Flying Safety Office

TAC ATTACK

JUNE 1968

THE THING !!
...page 4

for efficient tactical air power

TAC ATTACK

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Angle of ATTACK

PLAN FOR IMPROVEMENT

For several years a lot of knowledgeable people have been advocating the value of command emphasis as the first requirement toward a reduction in aircraft accidents. This has obviously paid off in the past as our 1967 accident rate reached a new all time low. Last year's record should have convinced even the severest skeptics that we can accomplish our often hazardous job without a lot of needless loss in men and equipment.

In the past three years TAC's flying hour requirement and the inherent mission hazard have steadily increased. Despite this, thanks to a grown-up approach by all concerned, we have seen our record steadily improve. This is especially significant when you consider that many of our RTU and combat crew training students have come from a variety of commands and flying backgrounds. It has taken real professionalism to produce combat ready crewmembers and still not harass the troops with the fear of having an accident. Each instructor, flight commander, ops officer, every supervisor in the chain of command who contributed deserves a share of the credit for last year's safety record.

Now all of a sudden we've had a rash of avoidable accidents. A large percentage of these are shaping up as pilot and instructor pilot error. This indicates that either we're beginning to get careless or we're training students with unqualified IPs. There's very little excuse for spinning-in a one or two million dollar airplane, losing control in the traffic pattern or simply running out of gas. The TAC pilot today has considerably more responsibility than his World War I or II counterparts. Every aircrewmember must recognize this and react accordingly.

Our training must be realistic and tough. But when we continue to have accidents because someone can't seem to stay ahead of the aircraft then something has to be done. This can only lead to a diluting of our combat readiness training with a resulting loss in quality to the combat aircrew.

After our poor accident record during April I'm sure everyone has been doing some serious thinking about how to improve the safety of our flying operation. Professional pride alone should require this. Hopefully with increased emphasis at all levels our safety record for 1968 will begin to show improvement. With everyone's help we can continue to provide realistic combat training and at the same time eliminate the "unforgivable" type aircraft accidents.

H. B. Smith

H. B. SMITH, Colonel, USAF
Chief of Safety

The "THING"

will get you if you don't watch out !

by A. W. (Tony) Levier
Director of Flying Operations
Lockheed-California Company
Burbank, Calif.

Tony Levier is probably the best known pilot in the U.S. today. His flying career encompasses several stages in the evolution of aviation from barnstorming and instructing to racing, transport flying, and test flying for Lockheed California Division. He has a long list of aviation "firsts." These include first flight in the T-33, the F-90, first plane to use afterburner, and the F-94. Mr. Levier began with Lockheed as a test pilot and today is their Director of Flying Operations. TAC ATTACK is honored to have him as a guest editor.

The five little racers are lined up abreast for a race horse start, barely 20 feet between wing tips. It's the start of the Greve Trophy Race during the 1939 National Air Races in Cleveland, Ohio.

I'm flying the Schoenfeldt Firecracker, the world's fastest 550-cubic-inch racer, and I'm sitting at the enviable left end (pole) position. Lee Williams, a novice, is on my right. Further on are Art Chester, Harry Crosby and George Bayrs, in that order. We are headed south on the grass turf of the municipal airport. The No. 1 scatter pylon is slightly to my right and No. 2 is well to the left.

The starters' flags both drop and five angry little "beasts" leap forward. Williams, on my right, charges ahead and then, suddenly, turns left, forcing me to veer left too. Keerist! What's the matter with the guy? He's going for the wrong pylon.

My racer is heavy and accelerating slower than Williams'. The ground is rough and giving me plenty of trouble keeping the little bird under control. Sure enough, Williams is heading for the No. 2 scatter pylon. I decide to follow him. I'm all loused up and out of position to cut right.

I know my racer is tail heavy. We had just installed a 35-gallon fuel tank behind my cockpit a

There is 20 gallons in it for this [illegible]e. I could feel the weight, and the tail was dragging hard against the ground, even with full forward stick and the stabilizer adjusted for full nose down.

Williams is in the air. His takeoff looked hairy. With the nose dangerously high he catches it, then straightens out toward the No. 2 scatter pylon. I follow him into the air. Ye gads! Is she unstable. Every little bump makes her want to pitch-up or tuck under. I was expecting this to happen, knowing full well that the Center of Gravity (CG) was aft of the normal limit.

I started a wide turn left to follow Williams. He's just about to the pylon. Now he starts rolling into the turn. He's almost vertical and pulling back on the stick. Then it happens. The little racer, "Miss Los Angeles," also with a new rear fuel tank, pitches and snaps. Williams, the poor guy, in his haste and excitement, hadn't gotten the warning, or just didn't understand what a rear CG meant. The racer, tumbling crazily, falls to the ground. I am directly over him when he crashes. God! What a start for an air race.

I circle on around to the left, as the rest of the racers pass around both scatter pylons. I eventually catch up and pass the other fellows, only to have my engine go sour, forcing me out of the race.

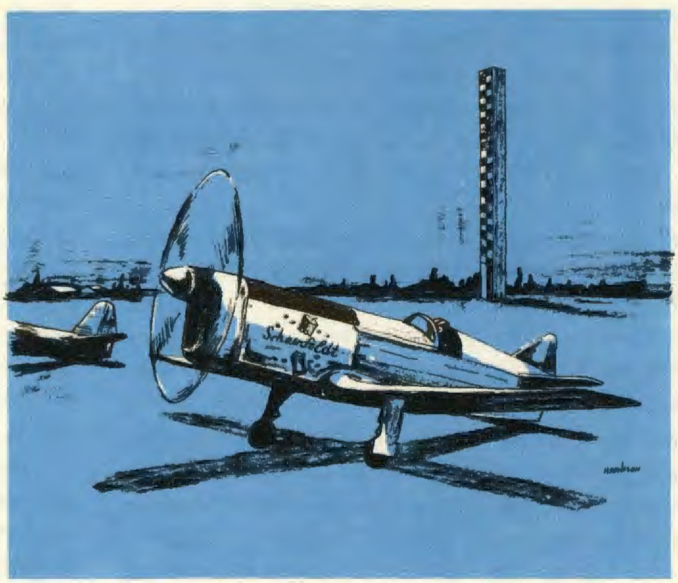
Even though I was out of the money, I learned a valuable lesson that day. All high-performance aircraft can, and do, perform maneuvers that result in out-of-control situations. The fighter pilots of today are faced with out-of-control maneuvers that can only be described as the "THING."

Now, really, there isn't much difference in the way some of those early-day racing aircraft acted and our present day fighters. Today, the words "pitch-up," "pitch-down," "tuck under," and "post stall gyrations" are spoken by jet fighter pilots. Is this a whole new terminology for aircraft behavior? Not at all. The basic behavior phenomena of aircraft hasn't changed at all throughout my years of flying.

Take these "new terms": super stall or deep stall. I used to call it CATASTROPHIC STABILITY in order to describe it. Anyway, I experienced it in 1933 during practice for an air show. I was going to do a series of dead stick loops. On my first attempt, the bird stalled inverted, and believe it or not, it wanted to stay inverted. I used every combination of control to get her off her back, but to no avail. The aircraft, an OX5 powered Travelaire biplane, was falling flat and absolutely so stable that it would have crashed inverted had I not hit turbulent air at about 1,000 feet. This upset the machine just enough for it to slide off on one wing. I was about to bail out at just that moment.

The only difference between those "early birds" and some of our very latest and hottest fighters is that they were lightweight and slow in speed. Generally speaking you could get away with making a lot of mistakes simply because you had a little more time to correct yourself. Even if a particular type of aircraft would snap at you for mishandling, you could recover by certain corrective action almost instantaneously.

Not so today. Our fighters, big and little, all have high wing loadings of over 100 pounds per square foot (PSF). And I think I'm correct in saying that none of them have a really clean bill of health when it comes to slow speed stability and control. That's what I would like to talk about now.



the thing

SLOW SPEED STABILITY AND CONTROL

By and large, we pilots tend to get into more trouble with an aircraft by fooling around at low speed and too low an altitude while executing some special maneuver. Often this pet maneuver is "verboten" by either the manufacturer's Dash One or the SOP set forth by the particular command to which you are attached.

Also, and it's not exactly rare, some odd characteristics of new aircraft are not completely understood by everyone until such time as an accident or incident investigation reveals the flaw. Sometimes it takes a lot of pilot and aircraft losses to jar people loose to do something about it. In the meantime, "pilot error" is only too often the final conclusion of an accident investigation report. I'm talking, of course, of those accidents that usually happen during seemingly normal circumstances . . . the pilot landed short, the aircraft stalls on base leg, etc., with everything else working okay.

Surprisingly enough, our skill levels are not always what they should be at any given time. Therefore, in my opinion and this is strictly from my personal observation from working with all kinds of pilots, military and civilian for 40-odd years, there is a percentage in any group who will over extend themselves. From time to time, they deviate from the standard and laugh about it . . . only if they get away with it. The helluvit is, frequently there's no one left to laugh.

Several years ago, a young ex-military pilot joined our ranks as a production test pilot. He was a darn good pilot, had an aeronautical engineering degree, and wanted to be an experimental test pilot. We sent him to a military test pilot school where he distinguished himself as an outstanding graduate. Later on, he had his chance to join the engineering department as a full-fledged experimental test pilot. Again, he distinguished himself by performing important development testing on the world's first Mach 2 fighter.

He and I spent his last evening together, talking about his work. There were many things that bore on his mind. He once told me that he had never been frightened while flying an aircraft. Perhaps he hadn't, but it appeared to me that evening that test flying was getting to him. "Joe," I said, "there are times when we all have to back away from our work to assess ourselves and the tasks at hand. If your job is getting on your nerves, you may need a rest . . . need to get away from it for awhile."

There was work to be done and Joe was the last person to throw in the towel or to ask for time off. It was late afternoon the next day when he approached Runway 07 at Palmdale. Witnesses stated that the aircraft looked normal until about 15 feet off the ground. Suddenly the right wing dropped some 15 to 20 degrees. At that moment, the nose came up and the bank angle increased. Now the plane started to veer to the right and headed off the runway. Joe put in full power and afterburner to try and save the situation. The bank angle increased to about 70 degrees with the nose high. Then it struck the ground. The right o[illegible] board tip tank fin cleaved the ground first. The an[illegible] was measured at 70 degrees.

Joe was really a wonderful guy. Unusual for our day. He didn't drink, smoke, swear, or raise hell like a lot of us do. His family life was very harmonious. But even with all these plus factors working for him, he still made one little mistake that day.

The particular aircraft he was flying did not yet have boundary layer air for the landing flaps. Therefore, all landings were to be made in takeoff flap position. For some unknown reason, Joe elected to use landing flaps. I had previously done the early investigation of the landing flap configuration and found that as you approached touch-down speed, the right wing drops - not abruptly, just gradually. It seemed to sneak up on you. This was basically caused by span-wise air flow over the ailerons which rendered them ineffective just at the time you needed them most.

The accident investigation board did their job. No one could ascertain what happened. I recounted my experience with the bird during earlier tests, but they refused to accept it. Findings: Cause Undetermined. They just weren't listening.

Now, let's talk about another so-called new term[illegible] inology - post stall gyrations. As time goes by, mc[illegible]

and more pilots in various fighter aircraft are encountering these out-of-control maneuvers. Naturally, aircraft manufacturers like to keep these things on a low key. The Dash One might mention them with a WARNING or CAUTION and touch on the subject so briefly one might conclude it to be of little significance.

Later on, when the service pilots get the bird and really put it through its paces, invariably someone, perhaps less experienced and not too long out of flight school, gets into trouble. Things get to popping. What's with this bird? Why does it fall out of the sky like a ruptured duck? Then, and only then, do the customer and the manufacturer lock heads and get serious about the facts of life. Result: The issuance of a SAFETY SUPPLEMENT.

Quite often the contents of a Safety Supplement were well known facts long before the bird went operational. Test pilots, aerodynamicists, and the like, if they have done their job right, usually know what these undesirable but inbred characteristics are. They should lay it on the line right off the bat.

I have had many hairy experiences during the early development of jet aircraft. Some of these birds had post stall gyrations like nothing you can imagine. Those of you who are relatively new to our jet-set and didn't fly the good old T-Bird (T-33) back in its early days might not know that it had a post stall gyration (PSG) that we called the "THING." I invite you to read an article by Sammy Mason and yours truly in the February 1968 issue of INTERCEPTOR. It tells about the history of the T-33 stall and spin program, and what we discovered caused the PSG. Even though you may never have the occasion to fly the T-Bird, it will give you an insight into the cause of PSG for most fighter types.

FIGHTER DESIGN

In order to design a modern fighter aircraft with Mach 2 plus capabilities, the designer must consider many things in determining the configuration he believes best to meet the military requirements. Usually the customer specifies the desired gross weight, pay load, range, speed, operating altitude and related equipment to complete a weapon system. The manufacturer chosen as the prime contractor assembles his staff for the project. They, in turn, start the task of refining the design already proposed. What will it look like? Will it be a delta, swept, or short, thin straight wing? High or low tail plane? Take your pick, we have 'em all.

Wind tunnel tests are used to optimize the design. Invariably, some undesirable characteristics rear-up to bug the aerodynamicists. They make trade-offs here and there to try and improve the situation, only to find that they adversely affected some other good characteristic. It takes a smart and patient engineering group to finally find a solution that will produce an aircraft acceptable to the customer.

However, and you must remember this, the trade-offs that are made in the final design of a supersonic fighter, in the cases I know of, have resulted in marginal low speed stability and control at high angles of attack. And, they all have some sort of undesirable handling characteristics during and after accelerated stalls.

At traffic pattern speeds and altitude, an accelerated stall most often will result in a PSG from which recovery will be extremely doubtful. When the modern fighter is man-handled into an abrupt pitch attitude of high angle of attack, several things happen almost simultaneously. . . and so fast that I defy any normal pilot to react quick enough to divert a wild ride.

Take a typical fighter, sweptwing, low horizontal tail, normal weight and CG. If the pilot, on the break for a landing, rolls and then racks it back to make an impressively tight turn, the air flow over the wings changes abruptly from chord-wise flow to span-wise flow on the underside and "burble" or flow separation on the top side. UNLESS CAREFUL WING DESIGN PREVAILS tip stall will occur which produces a forward shift in the aerodynamic center of pressure (CP). This in turn produces an extremely severe stalling moment (pitch-up). With a fast pitching rate, produced first by the pilot, plus the forward shift in CP, the angle of attack easily exceeds normal limits. The suddeness of the initial maneuver will usually mask or shadow any normal or artificial stall warning.

If incipient stall occurs, the aircraft may roll right or left. Roll application by the pilot may help trigger this condition, which can induce adverse yaw followed by AUTOROTATION. Under certain conditions one might expect a snap-roll ending up in a spin.

On the other hand, the long body (fuselage) and tail surfaces play an important part. When the wing stalls at the root it will affect the air flow along the aft fuselage, which also reduces the aircraft's directional stability. The vertical fin, now engulfed in a region of turbulence, can be partially stalled, reducing the directional stability still more.

Now, the forward body of the fuselage comes into play. It's there to carry the flight crew, some incidental equipment, and usually sticks way out in front. It makes most aircraft look real racy. Right now it would be better to have a short, forward body. The long, forward body wants to bend back. It may tend to pitch the nose still higher if the wings are level, or yaw the aircraft to excessive angles if the airplane has rolled toward a vertical bank attitude. The air flow produced by high angles of the fuselage body will tend to aggravate the flow of air across the aft fuselage and tail surfaces.

The sequence I have described takes place in about one and a half seconds at approach speeds. PSG is now in effect. You are going for one heck of a ride, like it or not. The speed of the aircraft drops so fast by virtue of the tremendous induced drag, that you will feel like you've been kicked in the face. There is, in my opinion, about a 50/50 chance for recovery under 10,000 feet above ground level in most supersonic fighter aircraft - and that's cutting it mighty close. These gyrations may even flameout the engine, which certainly compounds your problem. At traffic pattern altitude, you had better punch out pronto!

Let me tell you what happens with an F-104 in a high-speed pitch-up. The actions of the Starfighter can be compared to the maneuvers I went through when the turbine wheel let go on an early P-80 test flight and cut the whole damn tail off! You can imagine the resultant gyrations.

I was selected to be the project test pilot for the first flight of the XF-104 and subsequent Phase I development. During the wind tunnel tests, the phenomenon of negative static longitudinal stability at high angles of attack, given the name "pitch-up," was discovered. I was informed of the characteristic. However, no one was sure what the bird would end up doing. I, obviously, approached all stalls with great caution.

In the one G level stall tests, I encountered the point of neutral static longitudinal stability. As I cautiously continued to pull the stick back (about 145 knots) the bird would just sit there, nose high on the horizon, buffeting like crazy. Suddenly, lateral instability set in causing the bird to flop so fast that I couldn't keep up with it. I shoved the stick again the forward stops and the aircraft still wouldn't respond. I had found the neutral point and then exceeded it by a very small margin so that the aircraft was becoming divergently unstable. I was on the verge of pitching up. If a pilot were to make a rapid pull or jerk he could easily go through the neutral stability point and get into an uncontrollable pitch-up maneuver.

I didn't lose complete control during those one G tests - just almost. The thing I did notice, though, was that as I pulled back on the stick gradually to reduce speed and reached a fairly high angle of attack, the aircraft began buffeting quite severely. The stick force, of course, was high because of artificial feel force springs. This produced a false impression that shadows the somewhat sudden change in longitudinal static margin at the critical angle of attack. At the time, we did not have an automatic pitch control (APC) system.

Later on, we started doing what we called "V-G tests"...how many Gs the bird would produce at a given indicated airspeed (Vi)! This particular test called for 30,000 feet, Mach = 0.9; not to exceed 325 knots Vi (for safety considerations).

Test 1: Trim for one G flight, then pull a steady one and a half Gs in a turn to study stability an control, and buffet onset if any. There was no buffet.

Test 2: Pull two and a half Gs. This produced light buffet, no appreciable change in stability and control.

Test 3: Pull three and a half Gs. This produced very heavy buffeting and lateral oscillations that I could hardly keep up with. I was holding three and a half Gs steady for about one complete turn when all of a sudden the bird pitched and rotated so fast and so violently, I thought the tail had parted company.

This reminded me of the P-80 turbine failure incident which I mentioned before. I thought of four things, and acted on the fourth. The tail broke off... I've got to eject...I have the stick in my hand...I pushed it forward and the aircraft straightened out and flew off as though nothing had happened.

I was somewhat shook. My chase pilot failed to see the maneuver. I requested a visual inspection but he could find nothing wrong with my aircraft. Everything seemed normal in the cockpit. Even so, I discontinued any further testing. This may well have been the first pitch-up maneuver and successful recovery of a supersonic fighter.

I made my report. Both Lockheed and the Air Force thought only a "stick shaker" was necessary. Besides, they reasoned, the natural aerodynamic buffet and lateral oscillations were a very strong and effective warning system. Most people at the time didn't appreciate this new phenomenon until another fighter pitched up on takeoff and crashed. This brought everyone's attention to the phenomenon of pitch-up and post stall gyrations. As a result, an APC system was installed.

Now, the sad part of modern-day flying is this: pilots can't experience these strange happenings because they are forbidden. Read any Dash One and it WARNS you about slow speed flight, or to avoid a deep stall, and that spins are prohibited. Only by accident are you allowed to experience them. Some make it, some don't.

A couple of years ago a fighter pilot trainee made a weapons delivery pass on an Air Force range. On the pull-up he went into a crazy gyration and crashed. The pilot ejected only to smack the ground before his chute worked. The base commander and operations personnel tagged it as a flight control problem. Why would an aircraft do such a wild maneuver unless the flight controls suddenly went ape? It was a natural thing for them to think.

I thought differently. The bird had a clean bill of health with the hydraulic flight control system. I suspected pitch-up. I visited the air base and talked to the accident investigation board. I found out that this unit was flying at low altitude with the APC inoperative because they had experienced several malfunctions. The system was giving them stick kicks during low level pull-outs. They hadn't lost an aircraft due to their APC malfunctions, but now they chose to expose every aircraft and pilot to possible pitch-up at low altitude during the pull-out on gunnery range training.

We showed them motion pictures of pitch-up. One of the range witnesses said, "That's it, that's what the bird did." There was still some doubt in their minds, but the final report came out...probable cause: pitch-up.

In summing up the situation as I see it...the loss of aircraft due to the "THING" can be reduced very drastically by two steps.

1. Every pilot flying supersonic fighters must be made aware of what post stall gyrations are, what causes them and how to avoid them, particularly at low altitude where recovery is unlikely. At normal traffic altitude, takeoffs, approaches and landings, you must learn to handle the birds with kid gloves. There is no requirement for aerobatics in the traffic pattern.

2. Any supersonic aircraft having undesirable low speed stability and control characteristics wherein at high angles of attack the static margins become neutral or negative about any of the three axes, I strongly recommend an APC system to preclude any possible chance of a pilot encountering an uncontrolled stall maneuver...the "THING."

I believe the young officers of our military air forces of today are as fine a group of young men as I have ever had the pleasure of meeting. There's really little difference, that I can see, from pilots of 25 to 30 years ago. But now we have extremely expensive, high-performance aircraft that cost 10 to 15 times more than in World War II. Mission requirements are more demanding than ever before, requiring far greater attention to every detail of flight operations. Today's pilots, as a whole, are better educated. The Air Force Training Command turns them out second to none, in my opinion. And combat crew training at the tactical flight schools is equally as good.

the thing

Where, then, do we fall down? I think the young military pilot has to be hand fed and carefully watched for a much longer time than he is at present. With his formal training over, he joins a squadron and is expected to fit in and carry his weight in a very short time. I believe the system has cut this time period too short. This is, I am sure, the result of budgetary considerations. I have said it before and I say it now - a little more time, a little more training and I believe the so-called cost effectiveness and accident rate will improve.

Many years ago I recognized the need of pilot support for the world-wide F-104 program. I convinced our management to send out our best qualified pilots and engineers on company-funded trips to assist the units in all phases of their operations. We printed books that contained lectures explaining all the whys and wherefores of the warnings and cautions in the Dash One. We explained to all the pilots how we arrived at all the limitations on the Starfighter. This support program is still being funded, and I am convinced it's paid off in a big way for us and our customers.

For all you eager young pilots who are just beginning, I want to advise you to think ahead to the time when you'll have bags of experience in your fighter bird and be confident that you can lick anything in the skies. Until then, look at yourself; size yourself up. Don't kid yourself on how good you are - prove it by playing the game straight. Go by the rules or you go alone.

And watch out for the "THING"!

I'm out of CONTROL !!

by Major W. A. Stringfellow
121 TFW (ANG)
Lockbourne, Ohio

It's sure a nice clear day for flying even if I do have the number Four slot. No wind to speak of... so today I'll show mobile how a wing takeoff should be made. Gages are in the green, nod OK to Three. There goes One and Two. Eight seconds. There's Three's nod for brake release; we're on the roll - engines pretty well matched 'cause I can keep the light on the star. I'll ease a little closer and still have wingtip clearance. Line checks OK - nose coming up - and we're off the ground. Gear up nod from the Boss and... Oh Oh, I'm drifting into Three - left rudder, a little aileron, MORE RUDDER...MY GOD, I CAN'T STOP IT!!! FORWARD ON THE STICK... NOW!! Got some rudder control now - get out to the left and recover!! OOHH BOY! Thanks Lord, I'll take it now...

I'M OUT OF CONTROL !

Has this type of heart throbber ever happened to you? You won't soon forget if it does. I have experienced this phenomenon, and I have witnessed several of these close ones from mobile control. One of our confident tigers first experienced this moment of "out of control" as number Four during takeoff from a western AFB. He didn't have room to push the aircraft over, so he pulled up as he drifted uncontrollably over the top of number Three. I know of three other similar occurrences at home base during the past year. About a year ago in TAC, Four hit Three's wingtip just after lift off. This flipped Three into the ground inverted. Four received PILOT FACTOR for flying too close. A month ago, the very same thing happened at a southwest training base killing number Four; so we can't question him.

Well, what is the cause of these periods of uncontrollability? The first thing most of us would think of is jet wash. FAA provides an article in "THE AIRMEN'S INFORMATION MANUAL, PART I" that is very enlightening... 'prop jet wash" is now known as "thrust stream turbulence" and "wingtip vortices" or "vortex turbulence."

The FAA article downgraded the hazards of jet wash and pretty effectively laid the blame on wingtip vortices: "A vortex core is the center of a trailing mass of disturbed air created by the wing of an aircraft as it produces lift. An aircraft creates two such vortices with rotational air movement due to spillage about the wingtips. The air rolls into two distinct vortices, one trailing behind each wingtip. When an airfoil passes through a mass of air and creates lift, energy proportional to the weight being lifted is transmitted to the mass of air."

The article continued: "Since vortices are not formed until lift is produced, they will not be generated by an aircraft taking off until just before lift off - at the point where rotation is made. Vortices generated above the surface will drop nearly vertically in a no-wind condition until reaching a height equal to approximately one-half the wing span of the generating aircraft."

When we apply this thesis to our every day operational environment, we can recognize the logic and aptly apply the old pointed finger. Religiously abiding by the evolved teachings of our TAC bible (55 series), our four ship takeoffs for a right turn out are One, Two, and Three in right echelon with Four between One and Two as in Figure 1.

One and Two roll, then Three and Four follow a minimum of eight seconds later. The first element

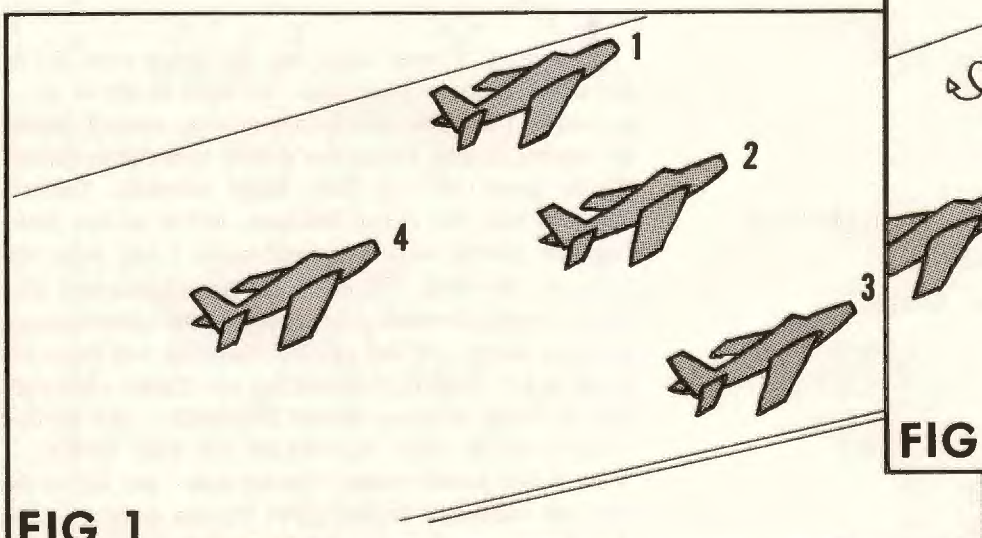


FIG 1

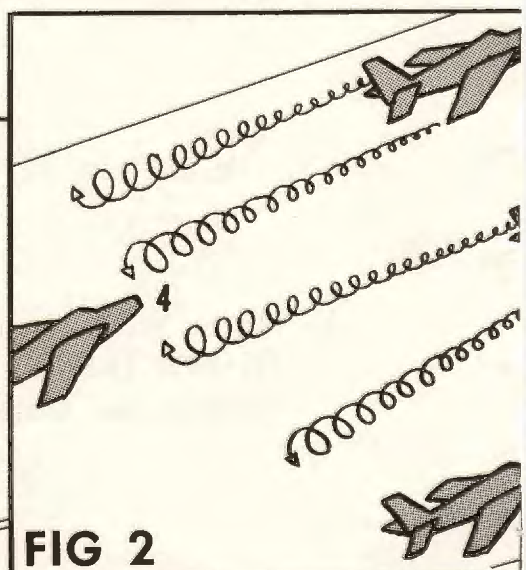


FIG 2

makes its computed takeoff roll and off the ground. The second element's roll is a little longer than computed because the runway temperature has been increased from the first element's exhaust. The first element has been generating vortices since the start of rotation. Now the second element churns down the runway and lifts off past the first's lift off point. And they plow right into the falling vortex turbulence. Since they are slow and heavy and can't zoom up through, they ride the waves until they can get above it or off to one side.

Now the reason that number Four almost goes into the real estate business and Three's not even propositioned is that Four is catching the right wingtip vortices of number One plus the left wingtip vortices of number Two. Check Figure 2.

The forces of the air in wingtip vortices can well exceed the aileron control capability or the climb rate of some aircraft. For those who want figures, the air in a vortex core can produce a roll rate of about 80 degrees per second.

Remember now that the most susceptible condition is with a calm wind. This condition may also exist if there is a light wind down the runway. It seems that a crosswind displaces the core or cores, reducing the possibility of this occurrence.

Loss of control has occurred during the landing phase if closely spaced behind another aircraft. This usually doesn't occur until over the overrun and during the flare because the second aircraft is usually a little above the first aircraft's flight path. Also, the vortex turbulence created by the first aircraft has fallen down or drifted from the flight path.

I think we have established that vortex turbulence has caused some very anxious moments. Now that we realize what causes this mixed-up wind, what can we do to steer clear of this hazard. I hereby and forthwith submit some beef-for-broth for your digestion or otherwise. First. If the conditions are right for maximum vortex turbulence, take more spacing between your elements. Second. Attempt to get above or to the upwind side of this disturbed air mass as quickly as possible. Third. Try to place the second element on the upwind side. Fourth. How about practicing takeoffs from various lineups as in Figure 3?

Other types of lineups may keep Four out of the combined air masses if there's space enough between the wingmen and leaders.

Discuss this problem, gentlemen. Submit solutions! Help bring this problem under control!!

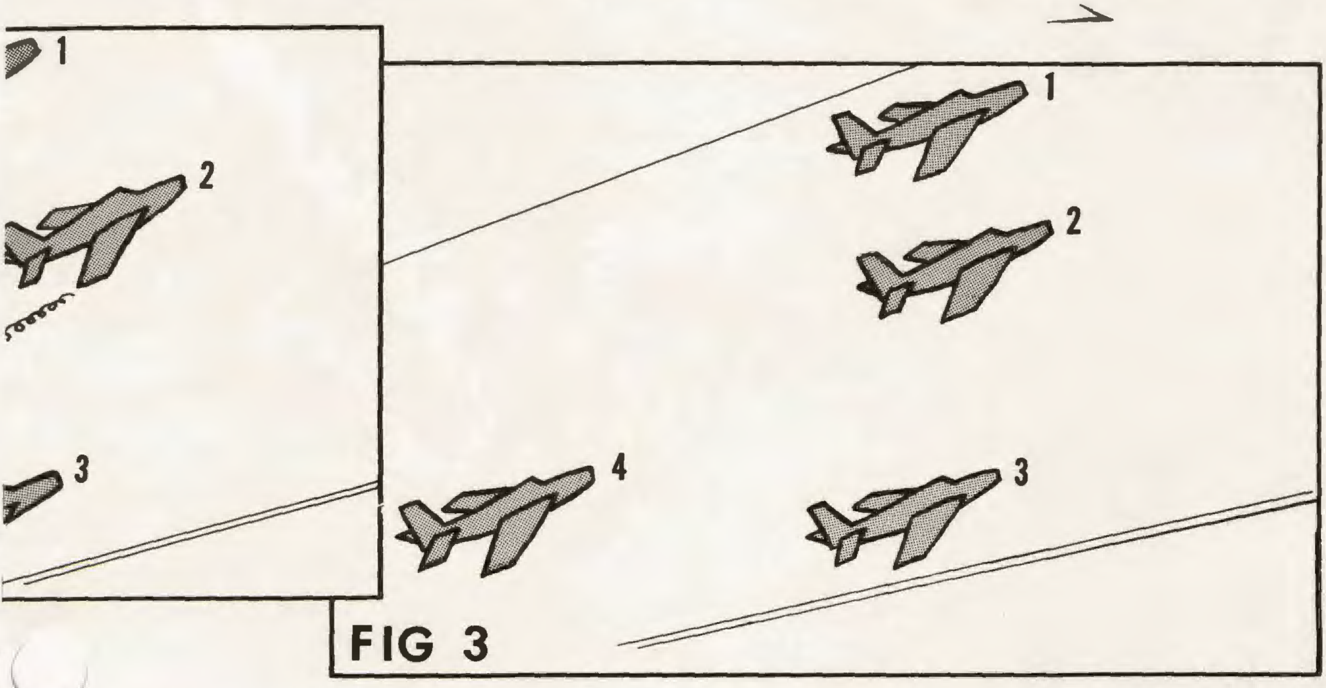
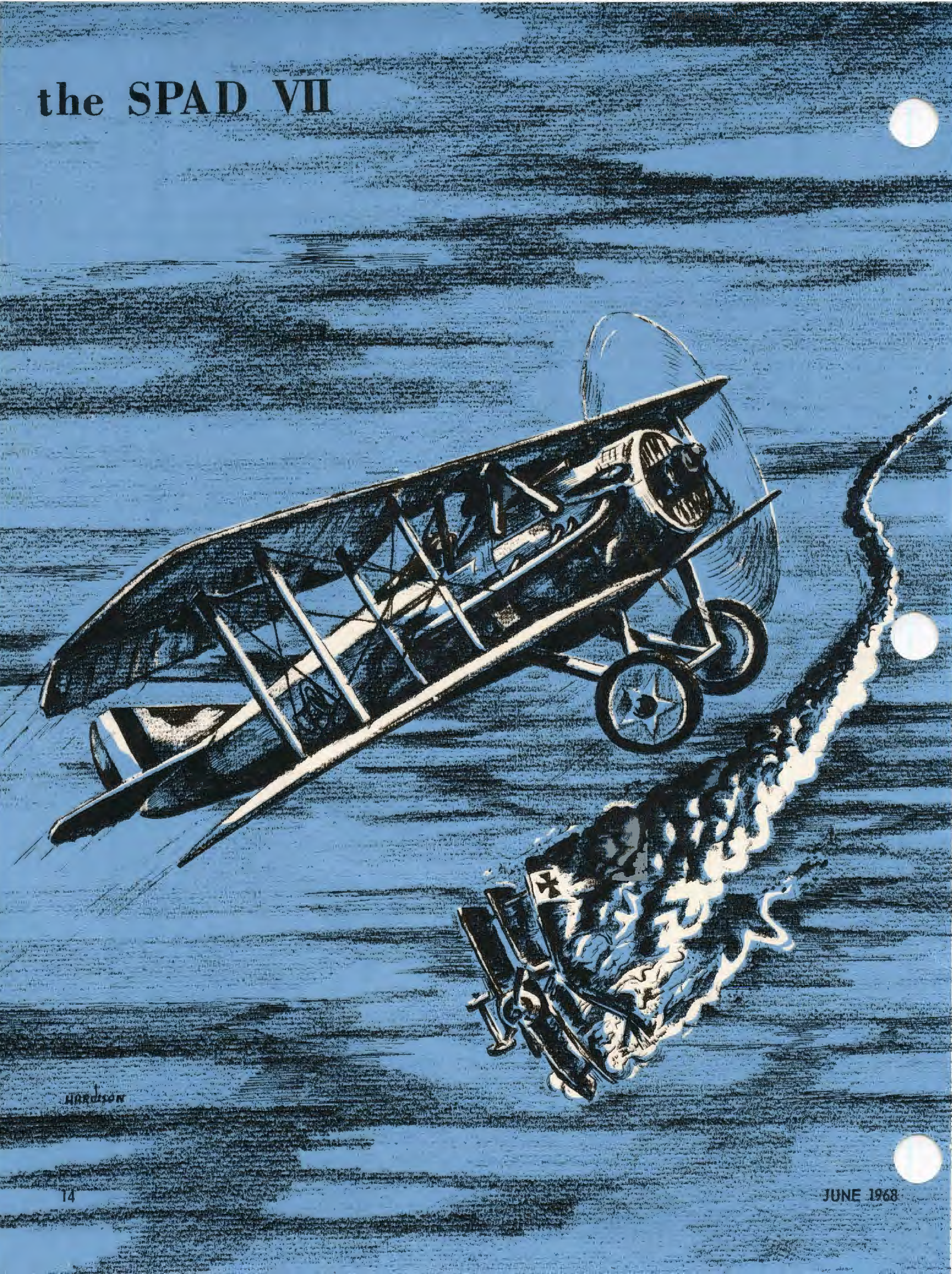


FIG 3

the SPAD VII



Flight Leaders

by Lt Col Carl E. Pearson

Pilots of the American Expeditionary Force in the summer of 1918 anxiously awaited delivery of the scrappy, pug-nosed Spad VII. Their Nieuport 28s ... rejected by the French Air Service... were inferior to the high-performing German Fokkers they tangled with daily over the front lines. Worst of all, the Nieuport 28 had the often-fatal habit of peeling wing fabric when overstressed in a dive.

America's foremost ace, Captain Eddie Rickenbacker, and his famous Hat-in-the-Ring Squadron, the 94th Pursuit, welcomed delivery of their French-built Spad VIIs three months before the war ended. They finally had a rugged fighter that could climb, fight, and dive with the best the Germans offered. In the short time remaining, Captain Rickenbacker upped his string of confirmed aerial victories from 12 to 26 in the pictured Spad VII.

Why call it the Spad? It was designed by the French aeronautical engineer Louis Bechereau in 1916. His company, Societe Pour Aviation et ses Derives, manfactured racing planes before World War I. The company's name being too long, its initials became their airplane's official designation. Voilà: the Spad.

Like the British S.E. 5, the French built the Spad around the revolutionary Hispano-Suiza V-8 engine. Swiss engineer, Marc Birkigt, founder of the renowned Hispano-Suiza motor car company designed the "Hisso" after World War I began. Birkigt's new V-8 boasted aluminum monobloc castings for the cylinder banks; steel cylinders threaded full length stiffened the lightweight castings; a complicated valve gear was enclosed and crankcase-oil lubricated. Worried about strength and endurance at high power settings, French officials insisted on a nonstop test run of 15 hours. The V-8 passed the endurance test easily and delivered 150 hp at 1550 rpm, about 50 percent more thrust than other fighter power plants then in use.

The original Spad design proposed mounting a Lewis machine gun between the V-8's cylinder banks, firing thru a hollow prop shaft. An ingenious geared drive system permitted raising the prop shaft to gun barrel level, eliminating a major problem - synchronizing machine gun firing thru the prop arc. The butt end of the Lewis gun extended into the cockpit for ease of loading and clearing frequently-jammed guns.

About this time Fokker invented a prop-to-gun synchronization system based on mechanical cams. Twin, belt-fed Spandaus, engine nacelle mounted, now fired thru the prop arc of German fighters at high rates of fire. Fortunately, George Constantinesco, a Rumanian inventor working for the British, designed a superior gun synchronizer replacing complicated mechanical cams, rods, and gears with a hydraulically actuated system. Double, belt-fed .303 Vickers machine guns firing thru the prop quickly became the firepower minimum for fighters. The drum-loaded, slow-firing single Lewis gun lost its appeal.

Guynemer, the legendary French ace, pursued the thru-the-prop-shaft gun installation one step farther. He substituted the famous French 37 mm cannon, the "one-pounder," for the engine-mounted Lewis gun. In his first combat trial with his cannon-firing Spad he scored a direct hit, blasting an Albatross D3 at a then phenomenal 200 yard range. Unfortunately, this hard-hitting weapon presented other problems. Slow rate of fire, heavy recoil, gun breech operation, cockpit ammunition storage, and asphyxiating powder fumes added too much to a pilot's survival problems. And he couldn't afford that much head-in-the-cockpit-time. His life depended on swivel-necking and max firepower with split-second availability. The cannon-firing Spad also lost its appeal.

Besides being an outstanding fighter the Spad VII looked the part. Its squat, bull-dog appearance caught the eye and fired the imagination of fighter pilots at first sight. Short in wing span (25' 8") and in overall height (7' 3-1/2") the round, shuttered, radiator grill sported a 7' 11" prop. In its first flight the Hisso-powered Spad smashed speed records, hitting 135 mph straight and level.

Follow-on versions of the Spad increased size, boosted gross weight, installed higher horsepower V-8s, and added armament. Throughout the development race the Spad's ruggedness, speed, rate of climb, strength in dive, and ability to absorb punishment gave the Allies a timely weapon system to meet and defeat the challenge of the German Air Force.

And American pilots learned the hard way that aerial combat survival demands keeping your speed up, your head out of the cockpit, and superior firepower ... you can't get by on just fancy footwork.

TAC ENHANCEMENT

Squadron Maintenance III

by Captain Bruce D. Emery, Canadian Armed Forces
Hq TAC (DMMMP)

I doubt that any reader would disagree with the statement that a team that trains together fights together more effectively. However, this truth wasn't always recognized or practiced. At one time deployed tactical units were little more than pickup teams because each squadron had to borrow maintenance and support personnel before it deployed.

TAC started to form more effective fighting teams in 1966 when an extensive reorganization of the maintenance and support functions began. The reorganization heralded one of the most significant developments in the employment of tactical air forces. Old timers in TAC will recall that the initial decentralization changes were of an interim nature. As a first move, crew chiefs and flight line supervisors were transferred from the organizational maintenance squadron to the tactical squadron. Load crews made a similar move from the munitions squadron.

TAC pressed on in an effort to create an organization that would be efficient in peacetime and have maximum deployability in wartime. Ultimately, the 4th Tactical Fighter Wing and the airlift wings were authorized to implement further decentralization. Phase inspection and specialist personnel were transferred to the tactical squadrons. Finally, in September 1967, after careful analysis of all factors, Hq USAF gave TAC the green light to reorganize all TAC units.

By the time this article is published the airlift wings, reconnaissance wings, a majority of the fighter wings, and the special warfare forces will be well along the road to decentralization. The tactical squadron will be organized as an independent entity, capable of conducting a prompt tactical air operation anywhere in the world.

Reorganization has brought about many important changes in the wing and squadron structure. As an example, directors replaced the deputy commander for materiel and the deputy commander for operations. The directors and their staffs act as advisors to the wing commander while the commanders of the tactical, the field maintenance and the supply squadrons report directly to the wing commander. The chief of maintenance complex no longer exists. Materiel officers in the tactical and field maintenance squadrons now head the maintenance organization. The materiel branch in the tactical squadro[n] is organized into three sections under the materi[el] officer: maintenance, supply, and transportation. A slightly different organization in the field maintenance squadron has four branches reporting to the FMS commander: supply, transportation, maintenance, and munitions.

The maintenance section of the tactical squadron performs organizational level maintenance on aircraft and aerospace ground equipment. This includes all on-equipment work such as servicing, troubleshooting, removal and replacement of components, calibration of on-equipment systems, and recovery phase inspections. Off-equipment repairs and those repairs beyond the capability of the tactical squadron maintenance section are passed on to the maintenance section of the field maintenance squadron.

A number of supply personnel in the supply branch form an integral part of the tactical squadron to ensure effective and efficient management of squadron supply functions. The same supply procedures are used whether at home or deployed. War Readiness Spares Kits (WRSKs) held in the squadron working area are utilized to satisfy the customer's demands in exactly the same manner as they would be used on a deployment. Items from the kit are issued immediately - if a like asset is available in bas[e]

supply. Daily use ensures the WRSK contains needed spares in the proper quantity and latest configuration.

The transportation section is a focal point for all squadron transportation activities. It now allows the squadron commander the opportunity to make the most efficient use of available vehicles.

Recovery phase inspections, the follow-on to periodic and phase inspections, are an important part of TAC's maintenance concept. Unscheduled downtime can be utilized to carry out portions of the phase inspection, thus deriving the maximum benefit from the unscheduled opening of panels or removal of components. As an example, TCTOs, lubrication, look inspections, and structural repairs are accomplished in otherwise inaccessible areas when an engine is removed prematurely.

The maintenance manager can now be flexible in his approach to inspections. Working together, the crew chief and phase monitor can call for the completion of a maximum number of phase items during non-flying periods. On the other hand when an operation demands an all out effort, the phase inspection can be anticipated to enhance the operation. All of TAC's weapons systems are scheduled to come under the recovery phase concept.

To provide guidance on the materiel procedures required to support the reorganized forces, a draft Materiel Management Manual was published as TACM 65-XX. This manual utilizes much of the management philosophy of AFM 66-1 while complying with AFR 66-1. The draft manual has been revised and will be formally published as TACM 65-2 in late 1968. Supervisors should ensure that all squadron personnel have the opportunity to study this new manual in detail!

With reorganization well in hand, it is imperative that the squadron be properly equipped for its new role. A Bare Base Program is now underway to develop the required equipment. The key word in the new equipment buy is "Mobility." The project has spawned a new list of initials such as ES/C, LSAT, POT and LUST. The last named will probably evoke the most interest. No! It is not a mechanized camp follower. It is a lightweight personnel sanitation facility and hence the name: lightweight urinal, shower, toilet. Naturally, the POT is a portable outside toilet. An interesting feature of both facilities is that waste is disposed of by incineration.

The ES/C is an expandable shelter that can be used as a container during transit. Once expanded they fulfill a number of purposes such as maintenance shops, kitchens, and shelters. An ES/C designated for a specific purpose and fitted with appropriate equipment to fulfill that purpose becomes a logistic shelter, air transportable (LSAT). The equipment in an LSAT is fitted in the rigid durable center section. On arrival at a bare base the shop personnel can quickly expand the walls to form a sheltered working area of 24 x 13 feet.

There are over 30 similar tasks under development to provide the squadrons with equipment that is portable and functional, including lightweight tents, LOX/LN2 generators, refueling trucks, folding cots, incinerators, and aircraft shelters.

The tactical squadrons have undergone dramatic changes in the past two years. There is no doubt that the squadron commander will soon have a well-trained team of familiar faces, equipped with the latest weapons systems and supported by functional, mobile facilities. Morale has improved and the fighting team is capable of projecting tactical airpower into any conflict regardless of the base structure in the theater of operations.

skid testing a grooved runway

by Major Clark Price
F-4D Project Pilot
68th TFS
George AFB, Calif.

In March, NASA conducted the first of its 1968 series of tests to gather detailed data on how runway grooving alleviates hydroplaning.

The first in a series of wet-runway grooving tests was completed in March at Wallops Island, Virginia by NASA's Langley Research Center. The United States Air Force provided the hardware, TAC furnished an F-4D and maintenance personnel, property of Nellis AFB, and a pilot (me), property of George AFB.

The test objectives were to:

- Gather detailed measurements on the effect runway grooving has on takeoff and landing performance.
- See if objectionable vibrations were generated.
- Determine any detrimental effects the grooves may have on tire treads and tire wear.

After installing the test gear in the bird at Langley, we moved to Wallops Island, Virginia, where NASA maintains a landing research runway. There, the 8750 x 150 foot runway had been modified so that the center 3450 x 50 feet could be used for testing.

The test section was composed of nine different surfaces using two textures of concrete and two textures of asphalt. Five surfaces were grooved and four were left ungrooved. To help hold the water, the test section of runway was completely de-crowned. An additional ungrooved asphalt surface, referred to as "Gripstop" and located in the center of the test section, retained its crown. The entire test section, as well as each surface within the section, was separated by rubber dams in order to contain the desired water level within each area. The grooving pattern used was 1/4 inch deep by 1/4 inch wide grooves separated by a one inch center. NASA found this pattern to be the best during their summer, 1967 test for the Air Force.

We accomplished 72 test runs with speeds ranging from 50 to 135 knots on surfaces ranging from dry to three-tenths inch water-depth. Maximum braking with antiskid was used.

On the ungrooved long canvas-belt-drag finish concrete (damp runway) the F-4 required in excess of 10,000 feet to stop. But when this same surface was grooved the old bird stopped at a respectable 4318 feet. The long burlap-drag finish was similar - 8498 feet to stop ungrooved and 3817 feet grooved. Best ungrooved surface was the large aggregat asphalt. It gave a stopping distance of 4654 feet u

Black lines on runway are rubber dams to hold water ~~t~~ controlled depths for groove testing.

grooved (damp) and 3216 feet grooved. Only problem with this finish however, is that the asperities polish with wear. The ungrooved friction potential then drops off significantly after a few months use.

There was little or no braking action felt in the cockpit with speeds above 110 knots on either the grooved or ungrooved surfaces. However, the data recorder measured a significant difference in deceleration forces while braking on the two surfaces.

The narrow width of the test section precluded any safe interjection of directional control investigation, however the crosswinds encountered were sufficient to create problems. I felt that directional control difficulties were minimal on the grooving. The NASA engineers say that this is partly due to the mechanical interlock that occurs between the tire and the grooved surface. Several runs were aborted due to a high crosswind, however, in each case, directional control problems were experienced after leaving the grooved area.

Many interesting sidelights occurred that reminded us of the problems with the F-4 during wet runway operations. Perhaps the SEA jocks don't need the reminder but the rest of us could use the refresher.

Although the bird had the up-to-date nose steering mod, we had several failures due to water in the system. The maintenance troops finally resorted to a super sealant, RTV I believe, to keep the water out of the plugs.

Being of the old school, my normal procedure has been to disregard the nose steering until the aircraft is almost stopped. But after considering the hazards involved, I decided I needed everything going for me. However, I used the pickle method of engaging the steering. That is, pickle the button and if no errant commands are detected, re-engage the steering with caution. One hard-over maneuver was avoided using this method. Needless to say, I now fully indorse this technique.

Unfortunately, my aircraft was equipped with the old, non-beefed-up flaps. So, as advertised, water damage to the flaps was severe. An interesting point ... the damage occurred with a full flap configuration. Subsequent runs with half flaps caused no damage.

Of course, one of the biggest operational problems that a Phantom Phlyer faces is successfully stopping the F-4 on the wet pavement. Initially, I was concerned about the safety of the project. In fact, after reading the test profile and recalling my previous experience with wet runway operations, I was petrified. Using the adage that fear is a product of ignorance, I began to arm myself with all the available knowledge on aircraft landings versus wet runways.

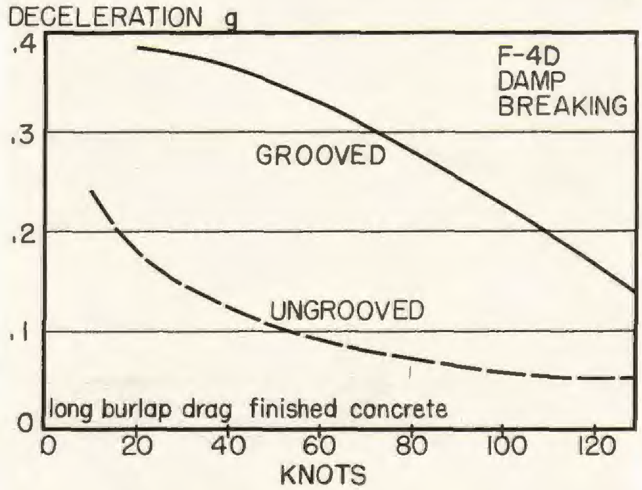
NASA's Langley Research Center has amassed considerable documentation pertaining to the cause and effects of vehicle skid. For simplification, the low friction coefficient that occurs on a wet pavement, thereby causing skids, is attributed to three phenomena: a) dynamic hydroplaning, b) viscous hydroplaning, and c) reverted rubber skid.

As you may know, during dynamic hydroplaning the tire literally planes on top of the water. The wheels cease to rotate and steering is practically non-existent. This condition occurs at high speeds (approximately nine times the square root of the tire inflation pressure). It is also dependent upon water depth and tire tread groove depth. The important point is: when the wheels spin down (stop turning) there is no antiskid protection in the F-4. Therefore, applying brakes while this condition exists will LOCK THE WHEELS!

Viscous hydroplaning is more familiar to us. It can occur at much lower speeds and is caused by

skid testing a grooved runway

One-quarter inch square grooves one inch apart proved to be optimum pattern on test runway.



thin-film lubrication of the tires on a relatively smooth surface. A rough textured pavement helps reduce this condition. But watch out for that last 1500 feet where landings have caused excessive rubber deposits to build up on the surface.

Many of us have seen the effects of reverted rubber skidding; we've seen the white streaks on the runway. They start just after touchdown and end where the aircraft exits the downwind side of the runway - or maybe the end. After one of these landings, the accident investigator notices funny-looking scald patches on the tires. A very brief explanation is that the tires have been riding on a cushion of steam. This produced the steam-cleaned tracks (white skid marks) on the runway. The scald patches on the tire are due to steam heating the rubber sufficiently to cause it to revert back to an uncured state. Three conditions must exist in order to experience this phenomenon: moisture; high ground speed; LOCKED WHEELS. This particular form of hydroplaning can continue to almost stopping speed.

These three forms of hydroplaning are practically non-existent on a grooved surface. NASA's Langley Research Center has determined that even the large rubber deposits which collect in the landi touchdown area will no longer plague airport ma agers. This has been substantiated by operationa experience at Kansas City and JFK International.

Now, let's take a look at a seasoned jock: his homework done, he's committed to a landing on a flooded runway. He flies the proper approach speed and touches down within the first 1000 feet, insuring that the forward vector of his seat cushion is on the center stripe. He deploys the chute, but he's ready to dump it if the rudder will not handle the yaw due to a crosswind. Because he figures nosewheel steering won't be effective until about 120 knots (tire pressure 160 to 180 psi) he concentrates on steering with rudder.

This wily fellow also knows that differential braking aggravates fishtailing in the F-4. He then checks airspeed for his magic figure of 110. Now he is reasonably sure that all four wheels are turning and unless the anti-skid system malfunctions, he won't LOCK THE WHEELS. He knows that locked wheels at this point will steam clean the runway and he will be absolutely unable to maintain directional control.

Now he engages the nose steering via the "pickle" method, and eases on the brakes for the first time. Our hero expects little or no braking action at this point but is pleased to feel the antiskid cycling.

Project test pilot, Maj Clark Price, confers with NASA hydroplaning program director, Walter B. Horne

can now gradually increase to full pedal displacement. He continues to exercise extreme caution for when he (the undisputed "TWISTER" champion) cannot maintain equal pressure on the brakes and operate the rudders without inducing some fishtailing. So he gladly trades braking action for directional control because he knows a barrier engagement is far superior to exiting the side of the runway.

Hopefully, our champion is down to a crawl 500 feet short of the turn-off. But he mustn't forget that he loses antiskid protection at about 20 knots and he mustn't forget that the surface beneath him is coated with rubber deposits. So, again, he reminds himself DON'T LOCK THE WHEELS.

I have heavily emphasized locking the wheels for this is the only hazard that the pilot can control. A properly functioning antiskid system will protect you against a skidding wheel, but know its limitations. Remember, the F-4 does not yet have locked wheel protection.

In summary, here are the pitfalls you must avoid during wet runway landings:

- Check the INOP light after lowering the gear handle. If you are an ARI-circuit-breaker-puller during crosswind landings remember: no antiskid protection until you reset the breaker. Believe the light.
- Once more with feeling. With the F-4, the main wheels must spin up before the antiskid system comes on the line (some aircraft are equipped with locked-wheel protection). Obviously, don't land with brake pressure applied. And don't assume that the wheels are turning until you are well below hydroplaning speed.
- The antiskid system tester does not check all system malfunctions. Remember, you must be reasonably sure that the system is operable before utilizing full pedal displacement. So squeeze down cautiously at first. A momentary loss of power to the box during heavy braking will also lock the binders.

In a recent magazine article, NASA's Mr. Walter Horne, who incidentally is the honcho of the grooving tests, discussed the following factors in alleviating vehicle skidding accidents: vehicle-operator education; vehicle design; tire design; pavement design. It is significant that the pilot's part in averting these accidents tops the list.

Unquestionably, runway grooving will virtually eliminate our wet-pavement skidding problem. The tests showed that the grooves don't produce any harmful vibrations nor do they increase tire tread wear. But until every air-patch in our vast area of operation is grooved, we will have to contend with those wild, unpredictable, landing rolls.

TAC TIPS

...incidents and incidentals with a maintenance slant.

poison pen

The Phantom phlyer completed his night recce mission. He pitched, lowered gear and flaps and read "on speed" about 45 degrees from turning final. Unannounced, his canopy suddenly departed. He continued the approach and landed okay ... but somewhat puzzled.

The maintenance troops couldn't find a malfunction in either the canopy locking or jettison system. The cartridge wasn't fired.

The culprit might've been the ball point pen in the pilot's left sleeve pocket. It started the flight with a straight clip, tight against the pen's barrel. It ended the flight with the clip bent outward about 45 degrees.

Best guess is that the canopy was unlocked by ball point pressure and blown off by the windstream. The pilot didn't notice any telelight panel lights before he wrote off his canopy.

Phantom phlyers: Beware of protruding pens ... they're poison.

gum trouble

Recently a pilot in another command was seen in the emergency room with an unusual problem. Following an episode of uncontrollable coughing, he had developed chills and fever. The onset of this problem was traced to his flight that afternoon. An unexpected positive G maneuver in the traffic pattern resulted in loss of his chewing gum. This chewing gum was later removed from his left lung, which had partially collapsed. Obviously, a larger piece of chewing gum would have obstructed both lungs and no doubt prove fatal. Because of this incident the flight surgeon advises, "avoid chewing gum while flying."

birdstrike data

According to The Flight Safety Foundation, birdstrikes have resulted in several crashes, an Electra in Boston, a Viscount in Maryland, and at least five Canadian CF-104s. Quite a few Air Force aircraft have been damaged for the same cause. When a aircraft flying at 200 mph strikes a two pound bird, such as a seagull, it impacts with a force of 8,000 pounds of energy. At 600 mph the impact force equals 72,000 pounds. Data gathered from 14 countries show that 79 out of 142 strikes were caused by gulls. Two-thirds of the reported strikes occurred at altitudes under 500 feet. These statistics should be reason enough to make your takeoff or landing with your helmet visor down. It also shows another reason why you should abide by the 250 knot rule below 10,000 feet. Night owl pilots would do well to obtain the clear helmet visors. Birds also fly at night especially during the spring and fall migration and especially in the coastal areas.

Hey! pass it along

CHOCK TALK

chock talk

...interest items, mishaps with morals, for the TAC aircrewman.

plug ugly

The Flying Boxcar pilot leveled off at 6500 feet and set cruise power. Number one engine responded with a bark - and kept barking. He feathered the rough-running recip and returned to home base. His landing was routine.

Maintenance troops found a gaping hole where number three jug should have a spark plug. The plug parted company somewhere in flight. With a new plug the engine ran without complaint... but the crew had a few about the troop who "installed" the missing sparkplug.

o rings on their fingers

As you walk into the Weapons Control Systems Section of the F-4C Maintenance complex, you will find prominently displayed signs that read, "Remove all watches and rings."

Now, a lot of people think that's going overboard on the safety program and that includes a few electronics technicians who should know better. As an example of the sound safety principles behind that "Remove" sign, let's take a look at the seemingly harmless looking scopes that our Phantom pilots peer into for hours at a time. With the shells removed, and the internal makings visible, as they often are in the shop environment, these scopes become as potentially dangerous as vipers.

"Oh, but there's really no sweat as long as the radar power is off," someone will often say. Again that "someone" is usually a someone who should know better. That someone is forgetting about the fact that capacitors can and often do retain their charge after the radar system is shut down. Just accidently brush your bejeweled hand against an exposed scope and see if there's really "no sweat."

If you have any reason to mosey into the Weapons ontrol Shop work area, please comply with those "Remove all watches and rings" signs. Don't be that "no sweat" someone who finds out the hard way about the meaning of those signs. And if you happen to be on a time-budgeted schedule, "no sweat." There's a clock on the wall!

Remember the old adage, "Keep a ring on your finger and a watch on your wrist, and in the Fire Control Shop, you'll soon 'cease and desist'."

by TSgt Ernest Feinberg
35th TFW Da Nang

can do it now !

The Phantom pilot taxied out to the arming area. Before he reached it the left main wheel assembly of his F-4D exploded, destroying the wheel and damaging the strut fairing door.

Maintenance inspectors found an old crack in the outer flange snap ring groove of the wheel assembly. The wheel assembly was installed prior to availability of facilities to comply with TO 4W1-8-23J, advised the unit.

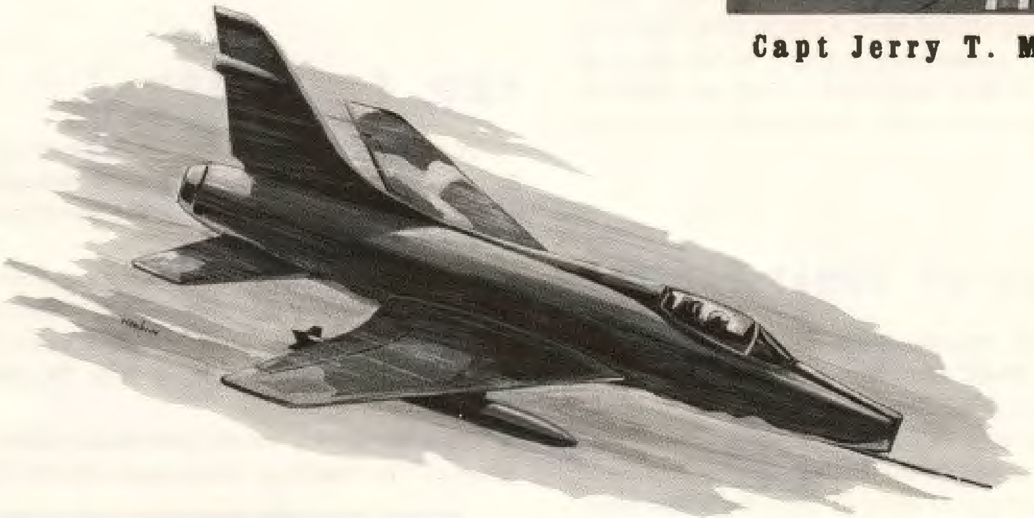
They've quickly established the facilities and procedures "for absolute compliance with the TO."

...by this time the bird was burning real bad. Then the auto pilot jumped out with the only parachute on board and I was left with a silkworm and a sewing machine. Boy, was I a busy S.O.B.

TACTICAL AIR COMMAND

PILOT OF DISTINCTION

Capt Jerry T. Mattox



Captain Jerry T. Mattox of the 4511th Combat Crew Training Squadron, Luke Air Force Base, Arizona, has been selected as a Tactical Air Command Pilot of Distinction.

While flying a ground attack mission as a student in an F-100D, Captain Mattox saw the oil overheat light illuminate. Upon notification of the in-flight emergency, the Instructor Pilot told Captain Mattox his aircraft was trailing oil smoke and ordered him to jettison his external stores.

After jettisoning, Captain Mattox placed his aircraft on a twelve mile final for Gila Bend airfield. Oil pressure was 10 to 20 psi and fluctuating. At two miles on final, he retarded the throttle to idle, extended speed brakes, and selected half flaps. The oil pressure was now at zero and the engine extremely rough. After earlier difficulties, contact with the tower was established on Guard channel.

Captain Mattox successfully landed the plane in the middle third of the runway and engaged the barrier. Inspection revealed the oil line to the number five bearing failed and damaged the bearings and engine.

Captain Mattox's prompt and correct actions when faced with a serious in-flight emergency readily qualify him as a Tactical Air Command Pilot of Distinction.

drownproofing

by Fred R. Lanoue
Professor of Physical Education
Georgia Institute of Technology

Would you like to be able to remain afloat and swim for miles without depending on floatation devices, even while fully clothed? There is a deceptively simple way of combining arm and leg motions with a precise breathing technique so that anyone can do it, irrespective of sex, age, condition, strength or fear.

You have doubts? Here's proof!

Every graduate of Georgia Tech in the last twenty years, ex-ɔt for a few medically excused ople, has stayed afloat at least one hour, and has swum one mile with clothing, using the technique I call "drownproofing."

Persons using the drownproofer technique find cramps and injuries moderately annoying, but never dangerous, because, when the method is mastered, it is just as easy to stay up with only one arm as it is with both arms and legs.

The results obtained with this system on handicapped children are fantastic. Nearly a thousand four and five year old children in the Atlanta area have stayed up one hour, swum one mile, then, with ankles tied up to the waist, remained afloat one half hour and then swam 100 yards. The same thing was repeated with hands tied together behind the back. All this was done with clothes on, and usu-lly with ten hours or less instruc-ɔn.

It is a fact that about 3,000 swimmers, rated as beginners, drown each year. And the majority of these happen within only yards from safety. It is obvious that if this technique were taught before traditional swimming methods, drowning rates could sink to an all time low.

In a short summary of drownproofing, I can tell you that it's based on several aspects of physics. The first is that 99 percent of all men will remain on the surface in fresh water without moving if they are chock full of air. About 99.99 percent of all women do the same.

An average head weighs close to 15 pounds. So, as a man floats vertically about five pounds of weight is in the air. With women about eight pounds protrude. These figures are general. Fat and tidal air volume, muscle and bone density, air trapped in clothes, the wet weight of clothes themselves -- all are factors. If a man wants to keep his nose and mouth out of water all the time to see where he is going, he must hold up with muscular energy at least five pounds all the time ... and during exhalation, a lot more. With clothes, even more. This sounds too small to be important, but over a period of time it causes most of our drownings because of the steady drain of energy.

Women and teenage girls, most children, men and teenage boys who are good floaters use one technique, while men and teenage boys who are poor floaters use a slight variation. In an emergency these basic strokes can help you bob along until you are rescued or drift ashore. To be able to propel yourself long distances without tiring, you also will need to learn the travel stroke.

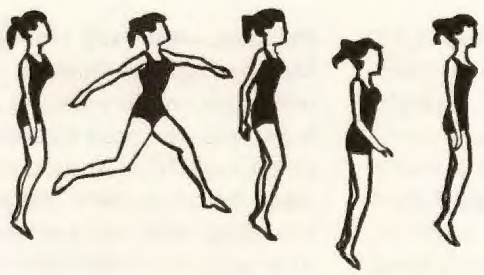
When using one of the illustrated techniques, the following tips will add to your success.

1. When exhaling, blow hard through the nose, clearing nostrils of all water to avoid choking if it trickles down throat.
2. Move arms and legs slowly. Quick, vigorous motions force body too far out of water and can be exhausting. Rest under water five to ten seconds.
3. Learn arm and leg strokes separately, then together. Either, used alone, will keep you afloat. Practice with hands behind back, using legs for upward motion.
4. During first attempts, you may ship water and sputter. After 10 or 15 cycles, the technique will become easier and comfortable.
5. Ask someone to observe and criticize your technique, noting your mistakes which can be corrected.

CONTINUED

STAY-AFLOAT STROKE

for women, teenage girls, most children and many men who are good floaters



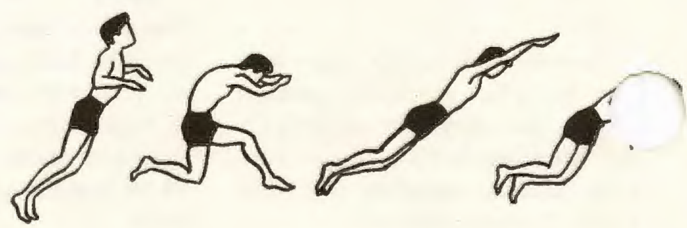
1 2 3 4 5

1. After breathing through mouth, sink under. Float relaxed, in vertical position with arms and legs dangling. Be sure head is relaxed.
2. Let yourself float to surface. The air you have inhaled will raise you naturally with no effort. When head is partly out of water, raise arms to side. At same time, stretch one leg forward and the other back as in scissors kick.
3. To thrust head above water to breathe, gently pull arms downward toward hips and bring legs together, pressing water easily with sole and heel. As arms start down (not before), begin to exhale through nose and continue until nose comes above surface. Be sure eyes are open. Then, inhale through mouth. Chin should be on surface, not above.
4. Just as head goes under again, give slight downward push with arms, legs, or both. This prevents sinking too deep. Though unnecessary in calm water, you should learn technique for less favorable conditions.
5. Rest under water, completely relaxed. Stay submerged until you desire a breath, not until you need one. At first you will probably stay under three seconds this should be the minimum. Gradually you must increase time of rest while submerged. Average under water time is 10 seconds after doing cycle for an hour.

6 Repeat entire cycle.

TRAVEL

for all



1 2 3 4

1. Inhale to stay afloat.
2. When head sinks under, tip face down and bring hands up to forehead. Prepare for scissors kick by cocking one leg so rear foot is high as possible.
3. Extend arms forward and upward toward surface with elbows straight, hands together. As you do this, complete scissors kick.
4. When kick is completed and feet come together, bring arms backward so hands touch thighs.
5. Glide toward surface, keep head down and horizontal. Body must be in a straight line. During glide, exhale slightly but never completely. How much to

STAY-AFLOAT STROKE

for men and teenage boys who are poor floaters

STROKE

swimmers

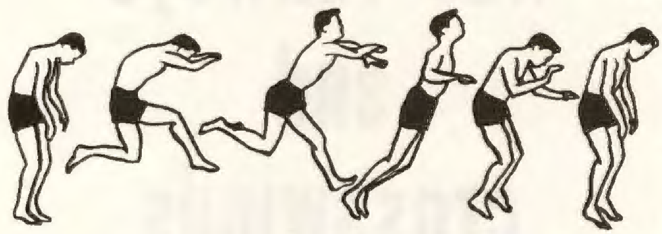
5 6 7 8 9

exhale will be learned from practice.

6. When you want a breath, begin return to vertical position by drawing both knees up near chest. Round the back and extend hands forward, up toward face.

7. Extend one leg forward for the scissors kick, without letting other knee go back. Keep arms in front of you.

8. When trunk is nearly vertical, raise head and press gently downward with sole of front foot and both hands. This will support you while taking a breath.



1 2 3 4 5 6

1. Take breath, relax with arms and legs dangling, and head resting horizontally. Back of head should protrude from the water. If buttocks swing upward, you have taken too big a breath. Exhale a little air through nose.

2. As air floats to surface, cross forearms in front of forehead. Bring one knee up toward chest, then extend the foot forward. At same time, raise other foot behind and extend. Don't lift head yet, or raise arms or legs too fast. Such motion will cause head to duck under.

3. With legs extended and arms crossed, raise head quickly out of water, stopping with chin in water. As head comes up, exhale through nose and continue until head is raised.

4. The instant head becomes vertical, sweep palms outward so they nearly scratch surface. Step gently downward with both feet, bringing legs together. Strokes should not be fast or vigorous or you will rise too far out of water, and go under again quickly, giving little time for inhaling. Take a breath through mouth.

5. Relax and sink. In rough water and while wearing clothes, you will sink too far unless you drop head as soon as it is under water, and make downward stroke with arms and legs.

6. Repeat entire cycle.

A 2nd Look at...

wet runways and crosswinds

by Major John M. Lowery

Not long ago one of TAC's younger pilots lost control of his fighter after landing on a wet runway with a left crosswind. Instead of the classic "drifted off the downwind side of the runway while hydroplaning," this pilot departed the runway on the upwind side and folded his nose gear.

He was leading a two ship formation landing... touched down, lowered his nosewheel to the runway and deployed the drag chute. The aircraft immediately began to weathercock left and head for the edge of the runway. The pilot attempted to jettison the drag chute and put in full right rudder in an unsuccessful attempt to stay on the runway. In his statement he said that he didn't try his brakes "for fear of hydroplaning."

The wingman also had his hands full with the crosswind, but managed to maintain control by using brakes.

Perhaps the most startling fact uncovered during the investigation was that this was the second such mishap in the same unit... pilots failed to use brakes for fear of hydroplaning.

CROSSWIND EFFECTS

With most Air Force aircraft the center of pressure from a crosswind is aft of the center of rotation-the main gear. As a result they tend to weathervane into the wind. The reason? There's more side area, fuselage and vertical stabilizer, exposed aft of the main gear (the F-102 is an exception).

Most flight manuals advise when landing in a crosswind on a dry runway to "...lower nose immediately after touchdown." The lower aircraft profile and the nosewheel steering traction combine to keep the crosswind effects controllable. Significantly, the same flight manuals when describing the wet or icy runway landing technique advise maximum aerodynamic braking due to the low tire-runway traction.

Using aerodynamic braking on a wet runway with a crosswind will increase the weathercocking tendency especially during the critical high speed portion of the landing rollout. This is because of the light or nonexistant (if hydroplaning) tire footprint pressure in the higher speed ranges.

Once on the runway, if you do begin hydroplaning you will also start drifting downwind. To make matters worse deploying the drag chute will increase your tendency to weathervane and accelerate your downwind drift toward the side of the runway.

Deploying the drag chute provides a large sail which gives a mechanical advantage to the cross-'nd... moves the crosswind center of pressure even ther aft. This increases the tendency to weather-vane.

On a slick runway with the drag chute deployed and the aircraft weathercocked, the wind blows almost directly into the drag chute canopy...your sail. With this enlarged frontal area to push against, the force of the crosswind is amplified and your downwind drift accelerates. Obviously you can run out of runway width in a hurry.

If you don't deploy the drag chute and keep the nosewheel on the runway you may be able to maintain the runway heading for a time, while aerodynamic controls are effective. Despite this, if your tires are hydroplaning you'll continue to drift downwind.

PILOT TECHNIQUES

Many of the techniques used in coping with crosswinds on slick runways are exactly opposite to those used on a dry runway. For example: With a left crosswind where conditions look good for hydroplaning, if you must land, do it on the upwind side of the runway. Then, should you begin to hydroplane and drift toward the downwind edge, you'll have more runway width in which to recover. This is opposite the dry runway crosswind technique taught with many aircraft.

Crosswinds and slick runways appear to leave the pilot with only two valid options:

1. Go to an alternate where the wind or runway conditions are more favorable.
2. Plan for a barrier arrested landing.

For most aircraft an alternate airport is probably the best solution. On the other hand, an F-4 can easily make an approach-end, midfield, or overrun barrier arrested landing. The midfield and overrun arrestment appear the least desirable since crosswind and hydroplaning effects are most powerful during the high speed portion of the landing roll while tire footprint pressure is light. This can cause the aircraft to drift off the side before reaching the barrier cable.

Some F-4 pilots recommend use of asymmetrical power (downwind throttle) to keep the aircraft on the runway. Although the forward thrust will not help you decelerate, it will help keep you on the runway for a successful barrier engagement. Forward thrust while weathercocked and skidding may also help keep a single engine fighter on the concrete by changing the drift vector.

In summary, remember: When landing conditions are critical, plan ahead. Use everything you have, brakes, nosewheel steering, aerodynamic controls, even some forward thrust if necessary, to keep your bird on the runway. Then hook-up with the barrier if you need it. If you have antiskid, be sure the system is ON.

Using the brakes does not cause hydroplaning. It's hydroplaning that causes loss of braking (traction).

MAINTENANCE MAN OF THE MONTH

Technical Sergeant Robert J. Alderink of the 4538 Fighter Weapons Squadron, Nellis Air Force Base, Nevada, has been selected to receive the TAC Maintenance Man Safety Award. Sergeant Alderink will receive a letter of appreciation from the Commander of Tactical Air Command and an engraved award.

TSgt Alderink

CREW CHIEF OF THE MONTH

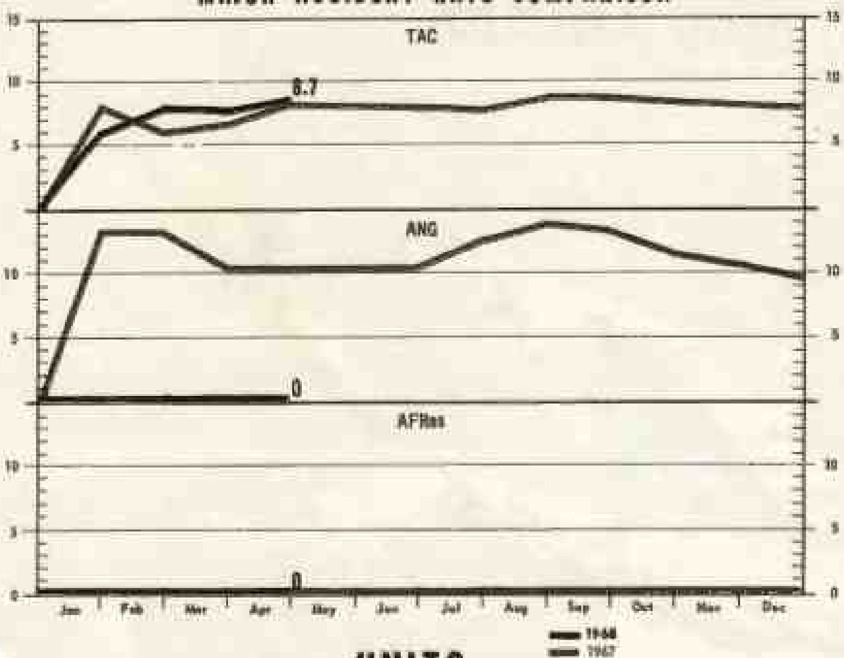
Staff Sergeant John H. Dysen of the 4538 Fighter Weapons Squadron, Nellis Air Force Base, Nevada, has been selected to receive the TAC Crew Chief Safety Award. Sergeant Dysen will receive a letter of appreciation from the Commander of Tactical Air Command and an engraved award.

SSgt Dysen

TAC TALLY

MAJOR AIRCRAFT ACCIDENT RATES AS OF 30 APRIL 1968 *

MAJOR ACCIDENT RATE COMPARISON



UNITS

	APRIL 1968	APRIL 1967		APRIL 1968	APRIL 1967
9 AF	8.0	10.9	12 AF	6.9	7.6
4 TFW	14.7	0	23 TFW	12.3	9.0
15 TFW	12.0	40.3	123 TRW	0	35.4
33 TFW	21.4	21.7	27 TFW	0	16.5
113 TFW	44.5	0	140 TFW	0	26.0
354 TFW	0	0	479 TFW	20.6	6.2
4531 TFW	15.0 *	0	474 TFW	48.2	0
363 TRW	0	15.2	67 TRW	0	0
64 TAW	0	0	75 TRW	0	15.6
316 TAW	0	0	313 TAW	0	0
317 TAW	0	0	516 TAW	0	0
464 TAW	0	0	4453 CCTW	13.7	0
4442 CCTW	0	20.4	4510 CCTW	0	9.3
H-21 *			4520 CCTW	0	0
SPECIAL UNITS					
1 ACW	0	0	4500 ABW	0	0
4410 CCTW	23.5	4.3	4440 ADG	0	0
			4525 FWW	32.3	38.1

AIRCRAFT

TYPE	TAC 1968	TAC 1967	ANG 1968	ANG 1967
A-1	70.9	17.8	0	0
RB-66	0	0	0	0
F/RF-84	0	0	0	[illegible]
F-86	0	0	0	0
F-111	36.2	0	0	0
F-100	10.4	10.2	0	[illegible]
RF-101	0	[illegible]	0	[illegible]
F-5	0	[illegible]	0	0
F-105	17.4	11.5	0	0
F-104	0	0	97.3	0
F/RF-4	13.0	17.8	0	0
C-47	0	0	0	0
KC-97	0	0	0	0
C-119(AFR)	0	0	0	0
C-123	25.5	0	0	0
C-130	0	0	0	0
T-29	0	0	0	0
T-33	5.9	0	0	0
T-39	0	0	0	0
C-7	0	[illegible]	0	0
O-1	0	0	0	0

* ESTIMATED FLYING HOURS


OVER HALF
OF DROWNINGS
■ over loaded
■ over anxious
■ over board
HARDISON
US MISSION SAFETY 70