A rare colour photograph of one of the P-80A-1s, 44-85004, in flight. **USAF**

Test flying the Lockheed P-80

The P-80 Shooting Star was Lockheed's first production jet fighter, and the risks involved with being part of the development of that plane were enormous. Bob Hoover and Steve Pisanos were both among those early elite pilots who were tasked with developing America's first generation of jet fighters.

After having been liberated from occupied France, double ace Steve Pisanos (the Flying Greek) was stationed in America, being used now as a test pilot for a number of different aircraft. Chief among these were the first generation of American jet powered fighter aircraft.

Steve Pisanos: "I finished test pilot school and Don Gentile, who was my roommate from the Royal Air Force and then the 4th Fighter Group… he and I along with two other guys were selected in the latter part of 1944 to come out to Muroc Airfield and do the service tests on the YP-80.

"Washington actually was very interested in getting that test going so they could send the aircraft to Germany to challenge the Me 262. But by flying every day, we finished up the damn service tests at the very end of April 1945, and then in early May, Germany gave up and Washington cancelled the idea of sending the P-80 to Europe."

There were numerous testing accidents with the early variants as Lockheed's chief engineering test pilot Milo Burcham was killed in the sixth prototype (YP-80) in October 1944 due to fuel pump failure on takeoff. Burcham had been one of the better aerobatic pilots of his day, and his loss was a

The prototype Lockheed XP-80 was named Lulu Belle and first flew on January 9, 1944. Here, Lockheed chief test pilot Milo Burcham and ground crew ready the XP-80 for trials at the north end of Rogers Lake. Powered by a British Goblin engine it reached a speed of 547mph in level flight. **USAF**

Bob Hoover seen in the cockpit of a Spitfire during the Second World War. **USAF**

blow to the programme. Compounding the situation was when his successor Tony LeVier, one of America's top air race pilots, was nearly killed in the crash of prototype number two (XP-80-A) when the jet engine started throwing turbine blades through the fuselage causing structural failure.

Pisanos: "While we were still at Muroc, I came down from a test run, landed on the lake bed and taxied over to the north base. Don Gentile came over to me and asked if I had heard about Tony LeVier. He said: 'the aircraft… the turbine wheel came loose and cut the damn fuselage like a butcher's knife. Tony tried to bail out from the aircraft but he had difficulties with his head getting bounced back and forth in the cockpit, they picked him up and he's at the hospital in Victorville'. I jumped down from my aircraft and Gentile and I jumped in a jeep and cut across.

"We didn't go on the highways, we cut across the damned desert, and we were bouncing all over the place from the Muroc base to Victorville. We got to the hospital and there was old Tony… the poor guy was bandaged up all over his head and everything. What he told us was that he noticed he had lost the tail of the aircraft and the front part was disintegrating and turning back and forth. He tried to open the canopy but he couldn't do it with his head bouncing around. Keep in mind at that time both Lockheed and ourselves… we didn't have the hard helmets like the boys are using today, we had the leather helmets from the Second World War."

That experience brought on the change to better headgear. Pisanos: "While we were chatting with Tony at the hospital he said: 'listen you guys, don't you fly that aircraft again with the leather helmets. Get something on your head, you need to have something'." Dr Lovelace, our flight surgeon from Wright Field, happened to be at Muroc at the same time. After we left Tony, we went over to the doctor's place and told him what Tony had said to us.

"The following day he was flown to Wright Field in a B-26. A week later guess what he came back, and guess what we were using initially… football player helmets. You remember those funny football helmets that they had? Later on the hard helmet came in."

Pisanos continues: "I remember when Bob Hoover and Chuck Yeager arrived, as we left Muroc near the end of May 1945 and not long after when we arrived at Wright Field, Hoover and Yeager were checked in there. Both of them got involved in additional tests with the YP-80 and the Me 262. I also flew the Me 262 to compare it with our YP-80, as the engineer came down one morning and said: 'Pisanos and Gentile… Gentile you take the Me 262, Pisanos you take the YP-80'. He gave us the orders of what to do, starting at 30,000ft, then 25,000ft, and 20,000ft. Every run we made, the YP-80 was pulling away from the 262. We came down and the engineer had us switch over, with me in the 262, and Don in the P-80. The result was the same and the YP-80 was faster."

Meanwhile, overseas Bob Hoover had been a crackerjack pilot whose skills had typically been used to make the first flights of aircraft that had arrived in North Africa. Bob Hoover: "The planes were brought overseas in crates and were assembled. They had to be flown to be sure they were airworthy for combat. Somebody had to make that first flight."

Years later, Hoover escaped from a German POW camp just before the end of the war in Europe, flying a stolen Focke-Wulf Fw 190A to freedom in Holland. "The war (in Europe) was two weeks from ending by the time I got out," said Hoover. "When I got back from Prison Camp, I was assigned to Wright Field and I went through the test pilots ➤

Above: Charles E 'Chuck' Yeager was one of the test pilots on the Shooting Star programme along with Bob Hoover and Steve Pisanos. **USAF**

Below: Steve Pisanos pictured earlier in his career when a P-51 Mustang pilot in Europe. **Steve Pisanos**

school. I was a junior pilot, but had a lot more qualifications than a lot of other people that were going through the school."

Bob Hoover and Chuck Yeager were often the air show pilots for the air force. Hoover: "The assignments were passed around to a lot of different people. When there was some reason for an open house at some air base, and they had enough political power… which I guess is the best way to put it… they would get hold of the Pentagon and say that they wanted a jet at their event, and would ask if they could provide them with one. These would be on the weekend and we would go wherever we had to go. It wasn't a full time assignment; it was just an occasional thing." Was it the glamour job? "Well, I'd been doing air shows since before the Second World War, so it was the same old sort of thing for me. It was always fun to take a new airplane that had never been seen before, and make it perform for you."

Colonel Bill Council was the head of flight testing at Wright Field, and combined with Lt Bob Hoover's air show experience, it sometimes made for a volatile combination. Pisanos recalls: "On July 4, 1945, Col Council said we are going to do a pass over at Wright Field as they had 100,000 visitors who wanted to see the new jet aircraft. I was supposed to fly the P-80 because I had more flying time than anybody from all my time at Muroc Lake.

"Since I was one of the test pilots and also was the engineering officer, of course I got extra time. Well, my boss (Council) took my P-80 and so I flew the P-59. Before the flight Col Council said: 'I don't want any excitement, I don't want any manoeuvres or anything'. So then I was flying behind Bob Hoover, who was in a P-47, and when we flew over the runway from the north, Hoover and another guy flying a P-47, Gus Lundquist… as they passed the airfield they made a roll.

"Well, Col Council in his P-80 way up ahead, he spotted that. He said: 'the two aircraft that just rolled over at the end of the runway are to proceed to Patterson Field, land, and stay there'. We continued the demonstration, and then landed at Patterson Field because Wright Field was full of visitors. Col Council said: 'You and you are going to training command and you are through with the test pilot business'. Gus said he didn't care because he was going to get out of the air force. Ol' Bob really didn't want to go to training command."

Chuck Yeager in the cockpit of a P-80 wearing the updated helmet as described in the article. **USAF**

A trio of aces, Don Gentile, John Godfrey and Steve Pisanos. All three flew test flights on the XP-80s and early production aircraft. **Steve Pisanos**

Pisanos continues: "We were both, along with Yeager and Gabreski, staying at the YMCA in Dayton. Over the weekend Bob and I went down to the dining room for breakfast and I told Bob 'I have a solution to your problem but you have to follow it, and I won't tell you what it is'.

"The following day was Sunday and I told him that we were going to take a ride somewhere. I called up Gentile, so he and Jim Little came along, another test pilot making it four of us. I was driving Chuck Yeager's Chevrolet as Chuck would leave the car with me when he was flying back to West Virginia to see his wife Glennis. We were driving and I told him 'Bob, we are going to Patterson Field and guess who you are going to see? Col Council. Listen, he might be an SOB, but he has a heart that is absolutely the best. I've checked him out on the P-80 and I know what the man is all about. You go to his house and apologisze'."

"He was in there for about half an hour and then he came out smiling like a baby. Council's wife had opened the door, and he asked to speak to the colonel. He told Council that he was there to apologise, so Council asked his

Lockheed chief test pilot Tony LeVier with one of the Lockheed YP-80 Shooting Stars. **Via Norm DeWitt**

The first of two XP-80A preproduction prototypes was known as the Gray Ghost due to its all light grey paint scheme. In flight over the Muroc Flight Test Base, it served as a testbed for a new engine and intake duct design improvements. **USAF**

wife to get a beer for Hoover and Council said he would change the orders, but that if Hoover pulled another shenanigan like that, he would kick him out of the air force." Bob Hoover was back in the flight test programme.

Bob recalls the struggles with those early Lockheed P-80s: "They put me into the jets right off. When I first flew it, the engine life was exceedingly short. After each flight, you had to wait until the engine cooled down so you could crawl up the tailpipe. We learned to do that ourselves, to crawl up and take a device that could measure the clearance between the blades on the turbine wheel against the shroud that surrounded it. It had to be within a paper-thin tolerance between each blade. I can't recall how many there were, but it took a considerable time to go through this procedure, which was commonplace with the earlier jet engines. That happens with a lot of the new engines when they are first developed."

Pisanos: "The engineers would have to look at them and if necessary, replace the engine to continue the flight. We also had problems at Muroc with blades coming off, one time I had to put a YP-80 on the lake bed dead stick because of that. Tony LeVier and ol' Kelly Johnson were really living at Muroc with us during the service tests. Of course, every time we had a major catastrophe, they would take the airplane back to Burbank and try to repair it."

Fuel control was one of the biggest problems with the early Shooting Star. Bob: "We didn't have fuel controls as nowadays, and we didn't have adequate controls with the P-59 before it. So, what we had to do… the pilot was responsible as the fuel controller. It was a manual procedure on those early engines. You had to meter it so delicately to avoid it getting excessive temperature and exceeding the limits on the engine. ➤

Early engine and fuel pump problems led to some accidents and off airfield landings, as with this early production P-80. **USAF**

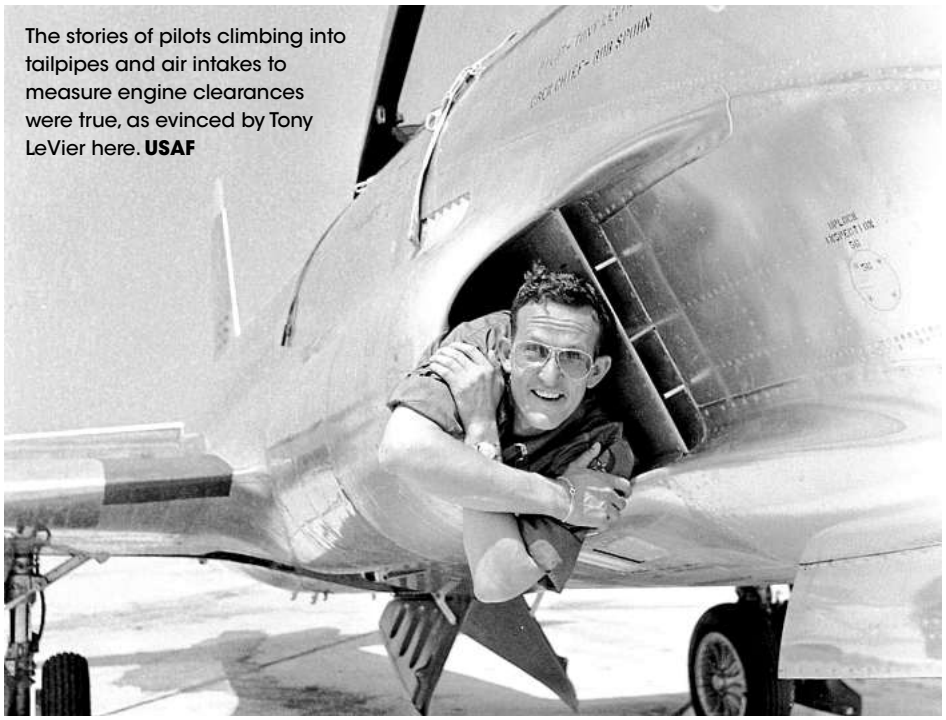
The top scoring USAF ace of the Second World War, Richard Ira 'Dick' Bong, was killed after a fuel pump failure in a production P-80 on August 6, 1945. He is seen here in the cockpit of a P-38, the aircraft he was so successful in, with his wife, Marge. **Via Norm DeWitt**

"When you would go to start the engine, the engine would be cranked up with an external power source to where the rpm of the engine was high enough to accomplish throttle movement. But we always had problems with the power unit getting it up to enough speed before ignition. Then when you hit the ignition, you barely broke the throttle out of its stop-cock, or closed position.

"In that position there was no fuel coming out at all, and then you'd have to come around a little horn on the throttle quadrant, to get out of that stop-cock position. If you came around that horn and moved it just a fraction of an inch too fast, you'd be to the limits of temperature and you'd have to stop it. So, you had to be very careful because the metering of the fuel was the most important thing in the world to jet engines before we got automatic fuel controls."

It was the opposite of what you'd expect with a piston engine, where the richer mixture would run cooler. With the jets, more fuel had the opposite result. Bob: "Correct, if you let the pressure build up too much, with too much of a squirt of fuel, then the turbine wheel couldn't accept it quick enough and all that fuel that it didn't need at low rpm would exceed the temperature needed for engine start. We eventually got fuel controllers on the P-80 and then it became a reasonable airplane, but even to the end, you had to be careful coming out of the stop-cock position. After the Shooting Star, the F-84 was the next one to come along and they had a fuel controller."

But with the early P-80, the problems continued. Almost a year after the loss of Milo Burcham, fuel pump failure also led to the loss of Richard Bong, America's top ace of the Second World War, on August 6, 1945. The Lockheed test pilot had a primary fuel pump failure on takeoff with an early production P-80, and was lost when he bailed out at insufficient altitude for the chute to deploy.



The stories of pilots climbing into tailpipes and air intakes to measure engine clearances were true, as evinced by Tony LeVier here. **USAF**

Pump failure had been a well documented issue with the planes, and they had recently been upgraded with an auxiliary I-16 fuel pump which needed to be engaged by the pilot. In the post-crash investigation it was determined that the auxiliary pump was not engaged. Flight testing of the P-80s was the very definition of hazardous duty.

Pisanos: "Exactly. Another episode I had was part of the test programme where we flew high over the lake, shut down the engine, and then tried to restart with the I-16 unit. Other guys did that and were able to, but on one occasion I tried to start the damned thing and couldn't get the engine to restart. I declared an emergency and landed it then I stopped in the middle of the lake, Tony LeVier and Kelly Johnson drove the company staff car over to me and asked what the hell happened. I told them how I could not restart the damn aircraft while up in the air. They inspected the airplane and corrected the problem."

Fuel was also an issue for other reasons, as it was unusual to find kerosene jet fuel at military locations, since everything in the supply chain was for serving piston powered internal combustion engines. As a result of this fuel situation, it was decided to test the P-80 using 100 octane gasoline for fuel. Bob Hoover was selected to perform this test with a tied down P-80. Hoover: "They had run it on the test stand, but they wanted it to be operated in the airplane, as if it were in flight, with the airplane surrounded by fire trucks. I wasn't too concerned with this procedure because they had already run tests in the

Test pilot Tony LeVier with an early P-80 in the background, behind the prototype of the TP-80C, a two seat trainer variant that later became the world famous T-33. **USAF**

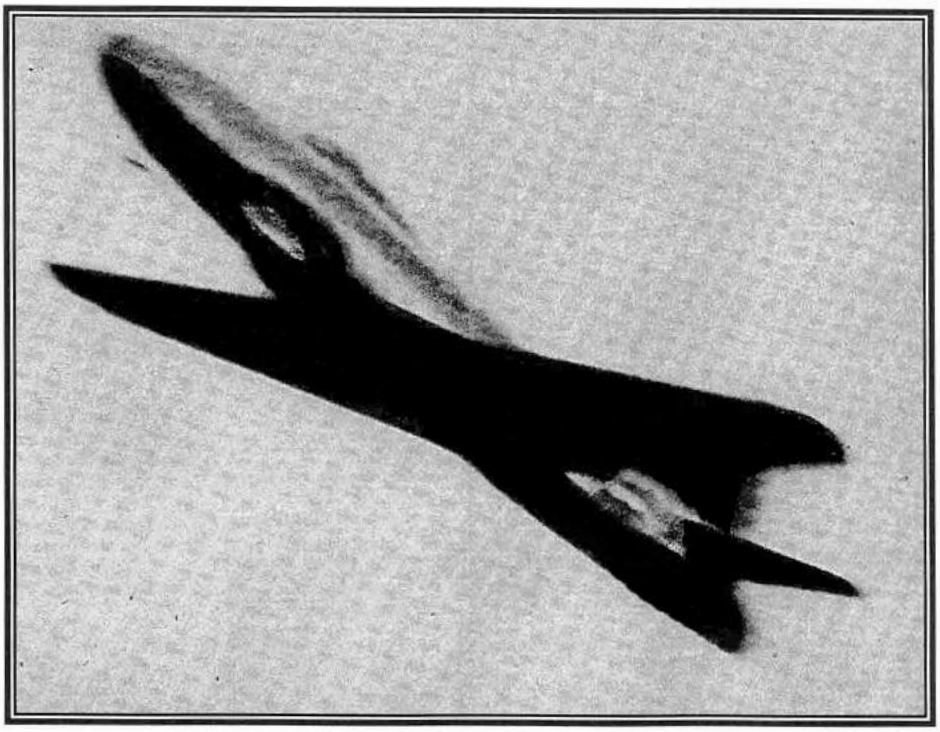
wind tunnel that didn't show any burner can coking and you had every reason to believe that it would be successful." This was a deadly serious business, as there was really no substitute for putting a pilot in the cockpit to monitor the test.

Steve Pisanos was similarly involved in fuel testing. He said: "Bob Hoover and I flew the P-59 at Wright Field with a fuel test programme. I flew the P-59 with plain alcohol, plain gasoline, and then plain kerosene. Then when I came down, the fuel guys would check the temperatures. They discovered that the alcohol was no good, as the temperatures produced were too high in the tailpipe. Gasoline was the same thing with high temperatures, but the mixture between gasoline and kerosene was what they eventually came up with, JP-4, which is what we have today." The 50-50 mix of gasoline and kerosene called JP-4 was to become the primary jet propulsion fuel used for almost 50 years.

Meanwhile, there was a problem with early production model P-80s crashing. Cockpit canopy failure wasn't an obvious concern, as that had not been a problem with the earlier prototypes. Pisanos: "When we pulled the service tests with the five YP-80s we had at Muroc, we didn't have that problem with the canopy. But the production aircraft were having their canopies blown off, and it was a defect on the production line." However, the cause wasn't known at the time of these failures. All that was known was that production P-80s were crashing without any reason being determined, as the pilots did not survive.

The football helmets previously mentioned by Pisanos clearly weren't standard issue as Bob Hoover had bought his own football helmet from a sporting goods store. "When I got that football helmet, I went to the parachute department and got them to put on snap buttons so I could snap the football helmet on top of my leather helmet and still be able to use my hookups for the oxygen mask and chin strap," he said.

Hoover, who was 6ft 2in tall, painted his own football helmet bright yellow which ended up providing a major clue in solving that issue of lost aircraft due to canopy failure. This discovery came during tests with ramjet engines added to the end of the wingtips. Hoover: "We lost three pilots at Wright Field, and we didn't know why until my incident. I had been bent over to turn the fuel tank valves for the ramjet engines that we were using on the wingtips. They were like water valves the size of a small steering wheel mounted on the floor."

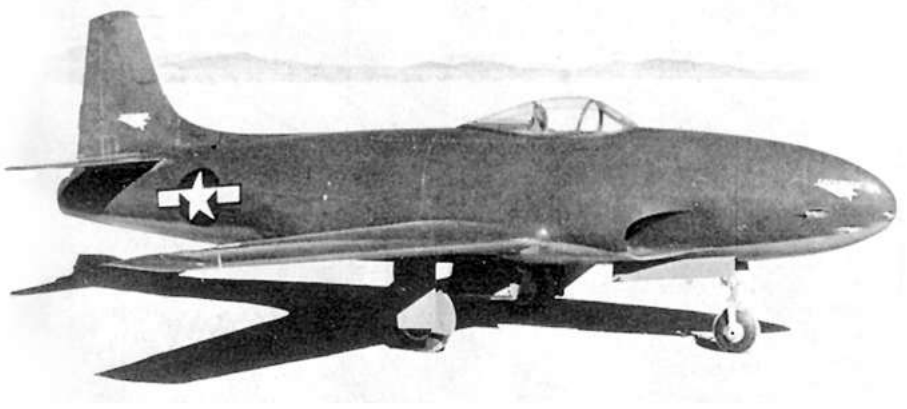


DAYTON, OHIO, WEDNESDAY, AUGUST 1, 1945

S-W-O-O-O-O-S-H — Daily News cameramen were confronted with a "new one" Tuesday . . . they attempted to photograph something they couldn't see. That was when Lt. Steve Pissanos, Wright Field test pilot, wound up the army's new Lockheed Shooting Star jet propelled plane, known as the "P-80" in flying circles. Pissanos said he would "slow the plane down" to around 500 miles per hour as he swished across the measured course . . . But this was still too fast for modern camera shutters to "arrest the motion" of this flying comet . . . consequently, the blurred image shown above is the result of shutter speed 1/1000th of a second. P-80's are going to give newspaper photographers a first-class headache, unless improvements are made on cameras . . . But fast. — (A. Scottiefotto.)

An excerpt from the Dayton newspaper of 1945 records the impression the speed of the early jet fighters made on the public and press. **Via Norm DeWitt**

Again providence was on Hoover's side, as the canopy picked that precise moment to deflect and rotate into the cockpit, leaving yellow marks along the inside of the canopy frame. Had he not had his head down to nearly between his knees, he would have been decapitated, and would have been test pilot number four lost under mysterious conditions. He said: "It was just coincidence, but the canopy was recovered and it indicated beyond question that the canopy was dishing into the cockpit as there was yellow paint along the inside of the canopy frame. They installed a triangular back plate by the windshield that would prevent the canopy from dishing."



The first XP-80 prototype, Lulu Belle with the early shape of the fin and rudder. This was the only P-80 to be fitted with this design, it was quickly changed to the more rounded fin. **USAF**

As if these issues surrounding the early production P-80s weren't enough, one couldn't rely upon the warning light system either. Chuck Yeager tells about how he would just unscrew the warning bulbs in the P-80 that would invariably go off like a Christmas tree in flight. Hoover: "About 90% of the time, they were false alarms. So, you got the impression that the alarms weren't real. I made that assumption, and the flights were very important but we would not have known if there was not a problem. The determination was on your own, as to whether to believe it or not believe it."

This sort of dice rolling often became what the superior officers began to expect from their pilots. Those risks were assumed by the test pilots, but one wouldn't expect the same from military pilots once the aircraft entered into operational service. Hoover: "I remember being in North Africa to demonstrate the F-100, in the early days when it was first getting out into the service. When I arrived, everyone was looking up at the sky, as a pilot had just ejected from an F-100.

"The commanding officer met me and said that he'd just lost an F-100 and told his executive office that if the pilot was okay, to bring him into his office. I went to his office to discuss what a demonstration flight would consist of. When the young man was brought in, the colonel started addressing the young lieutenant like he was an idiot because he'd ➤

An early production Lockheed P-80 Shooting Star with the modified canopy and other refinements developed during the test programme. **USAF**

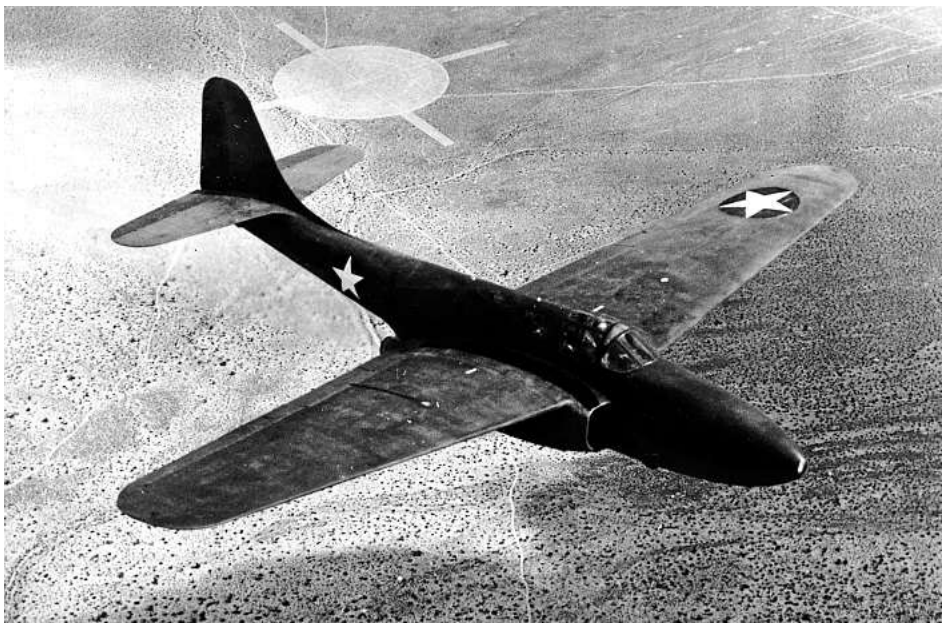
bailed out when he saw the fire warning light, saying 'that plane never blew up before it hit the ground after you ejected from it, and that tells me that there was no fire'. The young Lieutenant was dejected, his head hanging down and just miserable I said: 'Colonel, this is your show, but we could afford to do what we did when testing the airplane and ignore lights. But, we felt that it was important enough'.

"There were two fire warning lights, the forward light and the aft light in the tail section. If you throttled back when you had an aft warning light, you could make the light go out. But generally speaking, if you had the front warning light on at the same time as the aft warning light, you would almost immediately assume that both systems wouldn't fail. We had it written up in the handbook that if you had a forward warning light go on, get out as quick as you can because you are going to have a real explosion and should exit the airplane. The colonel still reprimanded the young lieutenant, and I was pretty upset about it but there was nothing I could do, so I at least voiced my opinion."

There was no doubt about the situation when Hoover once had an engine explosion in a P-80. Complicating the situation was a perfect storm of unreasonable orders, along with an incorrect weather report. Hoover: "It was the worst thing I've ever been through. The colonel was Bill Council again, who was the head of flight test, and it was about four o'clock in the afternoon. He had called me about having a request to have a P-80 flown to Beverly, Massachusetts; General Spaatz who was the chief of staff of the air force at the time was going to be there. This was back when the P-80s were brand new and hadn't been seen in much of the country… no jet had been.

"Council said: 'I want you to get there'. I asked him if he was going waive on flying at night. He said: 'I'm not putting a waiver on flying at night. You're not going to fly at night, but you'd better damn well get that airplane to Beverly Massachusetts before dark'. I explained to the colonel that it was impossible and that I had to release the external tanks, taking the tanks off, getting them trucked over to Patterson Field, as it had a longer runway. I told him 'getting them pressurised and put back on, after getting them driven over there by truck, I can't get there before dark'. Council said: 'I'm telling you I want that plane in Beverly, Massachusetts, and I want it there before dark. You heard me lieutenant, just make sure it happens'.

"By the time I had the pressurisation test done, the plane was ready and it was dark with a forecast to be clear. In the interest of conserving fuel, the higher you get, the less fuel you burn and the more speed you have. Going eastbound, the higher you get the better the tailwind due to the prevailing wind. I was well above 40,000ft, and keep in mind we had no heating or pressurisation in those days, so the canopy would fog up from your breathing. On every flight that was very long at all, it would get frosted up on the canopy



The P-80s were flown in comparative trials against a number of aircraft, including the Messerschmitt Me 262 and the Bell YP-59A Airacomet as seen here. **USAF**

The Lockheed P-80 design was to be extremely successful and long lived, the last of the T-33 two seat aircraft did not leave USAF service until 1987 as recorded on the airbrakes of this preserved aircraft. **Norm DeWitt.**

and you couldn't see out due to the exhalation from your oxygen mask.

"I remember taking off my gloves and putting my thumb against the side panel, which was the thinnest glass in the entire cockpit area, and I could get a peephole about the size of your thumbnail. I'd put my thumb against that side panel to make a little peep hole and could see one vertical light beam that was so powerful that it went up like a searchlight to about 30,000ft, and I figured it must be an experimental light at an airfield.

"Soon after I banked the plane and saw lights coming through the clouds, which I identified in my own mind as Boston, and it was socked in solid. I figured I could see that vertical light beam again if I turned around, reciprocated my heading, and looked through the peep hole in the canopy."

It all went horribly wrong. Hoover: "Right as I turned back, I heard an explosion. It was a fire ball and the canopy was lit up bright red with both of the fire warning lights on. I got on the radio but couldn't reach anybody. Nobody knew where I was, as we didn't have radar back in those days. I figured I had to get back to that light beam I had seen a few minutes before. I'd been at 50 degrees below zero for about 40 minutes or so, and I didn't have on heavy clothes. I thought 'Boy, I'm going to be in bad shape here, I'll head down to 10,000ft otherwise I'll not survive'. I was freezing while gliding down, heading for that light beam through my peep hole. I got down to about 10,000ft but I was still some distance from the light beam."

There were precious few options, none particularly promising. Hoover: "I got rid of the canopy at 10,000ft, if I had to bail out as I didn't have an ejection seat. If I bailed out now, I wouldn't know where I would be. The ground was covered with snow from a snowstorm that had just gone through over the last couple of days and I thought they'd never find me.

"I had one chance… so, and tried to see if I could get any power out of the engine at all. I'd had it shut down for quite a few minutes during the glide down. I took the fuel out of 'stop-cock', hit the ignition, and the engine took hold. It gave me a bit of thrust, but then gave up and that was all over. But I was headed for that light beam, and never saw the ground, staying on my glide speed and flared when I thought I was getting close to the level of the light. I had landed between the hangars, not on the runway. I passed out from exposure once I got on the ground. I had frostbite on my fingers and toes; I couldn't feel them at all.

"The major who was on duty had been out checking the runway, and he saw this airplane sitting there, thinking 'this airplane shouldn't be outside'. Then he saw me slumped over in the cockpit. They got me to the hospital where they told me how serious it was. They put my extremities in luke-warm water, including my hands and arms. At about midnight the doctor came by with another doctor, talking about having to amputate. I was conscious, and one doctor said he'd read something in a medical journal about how alcohol dilutes the blood vessels and permits the blood circulation to move more freely.

"They decided they had nothing to lose, so let's try. They gave me some alcohol every hour, and first thing I wasn't feeling any pain. After a while I had begun to feel my toes and fingers… this went on for 2 ½ days, and it sure worked in my case. But I've had everlasting problems. As soon as it gets anywhere near to cold, my fingers start to turn purple. My toes don't bother me, but my fingers… I have to come in and run warm water over them." A small price to pay…

In the wake of all this drama at Wright Field, Bob Hoover was selected as one of the Bell X-1 ➤

A single P-80 was developed into a record breaking aircraft, the XP-80R. Often flown by Tony LeVier, the sole example is preserved in the USAF Museum. **USAF**

programme pilots. Hoover: "There were a half dozen of us. I had been selected as the number one project pilot for the Bell X-1. I had done the compressibility work with other reciprocating engine airplanes, as they were trying to figure out how they were going to ever get through compressibility, which would make an airplane capable to go the speed of sound.

"We had sort of a built-in headwind because of the shape of everything with a conventional airplane. We just did not have the power, but even if we did have the power the airplane could not have handled it. Compressibility is where the airflow breaks down because of the design of the airplane where you don't have a smooth flow of air. When you start to go supersonic, the whole airplane starts to shake until it goes into a flutter condition and then almost instantaneous disintegration. The first tests had that disastrous situation, and the British lost two or three airplanes."

One of those was flown by Geoffrey de Havilland Jr., perhaps England's best known test pilot, who had been the first to fly both the Mosquito and the Vampire for de Havilland. The family's celebrity was certainly enhanced by his cousin, Olivia de Havilland's starring role in the movie Gone with the Wind, to say nothing of her sister Joan de Havilland (stage name Joan Fontaine) who was starring in musicals with Fred Astaire. Given all of this, Geoffrey's death while testing the de Havilland DH.108 Swallow was a massive shock to the public. The three Swallows built were all eventually lost in fatal accidents.

Hoover said: "The Germans lost them as well. Compressibility was the big bugaboo, and we had it with all our Second World War fighters. While testing the P-47 we determined it had its share of problems with that. When you got into a vertical dive, the airplane would become almost uncontrollable. One time we got a P-51 up to Mach 0.82. We then decided to put that device on the P-47 because it seemed to have more power.

"With a P-47, if you dived down on a formation of German airplanes, as you passed through the formation you could get one or two, and when they rolled over and started diving they could never catch up as you already had far more speed. When the P-47 got into compressibility, they would chop the throttle and pull back as hard as they could on the stick to get the nose up. What would happen then is that the airplane would tuck instead of pulling up. You didn't have enough physical strength to get the elevators up high enough to get effectiveness. In our test work, we put a mechanical device on the horizontal stabiliser ahead of the hinge point for the elevator. It would actuate a flat plate that went the full chord of the horizontal stabiliser, almost to the vertical."

There had been other attempts, using an electric device to deploy the plate. Hoover: "The first pilot assigned to the compressibility programme had an electric motor, but it would stall out and couldn't actuate the plate. It wasn't powerful enough against the force… too much air load. The pilot didn't survive. So they asked me if I wanted to take over the programme and I said 'yes'. I told them that I didn't want the electric motor. I wanted a telescoping rod control that was run to the cockpit, attached to the floor, with a part that went all the way up to the canopy so I could use a ratchet. If I needed it one notch higher, I could get it… I felt I had enough leverage. I was able to get it up to 0.82, the same as we had with the Mustang, and they said, 'okay, let's go for it'.

"Jim Fitzgerald, a fellow POW and a really good friend of mine was flying a P-80, he was my chase pilot. His job as a chase pilot is to observe everything going on with the airplane and offer advice. Well, I was going down vertically and I had the device almost up, and Jim kept telling me that I wasn't going to make it and I'd better get out while I can. I was at over 500mph indicated, and I never thought I'd have a chance.

"I used everything I had force-wise, and got it (the ratchet controlled plate) to the last stop. They had me recorded at 0.83 and then there was an enormous explosion. It was just the worst noise you ever heard… I would suspect that I'd gone through 10 or more Gs but it was instantaneous, and I was unconscious… for how many seconds I don't know.

"When I came out of it I couldn't even see at first, I was loaded up so heavily. When I cleared up, I was recovering from the dive. I had no idea what was happening. The plane was shaking so hard that I thought it was coming apart on me. I looked out at the wings, and they were wrinkled. What had happened was that the wings had buckled, and the stress on the wings was so much that the locks on the landing gear came loose, and the gear pulled right out of the wings. The wheels dropped, and the landing gear

Given his outstanding contribution to aviation as Lockheed's chief test pilot, Tony LeVier is commemorated in this memorial at the P-38 hangar of the March Field Museum in California. **Norm DeWitt**

The prototype XP-80 Lulu Belle as it appears today, preserved in the National Museum of the USAF at Wright Patterson Air Force Base near Dayton, Ohio. **USAF**

doors tore off, and then they tore off a good part of the tail, but the wheels didn't break off. I had about 10,000ft to make a recovery.

"Jim knew I was running into real trouble, and as I was slowing down, he pulled up next to me to ask what my intentions were. I told him that I was going to try and land it. He told me that he wasn't sure that the wings were going to stay on. I said that the wings were on right now, and if I don't hit some rough air, I feel pretty confident. So, he stayed right with me. All the indicators in the cockpit showed that the landing gear had failed, but it landed okay. I never saw it again, as the airplane was destroyed (due to the extensive damage throughout). I'm sure this led to my being selected for the X-1 programme, because I'd done all the preliminary testing for that kind of a project."

The X-1 rocket plane was quite unlike anything else in its day (originally known as the Bell XS-1). Hoover: "The X-1 was designed like a 30-6 rifle bullet, and that goes above Mach 1. Since the 30-6 bullet went Mach 1, what could we do to make an airplane go this fast. We thought we'd make the thinnest wings possible and the smallest tail possible, and still control it. And that's exactly what Larry Bell came up with.

"They (the air force) decided to bring it in-house because the Bell test pilot was demanding $150,000 to make the one flight. That was when it was decided that the air force would take it over. We would be the leaders, and NACA would also have a test vehicle. They would be the backup for whatever I was going to do with the X-1. Because of the X-1 programme, and my having flown jets, we had a few powered flights without achieving speeds that I hadn't already been through with the jets."

Just as it seemed like Bob Hoover would be the pilot to push the envelope into a new supersonic era, his plans came crashing down. Hoover said: "Colonel Al Boyd had me and two other fellows to consider for the number one slot. There was a selection process and I came out on top. I was happy as a clam, and really looking forward to it. I had every reason to believe that the design would help us to get to the objective we wanted. Chuck Yeager was still in maintenance. Boyd called me in and he said: 'young man, did you buzz the Springfield airport the other day?' I said, 'yes sir, I did'.

"Boyd said: 'I know two things about you. You are honest as there was only one jet that flew in the whole United States that day. But, I realise that you are not reliable, and I'm going to find somebody else to replace you with. And you will be his number two, and you will offer him as much assistance as you can possibly give someone'.

"I've looked back on that over the years. What kind of pilot would you be to nail somebody because of a simple buzz job? The only reason I'd done the buzz job was I was in a P-80 training one of the new pilots. It had been an hour, which was the most time I'd been able to get without external tanks. I was trying to get it back to the base at Wright Field… and I had to cross over Springfield airport, so I just dropped down and went across upside down. The guys who were at the airfield couldn't read the number because I was upside down and the numbers were really small in those days. But the fact that a P-80 had buzzed the field illegally, was too much and I got the call.

"A few weeks later I was called back to Boyd's office. 'Do you know Captain Yeager?' He didn't feel the other pilots who were candidates could handle it, to do what had to be done. Of course by then, Chuck and I were beer drinking pals, and I never let the colonel know that in fact I was going from despair to happiness because I respected Chuck's flying ability so much. I was behind him 100% and always have been."

Everyone involved in heading up the flight test programmes was a talented pilot in their own right. Col Boyd, who made the call to pull Hoover from the X-1 assignment, was to set a World Speed Record of 623mph in June 1947 with the specially modified Lockheed XP-80R racer. Similar achievements were accomplished by Col Council in January 1946, when he flew a P-80 in the first nonstop transcontinental flight of a jet aircraft, averaging 584mph from Los Angeles to New York.

So, Chuck Yeager instead of Bob Hoover has gone into the record books as the first pilot to break the sound barrier. Hoover: "I'm not taking anything away from Chuck, because he did it, and he did it because of his skill. He was one of the finest pilots that I've ever met." Of course, in Yeager's book, he states that there was nothing to choose between the two of them in terms of flying ability.

"I know I felt that way," said Hoover. "We had many a dogfight against captured ➤

Chuck Yeager and Bob Hoover at an awards ceremony in 2012. **Norm DeWitt**

Japanese airplanes immediately after the war. As a result, each of us really knew how good the other was." Bob's method of introducing himself had been to take a P-38 Lightning and jump Chuck Yeager in the Bell P-59 jet, during a test flight. "That's the way we met. Fighter pilots always felt they were the best, that they could beat anybody. That isn't necessarily true for the average person.

"That was one thing that was significant about that entire programme. There were a bunch of doctors… people who were trying to figure out the psychological and physical aspects of what we were trying to do. They wanted to determine what a human being could withstand, as the airplane was designed for 18 positive and 18 negative Gs. They wanted to know at what point we would not function properly. This was before those astronauts had to go through all that terrible treatment.

"So, they would take Chuck and I right to the point of unconsciousness with the centrifuge, and that was a pretty miserable experience. Then they redesigned the pressure suits, with a new type called Capstan. So, Chuck and I would go back and forth to Worcester, Massachusetts, where the David Clark Company was located. They had contracted with the government to make this new pressure suit. We were testing them to about 65,000ft and at that elevation your blood boils (without the suit). I was in the chamber one day and when I was at 50,000ft, I had lost everything, and couldn't speak. I was holding my breath, not inhaling or exhaling… you can't breathe as when this happens you are paralyzed in your throat, but I could wave my arms. There was only one porthole, and the doctor who was supposed to be watching me was instead talking to another doctor, and Chuck was looking through the porthole. He started yelling for the doctor, saying 'Bob's in real trouble'. They got things connected to me before I lost consciousness. I tell this story because I would have done the same for Chuck."

Hoover flew the P-80 chase plane for Chuck Yeager's X-1 record flights. By then had they resolved the various issues with the P-80? "Yes, it had the good fuel control by then, but you had to still be very careful on the start. But it helped you avoid getting too much fuel at one time. It had become easier, but was still a pain in the neck, all the way to the end of the P-80 programme or with the T-33 engine."

Just to add to the challenges that Yeager faced, he never had enough airspeed to fly the plane upon being dropped. Chuck Yeager: "The stall speed was 190mph and every time he'd drop me, I was in a stall." One assumes it was one of the big downsides of the tiny wings. Bob Hoover: "Oh, heavens yes, the airplane had a very high stall speed."

Bob Cardenas, pilot of the B-29 that carried the X-1, mentions that the Bell X-1 was deployed in the boundary layer of the bomber, contributing to the problem. All in all, it added up to a challenging situation. The X-1 pilot is blinded, dropped out in a stall, then looks for Hoover's contrail, hits the rockets on and aims for Hoover's P-80? Hoover said: "That's it. What Chuck always did, when he would drop out the belly of the B-29, was be blinded as he'd been in a dark airplane going into the bright sunlight. The first thing he had to do, was to look straight up and hopefully he would see my contrail and head in that direction. That way when he went by me, he was roughly in the right position to glide back to the lake bed."

Dick Frost was flying the other P-80 chase plane. Hoover: "He was also part of the X-1

Chuck Yeager and Steve Pisanos, reunited in 2012. **Norm DeWitt**

programme and would stay with the bomber all the way through the release. When Chuck was released from the bomber, I was already sitting above 40,000ft. Dick would be sitting in formation with the bomber, and stay with Chuck until he ignited the rockets. When Chuck ignited the rockets, he would go away from Dick so fast he would be out of sight in a matter of seconds and then would go vertical looking for my contrail. He would go by me, and have burnout maybe 3000 or 4000ft above me. When that would occur he would be decelerating because he had no power, and he'd just go to glide speed and I would catch up with him really quick."

Aiming for Bob Hoover had saved Yeager on one high altitude flight test. Hoover said: "Well, on one of his flights he was whistling like all get-out at 47,000ft plus and when he went by me I knew he was going to be getting pretty high. At the apex of his flight, where the rocket fuel is exhausted, he said: 'Bob, I've lost my compression'. Decompression meant that immediately you'd get ice all over everything including the inside of the glass so that you couldn't see out. I asked him if he could see okay, and he said: 'No, I can't see anything'. I told him 'just stick with what you've got', he was within my sight.

"Of course I had my engine running full bore. Each time when he had run out of fuel, within seconds I would be right on his wing as I would be at Mach 0.8 and there is not a big spread between that and Mach 1. We still didn't have a heated or pressurised cockpit in the P-80, so I was still having to hold my thumb against the side of the frosted over canopy to create a peep hole to look through. Chuck was still blind, so I told him 'I got you, turn a little bit to the left… okay, hold it right there, we are on a direct line for the lakebed'. I followed him all the way down to the landing, but I did that on every flight.

"Sometimes he couldn't see out, but in this case he really could not see anything. I'd tell him 'you are 100ft up', counting down what he's got until he got to 10ft, when I'd say 'don't touch anything'. He did the landing beautifully and I made one pass over him and said… 'All right, now we are even'.

Yeager had saved Hoover in the pressure suit testing, and now Hoover had saved Chuck's life. Hoover: "I was working with him from the first flight, until I got broken up in an F-84 accident." All too often the only person Chuck had looking out for him, other than himself was Bob, and visa versa. Both are among the very few survivors today who flew in what was perhaps the most dangerous era of flight testing.

The job of the test pilot is obviously to put the aircraft beyond the comfort zone, as with most performance vehicles, one doesn't discover the flaws and imbalances with a design or setup until it is pushed to the limit. One example from the mid-1950s F-100 test programme stands out, when Hoover had nearly killed himself while trying high speed manoeuvres with the plane. The engineers at North American played a large part in the disastrous subsequent flight by not immediately taking the test pilot's feedback into account and making the needed modifications. Was this the normal occupational risk for test pilots flying these late 1940s and 50s jet fighters?

Hoover: "They (the engineers) were willing to do that, but in most cases it was corrected before further flights. They hadn't even read my report from the day before, where I wrote up that with the yaw problems, we would lose the airplane if it went any faster or pulled any additional Gs due to an undersized vertical stabiliser. So, the next day they sent somebody (George 'Wheaties' Welch) up to go faster than I had gone. When I explained this to George Welch, he told me: 'Hoover, you are overeducated in grade, why don't you quit being a test pilot and be an engineer?'

"My response was: 'George, I've got to be as smart as an engineer to stay alive, and if you accept this flight I don't think you have a chance in the world'. Fifteen or 20 minutes later it was all over and he was dead." George Welch, one of America's top Second World War aces (16 kills), and the first pilot to exceed Mach 1 in the F-100, was lost when the F-100A broke up in flight while trying to pull out of a supersonic dive.

Pisanos was one of the first P-80 pilots to leave the test flight programme. He said: "I left Wright Field to fly for TWA, and Bob Hoover continued the test programme I had been involved in." Bob Hoover stayed involved in cutting edge developments with the service and then after. Hoover: "Later, upon leaving the service, I joined the Allison division of General Motors, testing engines. We'd set them up on the test bed and it would work out pretty good, but when you have a new design, you are still working out the fuel controls and there are a lot of things you have to worry about."

Steve Pisanos, Bob Hoover, Bob Cardenas, and Chuck Yeager were reunited for a number of events at the San Diego Air and Space Museum during 2012. These men are a living testament to an era when test pilots pushed the aircraft design envelope further and faster than had been thought possible, while both capturing the attention and firing the imagination of the world. ■ *Words: Norm DeWitt*

NORM DEWITT'S HOORAY FOR HOLLYWOOD

In 1955 Universal Studios released science fiction movie Tarantula! This followed the story of a scientist attempting to create a food nutrient from radioactive isotopes. One of the animals used in the experiments is a Mexican Red Rumped Tarantula spider, which grows to over 100ft tall and goes on the rampage in the Arizona desert. To combat the giant spider, a squadron of P-80 Shooting Stars attacks and destroys the beast with napalm. In an unaccredited early role, the leader of the jet squadron is none other than Clint Eastwood. Jet aircraft were used to set the film firmly in the present, as the public still perceived them as the latest thing in aviation.

Right: The movie poster for the 1955 science fiction movie Tarantula! **Via Norm DeWitt**

The uncredited Clint Eastwood leads the P-80 attack on the giant spider. **Via Norm DeWitt**

P-80 formation leader Clint Eastwood dives into the attack. **Via Norm DeWitt**