

Aviation Investigation Factual Report

Location:	Oshkosh, Wisconsin	Accident Number:	CHI07FA243
Date & Time:	July 27, 2007, 15:19 Local	Registration:	N8082U
Aircraft:	Beck P-51A	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Air race/show		

Factual Information

HISTORY OF FLIGHT

On July 27, 2007, about 1519 central daylight time, an amateur-built Beck P-51A Mustang, N8082U, was destroyed when it struck a North American P51-D Mustang, N151RJ, and crashed during landing approach. N151RJ had just landed on runway 36 at the Wittman Regional Airport (OSH), Oshkosh, Wisconsin, when N8082U struck its empennage and fuselage. N8082U was still airborne at the time of the collision, and it rolled over to the right of the aft fuselage of N151RJ and impacted the terrain in a wings level, inverted attitude. The collision pushed N151RJ onto its nose, and N151RJ skidded down the runway and came to rest about 788 feet from the initial impact point. The pilot in N8082U received fatal injuries, and the pilot in N151RJ was not injured. Visual meteorological conditions prevailed at the time of the accident.

Both airplanes had previously departed OSH as part of a five-aircraft air race demonstration event known as the "Reno Racers" at the Experimental Aircraft Association (EAA) AirVenture 2007 air show. The demonstration air race was completed and the five aircraft were in the process of landing separately (not in formation) on runway 36. The five aircraft performing in the Reno Racers air race demonstration event were: 1) N805MB, Grumman F7F-3, call sign "Tigercat" 2) N62143, Hawker TKM 20, call sign "Sea Fury" 3) N5588N, Goodyear F2G, call sign "Super Corsair" 4) N8082U, Beck P-51A, call sign "Precious Metal" and 5) N151RJ, North American P-51D, call sign "Stang."

Video and still photographs provided to the National Transportation Safety Board (NTSB) by spectators and the EAA, showed Stang and Precious Metal on short final for runway 36. The videos and photographs showed that Precious Metal was in trail and progressively getting closer to Stang. The video showed Stang landing on runway 36 on its main gear and beginning its rollout. Before Stang's tailwheel dropped to the runway, Precious Metal's propeller hit Stang's left horizontal stabilizer. Precious Metal started to pitch up, and its right landing gear lodged under Stang's left horizontal stabilizer next to the rudder and lifted Stang's tail up. As Precious Metal rolled right, over Stang's empennage, Precious Metal's propeller impacted the top of Stang's fuselage about 2 feet behind the canopy. Precious Metal continued to roll right and it impacted the terrain in a wings level, inverted attitude. Stang skidded down the runway on its nose and came to rest about 300 feet from Precious Metal.

PERSONNEL INFORMATION

The pilot of Precious Metal was a 58-year-old commercial pilot with single-engine land and sea and multi-engine land ratings. He held a second-class medical certificate that was issued in October 2006. He reported more that 10,000 hours of total flight time at the time of his last medical certificate. His total time in the P-51A was about 128 hours.

The pilot of Precious Metal had not flown as part of the Reno Racers air race demonstration event until the EAA AirVenture 2007 air show. He flew on Wednesday and Thursday of the air show. His third flight with the Reno Racers was the accident flight on Friday.

The pilot of Stang was a 24-year-old commercial pilot with single- and multi-engine land and instrument ratings. He held a second-class medical certificate issued in September 2006. He reported a total of 1,270 flight hours with 100 hours in a P-51D.

The pilot of Stang had not flown as part of the Reno Racers air race demonstration event until the EAA AirVenture 2007 air show. His first flight with the Reno Racers was the accident flight on Friday.

The Reno Racer pilots of the Super Corsair, Sea Fury, and Tigercat were experienced air race pilots who had flown at air race events such as the Reno Air Races in Reno, Nevada, and at the EAA AirVenture air shows. The pilot who organized the Reno Racers in 2000 had 20 plus years of air race and air show experience. During the EAA AirVenture 2007 air show, he flew with the Reno Racers in Stang on Wednesday and Thursday. On Friday he flew as the copilot of the DC-3 used for the parachute jump team. He, along with the pilot of the Super Corsair, recommended that the pilot of Stang fly in the Reno Racers event on Friday.

AIRCRAFT INFORMATION

Precious Metal, N8082U, was an experimental, amateur-built Beck P-51A Mustang, serial number 311. The airplane's Special Airworthiness Certificate was issued on June 4, 2006. The engine was an Allison V-1710-81, serial number 7368. The last conditional inspection was conducted on April 18, 2007. At the time of the inspection, the aircraft had a total time of 86.1 hours. The Hobbs meter indicated 127.5 hours at the time of the accident.

The pilot/builder made the following statement about the aircraft on the FAA Form 8000-38 when he applied for the Special Airworthiness Certificate:

"This project represents a built from scratch exact full scale replica of the North American P-51A Mustang. It is a 'Plans Built' aircraft built from the original production drawings acquired from the National Archives. The only exception would be the landing gear and a handful of original small components."

Stang, N151RJ, was a North American P-51D Mustang, serial number 44-74404, manufactured in 1945. The engine was a 1,490 horsepower Packard built Rolls Royce V-1650-7, serial number 43-49502, manufactured in 1943. A Special Airworthiness Certificate was issued for the airplane in May 1995. The last annual inspection was conducted on June 10, 2007. The airplane had flown 20 hours since the annual inspection and had a total time of 628 hours since the Special Airworthiness Certificate was issued.

The pilot of the Tigercat had flown a single-engine Sea Fury in the previous years demonstration races. The EAA AirVenture 2007 air show was the first year that the twin-engine Grumman F7F-3 Tigercat was used in the Reno Racers event.

METEOROLOGICAL INFORMATION

At 1532, the surface weather observation at OSH was: Wind 040 degrees at 9 knots, visibility 5 miles, clouds few at 2,600 feet, overcast 4,600 feet, temperature 25 degrees Celsius (C), dew point 20 degrees C, altimeter 29.88 inches of Mercury.

AIRPORT INFORMATION

The Federal Aviation Administration (FAA) issued a Notice to Airmen (NOTAM) to provide special flight procedures in effect during the EAA AirVenture 2007 air show. The NOTAM stated that the air show demonstration area was from the surface to 12,000 feet mean sea level within a five nautical mile radius of OSH, and was in effect during the aerobatic demonstration and air show times. All uninvolved aircraft were required to remain clear of the air show demonstration area during the aerobatic demonstration times.

The FAA issued a waiver for the affected airspace while the air show demonstration area was in effect during the Showcase, Aerobatic, and Warbird portions of the air show. The air traffic control tower at OSH did not provide services to the participating aircraft when the waiver was in effect. During those times, the control of the aircraft and radio communications were transferred to the Air Boss. The Air Boss was the individual who had the primary responsibility for air show operations on the active taxiways, runways, and the surrounding air show demonstration areas. The Air Boss was not responsible for providing aircraft separation. The Showcase, Aerobatic, and Warbird portions of the air show each had its own Air Boss.

The airport's primary runways are runway 9/27 (6,178 feet by 150 feet, asphalt) and runway 18/36 (8,002 feet by 150 feet). During the air show, all air show events are oriented around runway 18/36 because the crowd control line runs parallel to the runway, 500 feet east of the runway. All 4 runways could be utilized for takeoffs and landings during the air show, depending on the winds.

COMMUNICATIONS

During the Showcase portion of the air show, the Showcase Air Boss was located at "Rooftop," a raised platform near the air show center on the west side of runway 18/36, and about 5,000 feet north of the approach end of runway 36. He and the assistant Air Boss, along with the Warbird Air Boss and two FAA representatives, were located at Rooftop to conduct or monitor the air show operations. The Showcase Air Boss controlled the primary radio frequency used to communicate to the participants in the air show. Because the airspace had been "waivered" by the FAA, takeoff and landing clearances were not required. However, the Showcase Air

Boss typically cleared a single-ship aircraft or a group of aircraft to land on runway 18/36, even though it was not required.

The Showcase Air Boss and the assistant Air Boss had radios, which they used to receive and transmit over the primary radio frequency. The assistant Air Boss monitored the radio and only occasionally transmitted instructions over the frequency. The Warbird Air Boss had a radio that he used to monitor the primary frequency, but often switched to a different frequency to communicate with warbird aircraft. After the accident occurred, the Warbird Air Boss provided landing instructions to the airborne aircraft to land on runway 9. The FAA representative had a radio that provided him a radio link to the control tower, but he did not monitor the primary radio frequency. The other FAA representative at Rooftop observed the air show operations to ensure the performers were complying with the waiver, but he did not have a radio.

The Reno Racers air race demonstration event was a pre-briefed event. Once airborne, the Reno Racers were expected to perform the air race demonstration event according to their internal briefing. Once the event was completed, the pilots were expected to land their airplanes according to their internal briefing, and no communication, including a landing clearance, was required from the Showcase Air Boss. However, the Showcase Air Boss typically provided a landing clearance for the group of Reno Racers airplanes; he did not provide a landing clearance to each airplane in the group. Likewise, the pilots were neither required nor expected to make the radio calls a pilot would typically make in non-waivered airspace. Therefore, the radio calls typically made by pilots when turning from downwind to base, base to final, or on short final were not required. Instead, the Reno Racers maintained visual contact with the other aircraft in the flight, and provided their own separation during the landing sequence after the air race was completed.

A four-airplane aerobatic team had taxied to the Tower Road taxiway and was waiting for takeoff once the Reno Racers landed. One of the airplanes was equipped with a digital video camera that recorded about 9 minutes of video, and it recorded radio transmissions made over the primary Showcase radio frequency. It captured video of 2-second segments of the Reno Racers as they flew north over runway 36 prior to making the right turn to downwind. The transcript of the radio transmissions indicated that the Reno Racers were in their second lap when the video recorder started to record the radio transmissions of the Reno Racers, the Air Boss, and other air show performers.

The transcript of the radio transmissions indicated that at the video recorder time stamp of 00:28 (minutes/seconds), the Air Boss stated, "That's two," indicating two laps of the race had passed. At 01:27, the Air Boss stated, "That's three." At 02:28, the Air Boss stated, "Okay racers, white flag, white flag."

The video indicated that after "white flag" was called over the radio, the Tigercat came into view at 02:31, Sea Fury came into view at 02:34, Precious Metal came into view at 02:42, Stang came into view at 02:47, and the Super Corsair came into view at 02:49. After the racers

completed the fifth lap, the Tigercat came into view at 03:35, Sea Fury came into view at 03:38, Precious Metal came into view at 03:47, and Stang and the Super Corsair came into view at 03:51.

At 03:54, the Air Boss stated, "Yeah, Mike (Sea Fury), are you leaving or are you landing?" Sea Fury responded, "We're just landing."

At 04:12, the Air Boss stated, "Okay guys, wind zero three zero at twelve, cleared to land runway three six left."

At 04:19, Sea Fury stated, "Okay, Race Ninety-nine (Sea Fury) is, uh, we're on base and we'll be landing number one, 36."

At 04:25, the Air Boss stated, "Ah, roger."

At 04:27, Tigercat stated, "And the Tigercat is gonna be making an initial three six, come back in behind ya."

At 04:32 Sea Fury stated, "Oh, nevermind. Go ahead, Mikey (Tigercat). I didn't see you down there."

At 04:36, Tigercat stated, "That's okay. I'm too fast, uh, too fast. I have to go back around."

At 04:40, Super Corsair stated, "Let Casey (Stang) land first."

At 04:53, Sea Fury stated, "Okay, Race Ninety-nine (Sea Fury), we're number one for three six. Three down and locked. Landing."

At 05:00, the Air Boss stated, "Race Ninety-nine, cleared to land runway three six."

At 05:07, the videotape showed that the Tigercat came into view.

At 05:22, Precious Metal stated, "Precious Metal, one mile final."

At 05:47, the videotape showed Sea Fury on the runway and rolling out on runway 36.

At 05:53, Sea Fury stated, "Ninety-nine's (Sea Fury) cold side."

At 06:04, the Air Boss stated, "Okay, racers, I need you to come back, uh, and just park where you left from and they'll come and get ya."

At 06:13, the Air Boss stated, "[sound similar to a "stepped on" transmission] and, ah, and race planes, I need you to expedite taxiing as much as you can, uh, and get shut down for the jumpers."

At 06:19, an unknown source stated, "oh ***" (expletive)

At 06:22, a pilot in the DC-3 that was holding overhead with the parachute jumpers onboard, stated, "And Air Boss, where's the last."

At 06:24, the Air Boss stated, "[sound similar to a stepped on transmission] Okay, race."

At 06:26, the Air Boss stated, "Okay, other, uh, race planes, I want you to go over and call Air Boss runway nine."

At 06:30, the Air Boss stated, "All other aircraft, you'll be landing nine two seven."

WRECKAGE AND IMPACT INFORMATION

The initial impact occurred near the intersection of runway 36 and taxiway A5. Eighteen propeller strike marks from Stang were found on the right side of the runway about 270 feet from the initial impact point and they traveled for about 100 feet. Propeller skid marks then veered to the right to where Stang skidded off the runway.

The inspection of Stang revealed that 12 inches of the lower section of the rudder was missing. The left horizontal stabilizer was destroyed and it exhibited propeller strike damage in the remaining structure near the empennage at 5.5-inch intervals. The top of the vertical stabilizer was crushed downward with about a 5-inch bend to the right. A hole about 11 inches wide and 3 feet long was located about 2 to 3 feet aft of the cockpit canopy. The airplane's propeller exhibited ground strike damage.

The wreckage of Precious Metal came to rest about 300 feet south of Stang. The propeller and engine were found separated from the fuselage. The propeller blades exhibited leading edge strike damage. One blade was found in a feathered position and the other blades were found in negative pitch positions. The inspection of the engine controls and flight control system did not reveal any evidence of pre-impact failure or malfunction.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy of the pilot of Precious Metal was conducted at the Fond du Lac County Medical Examiner's Office, Fond du Lac, Wisconsin, on July 27, 2007. A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute. The results were negative for all substances tested.

The pilot of Stang voluntarily provided a blood sample to the Oshkosh Police Department for toxicological testing. The results were negative for all substances tested.

SURVIVAL ASPECTS

The digital video recording of the accident that EAA provided to the NTSB showed Precious Metal impacting the terrain at the time of 0.49 seconds recorded on the video. A crash fire rescue vehicle arrived at the scene about 02:25 (mm/ss). At 02:40 (mm/ss), the video showed a "civilian" who was not wearing fire protective clothing applying a fire-retarding agent from a fire bottle at the base of a small fire near the nose of the airplane. The crash fire response personnel who were dressed in their protective gear started applying a fire-retarding agent from the truck at the video recording time of about 03:18, about 2 minutes and 29 seconds after the impact.

TESTS AND RESEARCH

On August 15, 2007, the NTSB investigator-in-charge (IIC) and an accident reconstruction specialist from the Winnebago County Sheriff's Department conducted a visibility study of the P-51A. A representative North American P-51A (XP-51) aircraft, located at the EAA Museum in Oshkosh, Wisconsin, was used for the visibility study. Using a representative pilot positioned within the cockpit of the exemplary P-51A, measurements were gathered documenting areas of zero forward visibility. These measurements were recorded on a field sketch diagram. A description sheet was used to complete scaled, 2-dimensional (2-D) images of the P-51A. Using the completed, scaled 2-D diagrams (both top and side view), a 3-dimensional (3-D) image of the P-51A was created. Measured lines of sight were added to the 3D image of the P-51A. Objects positioned within the arc would not be visible to the pilot. A simulation of the collision of the P-51A and the P-51D was constructed using approximated altitudes and aircraft pitch attitudes. Aircraft positions were determined through estimations based upon viewing photographs and crash video. It was estimated that the P-51D was 88 feet behind the P-51D and 8 feet higher in altitude when the wingtips of the P-51D became potentially visible to the pilot of the P-51A.

ADDITIONAL INFORMATION

Sequence of Events

The daily EAA Showcase brief was conducted at the Charlie Hilliard Operations building located near air show center at 1100. The Showcase Air Boss conducted the pre-show briefing for all Showcase air show performers, and key EAA operations, and support personnel. During the Showcase brief, the Air Boss briefed the standard items included in the pre-show briefing guide that included a review of the day's flying schedule, act-by-act, which included the Reno Racers. The pilot of the Super Corsair of the Reno Racers attended the Showcase brief as the team representative. The representative reported that he informed the Air Boss that it was the first time that the pilot of Stang would be flying in the air race demonstration event.

The Reno Racers team representative reported that after the Showcase brief, he briefed extensively with the pilots of Precious Metal and Stang at the Reno Air Race Association tent. The team representative reported that he briefed the pilots about how to avoid flying through

the "bad air" created by the Tigercat because he considered the wingtip vortices created by the Tigercat as a serious risk to the smaller P-51's.

The team representative reported that he briefed all five pilots about the landing sequence when the team met at the airplanes before takeoff. Typically, the air racers landed in the order that they finished the race. After the checkered flag, the racers were expected to get their interval from the airplane ahead of them and sequence their own landings. For this particular day's event, the team representative reported that he briefed that Stang should land first, since it was the pilot's first time flying as part of the air race team, and in order to keep Stang out of the turbulent air created by the Tigercat on landing. The pilots of the Tigercat and Sea Fury stated that they did not recall being briefed that Stang should be the first airplane to land. Also, the pilot of Stang reported that he understood that Precious Metal would be departing the pattern after the air race, and would not be landing at OSH. The team representative reported that the pilot of Precious Metal actually intended to land, take on a passenger, and then depart OSH for another nearby airport.

Before the start of the race, the Reno Racers departed OSH and flew to the southeast where they joined up with the pace airplane, a T-6 Texan, and entered a holding pattern until the Showcase Air Boss instructed them to turn inbound. Once notified, the pace airplane led the Reno Racers back to OSH for the start of the race. The T-6 was on the far left flying over the crowd control line with Stang, Precious Metal, Super Corsair, Sea Fury, and Tigercat in a right formation, respectively. After the racers were given the green flag to start the race, the Tigercat went into the lead and the other racers took their interval and separation into the first turn. The Tigercat increased its lead and remained in the lead for the entire 5-lap demonstration race. The Super Corsair initially gave chase but then dropped back. The Sea Fury kept pace with the Tigercat but never took the lead. By the time the 4th and 5th lap occurred, the Tigercat had opened about a 12 - 15-second lead over the Super Corsair and the P-51's, which created a notable gap in the race.

After the fifth lap, the demonstration air race was over and the pilots prepared to land on runway 36. The Tigercat was in the lead and was the first to be in a position to land, but it did another lap in front of the crowd line. The Sea Fury finished second and while on downwind the Air Boss questioned the Sea Fury if it was going to land or depart the pattern to the south, as it had done on Wednesday. The Sea Fury reported that it was going to land on runway 36. Once on the base leg, Sea Fury stated it was on base and going to land.

At time stamp 04:40, about the time that the Sea Fury was on base leg turning to final, Super Corsair stated, "Let Casey (Stang) land first." There was no acknowledgment of the radio transmission from the other aircraft.

Precious Metal finished the race third with Stang finishing fourth and the Super Corsair finishing fifth. When the Sea Fury was about to land, Precious Metal was near the abeam position, Stang was near the mid-field position on the downwind leg, and the Super Corsair was behind Stang on the downwind leg.

The pilot of Stang reported that Precious Metal was about 1,000 feet above ground level (agl) on a southwesterly heading with its gear and flaps retracted when Stang was about two miles past the abeam position at 700 to 800 feet agl. He thought that Precious Metal was departing the pattern and was not landing at OSH, so he turned toward the runway. The pilot of Stang did not do a standard 180-degree turn to final. Instead, he made a sharper, angled turn onto final because he was 2 miles past the approach end of the runway. The pilot of Stang reported that he did not make a radio call to indicate that he had turned base leg or when he turned onto final approach because the Showcase Air Boss had cleared the entire flight to land. Photographs showed that Stang's canopy was open during the final approach to landing. The Stang pilot reported that he did not hear Precious Metal make the radio call at time stamp 05:22 that stated, "Precious Metal, one mile final." He was on about a 1/2 mile final when he heard Sea Fury call at time stamp 05:53, "Ninety-nine's cold side."

The Super Corsair pilot reported that he saw Precious Metal turn final and it appeared to him that there was adequate separation between Precious Metal and Stang. When he was on a long base to final turn, he was unable to determine the separation between Precious Metal and Stang. After the collision occurred, the Tigercat and Super Corsair were directed to land on runway 27.

The Showcase Air Boss reported that he did not observe the collision of Stang and Precious Metal. He reported that just before the collision, he was looking at Sea Fury and the taxiways near the air show center to check if there were any conflicting taxi traffic so that he could get the Reno Racers back to their parking spaces on the west ramp. He reported that he turned and looked to the south just about the time that Precious Metal impacted the terrain. The radio transcript indicated that he was providing instructions to the Reno Racers about returning to their parking spaces when the collision occurred.

The assistant Air Boss for the Showcase event reported that he was not looking at the airplanes on final approach when the collision occurred. The Warbird Air Boss was also on Rooftop at the time of the accident, but he reported that he was looking to the north when the accident occurred. The FAA representative who had a radio link to the control tower reported that he did not observe the airplanes when they were on final approach. The other FAA representative located on Rooftop, who had no radio, reported that he observed the two airplanes on final approach, but because of the perspective from Rooftop, it was difficult to determine the separation between the airplanes.

FAA and EAA Oversight

The FAA Flight Standards District Office (FSDO) inspectors observed and monitored the preshow briefs conducted by the Showcase Air Boss, the Aerobatic Air Boss, and the Warbirds Air Boss. The FSDO inspectors ensured that the Waiver/Authorization was briefed, and that the pre-show briefing guide was used as a standardization tool and all items were covered in sufficient detail. The FAA FSDO inspectors did not observe or monitor the briefs of individual acts (including the Reno Racer's brief) because it was not a FAA requirement and because of limited resources.

The air bosses for the EAA conducted the pre-show briefs, but no one within the EAA observed or monitored the briefs of individual acts. The team leaders or representatives from the individual acts were responsible for relaying the information covered in the pre-show briefs to the individual pilots within their groups. The actual maneuvers performed by the individual acts, or the order of the aircraft during takeoff and landing, were briefed internally within the act. It was not required that the Air Boss be briefed on the specific maneuvers or the takeoff and landing sequence of the aircraft within the group.

The EAA Director of Aircraft Operations for the EAA AirVenture 2007 air show reported that he and the President of the EAA carefully selected the pilots who performed at Oshkosh. If they did not know the pilots personally, they relied upon the recommendations of a cadre of well-respected, experienced air show pilots and air show professionals, and the recommendations of the International Council of Air Shows. In the case of the Reno Racers, they relied upon the judgment of the pilot who organized the Reno Racers in 2000, and upon the judgment of the pilot of the Super Corsair, since both were highly regarded race pilots with over 20 years of experience each. The Director of Aircraft Operations reported that he relied on their judgment concerning the selection of the pilots flying in the Reno Racers team. He accepted their recommendation that the pilot of Stang and the pilot of Precious Metal were ready to fly in the Reno Racer's event.

The EAA Aviation Safety Officer for the EAA AirVenture 2007 air show reported that he worked closely with the Director of Aircraft Operations and provided him technical assistance concerning the FAA waiver provisions, rules, and guidelines. He also attended all the Showcase, Aerobatic, and Warbird general briefings to ensure the quality and completeness of the briefs, but he did not attend the specialized briefs of individual acts. He described his role as "another set of eyes and ears" for the Director of Aircraft Operations. His role did not include deciding which air show acts or pilots would be chosen to perform at Oshkosh. In regards to the Reno Racers, he knew the pilot who organized the Reno Racers and the Super Corsair pilot, whom he described as very professional pilots, but did not know the other pilots on the team as well. He did not know the pilots of Sea Fury or Stang. He was not aware that it was the pilot of Stang's first time flying with the Reno Racers at Oshkosh. He reported that the Director of Aircraft Operations would have made him aware of it if he had felt it was an issue.

Federal Aviation Regulations (FAR) 91.113 Right-of-Way Rules

The FAR 91.113 Right-of-Way rules state the following:

(b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over,

under, or ahead of it unless well clear.

(g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

Pilot Information

Certificate:	Commercial	Age:	58,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Front
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	October 1, 2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	May 1, 2007
Flight Time:	10000 hours (Total, all aircraft), 128	hours (Total, this make and model)	

Aircraft and Owner/Operator Information

Aircraft Make:	Beck	Registration:	N8082U
Model/Series:	P-51A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	Yes
Airworthiness Certificate:	Experimental (Special)	Serial Number:	311
Landing Gear Type:	Retractable - Tailwheel	Seats:	2
Date/Type of Last Inspection:	April 1, 2007 Condition	Certified Max Gross Wt.:	7870 lbs
Time Since Last Inspection:	41 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	128 Hrs at time of accident	Engine Manufacturer:	Allison
ELT:	Installed, not activated	Engine Model/Series:	V1710-81
Registered Owner:	On file	Rated Power:	1125 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	OSH,808 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	15:32 Local	Direction from Accident Site:	0°
Lowest Cloud Condition:	Few / 2800 ft AGL	Visibility	5 miles
Lowest Ceiling:	Overcast / 4600 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	9 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	40°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.87 inches Hg	Temperature/Dew Point:	25°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipita	tion	
Departure Point:	Oshkosh, WI (OSH)	Type of Flight Plan Filed:	None
Destination:	(OSH)	Type of Clearance:	VFR
Departure Time:		Type of Airspace:	

Airport Information

Airport:	Wittman Regional OSH	Runway Surface Type:	Concrete
Airport Elevation:	808 ft msl	Runway Surface Condition:	Dry
Runway Used:	36L	IFR Approach:	None
Runway Length/Width:	8002 ft / 150 ft	VFR Approach/Landing:	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	43.967498,-88.556663

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Mike Monroe; FAA - Milwaukee FSDO; Milwaukee, WI Karen Kryzaniak; EAA; Oshkosh, WI Robert Odegaard; Odegaard Aviation Inc.; Kindred, ND
Report Date:	June 13, 2008
Last Revision Date:	
Investigation Class:	<u>Class</u>
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=66327

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.



Aviation Investigation Factual Report

Location:	Oshkosh, Wisconsin	Accident Number:	CHI07FA243
Date & Time:	July 27, 2007, 15:19 Local	Registration:	N151RJ
Aircraft:	North American P-51D	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Air race/show		

Factual Information

HISTORY OF FLIGHT

On July 27, 2007, about 1519 central daylight time, a North American P51-D Mustang, N151RJ, sustained substantial damage during landing when it was struck by an amateur-built Beck P-51A Mustang, N8082U. N151RJ had just landed on runway 36 at the Wittman Regional Airport (OSH), Oshkosh, Wisconsin, when N8082U struck its empennage and fuselage. The collision with N8082U pushed N151RJ onto its nose, and N151RJ skidded down the runway and came to rest about 788 feet from the initial impact point. N8082U was still airborne at the time of the collision, and it rolled over to the right of the aft fuselage of N151RJ and impacted the terrain in a wings level, inverted attitude. The pilot in N151RJ was not injured, and the pilot in N8082U received fatal injuries. Visual meteorological conditions prevailed at the time of the accident.

Both airplanes had previously departed OSH as part of a five-aircraft air race demonstration event known as the "Reno Racers" at the Experimental Aircraft Association (EAA) AirVenture 2007 air show. The demonstration air race was completed and the five aircraft were in the process of landing separately (not in formation) on runway 36. The five aircraft performing in the Reno Racers air race demonstration event were: 1) N805MB, Grumman F7F-3, call sign "Tigercat" 2) N62143, Hawker TKM 20, call sign "Sea Fury" 3) N5588N, Goodyear F2G, call sign "Super Corsair" 4) N8082U, Beck P-51A, call sign "Precious Metal" and 5) N151RJ, North American P-51D, call sign "Stang."

Video and still photographs provided to the National Transportation Safety Board (NTSB) by spectators and the EAA, showed Stang and Precious Metal on short final for runway 36. The videos and photographs showed that Precious Metal was in trail and progressively getting closer to Stang. The video showed Stang landing on runway 36 on its main gear and beginning its rollout. Before Stang's tailwheel dropped to the runway, Precious Metal's propeller hit Stang's left horizontal stabilizer. Precious Metal started to pitch up, and its right landing gear lodged under Stang's left horizontal stabilizer next to the rudder and lifted Stang's tail up. As Precious Metal rolled right, over Stang's empennage, Precious Metal's propeller impacted the top of Stang's fuselage about 2 feet behind the canopy. Precious Metal continued to roll right and it impacted the terrain in a wings level, inverted attitude. Stang skidded down the runway on its nose and came to rest about 300 feet from Precious Metal.

PERSONNEL INFORMATION

The pilot of Precious Metal was a 58-year-old commercial pilot with single-engine land and sea and multi-engine land ratings. He held a second-class medical certificate that was issued in October 2006. He reported more that 10,000 hours of total flight time at the time of his last medical certificate. His total time in the P-51A was about 128 hours.

The pilot of Precious Metal had not flown as part of the Reno Racers air race demonstration event until the EAA AirVenture 2007 air show. He flew on Wednesday and Thursday of the air show. His third flight with the Reno Racers was the accident flight on Friday.

The pilot of Stang was a 24-year-old commercial pilot with single- and multi-engine land and instrument ratings. He held a second-class medical certificate issued in September 2006. He reported a total of 1,270 flight hours with 100 hours in a P-51D.

The pilot of Stang had not flown as part of the Reno Racers air race demonstration event until the EAA AirVenture 2007 air show. His first flight with the Reno Racers was the accident flight on Friday.

The Reno Racer pilots of the Super Corsair, Sea Fury, and Tigercat were experienced air race pilots who had flown at air race events such as the Reno Air Races in Reno, Nevada, and at the EAA AirVenture air shows. The pilot who organized the Reno Racers in 2000 had 20 plus years of air race and air show experience. During the EAA AirVenture 2007 air show, he flew with the Reno Racers in Stang on Wednesday and Thursday. On Friday he flew as the copilot of the DC-3 used for the parachute jump team. He, along with the pilot of the Super Corsair, recommended that the pilot of Stang fly in the Reno Racers event on Friday.

AIRCRAFT INFORMATION

Precious Metal, N8082U, was an experimental, amateur-built Beck P-51A Mustang, serial number 311. The airplane's Special Airworthiness Certificate was issued on June 4, 2006. The engine was an Allison V-1710-81, serial number 7368. The last conditional inspection was conducted on April 18, 2007. At the time of the inspection, the aircraft had a total time of 86.1 hours. The Hobbs meter indicated 127.5 hours at the time of the accident.

The pilot/builder made the following statement about the aircraft on the FAA Form 8000-38 when he applied for the Special Airworthiness Certificate:

"This project represents a built from scratch exact full scale replica of the North American P-51A Mustang. It is a 'Plans Built' aircraft built from the original production drawings acquired from the National Archives. The only exception would be the landing gear and a handful of original small components."

Stang, N151RJ, was a North American P-51D Mustang, serial number 44-74404, manufactured in 1945. The engine was a 1,490 horsepower Packard built Rolls Royce V-1650-7, serial number 43-49502, manufactured in 1943. A Special Airworthiness Certificate was issued for the airplane in May 1995. The last annual inspection was conducted on June 10, 2007. The airplane had flown 20 hours since the annual inspection and had a total time of 628 hours since the Special Airworthiness Certificate was issued.

The pilot of the Tigercat had flown a single-engine Sea Fury in the previous years demonstration races. The EAA AirVenture 2007 air show was the first year that the twin-engine Grumman F7F-3 Tigercat was used in the Reno Racers event.

METEOROLOGICAL INFORMATION

At 1532, the surface weather observation at OSH was: Wind 040 degrees at 9 knots, visibility 5 miles, clouds few at 2,600 feet, overcast 4,600 feet, temperature 25 degrees Celsius (C), dew point 20 degrees C, altimeter 29.88 inches of Mercury.

AIRPORT INFORMATION

The Federal Aviation Administration (FAA) issued a Notice to Airmen (NOTAM) to provide special flight procedures in effect during the EAA AirVenture 2007 air show. The NOTAM stated that the air show demonstration area was from the surface to 12,000 feet mean sea level within a five nautical mile radius of OSH, and was in effect during the aerobatic demonstration and air show times. All uninvolved aircraft were required to remain clear of the air show demonstration area during the aerobatic demonstration times.

The FAA issued a waiver for the affected airspace while the air show demonstration area was in effect during the Showcase, Aerobatic, and Warbird portions of the air show. The air traffic control tower at OSH did not provide services to the participating aircraft when the waiver was in effect. During those times, the control of the aircraft and radio communications were transferred to the Air Boss. The Air Boss was the individual who had the primary responsibility for air show operations on the active taxiways, runways, and the surrounding air show demonstration areas. The Air Boss was not responsible for providing aircraft separation. The Showcase, Aerobatic, and Warbird portions of the air show each had its own Air Boss.

The airport's primary runways are runway 9/27 (6,178 feet by 150 feet, asphalt) and runway 18/36 (8,002 feet by 150 feet). During the air show, all air show events are oriented around runway 18/36 because the crowd control line runs parallel to the runway, 500 feet east of the runway. All 4 runways could be utilized for takeoffs and landings during the air show, depending on the winds.

COMMUNICATIONS

During the Showcase portion of the air show, the Showcase Air Boss was located at "Rooftop," a raised platform near the air show center on the west side of runway 18/36, and about 5,000 feet north of the approach end of runway 36. He and the assistant Air Boss, along with the Warbird Air Boss and two FAA representatives, were located at Rooftop to conduct or monitor the air show operations. The Showcase Air Boss controlled the primary radio frequency used to communicate to the participants in the air show. Because the airspace had been "waivered" by the FAA, takeoff and landing clearances were not required. However, the Showcase Air

Boss typically cleared a single-ship aircraft or a group of aircraft to land on runway 18/36, even though it was not required.

The Showcase Air Boss and the assistant Air Boss had radios, which they used to receive and transmit over the primary radio frequency. The assistant Air Boss monitored the radio and only occasionally transmitted instructions over the frequency. The Warbird Air Boss had a radio that he used to monitor the primary frequency, but often switched to a different frequency to communicate with warbird aircraft. After the accident occurred, the Warbird Air Boss provided landing instructions to the airborne aircraft to land on runway 9. The FAA representative had a radio that provided him a radio link to the control tower, but he did not monitor the primary radio frequency. The other FAA representative at Rooftop observed the air show operations to ensure the performers were complying with the waiver, but he did not have a radio.

The Reno Racers air race demonstration event was a pre-briefed event. Once airborne, the Reno Racers were expected to perform the air race demonstration event according to their internal briefing. Once the event was completed, the pilots were expected to land their airplanes according to their internal briefing, and no communication, including a landing clearance, was required from the Showcase Air Boss. However, the Showcase Air Boss typically provided a landing clearance for the group of Reno Racers airplanes; he did not provide a landing clearance to each airplane in the group. Likewise, the pilots were neither required nor expected to make the radio calls a pilot would typically make in non-waivered airspace. Therefore, the radio calls typically made by pilots when turning from downwind to base, base to final, or on short final were not required. Instead, the Reno Racers maintained visual contact with the other aircraft in the flight, and provided their own separation during the landing sequence after the air race was completed.

A four-airplane aerobatic team had taxied to the Tower Road taxiway and was waiting for takeoff once the Reno Racers landed. One of the airplanes was equipped with a digital video camera that recorded about 9 minutes of video, and it recorded radio transmissions made over the primary Showcase radio frequency. It captured video of 2-second segments of the Reno Racers as they flew north over runway 36 prior to making the right turn to downwind. The transcript of the radio transmissions indicated that the Reno Racers were in their second lap when the video recorder started to record the radio transmissions of the Reno Racers, the Air Boss, and other air show performers.

The transcript of the radio transmissions indicated that at the video recorder time stamp of 00:28 (minutes/seconds), the Air Boss stated, "That's two," indicating two laps of the race had passed. At 01:27, the Air Boss stated, "That's three." At 02:28, the Air Boss stated, "Okay racers, white flag, white flag."

The video indicated that after "white flag" was called over the radio, the Tigercat came into view at 02:31, Sea Fury came into view at 02:34, Precious Metal came into view at 02:42, Stang came into view at 02:47, and the Super Corsair came into view at 02:49. After the racers

completed the fifth lap, the Tigercat came into view at 03:35, Sea Fury came into view at 03:38, Precious Metal came into view at 03:47, and Stang and the Super Corsair came into view at 03:51.

At 03:54, the Air Boss stated, "Yeah, Mike (Sea Fury), are you leaving or are you landing?" Sea Fury responded, "We're just landing."

At 04:12, the Air Boss stated, "Okay guys, wind zero three zero at twelve, cleared to land runway three six left."

At 04:19, Sea Fury stated, "Okay, Race Ninety-nine (Sea Fury) is, uh, we're on base and we'll be landing number one, 36."

At 04:25, the Air Boss stated, "Ah, roger."

At 04:27, Tigercat stated, "And the Tigercat is gonna be making an initial three six, come back in behind ya."

At 04:32 Sea Fury stated, "Oh, nevermind. Go ahead, Mikey (Tigercat). I didn't see you down there."

At 04:36, Tigercat stated, "That's okay. I'm too fast, uh, too fast. I have to go back around."

At 04:40, Super Corsair stated, "Let Casey (Stang) land first."

At 04:53, Sea Fury stated, "Okay, Race Ninety-nine (Sea Fury), we're number one for three six. Three down and locked. Landing."

At 05:00, the Air Boss stated, "Race Ninety-nine, cleared to land runway three six."

At 05:07, the videotape showed that the Tigercat came into view.

At 05:22, Precious Metal stated, "Precious Metal, one mile final."

At 05:47, the videotape showed Sea Fury on the runway and rolling out on runway 36.

At 05:53, Sea Fury stated, "Ninety-nine's (Sea Fury) cold side."

At 06:04, the Air Boss stated, "Okay, racers, I need you to come back, uh, and just park where you left from and they'll come and get ya."

At 06:13, the Air Boss stated, "[sound similar to a "stepped on" transmission] and, ah, and race planes, I need you to expedite taxiing as much as you can, uh, and get shut down for the jumpers."

At 06:19, an unknown source stated, "oh ***" (expletive)

At 06:22, a pilot in the DC-3 that was holding overhead with the parachute jumpers onboard, stated, "And Air Boss, where's the last."

At 06:24, the Air Boss stated, "[sound similar to a stepped on transmission] Okay, race."

At 06:26, the Air Boss stated, "Okay, other, uh, race planes, I want you to go over and call Air Boss runway nine."

At 06:30, the Air Boss stated, "All other aircraft, you'll be landing nine two seven."

WRECKAGE AND IMPACT INFORMATION

The initial impact occurred near the intersection of runway 36 and taxiway A5. Eighteen propeller strike marks from Stang were found on the right side of the runway about 270 feet from the initial impact point and they traveled for about 100 feet. Propeller skid marks then veered to the right to where Stang skidded off the runway.

The inspection of Stang revealed that 12 inches of the lower section of the rudder was missing. The left horizontal stabilizer was destroyed and it exhibited propeller strike damage in the remaining structure near the empennage at 5.5-inch intervals. The top of the vertical stabilizer was crushed downward with about a 5-inch bend to the right. A hole about 11 inches wide and 3 feet long was located about 2 to 3 feet aft of the cockpit canopy. The airplane's propeller exhibited ground strike damage.

The wreckage of Precious Metal came to rest about 300 feet south of Stang. The propeller and engine were found separated from the fuselage. The propeller blades exhibited leading edge strike damage. One blade was found in a feathered position and the other blades were found in negative pitch positions. The inspection of the engine controls and flight control system did not reveal any evidence of pre-impact failure or malfunction.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy of the pilot of Precious Metal was conducted at the Fond du Lac County Medical Examiner's Office, Fond du Lac, Wisconsin, on July 27, 2007. A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute. The results were negative for all substances tested.

The pilot of Stang voluntarily provided a blood sample to the Oshkosh Police Department for toxicological testing. The results were negative for all substances tested.

SURVIVAL ASPECTS

The digital video recording of the accident that EAA provided to the NTSB showed Precious Metal impacting the terrain at the time of 0.49 seconds recorded on the video. A crash fire rescue vehicle arrived at the scene about 02:25 (mm/ss). At 02:40 (mm/ss), the video showed a "civilian" who was not wearing fire protective clothing applying a fire-retarding agent from a fire bottle at the base of a small fire near the nose of the airplane. The crash fire response personnel who were dressed in their protective gear started applying a fire-retarding agent from the truck at the video recording time of about 03:18, about 2 minutes and 29 seconds after the impact.

TESTS AND RESEARCH

On August 15, 2007, the NTSB investigator-in-charge (IIC) and an accident reconstruction specialist from the Winnebago County Sheriff's Department conducted a visibility study of the P-51A. A representative North American P-51A (XP-51) aircraft, located at the EAA Museum in Oshkosh, Wisconsin, was used for the visibility study. Using a representative pilot positioned within the cockpit of the exemplary P-51A, measurements were gathered documenting areas of zero forward visibility. These measurements were recorded on a field sketch diagram. A description sheet was used to complete scaled, 2-dimensional (2-D) images of the P-51A. Using the completed, scaled 2-D diagrams (both top and side view), a 3-dimensional (3-D) image of the P-51A was created. Measured lines of sight were added to the 3D image of the P-51A. Objects positioned within the arc would not be visible to the pilot. A simulation of the collision of the P-51A and the P-51D was constructed using approximated altitudes and aircraft pitch attitudes. Aircraft positions were determined through estimations based upon viewing photographs and crash video. It was estimated that the P-51D was 88 feet behind the P-51D and 8 feet higher in altitude when the wingtips of the P-51D became potentially visible to the pilot of the P-51A.

ADDITIONAL INFORMATION

Sequence of Events

The daily EAA Showcase brief was conducted at the Charlie Hilliard Operations building located near air show center at 1100. The Showcase Air Boss conducted the pre-show briefing for all Showcase air show performers, and key EAA operations, and support personnel. During the Showcase brief, the Air Boss briefed the standard items included in the pre-show briefing guide that included a review of the day's flying schedule, act-by-act, which included the Reno Racers. The pilot of the Super Corsair of the Reno Racers attended the Showcase brief as the team representative. The representative reported that he informed the Air Boss that it was the first time that the pilot of Stang would be flying in the air race demonstration event.

The Reno Racers team representative reported that after the Showcase brief, he briefed extensively with the pilots of Precious Metal and Stang at the Reno Air Race Association tent. The team representative reported that he briefed the pilots about how to avoid flying through

the "bad air" created by the Tigercat because he considered the wingtip vortices created by the Tigercat as a serious risk to the smaller P-51's.

The team representative reported that he briefed all five pilots about the landing sequence when the team met at the airplanes before takeoff. Typically, the air racers landed in the order that they finished the race. After the checkered flag, the racers were expected to get their interval from the airplane ahead of them and sequence their own landings. For this particular day's event, the team representative reported that he briefed that Stang should land first, since it was the pilot's first time flying as part of the air race team, and in order to keep Stang out of the turbulent air created by the Tigercat on landing. The pilots of the Tigercat and Sea Fury stated that they did not recall being briefed that Stang should be the first airplane to land. Also, the pilot of Stang reported that he understood that Precious Metal would be departing the pattern after the air race, and would not be landing at OSH. The team representative reported that the pilot of Precious Metal actually intended to land, take on a passenger, and then depart OSH for another nearby airport.

Before the start of the race, the Reno Racers departed OSH and flew to the southeast where they joined up with the pace airplane, a T-6 Texan, and entered a holding pattern until the Showcase Air Boss instructed them to turn inbound. Once notified, the pace airplane led the Reno Racers back to OSH for the start of the race. The T-6 was on the far left flying over the crowd control line with Stang, Precious Metal, Super Corsair, Sea Fury, and Tigercat in a right formation, respectively. After the racers were given the green flag to start the race, the Tigercat went into the lead and the other racers took their interval and separation into the first turn. The Tigercat increased its lead and remained in the lead for the entire 5-lap demonstration race. The Super Corsair initially gave chase but then dropped back. The Sea Fury kept pace with the Tigercat but never took the lead. By the time the 4th and 5th lap occurred, the Tigercat had opened about a 12 - 15-second lead over the Super Corsair and the P-51's, which created a notable gap in the race.

After the fifth lap, the demonstration air race was over and the pilots prepared to land on runway 36. The Tigercat was in the lead and was the first to be in a position to land, but it did another lap in front of the crowd line. The Sea Fury finished second and while on downwind the Air Boss questioned the Sea Fury if it was going to land or depart the pattern to the south, as it had done on Wednesday. The Sea Fury reported that it was going to land on runway 36. Once on the base leg, Sea Fury stated it was on base and going to land.

At time stamp 04:40, about the time that the Sea Fury was on base leg turning to final, Super Corsair stated, "Let Casey (Stang) land first." There was no acknowledgment of the radio transmission from the other aircraft.

Precious Metal finished the race third with Stang finishing fourth and the Super Corsair finishing fifth. When the Sea Fury was about to land, Precious Metal was near the abeam position, Stang was near the mid-field position on the downwind leg, and the Super Corsair was behind Stang on the downwind leg.

The pilot of Stang reported that Precious Metal was about 1,000 feet above ground level (agl) on a southwesterly heading with its gear and flaps retracted when Stang was about two miles past the abeam position at 700 to 800 feet agl. He thought that Precious Metal was departing the pattern and was not landing at OSH, so he turned toward the runway. The pilot of Stang did not do a standard 180-degree turn to final. Instead, he made a sharper, angled turn onto final because he was 2 miles past the approach end of the runway. The pilot of Stang reported that he did not make a radio call to indicate that he had turned base leg or when he turned onto final approach because the Showcase Air Boss had cleared the entire flight to land. Photographs showed that Stang's canopy was open during the final approach to landing. The Stang pilot reported that he did not hear Precious Metal make the radio call at time stamp 05:22 that stated, "Precious Metal, one mile final." He was on about a 1/2 mile final when he heard Sea Fury call at time stamp 05:53, "Ninety-nine's cold side."

The Super Corsair pilot reported that he saw Precious Metal turn final and it appeared to him that there was adequate separation between Precious Metal and Stang. When he was on a long base to final turn, he was unable to determine the separation between Precious Metal and Stang. After the collision occurred, the Tigercat and Super Corsair were directed to land on runway 27.

The Showcase Air Boss reported that he did not observe the collision of Stang and Precious Metal. He reported that just before the collision, he was looking at Sea Fury and the taxiways near the air show center to check if there were any conflicting taxi traffic so that he could get the Reno Racers back to their parking spaces on the west ramp. He reported that he turned and looked to the south just about the time that Precious Metal impacted the terrain. The radio transcript indicated that he was providing instructions to the Reno Racers about returning to their parking spaces when the collision occurred.

The assistant Air Boss for the Showcase event reported that he was not looking at the airplanes on final approach when the collision occurred. The Warbird Air Boss was also on Rooftop at the time of the accident, but he reported that he was looking to the north when the accident occurred. The FAA representative who had a radio link to the control tower reported that he did not observe the airplanes when they were on final approach. The other FAA representative located on Rooftop, who had no radio, reported that he observed the two airplanes on final approach, but because of the perspective from Rooftop, it was difficult to determine the separation between the airplanes.

FAA and EAA Oversight

The FAA Flight Standards District Office (FSDO) inspectors observed and monitored the preshow briefs conducted by the Showcase Air Boss, the Aerobatic Air Boss, and the Warbirds Air Boss. The FSDO inspectors ensured that the Waiver/Authorization was briefed, and that the pre-show briefing guide was used as a standardization tool and all items were covered in sufficient detail. The FAA FSDO inspectors did not observe or monitor the briefs of individual acts (including the Reno Racer's brief) because it was not a FAA requirement and because of limited resources.

The air bosses for the EAA conducted the pre-show briefs, but no one within the EAA observed or monitored the briefs of individual acts. The team leaders or representatives from the individual acts were responsible for relaying the information covered in the pre-show briefs to the individual pilots within their groups. The actual maneuvers performed by the individual acts, or the order of the aircraft during takeoff and landing, were briefed internally within the act. It was not required that the Air Boss be briefed on the specific maneuvers or the takeoff and landing sequence of the aircraft within the group.

The EAA Director of Aircraft Operations for the EAA AirVenture 2007 air show reported that he and the President of the EAA carefully selected the pilots who performed at Oshkosh. If they did not know the pilots personally, they relied upon the recommendations of a cadre of well-respected, experienced air show pilots and air show professionals, and the recommendations of the International Council of Air Shows. In the case of the Reno Racers, they relied upon the judgment of the pilot who organized the Reno Racers in 2000, and upon the judgment of the pilot of the Super Corsair, since both were highly regarded race pilots with over 20 years of experience each. The Director of Aircraft Operations reported that he relied on their judgment concerning the selection of the pilots flying in the Reno Racers team. He accepted their recommendation that the pilot of Stang and the pilot of Precious Metal were ready to fly in the Reno Racer's event.

The EAA Aviation Safety Officer for the EAA AirVenture 2007 air show reported that he worked closely with the Director of Aircraft Operations and provided him technical assistance concerning the FAA waiver provisions, rules, and guidelines. He also attended all the Showcase, Aerobatic, and Warbird general briefings to ensure the quality and completeness of the briefs, but he did not attend the specialized briefs of individual acts. He described his role as "another set of eyes and ears" for the Director of Aircraft Operations. His role did not include deciding which air show acts or pilots would be chosen to perform at Oshkosh. In regards to the Reno Racers, he knew the pilot who organized the Reno Racers and the Super Corsair pilot, whom he described as very professional pilots, but did not know the other pilots on the team as well. He did not know the pilots of Sea Fury or Stang. He was not aware that it was the pilot of Stang's first time flying with the Reno Racers at Oshkosh. He reported that the Director of Aircraft Operations would have made him aware of it if he had felt it was an issue.

Federal Aviation Regulations (FAR) 91.113 Right-of-Way Rules

The FAR 91.113 Right-of-Way rules state the following:

(b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over,

under, or ahead of it unless well clear.

(g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

Pilot Information

Certificate:	Commercial	Age:	24,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Front
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	September 1, 2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	April 1, 2007
Flight Time:	1270 hours (Total, all aircraft), 100 hours (Total, this make and model), 1050 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	North American	Registration:	N151RJ
Model/Series:	P-51D	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Limited (Special)	Serial Number:	44-74404
Landing Gear Type:	Retractable - Tailwheel	Seats:	2
Date/Type of Last Inspection:	June 1, 2007 Annual	Certified Max Gross Wt.:	10500 lbs
Time Since Last Inspection:	20 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	628 Hrs at time of accident	Engine Manufacturer:	Packard
ELT:	Installed, not activated	Engine Model/Series:	V-1650-7
Registered Owner:	Robert and Donna Odegaard Family LTD LLP II	Rated Power:	1490 Horsepower
Operator:		Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	OSH,808 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	15:32 Local	Direction from Accident Site:	0°
Lowest Cloud Condition:	Few / 2800 ft AGL	Visibility	5 miles
Lowest Ceiling:	Overcast / 4600 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	9 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	40°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.87 inches Hg	Temperature/Dew Point:	25°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitat	tion	
Departure Point:	Oshkosh, WI (OSH)	Type of Flight Plan Filed:	None
Destination:	(OSH)	Type of Clearance:	VFR
Departure Time:		Type of Airspace:	Special

Airport Information

Airport:	Wittman Regional OSH	Runway Surface Type:	Concrete
Airport Elevation:	808 ft msl	Runway Surface Condition:	Dry
Runway Used:	36L	IFR Approach:	None
Runway Length/Width:	8002 ft / 150 ft	VFR Approach/Landing:	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None	Latitude, Longitude:	43.967498,-88.556663

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Mike Monroe; FAA - Milwaukee FSDO; Milwaukee, WI Karen Kryzaniak; EAA; Oshkosh, WI Robert Odegaard; Odegaard Aviation Inc.; Kindred, ND
Report Date:	June 13, 2008
Last Revision Date:	
Investigation Class:	<u>Class</u>
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=66327

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.