look down, and aerial dogfight capabilities.

The 8 types of modes associated with the air to air area are 1) Look down search. Simultaneous range finding. Capable of indicating azimuth and distance of targets. 2) Look up search. Simultaneous range finding. 3) Speed search. Indicates approximate target air speed. 4) Side scan side track. Capable of simultaneously tracking 10 targets. In conjunction with that, simultaneously launches advanced medium range air to air missile similar to the AIM-120. What needs to be explained is that this mode requires going through the U.S. government for sanctioning after which it can then be acquired. 5) Dogfight. Based on the situation, pilots can select 4 types of different angles of view projected on heads up displays in order to facilitate carrying out aerial combat. 6) Single target tracking. Generally, it is made use of after a specially designated target has been found during search and range finding. 7) Situation observation mode. Makes use of aerial search and single target tracking in turn to make pilots capable of simultaneously grasping targets during tracking and other targets in scanning sectors. 8) Self-adjusting search mode. APG-67 radar effective look up and look down search ranges are, respectively, 67km and 43km.

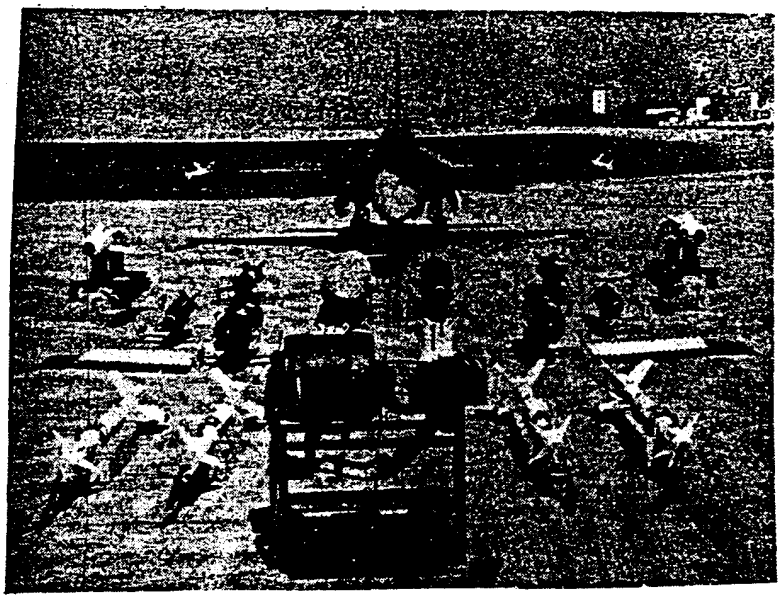
The 7 types of modes in the air to ground area are 1) True beam terrain mapping. 2) Doppler beam sharpening. The greatest characteristic of this mode is the ability to supply terrain maps

with angular resolution magnifications of 40 times for pilots, making them as clear as photography. 3) Air to ground range finding. 4) Ground moving target indication. 5) Ground moving target tracking. 6) Target search on the surface of the sea. 7) Freeze. What needs to be explained is that this freeze mode is used a lot in super low altitude air to ground attack situations. Before aircraft approach targets, pilots pull up the nose of the aircraft and rapidly make use of radar to detect targets. The imagery is immediately frozen. The aircraft nose is put back down, correcting back to the original flight attitude. After that, assistance is gotten from the central computers of navigation systems. Moreover, there is no need to turn the radar on again, and it is then possible to complete missions associated with ultra low altitude air raids on targets so as to avoid exposing oneself inside the enemy air defense weapon search zone. The maximum effective distance for APG-67 radars air to ground is 148km.

APG-67 radars are composed of four replacable modules--antennas, transmiters, signal processing devices, and computers. The average malfunction interval time period is 200 hours. This is, respectively, one fold higher than APG-65 radars and increased 40% over APG-66 radars on F-16's.

3. Cockpit Equipment

Generally speaking, from cockpit equipment--in particular,



IDF FIGHTER MAIN WEAPONS AND EQUIPMENT

From front to back, they are, respectively: M61A1 model 20mm machine cannon; the "Tianjian (Heavenly Sword)" 1 model air to air missile; CBU-20 cluster bomb; 70mm rockets as well as rocket pod; 500lb Mk82 bomb; AGM-65 "Youchu (Young Livestock)" air to ground missile; laser guided bomb; auxilliary fuel tank; and, 1000lb Mk82 bomb

display capabilities--it is possible to see the level of avionics equipment in fighters. What IDF fighters opt for the use of is an integrated display system supplied by the Bendix flight systems portion of the Allied Signal Company. In this is included a heads up display (the visual angle is relatively wide, azimuth angle approximately 20 degrees, angle of pitch around 15 degrees) as well as a digital type data trunk line and data processors. On the top of the pilot's knees, there are two multiple function display units. They are both capable of displaying navigation, communications, radar, and weapons information. In the middle is a conventional instrument panel. The H423 model laser gyroscope inertial guidance system manufactured by the U.S. Honeywell Company supplies position information. This type of inertial system is capable of rapid start up in order to supply fire control systems navigation data needed to attack. Due to the fact that use is made of two multiple function display units, it is estimated that the IDF fighter cockpit display system is similar to the F-20. There have also been briefings that, besides "Golden Dragon"-53 radars, the average malfunction interval time period associated with other avionics equipment exceeds 1000 hours in all cases--equivalent to the level of the F-16C.

Because Taiwan has already placed an order for 150 F-16A/BMLU--considered from the angle of interchangability--IDF fighters are capable of opting for the use of AN/ALR-56M radar alarm receivers and AN/ALQ-184 electronic countermeasure pods. Inside IDF cockpits, option is made for the use of right side flying sticks and left side engine throttle sticks even with the elbows of the pilot. This is probably in order to increase pilot counter overload capabilities. It is also equiped with Madingbeike (phonetic) Mk12 zero-zero ejection seats. The backward angle of slant on the seat is 30 degrees. This is also in order to increase the pilot's counter overload capabilities.

"The Tianjian (Heavenly Sword) Project"----Airborne Weapons Outfits and Their Development

From pictures that have already been published, one sees that IDF fighter weapons outfits are still relatively complete in their readiness. As far as fixed weapons are concerned, there is one 20mm caliber U.S. made M61A1 "Vulcan" 6 tube machine cannon. It is positioned on the left side inside the wing side strip. There are 400 rounds of reserve ammunition. The firing speed is estimated at 6000 rounds/minute. Altogether, there are 8 exterior hanging points. Respectively, the wing tips have 2. There are 4 under the wings, and there are 2 in tandem under the belly. They are capable of carrying numerous kinds of air to air missiles. They can also carry conventional bombs, cluster bombs, rocket launching pods, laser guided bombs, as well as auxilliary fuel tanks, and so on. Below are two types of typical cases associated with counter air and counter sea combat.

When carrying out air defense missions, exterior hanging racks on wing tips and under wings carry 4 "Tianjian (Heavenly Arrow)" 1 model air to air missiles. The belly carries 2 "Tianjian (Heavenly

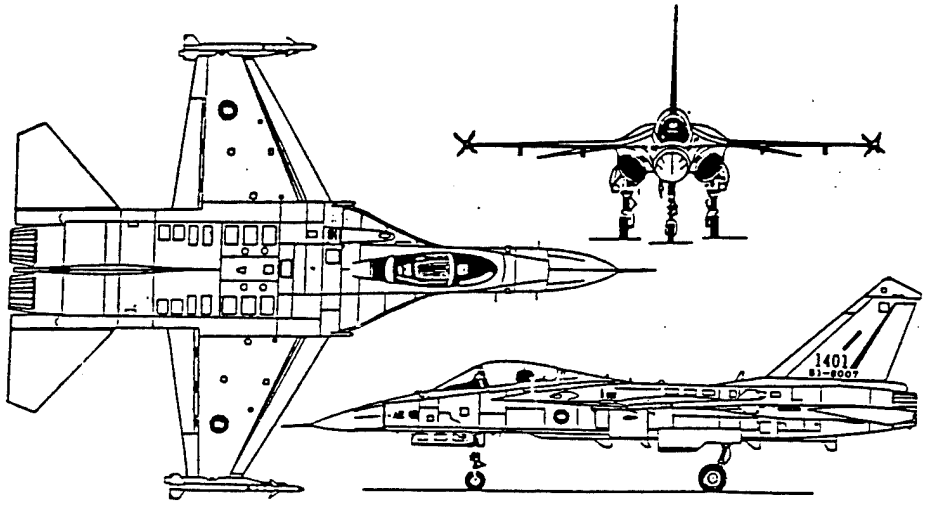
Arrow" 2 model air to air missiles. According to briefings, the "Tianjian (Heavenly Arrow)" 1 is a type of infrared guided close range dog fight missile--similar to the AIM-9L "Sidewinder". However, the weight is somewhat more. The range is approximately 10 km. Because the guidance head opts for the use of liquid ammonia, it is possible to take the sensing and measurement components and cool them to -200°C. It is possible to possess an all around attack capability. The missiles in question completed development work in June 1993. It was projected to produce around 700 of them. Due to the fact that, when orders were placed with the U.S. and France for F-16A/B and Mirage 2000-5 fighters, orders were also placed at the same time for 3000 missiles (among them were air to air missiles), the numbers to be produced have now already been reduced to 300. The "Tianjian (Heavenly Sword)" 2 is a type of semi-independent, radar guided medium range air to air missile. As far as its hardware and software development is concerned, based on briefings in foreign publications, it has gotten the help of the U.S. Motorola Company and the Israeli Lafei (phonetic) Company. The exterior dimensions come close to those of the AIM-7M "Sparrow" missile. However, the missile wing span is relatively smaller. The range exceeds 50 km. Development at the present time may possibly have run into problems associated with bad guidance system coordination with the "Golden Dragon"-53 radar and awaits further solutions. However, Taiwan military magazines have recently reported that, on the 29th of September last year, during one military exercise, there had already been a successful launching of a "Tianjian (Heavenly Sword)" 2 missile.

When carrying out antimaritime combat missions, IDF fighters are capable of carrying, at the most, 3 "Xiongfeng" 2 model antiship missiles and 2 "Tianjian" 1 model missiles used for self-defense. On the basis of introductions in the Taiwan press, the "Xiongfeng" 2 opts for the use of composite radar and infrared guidance heads. The missile length is 3.9 meters. Launch weight is 520 kilograms. They are equiped with a semi armor piercing high explosive warhead. Cruising speed is M0.9. Effective range can reach 160 km. There are already records of using AT-3 trainer planes to launch the missiles in question, hitting target ships.

CONJECTURES ABOUT PRIMARY CHARACTERISTICS AND THEIR FUTURE UTILIZATION

As a new model of military fighter which has just been equiped and has not been around very long, accurate technical characteristics data with regard to it are temporarily unknown. Here, there are enumerated a number of figures and statuses. The primary sources are some open periodicals. Most are estimated or conjectural values. On the basis of briefings, the IDF fighter wing span is 9.42 meters. The fuselage length is 14.21 meters. The height of the aircraft is 4.73 meters. Wing surface area is 23.2 square meters. Exterior dimensions are slightly smaller than the F-16 and about the same as the F-20. However, wing surface ares is larger than the latter. A possible reason for this is the

existence of side strip wings. As far as weight data are concerned, empty weight is 6691 kilograms. The maximum amount of fuel that can be carried in the aircraft is 2129 kilograms. The maximum amount of ordnance that can be carried is 3160 kilograms. Aerial combat take off weight is 9534 kilograms. Maximum take off weight is 11980 kilograms--very much the same as the F-20. Maximum speed in level flight is around M1.7. The practical ceiling is 16600 meters. Rate of climb is 254 meters/second. Combat radius is 600 km. Maximum range is 2400 kilometers. These capabilities



Three View Drawing of the IDF Fighter

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all do not compare with the F-20. The primary causes lie in the engines. The IDF is equiped with two TFE1042-70 engines. Even speaking generously, one unit after burner thrust is only 42.95 kilonewtons. However, the final selection for the F-20 was the F404 engine. Its after burner thrust could reach 71.1 kilonewtons.

Although the thrust of two engine units added together is not smaller than the latter, the addition of another engine unit, however--besides the weight increase itself--brings difficulties with it in terms of structural and aerodynamic design and will certainly influence the performance of the aircraft. However, IDF allowable overloads can reach 9G--the same as the F-20. The explanation is that the structural design is successful. This is perhaps a benefit from wing fuselage integral fusion design.

Seen as a whole, the IDF fighter integates several types of technology from the aircraft of foreign countries to include directly applying their products. The main source is the U.S. Because of this, there are people who call it the "hybrid". As far

as an overall evaluation of its performance is concerned, it belongs to a type of fighter that is mainly suitable for aerial intercept missions, at the same time, with a view to air to ground operations as well.

With regard to the status of the utilization and equiping of the IDF fighter, not long ago 20 planes were delivered to the Taiwan KMT air force (among them were included two seater versions), equiping a flight squadron of the Taizhong Qingquangang air force base. It is projected that, before the end of 1998, Taizhong, Tainan, and Hualian air force bases will complete two IDF fighter wings, that is, 6 flight squadrons equiped to deploy to missions.

At the present time, Taiwan has already ordered 150 F-16A/B from the U.S. and placed orders for 60 Mirage 2000-5 from France. It is said that orders will also be placed with the U.S. for 60 to 100 F-5E/F and 4 E-2T airborne early warning aircraft. It is planned to equip 130 IDF at the present time. Deliveries will begin of E-2T in 1995 and F-16/B and Mirage 2000-5 in 1996. It is projected that by around the year 2000 Taiwan's air defense strength will form a new pattern.

The high altitude performance of Mirage 2000-5 is relatively good. Its practical ceiling is 18000 meters. Maximum rate of climb (sea level) is 284 meters/second. The climb time for climbing to 15000 meters at a speed of M2 is 4 minutes. It is capable of being utilized primarily to do high altitude intercept. As far as F-16A/B are concerned, although intercept performance is relatively bad, aerial combat performance, however, is comparatively good. Cruising ranges and useful loads are relatively large. They are capable of being used primarily for tactical attack and locally for intercept. IDF, by contrast, will be used to act as a short range multiple use fighter.

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