

NEWSLETTER

EDITED BY KEVIN CALLAHAN

NOVEMBER 1996

Flying Sharks

The Camouflage and Markings of the American Volunteer Group

By Terry Clements

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Part One:
Camouflage

The American Volunteer Group (AVG), more popularly known as the "Flying Tigers", was composed of three fighter squadrons of "civilian" ex-Army, Navy and Marine Corps volunteers operating as a part of the Chinese Air Force from August 1, 1941 to July 4, 1942. At that time it was disbanded and replaced with the 23rd Fighter Group of the US Army Air Force. There were about 84 pilots in the AVG (although only about 60 were fully combat-qualified at any time), and at no time did it have more than about 60 serviceable fighters. Its original equipment comprised 99 Curtiss Hawk model 81-A2s (let's just call them Tomahawks), a version similar to the P-40C model, but without provisions for an external fuel tank. They were originally built (less wing guns,

sights and radios) by Curtiss for the British, then diverted prior to shipment. Beginning in late March, 1942, the AVG also received 34 P-40E models from the existing USAAF inventory. The AVG lost 25 pilots to all causes (14 more died later in the war), and upon disbandment it turned over to the USAAF 29 Tomahawks and 19 P-40Es. Training accidents and lack of spare parts and equipment were responsible for a disproportionate share of the aircraft losses.

Many secondary sources state that, since the AVG's Tomahawks were built for export to the British, Curtiss painted them in exact matches of the Dark Earth, Dark Green, and Sky colors in use by the RAF in 1940-41. Although this is a reasonable assumption, it is in fact not correct. Curtiss, like other US manufacturers at the time, actually used

available paints that it deemed "close enough" to what it *thought* were the colors the British wanted.

The AVG's Hawk 81s were painted on the upper surfaces in a disruptive camouflage pattern of DuPont Dark Earth no. 71-065 and Dark Green no. 71-013. The Dark Earth color was a virtual match of British Dark Earth, while the green was a virtual match of US Medium Green 42. In early 1941 Curtiss was also using a "Sandy Earth" color, DuPont 71-009, on many Kittyhawks. This color was similar to British Light Earth and a little darker than US Sand 49. Photos indicate that this color was supplied to the AVG as a touch-up paint (along with some of the green). It may also have been used instead of the Dark Earth on a couple of the AVG Tomahawks.

The lower surfaces of the AVG's Tomahawks were light gray and not the British Ministry of Aircraft Production Sky color, or even the pastel blue Curtiss used for some Kittyhawks in 1941. The photographic (and eyewitness) evidence establishes the use of a light gray beyond doubt; the real problem is determining exactly which light gray was used and how/why this substitution occurred.

It is likely that at the time these airplanes were built (late 1940 - early 1941) Curtiss officials mistakenly thought that the British painting diagrams (which probably used the confusing nomenclature "Sky Type S Grey" to identify the bottom color) specified a British color already in use, Sky Grey. Other manufacturers, such as Lockheed and Vultee, made the same mistake. It is likely that Curtiss, as it did for the gray and brown, picked the closest match to British Sky Grey that was available. (There is also the possibility that Curtiss was painting these machines according to a tentative early British "tropical land" scheme of Light Earth, Dark Green, and Sky Grey). There were only two grays in the American camouflage color "palette" at the end of 1940 that could have filled this need: Aircraft Gray and M-495 Non-Specular Light Gray.

Aircraft Gray (later ANA 512, FS 16473) is the better match for British Sky Grey and the gray visible in color photos of the AVG's Tomahawks. It was used on the metal components of US naval aircraft and would have been well known to Curtiss. M-495 Non-Specular Light Gray (FS 36440) was a

somewhat "warmer" gray specified for overall camouflage of US Navy aircraft on December 30, 1940. It cannot be completely ruled out in some of the photos, but it is much less likely that Curtiss would have had stocks of this paint on hand at the time these aircraft were built, and it is not consistent with the best color photos and film.

The vast majority of the AVG's Tomahawks were painted in the same camouflage pattern, which was based on the standard British pattern for single seat fighters. Only three or four AVG Hawks can be seen in "mirror image" patterns. The patterns were applied uniformly from one aircraft to the next, with only minor differences. Mats or masking were used since the colors have a sharp separation line. The light gray was added last, with a straight, tight sprayed edge with the topside colors.

Close examination reveals that the camouflage patterns often did not exactly match up at the points where the different assemblies were put together, indicating that these aircraft were painted at the factory in an unassembled state. This effect is most apparent at the wing joints, especially forward of the wing roots.

Painted-out (?) Roundels

There are no known photos of any of these aircraft with British insignia in place, and it is obvious that these had either been painted over prior to shipment, or their locations were "built into" the camouflage patterns and then

left blank. Either way, there were readily apparent brown "holes" in the pattern where the British insignia would have been located. The vertical fins (where the fin flash would have been located) were overpainted with matching camouflage paint in several different patterns that never lined up with the rest of the camouflage pattern. RAF serial numbers had been assigned to these machines as well, and so they may have been applied, then overpainted too. This is not apparent in photos, however.

The underwing roundels on most aircraft appear to have been painted out with the actual lower surface camouflage color, leaving no visible traces in photographs. (If decals were intended to be used, there would of course generally be no traces of overpainting). However, two of the last three aircraft assembled and delivered to the AVG (#92 and #99) can be seen in photos with roughly applied patches of a very light gray color in the exact position that would have been occupied by a British roundel. Since a similar very light underside touch-up paint can also be seen in other photos, it is likely that this particular overpainting was done by AVG personnel to cover RAF roundels that had not been removed by Curtiss.

Spinners and Wheel Covers

Some secondary sources have stated that the propeller were painted with the dark green camouflage paint. In fact the spinners were Dark Earth, but often so stained with lubricant from the pitch change mechanisms and/or the thrust

bearings (which were very problem-prone) that they had a darker, slightly glossy appearance probably mistaken for dark green or other dark colors in black and white photos. While it is possible that a few spinners may have been painted in different colors by AVG personnel, there is no clear evidence of this. Many wheel covers were painted the light gray color of the underside of the aircraft, but just as many were Dark Earth or Neutral Gray. Of course, some wheel covers were repainted in AVG-applied colors.

Factory-Applied Stencils

Various small service stencils are observable in photos of AVG (and other) Tomahawks, and these were of course applied at the factory. On the top of the cowling, along the hinge of the radiator expansion tank access door, was a white rectangle with "Prestone" in black on it. The propeller blades were painted Black, with tips marked in a yellow color similar to Orange Yellow 48 (close to FS 33538). The usual data stencils were marked near the root of the blades in white. No "Curtiss Electric" decals are visible on the blades.

There were three fuel tanks in the Curtiss model 81-A2, two in the wing center section, and the main fuel tank in the fuselage behind the pilot. The fuel filler caps for these tanks were respectively in the left wing root (2), and directly behind the cockpit on the left side, accessible through a cut-out in the rear plexiglass. Aft of this fuselage filler cap was the filler for the oil tank, which was located behind and above

the fuselage fuel tank. (Yes, oil lines were a maintenance problem). Immediately above the fuel filler cap was a white stencil indicating the type of fuel to be used. (It is only partially readable in photos: *_D.E./F./100*). The two wing root fuel filler caps were covered by small hinged doors, with black lettering (about 1") marking each location: the forward filler was marked "RESERVE FUEL", and the aft filler door was marked "WING FUEL".

To the rear of these fuel filler markings, near the trailing edge of the wing, was a black "NO STEP" marking, again in what appears to be 1" lettering. An identical "NO STEP" marking was placed on the trailing edge of the wing, readable from the rear, about 18" out from the joint of the wing and the wing fillet. The two "NO STEP" markings were repeated on the starboard side in corresponding locations. This lettering was placed on what looks like an Olive Drab rectangle darker than the surrounding camouflage color (Dark Earth).

There were undoubtedly other servicing markings on these aircraft, such as at the tie-down points under the wing tips, but none of them are visible in any of the available photos. However, there were *no* visible markings on the port side fuselage access door (or anywhere else) indicating the location of a first aid kit.

AVG Serials and Aircraft (Identification) Numbers

The AVG's Tomahawks were shipped unassembled in crates to Rangoon, where they began arriving on the docks in May of

1941. They were taken to nearby Mingaladon airfield and slowly assembled under primitive conditions. From August 3 to November 28, 1941 they were ferried singly or in small groups to the AVG training base at Kyedaw airfield near Toungoo, Burma. During assembly, each machine was given an AVG serial number on the fin in small (about 2") white numerals -- for example, P-8101.

Large (about 21" tall) white identification numbers were added to the rear fuselage of the aircraft some time after receipt at Kyedaw, when the three squadrons were being organized. The first squadron used numbers 1-33; the second squadron 34-67; the third squadron 68-99. This system began to break down by March, 1942, however, as aircraft had to be reassigned from one squadron to another to make up losses. Most aircraft had the identification number repeated in smaller (about 5-6") white numerals on the nose, in front of the exhaust stacks, although most of these were painted over when the "sharkhead" designs were added in late November 1941.

The placement, style and size of the fuselage numbers varied only slightly from one aircraft to another, although there were some interesting exceptions (as there were for every aspect of AVG markings). But unlike the numbers placed on the Kittyhawks received later, these were laid out and painted better.

Until mid-November 1941, when the squadrons neared

full operational status, the serials and fuselage numbers were the only markings on the planes. This was perhaps to placate the British, who, with enough problems already, wanted to maintain some semblance of deniability to avoid antagonizing Japan any more than necessary. The Japanese had been aware that something was going on as early as June of 1941, and the arrival in Rangoon of AVG personnel, beginning in August of 1941, was under immediate observation by Japanese consular personnel there, with potential diplomatic repercussions.

Other details

The cockpits of the AVG's Hawks were painted standard Interior Green (later ANA611, close to FS 34151), while the common yellowish version of Zinc Chromate primer was most likely used for protecting

undercarriage doors and similar components. The canvas wheel well liners were probably painted the undersurface gray color.

AVG Tomahawks were equipped only with wide, khaki-colored lap belts, and no shoulder harnesses, like many US military aircraft up until mid-1942. Only a few Tomahawks had rear-view mirrors. In addition to ring and bead sights, the AVG acquired US-made model N-2A optical gun sights which were floor-mounted and designed to project the sighting ring onto a windscreen-mounted glass reflector plate. These sights were difficult to install because the aircraft lacked windscreen mounting holes for the reflector plates, and AVG personnel did not have the proper equipment to drill through the plexiglass themselves. After much frustration, Crew Chief / sheet

metal man Joe Gasdick, under the direction of Group Adjutant Charlie Mott, fabricated a different reflector plate bracket that attached to the grab handle on the upper front of the canopy above the internally-mounted 1.5" armor glass. This arrangement, with the floor-mounted sight vulnerable to being knocked out of alignment, was less than ideal. The radio gear was civilian equipment obtained on the private market, which also gave considerable trouble. Gun muzzles were usually covered with masking tape in order to keep out dust and make malfunctions easier to detect. The first squadron's aircraft had 7.92mm guns in the wings, while the others had .30 cal Browning guns, just another of many logistical headaches.

Coming up in Part 2 of *Flying Sharks: Shark Heads and More Profiles*

Flying Sharks Painting Notes

Here are some hobby paint matches for the AVG's camouflage colors. Note that the given "names" of the hobby paints do not necessarily conform to those of the colors they match here, and that other hobby paints with the same "names" WILL NOT NECESSARILY match their namesake paints listed below.

DuPont / Curtiss Dark Green (71-013) (Virtually identical to US Medium Green 42, similar to FS 34092).



Floquil Classic 303172; Humbrol 149; Testor Model Master Enamel 1764; Xtracolour X114; Gunze Sangyo H302; Pactra Acrylic A31; Testor Model Master Acrylic 50164

DuPont / Curtiss Dark Earth (71-065) (Virtually identical to British Dark Earth, similar to FS 30118)



Floquil Classic 303145; Humbrol 29; Xtracolour X2; Gunze Sangyo H72; Pactra Acrylic A22; Polly S 500064

Aircraft Gray (later ANA 512, FS 16473)



Testor Model Master Acrylic 1731; Xtracolour X138; Gunze Sangyo H062; Tamiya XF66

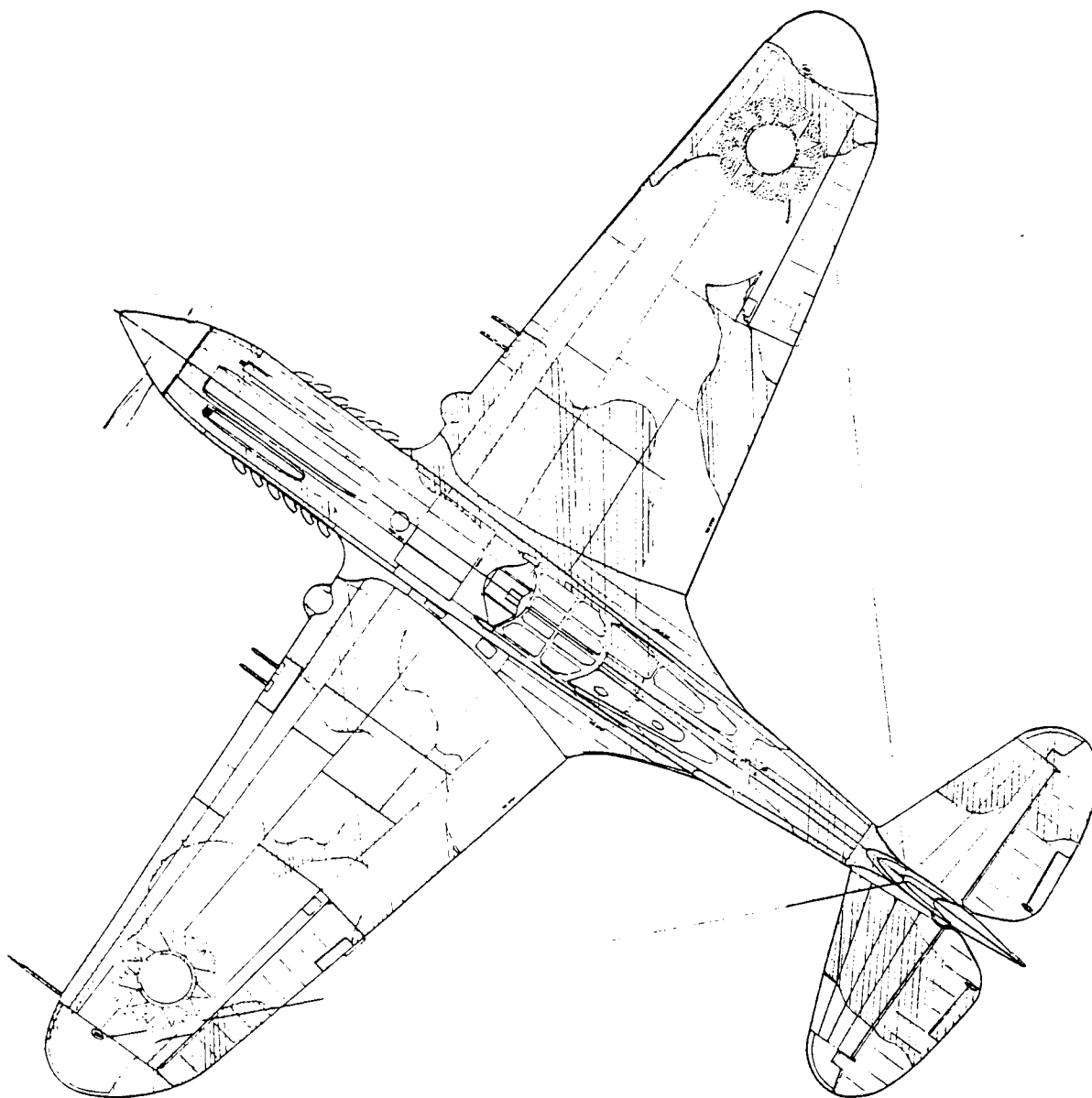


FIGURE 1 (and following): This was the basic camouflage pattern used for the AVG's Tomahawks. The cross-hatched areas represent Dark Green, the unmarked areas Dark Earth. The demarcation line with the light gray lower surfaces followed the obvious panel lines on the lower cowling, and a straight line back from the wing fillet to the rudder. (The rudder was in green and brown only). Upper surfaces colors had sharp, masked borders, and the light gray had a tight-sprayed edge with the top colors. The starboard wing tip was typically all green, but the pattern shown was an occasional variation. Note that because the camouflage was painted before the major components were assembled, the patterns seldom matched at the wing joints and fillets. Also note the obvious locations for the British roundels on the top of the wings and on the fuselage sides. The fin flashes were overpainted in several patterns which never matched the basic pattern. Only a few machines were painted in "mirror image" camouflage patterns.

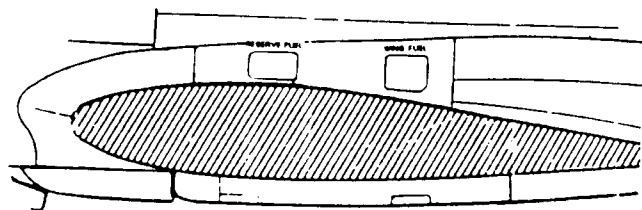


Figure 2: Location of port wing root fuel filler stenciling.

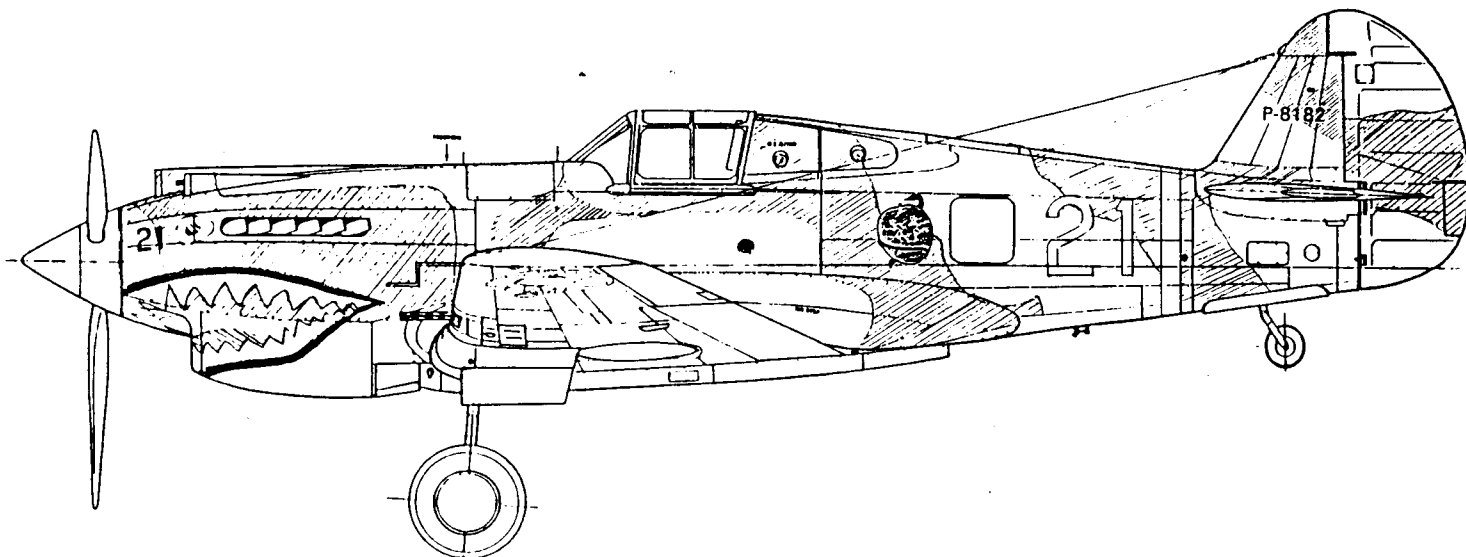


Figure 3: Hawk 81-A2 number 21 (P-8182), January-February 1942. This first squadron machine was initially assigned to Vice Squadron Leader Frank Schiel, then later to Greg "Pappy" Boyington. It was also flown by Vice Squadron Leader Charles Bond on December 20, 1941 in the AVG's first bomber interception mission at Rangoon. (His own plane, number 5, was unserviceable at the time). This was the most common style of shark head design; black "lips", white teeth, red tongue, with red and white eyes. The camouflage showed in the inside of the sharkmouth. Tail band was white. The first squadron insignia was composed of a light green apple, black snake, and white stick figures and lettering. Like all AVG markings, these were individually hand-painted, so details varied. Serial on fin was white. The fuselage and nose numbers were either light green, like the apple, or pale gray rather than the typical white. No pilot inscription or kill markings were carried, and no Disney flying tiger decal (which were not received by the AVG until April 1942). Note the odd patch of dark green camouflage paint on the fuselage between the exhaust stack and the canopy, probably the result of a touch-up, perhaps of a misplaced apple insignia. Color of wheel covers is unknown, but certainly Aircraft Gray, Dark Earth, or Neutral Gray.

Frank Schiel was credited with 7 victories in the AVG. He also flew a number of solo reconnaissance missions over Indochina. After disbandment of the AVG he stayed in China as the first commander of the 74th Fighter Squadron of the 23rd FG. He was killed in a flying accident on December 5, 1942 while on a reconnaissance mission in bad weather.

Boyington was officially credited with 3.5 victories in the AVG, and apparently had one other unrecognized claim. Of course he later won the Congressional Medal of Honor flying Corsairs for the Marines, where he was credited with 22 additional victories. As he himself admitted, he was a misfit in the AVG and his behavior and attitude alienated nearly everyone. He resigned / was discharged from the AVG in April of 1942.

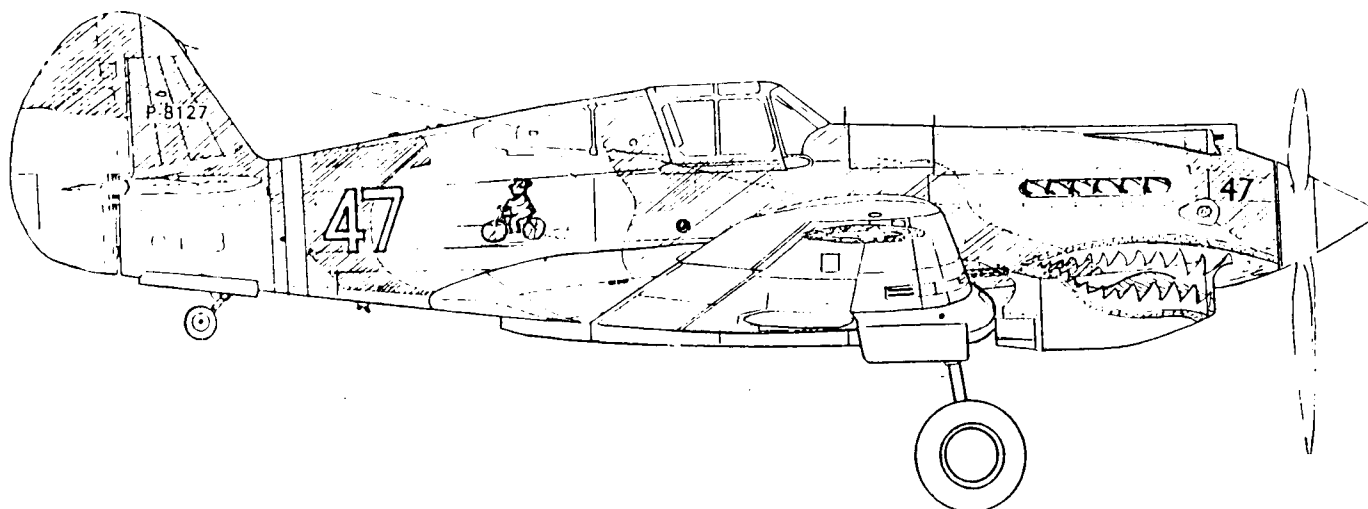


Figure 4: Hawk 81-A2 number 47 (P-8127), January-February 1942. This second squadron (Chinese blue tail band) aircraft was assigned to John Petach. It is one of the few second squadron machines to sport any sort of Panda Bear insignia. Serial, fuselage and nose numbers were white. The shark head was in a typical pattern, with camouflage showing through, but with probable Chinese blue lips rather than black, along with the white teeth and red tongue. The pupil of the eye was blue also. The colors of the Panda and bicycle are unknown, although the bear is certainly black and white, and the bike is a light color with black wheels. The "dust cloud" is probably tan. A similar design was almost certainly carried on the port side as well. No pilot inscription or kill markings were carried on this aircraft. The fin was overpainted in an unusual pattern. Color of wheel covers is unknown.

John Petach was credited with 3.98 victories in the AVG, and he was one of the pilots who volunteered to stay in China two extra weeks to help the 23rd FG get going. He flew in the 75th FS and scored one additional victory during that time, but was killed in action on July 10, 1942 during a ground attack mission. While the US government has never decorated any member of the AVG for his AVG service per se, Petach was awarded the Distinguished Flying Cross in 1984 (!) for his conduct as a member of the 75th FS.

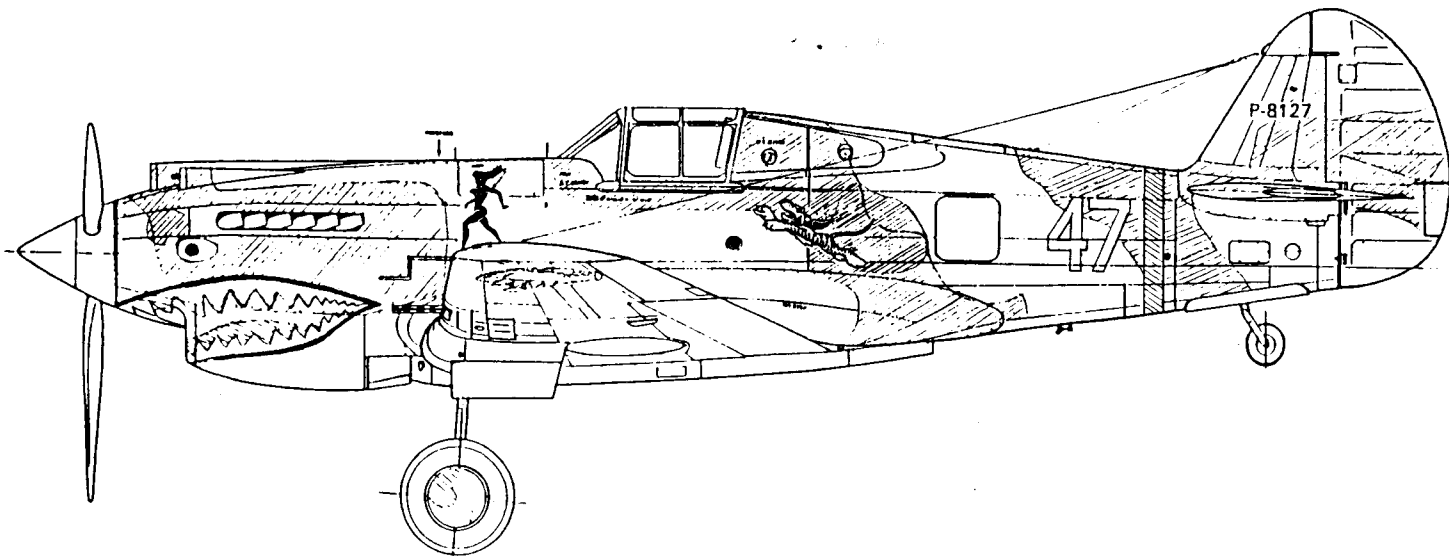


Figure 5: Hawk 81-A2 number 47 (P-8127), June 1942. Beginning in about April of 1942, second squadron aircraft (among others) were reassigned to the third squadron, and their places taken with newly-arrived P-40E models. Number 47 was one of these, being reassigned to RT Smith in May of 1942. Smith began to update and revise the markings, and eventually this is what the plane looked like. The serial number and fuselage numbers of course remained the same as before. The nose number was painted out, however, and the tail band was repainted in the third squadron's red color. The shark head was refreshed, with the lips repainted black. The pupil of the eye was repainted black with a thin red edge. The panda/bicycle design was also painted out with fresh dark green paint. A pilot inscription was added in front of the cockpit, with ten small kill marks. Red and white third squadron "hell's angels" insignia were also added by Stan Regis. These angels were placed on both sides of the fuselage, and were seldom identical, even on the same aircraft. The exact pose of these is uncertain. The Walt Disney tiger decals were received by the AVG in about April of 1942, and were applied to many – though not all – aircraft. They were in two shades of orange-tan, black, and white, with a red tongue and light blue wings. A large area under the tiger decal appears to have been cleaned, and thus looks darker, before placement of the decal. These decals were also heavily brushed over with glossy varnish to prevent peeling. The third squadron red/blue/white pinwheels were painted on the wheel covers, handed for left and right wheels. Note the odd pattern of the fin camouflage overpainting.

Robert T. Smith was a flight leader in the third squadron of the AVG, and he was officially credited with 8.73 victories. After disbandment of the AVG, he served as a squadron commander in Phil Cochran's 1st Air Commando Group in India/Burma, flying P-51As and B-25s. This was the second Tomahawk that Smith was assigned in the AVG (the first was number 77), although of course he flew others as well.

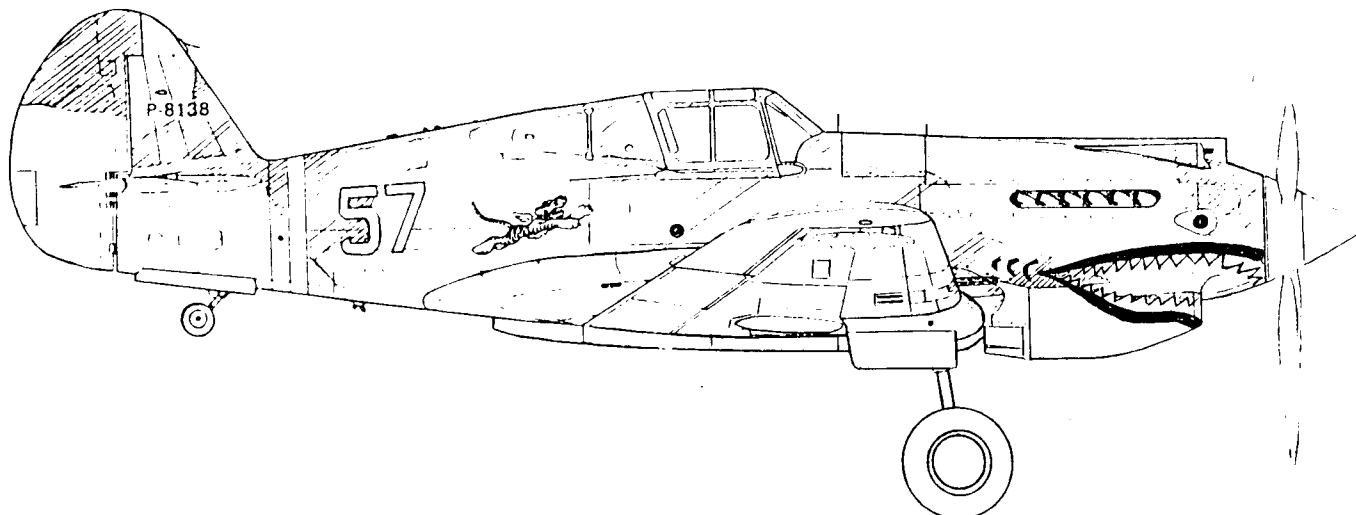


Figure 6: Hawk 81-A2 number 57 (P-8138), June-July 1942. This was the aircraft assigned to James H. Howard of the second squadron. Tail band was Chinese blue, and all numbers were white. A small nose number is visible in earlier photos, but was painted out by June of 1942. Except for the three white "dimples", the shark head design was in the most common style, with black lips, white teeth, and red tongue with camouflage showing inside. The pupil of the eye was black, possibly edged in red, in a white eyeball. No pilot inscription or kill markings were carried on this aircraft. Color of wheel covers is unknown, but certainly one of the three documented options. The pattern of the overpainting on the fin is unknown, too, but that shown here is the most common one. The tiger decal was added some time after April-May of 1942, and is not seen in earlier photos of this machine.

James Howard was credited with 6.33 victories in the AVG, where he was also Group Operations Officer and a Vice Squadron Leader. He volunteered for two extra weeks in China with the 23rd FG, and later commanded the 354th FG in Europe, where he scored 7 more victories to become the first American ace of both theatres. He won the Congressional Medal of Honor for his actions on January 11, 1944, single-handedly protecting a bomber formation from attacks by some 30 German fighters. "I seen my duty and I done it", he said later.

NEXT MEETINGS!!

SATURDAY, NOVEMBER 9 at 10.00am
SATURDAY, DECEMBER 14 at 10.00am

NATIONAL GUARD ARMORY
Room 114
1601 W. Armory Way
Seattle, WA

From north- or southbound I-5, take the NE 45th st exit. Drive west on 45th under Highway 99 (Aurora Ave) to Market Street. Continue west on Market St to 15th Ave NW. Turn left and drive south on 15th Ave NW across the Ballard Bridge to Armory Way. Watch for signs!

If you are coming from south Seattle, take Highway 99 onto the Alaska Way viaduct to Western Ave. Follow Western north to Elliott. Continue north on Elliot to Armory Way. Watch for signs! There is plenty of parking in the Metro Park and Ride lot.

DON'T FORGET that the December meeting will be the traditional year-end gorge and purge session. Besides the usual models, feel free to bring along any sort of snacks: brownies, cookies, soft drinks, Christmas candies.



Membership information:

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NEXT MEETING: Saturday, November 9 at 10.00am
Saturday, December 14 at 10.00am

Jim Schubert
230 173rd PI NE
Bellevue, WA 98008