Barstow-Daggett Airport,
Hangar Shed No. 4
(Barstow-Daggett Airport, Nose Dock No. 4)
39500 National Trails Highway
Daggett Vicinity
San Bernardino County
California

HAER No. CA-225-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
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HISTORIC AMERICAN ENGINEERING RECORD
Barstow-Daggett Airport
Hangar Shed No. 4 (Nose Dock No. 4)

I. INTRODUCTION

Location:	Hangar Shed No. 4 is one of three remaining hangar sheds, or "nose dock hangars," at Barstow-Daggett Airport. The airport is located approximately 6 miles east of Daggett, and 12 miles east of Barstow, in San Bernardino County, California (Figures 1 and 2).
Quad:	Minneola, California—San Bernardino County 7.5-Minute Series (Topographic), 1971
UTM:	Zone 11 E 519420 N 3857440
Date of Construction:	May–June 1942
Present Owner:	San Bernardino County San Bernardino, California
Present Use:	Storage
Significance:	Constructed at the outset of World War II, Hangar Shed No. 4 was one of only four such buildings, all of which were located at Barstow-Daggett Airport (then known as Modification Center No. 1, Daggett). Uniquely designed to serve as aircraft-modification facilities, the hangar sheds could accommodate the "noses" (including the engines) of up to 36 aircraft at one time. Several aircraft types, including A-20s, C-47s, and P-51s, were modified in Hangar Shed No. 4 throughout the war, many of which were destined to serve the U.S. allies.
Historian and Date:	Matt C. Bischoff, Statistical Research, Inc., 1998

II. HISTORY OF THE BARSTOW-DAGGETT AIRPORT

NOTE: See field records for figures.

A. Introduction

The Barstow-Daggett Airport has served numerous roles throughout its long history. The airport's peak of operation came during World War II, when it served as a modification center for the U.S. Army Air Force (USAAF). Operated by the Douglas Aircraft Company, Daggett was one of several modification centers across the country that were designed to modify aircraft for specific environments, missions, or tasks. During the war, the Army found that airplanes in their service often had to be altered or modified to fit very specific needs. These modifications could not be anticipated during the initial manufacture of the aircraft. The Army also found that, because of production volumes, the manufacturers' factories could not perform the required alterations. Hence, several modification centers were established, including one at Daggett. Hangar Shed No. 4 was constructed during this period, and was one of four such hangars at Daggett designed to facilitate modification of several types of aircraft.

Prior to and after the war, the Daggett airport served in several other capacities, although in reduced form from its wartime activity peak.

B. Beginnings—Communication and Airways Station

Originally a Desert Airways Communication Station, Daggett's first construction was a beacon and associated shed housing, built in 1930. The following year, a well was sunk, and a 40-foot tower was erected. By 1932, three runways were built, along with small quarters for field personnel. In the same year, with flight activity in the nation still light but increasing in frequency, the facility was established as an Airways Keeper Station (*Barstow Printer Review* [*BPR*], 21 May 1931). The presence of the radio beacon at Daggett made the station a dividing point for transcontinental flights. Routes from Los Angeles to Kansas City and Salt Lake City diverged at Daggett (*BPR*, 9 April 1931). By this time, the beacon was capable of maintaining voice communication with approaching aircraft that possessed radios. A low-frequency range was established at Daggett in 1934, the first of its kind in the region. By this time, weather surveillance was provided by Daggett personnel to stations in Burbank and Kansas City (*BPR*, 21 May 1931).

C. Civil Aeronautics Authority

In the late 1930s, the Civil Aeronautics Authority (CAA) selected Daggett as a municipal airport and a civil air field, and negotiated with the County of San Bernardino for use of the field. In 1939, with power supplied to the facility and a crew of four men on board, Daggett was commissioned as a CAA intermediate field. Daggett was listed as Site 10 on the Amarillo to Los Angeles route (Johnson 1976:67).

The CAA constructed several additional buildings, structures, and equipment. By the opening of the 1940s, the facility consisted of an auxiliary landing field with two runways, a beacon, four small houses, and a well (U.S. Army Air Corps [USAAC] 1942).

D. World War II and Airport Expansion

Early in 1941, prior to American involvement in the war, $389,000 was allocated to enlarge the Daggett airport. The increase in size of the airport was to support bombing and antiaircraft operations by the USAAC. The Air Corps was utilizing Bicycle Lake (on present-day Fort Irwin) and Muroc Dry Lake (now Rogers Dry Lake) for aerial maneuvers and training and needed additional landing strips and airports to support these activities. Funding came from the Works Progress Administration (WPA), a program of President Roosevelt's New Deal. Originally, the funding was not targeted for the CAA field at Daggett because the government had only leased the property on a short-term lease basis. Eventually, however, it was decided to expand the facility. In January 1942, under the supervision of the U.S. Army Corps of Engineers (USACE), construction began on two runways: one 150 feet wide and 6,400 feet long, and the other 100 feet wide and 5,494 feet long (*BPR*, 6 February 1941). In March, the field was no longer a "designated landing area," and it was restricted to only air carrier and government aircraft (Johnson 1976:67). Completed in May, the runways were hard-surfaced and designed to handle loads of up to 30,000 pounds.

WPA funding was provided to San Bernardino County in an attempt to encourage local sponsorship of the project. The Army claimed that they wished to see Daggett, and other airports like it, become commercial assets to the communities in which they were located (*BPR*, 13 February 1941). Later in the year, the CAA agreed to spend $200,000 to assist in the development of the airport. It is unclear if this funding was in addition to the WPA monies or replaced it. It is also unclear what exactly was constructed for this $200,000. The County of San Bernardino assisted by acquiring through condemnation the additional 20 acres of land necessary for construction of the airport (*BPR*, 25 December 1941). The county also agreed to maintain the airfield. The airport, at that time, was intended to serve as an auxiliary air field for the Victorville

Flying School and the San Bernardino Army Air Corps Maintenance Depot (*BPR*, 30 November 1941).

With American involvement in World War II, various safety measures were instituted, including radio blackouts. Under an agreement worked out with the War Department, San Bernardino County purchased and held in fee simple title the entire airport facility for the federal government. The county also agreed to bear the costs of maintaining the runways (Grier 1942). There was power supplied to the site, although it was insufficient for the government's future use. The Atchison Topeka and Santa Fe Railroad, approximately 900 feet away, did not, at that time, have a spur to the site (USAAC 1942).

Further condemnation suits brought by San Bernardino County acquired additional land for the Daggett Airport, bringing the total to 1,000 acres in early 1942. A spur line from the Atchison Topeka and Santa Fe Railroad was also brought to the airfield early in the same year. It was reported that the airport would be turned over to the county once the improvements were completed, "unless military operations necessitate its full facilities" (*BPR*, 29 January 1942).

A group of four Air Corps officers visited the Daggett airport in March 1942, which at that time was known as CAA Intermediate Field. The officers were joined by representatives from the Douglas Aircraft Company and the U.S. District Engineer's Office (U.S. War Department 1942). Apparently, Douglas had already proposed and won a contract to modify aircraft at the site for the govemmcnt. The site was originally supposed to house approximately 800 employees (USAAC 1942). Apparently, San Bernardino County had encouraged representatives from the Douglas Company to choose the Daggett airport for the location of another plant (in addition to corporate headquarters in Santa Monica) (*BPR*, 16 July 1942).

Soon thereafter, the War Department chose the airport as a modification center for adapting airplanes for combat purposes. The airport, now consisting of 1,060 acres, was leased from the County of San Bernardino for $1.00 per year. The airport was enlarged to handle this new role, and the whole facility was leased to the War Department for the Material Command beginning on May 4, 1942 (USACE 1946:1). The govemment retained exclusive use of the airport, "to a date six months after the termination of the unlimited national emergency declared by the President on May 27, 1941" (San Bernardino County 1941:1).

E. Douglas Aircraft Company

On May 29, 1942, the War Department entered into a cost-plus-fee contract with the Douglas Aircraft Company of Santa Monica, which agreed to operate the Daggett modification center for the govemment.

Douglas was to operate the airport as an auxiliary factory to their headquarters in Santa Monica, and did so until mid-1944, when the Army Air Forces deactivated the project. Douglas was to operate and maintain the facility, which included equipment, tools, and fixtures. The maintenance of the runway remained the responsibility of the County of San Bernardino (USACE 1946:1). Apparently, Douglas modified and operated up to 150 aircraft at Daggett at one given time (USAAF 1944a:2).

The facility was termed Modification Center No. 1, Daggett. The center operated as a branch plant of the Douglas Aircraft Corporation's Plant J (in Santa Monica). Daggett was one of several modification centers across the country (U.S. Engineer Office 1944:3). The centers, originally housed in airline facilities, soon were established as permanent bases in a variety of locations. Construction of the centers was made the responsibility of the USACE. Most of the centers became War Department property (unlike Daggett), and operated under leases to aircraft manufacturers. According to the Army Air Force, modification centers were designed to:

> make airplanes operationally suitable to a customer other than the one originally intended; to prepare airplanes for special missions; to install equipment for combat operations; to make last-minute adjustments; and to remedy shortages of equipment not available when the airplanes left the factory [Air Historical Office 1947:15].

The U.S. Engineer Office, in a teletype to an unknown recipient, summed up the purpose of the modification center:

> for completed airplanes manufactured by the Douglas Aircraft Company for the purpose of incorporating operational changes to make them suitable for use by the British, Russian, Dutch, and American units that will operate in foreign climates and terrain: To install equipment urgently needed in order to use the planes in combat operations and to install [equipment] not available at the time of manufacture [U.S. Engineer Office 1944].

Every effort was made to save time, materials, and money during the construction of the modification center. This point was stressed by the U.S. Engineer Office to its Division Engineer in San Francisco:

> It is desired that the construction of Modification Centers be of a temporary nature with emphasis on speed of construction. The use of wood wherever possible in order to save critical materials is hereby approved. Monorail equipment and other expensive items or

> installations should not be approved for use in these Modification Centers [U.S. Engineer Office 1944].

Following several delays, construction of improvements necessary for a modification center at Daggett began in the summer of 1942. The center was constructed by several private contractors, who were overseen by the U.S. Engineers Office. During this period, the four hangar sheds were constructed, along with several other facilities, including three domed hangars, 20 two-story barracks, 20 family cottages, dispensary, administration building, theater, cafeteria, and swimming pool (Johnson 1976:67). The CAA also spent over $289,000 to expand runways and install a lighting system (*BPR*, 16 July 1942). Construction was completed by June 1942 (Figure 3) (Groene 1942:1).

During this period, the facility was known as "Douglas Town." Work being conducted at Daggett was reportedly top secret. A heavy-duty chain-link fence with three rows of barbed wire along the top bordered the field, and the perimeter was patrolled regularly. Security was tight, and the general public was given little information about activities at the facility, except for vague statements such as: "various items are installed in airplanes for various tactical uses" (Miller 1943:10). The facility was highly regulated, and in many ways was a closed plant.

Aircraft-modification work commenced in the fall of 1942. The company primarily modified Douglas A-20 Havocs and C-47 Skytrains, along with North American P-51 Mustangs (Figure 4). These planes were modified for use in England, Russia, and later the United States and China. Other planes reportedly modified were all cargo planes, and consisted of C-49s, C-53s, and C-54s (Air Historical Office 1947:4). Douglas operated the facility for approximately 22 months, modifying 4,300 planes during that period. Planes were brought to Daggett, modified, and then flown out, with no test flights at the airfield itself. Apparently, Daggett received work orders from nearby air bases, such as the Victorville Army Air Base (Johnson 1976:67).

Douglas personnel consisted of over 1,000 civilian workers, the majority of which were housed on base in barracks (Figure 5) and cottages, most of which were air-conditioned. Some of the employees chose to live off-site in residences in the surrounding communities. They ate communally in large mess halls at the plant. Due to increasingly heavy workloads, a six-day workweek was inaugurated. Men worked 12 days, with two days off, and women worked six days with one day off (*BPR*, 2 September 1943). Three shifts were also initiated to handle the large volume of modification work required. At its peak, the Daggett facility employed 846 people on the first shift, 204 on the second, and 50 on the third (U.S. Engineer Office 1944:4).

Douglas Town had a general store, canteen, library, and swimming pool. The employees also printed small newspapers entitled the *Blue Racer News* and the *Daggett Airview News*. Numerous social clubs were formed, and classes were held on various subjects. The Douglas employees provided Barstow with an economic boost, after gas rationing had all but eliminated tourist trade in the town. Bus service was eventually provided to Barstow, to allow the Douglas employees to shop and generally relieve the isolation that existed at the airport (*BPR*, 2 Septemher 1943). Morale was reportedly high, with team spirit pervasive (Figure 6) (Miller 1943:11).

The Army Air Forces also maintained a small detachment of personnel at the facility, consisting of detachments of Weather and Army Air Corps Supply squadrons from Material Command (USAAF 1944a:3) (Figure 7). There were reportedly several Russian liaison officers stationed at the Daggett Modification Center during the Douglas tenure there (Johnson 1976:67).

In addition, beginning in February 1943, the 79th Army Air Forces Technical Training Detachment was assigned to Daggett. Other training detachments were assigned to modification centers in Cheyenne, Kansas City, Omaha, and Tucson, among others. The detachment's responsibility was to house, feed, and train apprentice crew chiefs. These crew chiefs were then to be sent to an airplane factory to study a certain airplane, and follow it through all stages of its modification throughout the country. Several crew chiefs trained with A-20 and C-47 aircraft were stationed at Daggett to follow their airplanes through the modification process. The Douglas Company was requested to provide barracks and a mess hall for these trainees. Because of housing shortages, however, many of the men slept in tents provided by March Field. The company, however, refused to grant credit at the mess hall to any of the crew chiefs, many of whom came with no money on hand. Apparently, the crew-chief trainees assisted in some of the modifications, including intstallation of bomb bay gas tanks in A-20G aircraft. By November 1943, the detachment was deactivated and left the Daggett airport (Schumacker 1943:1–16).

In January 1943, the CAA built a tower on top of the Douglas Administration building, operated by CAA personnel. Throughout Douglas's occupation of the field, CAA employees remained, serving in the same roles they had always served. In December 1943, the War Department permitted the CAA to operate communications and weather-reporting facilities at the Daggett Modification Center. The permit included a Radio Range Site and a Communication Building Site (Johnson 1976:67).

From sometime after the tower was built in 1943 to mid-1944, the airport was closed to all air traffic except aircraft involved in official Douglas or military business (Johnson 1976:67), presumably for security reasons.

Interestingly, during this time, Daggett was designated a San Bernardino County airport and not an Army air field (Barstow-Daggett Airport 1998).

In April 1944, the Richfield Oil Corporation of Los Angeles installed underground fuel-storage facilities with a capacity of 54,000 gallons in the westerly clear zone of the east-west runway at the airport. The facilities were installed under a contract between Richfield and Douglas, with Douglas given a purchase option. By mid-1944, Douglas had ceased operations at Daggett and was thus not interested in the option. Richfield then offered to sell the facilities to the War Department, which had taken over Daggett in mid-1944 (see below). In March 1945, the Office of the Assistant Chief of Air Staff, Materiel and Services, recommended that the government purchase the facilities for a cost not to exceed $10,000 (USAAC 1945a). For almost a year, the Fourth Air Force had been using the facilities under a temporary agreement with Richfield (USAAC 1945b).

F. Fourth Air Force

On July 1, 1944, the facility was taken over by the Fourth Air Force, which replaced the Douglas Aircraft Company as the tenant. Daggett was established as a sub-base of Ontario Army Air Field, to act as a housekeeping detachment for other Fourth Air Force units using gunnery ranges (USAAF 1945a). Technically, the airport was transferred from the Army Air Forces Material Command to the Fourth Air Force. The 444th Army Air Forces Base Unit was organized at the Ontario facility and ordered to occupy the Daggett Municipal Airport (USAAF 1944a:1). The name of the facility was changed to Daggett Municipal Airport, and it was commanded by Lt. Robert A. Nagle (USAAF 1944a:4). Apparently, the Army Air Force had decided to transfer all modification of combat airplanes to production lines, instead of continuing to use plants such as Daggett (*BPR*, 4 May 1944). It was decided that all Douglas property that would prove necessary in operating a base would be retained by the Army Air Forces. The Army, when taking over the facility, hired over 300 Douglas personnel already on-site. The initial military personnel assigned consisted of 15 officers and 141 enlisted men, who were assigned housekeeping duties until further orders came. Apparently, the transition was not completely smooth, as the civilian employees at first chafed under Army control. It appears, however, that this problem was soon alleviated, and military and civilian employees got along well thereafter (USAAF 1944b:4, 12–13).

The Fourth Air Force used Daggett as a fighter base, where training, calibration, and testing of aircraft guns could be accomplished (USAAF 1944a, 1944b). The Fourth Air Force also operated a Fighter Pilot's Instructor School and a supply base at Daggett. Fighter pilot instructors were trained on 20 P-38 aircraft assigned to the Daggett airfield (Figure 8). The fighter pilot instructors were generally veterans of overseas

service who were sent to Daggett after returning to the states and being processed through redistribution centers. These pilots were to be trained in the latest techniques, then sent to other Fourth Air Force installations to teach other fighter pilots (USAAF 1944c:1–3).

Gunnery instructor pilot training was also accomplished with P-38 aircraft from other Fourth Air Force stations, when weather was poor at those stations. The prevalent clear skies and dry climate at Daggett allowed for excellent flying conditions nearly year-round. The Daggett facility was also ordered to service the other stations' P-38s and equip them for gunnery training (USAAF 1944c:1).

On July 7, 1944, the first batch of trainees arrived at Daggett. This first group was from the Santa Maria Army Air Base, Califomia, and they had been ordered to Daggett to undergo air-to-air gunnery training (USAAF 1944a:4–5).

Soon after its establishment, other units were assigned to Daggett Municipal Airport. In September 1944, the Fourth Air Force Gunnery Headquarters at Hamilton Field was ordered to Daggett. The unit consisted of 8 officers and 36 enlisted men; 7 P-38 aircraft, 7 tow-target aircraft, and RB-37, AT-23, and BT-13 aircraft; and miscellaneous equipment (USAAF 1944c:3).

In mid-September, Daggett was designated a Central Instructor's School, with its mission set forth in the following manner:

> a. To indoctrinate all returned combat fighter pilots who are destined to become flight instructors, in the Fourth Air Force policies and training procedures.
>
> b. To give training to potential instructors and such instructor pilots as may be sent to Daggett Municipal Airport from other fighter bases in the fundamentals of aerial gunnery, camera gunnery, film assessing, and rocket firing.
>
> c. To provide facilities for gunnery training of other fighter base units that may be forced by weather conditions to move into Daggett Municipal Airport, temporarily for completion of gunnery training.
>
> d. To conduct experimental and developmental work in the furtherance of fixed gunnery training in the Fourth Air Force [USAAF 1944c:1].

The Daggett airport trained instructors and potential instructors from other fighter bases in aerial gunnery, camera gunnery, film assessment, and rocket firing. The facility was essentially a postgraduate, or advanced, school for fighter pilots who had already received basic flight training elsewhere. Daggett provided this training for all Fourth Air Force bases in coastal and mountainous regions (Figure 9). During a conference on aerial gunnery held at Daggett Municipal Airport in November 1944, in attendance was Major Barry M. Goldwater, Gunnery Officer of the 318th Wing (USAAF 1944d:18).

During training, students would complete a ground school that would indoctrinate them to topics such as 100-mile sight, theory of deflection, curve of pursuit, ballistics, bore sighting, effect of gravity, camera exercises, high-altitude gunnery, and film assessment. Aiding in the training procedure was the "Gunairinstructor," which was basically a simulator complete with movie screen upon which the student would align his sights and fire at an airplane silhouette. Following ground school, the student received camera training, where he fired at a tow target with a gun camera. The film from this camera was then assessed by the instructor. The next phase of training included live firing at tow targets hauled by B-26 airplanes (Figure 10) (USAAF 1944c, 1994d:17–18).

Training was rapid, with air-to-air gunnery students only spending three weeks at the airfield. A total of 259 gunnery instructor pilots received training at Daggett during the Fourth Air Force's occupation of the facility (USAAF 1945a:15).

Tow targets were used for air-to-air gunnery training. The targets themselves were maintained at Daggett and towed by planes such as the B-26, the A-20, and the A-24 (USAAF 1945a:18). The B-26s were also utilized for night anti-aircraft firing at Camp Irwin. Radio-controlled airplanes (PQ-14s and CQ-3s) were also used as expendable targets in anti-aircraft training. Other units came to Daggett to use the facilities and tow targets. These units brought their own planes and tow-target planes, but made use of the quarters and other services at Daggett (USAAF 1944e:5).

Daggett also conducted experimental and developmental work in fixed-gunnery training. The base served as a laboratory for gunnery training, and personnel at the base succeeded in developing improved fixed-gunnery techniques. Two enlisted men assigned to the Ordnance Section, for example, submitted an idea for an improvement in aircraft armament to Patterson Field, Ohio. The idea consisted of a booster-motor mechanism to improve performance of the P-38s during violent combat maneuvers (USAAF 1944c:35). Another experimental project, begun elsewhere but implemented at Daggett, was the use of infra-red sighting in night-fighter training. Infra-red lamps were installed on P-61 aircraft, which were then test flown near the airport (USAAF 1944d:19, 1945b:9–12).

The majority of the maintenance work was accomplished by Douglas employees who had stayed to work for the Army Air Force. The P-38s were unfamiliar to the Douglas employees (as it was a Lockheed airplane), and some training was necessary. The Army Air Forces utilized the hangars and hangar sheds built during the Douglas occupancy of the facility. Hangar Shed No. 3, for example, was used by the Army Air Force Supply for receiving, storing, and issuing material for use at the facility (USAAF 1944a:6–7, 1945a:20). The Radio Maintenance Shop, taken over from Douglas, tested and fixed several types of radios.

Because of the large amount of work to be accomplished at the airfield and the relative lack of manpower, the Fourth Air Force requested additional workers from the War Manpower Commission in Los Angeles. It is not known if additional employees were found (USAAF 1944a:11).

Unfortunately, crashes occurred relatively often, and they were the source of many questions and close scrutiny during official inspections by visiting officers. At least one case of a mid-air collision took place between two P-38s. Other crashes occurred at Harpers Lake (October 25) and at a location 3 miles southwest of Daggett (October 27). Daggett salvaged many of the planes that crashed nearby (USAAF 1944a:8, 1944c).

An ordnance section operated at the airport, turning out .50-caliber ammunition for gunnery training (USAAF 1944a:9). The base utilized the Mojave Range of the nearby marine base, located approximately 25 miles northwest of Daggett, for its air-to-air gunnery training. The gunnery range at Edwards AFB (then known as Muroc) was also used occasionally by personnel from Daggett (USAAF 1944a:14).

Other miscellaneous planes operated from the airport, including several classes of airplanes from bombers to cargo to transport (USAAC 1945b). An additional 10 PT-13s arrived in October 1944. Six of these planes were used in the Gunnery Instructor's School, two were used for administrative purposes, and two were held in reserve. Two AT-23 aircraft also arrived in the fall of 1944, and both were used for the Gunnery Instructor's School. The Fourth apparently completed several construction projects during their occupancy, including at least one firing butt for machine-gun practice, a small-arms range, and a gas-training chamber converted from an office building (USAAF 1945c).

Aerial rocket training was quite new to the Army during the war, and most pilots had little to no experience with the weapons. Eventually an Aircraft Rocket School was established by nine officers who had gone through a course of instruction at the Naval Ordnance Test Station at Inyokern (today's China Lake Naval Air Weapons Station). The first rocket training course held at Daggett was in March 1945. A rocket firing range was built at Langford Dry Lake near Daggett in May 1945, and the first tests were made in June

(USAAF 1945a:14, 1945b:17). Because of V-J Day, however, the base was soon to be closed.

Many of the officers at the Daggett Municipal Airport hoped that the facility would be made a permanent base, and pointed to its two runways, excellent flying weather, and ample buildings (Figures 11 and 12). The base also had mess halls, a post exchange, and a commissary; few recreational facilities were available, however. There was no service club, and the only sport facilities consisted of a basehall diamond and two volleyball courts. Because of its isolated location, there were few leisure outlets in the surrounding area. The town of Daggett was small and provided little recreation. Barstow, although a larger town than Daggett, was lacking in diversions as well. Troops at Daggett were provided some entertainment, however; in 1945, Jimmy Durante, Tommy Dorsey, and the USO show "Hollywood Hi-Jinks" were on-base attractions (USAAF 1945a:34–35, 1945b:19).

More important, the base also lacked adequate warehouse facilities, fuel-storage capabilities, housing, and sewage facilities (USAAF 1944e:12–13). Because the end of the war was near, funding for base construction was extremely limited. Although officers of the Fourth Air Force wanted new facilities to be built at Daggett, money was tight: "At a conference held recently in Washington, D.C., General Arnold stated that he would not approve one dime for any post that would not be a permanent Army Base after the war is over" (USAAF 1944c:10–11).

The Daggett Municipal Airport was placed on inactive status on October 5, 1945, and the 444th Army Air Force Base Unit was discontinued effective October 20, 1945 (USAAF 1945a:1).

G. Navy Acquisition

By war's end, the airport was taken over as surplus property by the War Assets Administration (WAA) and was transferred to the Navy Department in 1946 (Figure 13). The Navy paid the WAA a total of $141,450 for the entire facility. The Navy apparently was to remove the improvements made to the airport facility and compensate San Bemardino County accordingly (U.S. Navy 1946). The Navy operated the facility as part of its Barstow Annex. The annex was a Marine Corps Depot of Supplies, which included a main base of operations at Nebo, an auxiliary facility at Yermo, and the Daggett airport. The Barstow Annex was designed to provide Marine Corps posts and stations with all classes of supplies and equipment. The Marine Corps used the airport as an Electronics Repair Depot and also for general storage. Daggett was the only facility out of the three that was leased property; the rest were owned by the govemment. By 1947, the CAA had resumed complete maintenance responsibility for the field (Barstow-Daggett Airport 1988).

In 1952, when there were 700 personnel stationed at Daggett, the Navy wanted to purchase the property (U.S. Navy 1952). The land was leased at a rate of $1.00 per year, with an option to buy at $13,200. By 1958, however, the Marine Corps left the airport, and the CAA, which became known as the Federal Aviation Agency (FAA) the following year, took over the field once again (Barstow-Daggett Airport 1988).

H. San Bernardino County Occupation

In November 1959, the federal government turned the entire airport complex back over to San Bernardino County. However, the federal government retained certain rights to the airport, including landing privileges (San Bernardino County 1959).

In 1961, the airport in Barstow closed, and Daggett became the only civilian airport in the area. Soon thereafter, the field became known as the "Barstow-Daggett Airport." In 1962, a manufacturer of mobile homes took up residence in the airport and reconfigured three of the hangars and three of the hangar sheds for this work (Johnson 1976:67). Throughout the 1970s and 1980s the U.S. Army temporarily utilized the airfield for various operations and maneuvers. In 1981, the Army began leasing two of the large hangars for use by two helicopter units from Fort Irwin-National Training Center (NTC). The California Highway Patrol also began using the airfield in the same year. In 1987, Hangar Shed No. 3 (immediately west of No. 4) burned down completely (Barstow-Daggett Airport 1988). The following year, the airport ceased to be an FAA flight service station.

Today, the facility continues to be known as the Barstow-Daggett Airport, and it is reportedly one of the busiest small airports in the country. The facility is currently administered by the San Bernardino County Public Services Group, Airports Division. Fort Irwin-NTC continues to use portions of the facility for helicopter activities. Current helicopter operations include flight training on the NTC, support to the Space Shuttle missions at Edwards AFB, and transport of military and civilian dignitaries to other military installations or civilian air fields. Helicopters in use presently include UH-1 (Huey), OH-58 (Kiowa Warrior), UH-60 (Blackhawk), and Bell Jet Rangers (civilian) (USACE 1998:2–3).

III. IMPORTANCE OF DAGGETT AIRFIELD DURING WORLD WAR II

The Daggett airfield served several important roles during World War II. As a modification center, the facility configured airplanes for specific purposes and environments.

During the war, nearly 100 percent of bombers and 50 percent of fighters coming off the assembly lines required modification of some kind in order to be suitable for combat use. In addition, many defects and deficiencies in airplanes would be discovered by the squadrons that actually flew the airplanes in combat. These deficiencies would be reported to both the manufacturer of the aircraft and the Army Air Force Materiel Division, both of whom would devise changes to remedy the problem. These changes would be implemented in the modification centers. When a change was officially adopted, deviations were made to the original specifications of the aircraft. In this way, the modification centers played a crucial role in the improvement of American aircraft (Air Historical Office 1947:1–10).

Some of the reported destinations of the planes modified at Daggett included Russia, England, and China. Although the range of modifications performed is not currently known, airplanes were apparently fitted for specific combat uses. This work was performed under tight schedules, with limited manpower and scarce materials. Modifications performed by the Douglas Aircraft Company for the Army Air Forces were often on airplanes built by other manufacturers. Along with Douglas A-20 Havocs and C-47 Skytrains, the plant also modified North American P-51 Mustangs. This flexibility reflects the cooperative spirit that prevailed on the American homefront during World War II.

The Douglas operations at Daggett also reflect the American civilian workforce's commitment to the war effort. Employees of the Douglas Company that were assigned to Daggett lived in an isolated area, often far from their homes. The weather could be oppressive. Work shifts often extended to 12 straight days on the job, and many of the employees performed difficult manual labor. Their quarters were simple; few services were available, and recreation was limited. Security was tight, and the employees lived in quasi-military fashion, their movements restricted by the sensitive nature of the work being accomplished.

Under the Army Air Forces, the airfield served other important roles in training and development. Although the majority of this training was accomplished late in the war effort, many pilots and gunners were trained in firing from P-38 aircraft, including air-to-air and air-to-ground maneuvers. The P-38 Lightning was one of the United States' preeminent fighters, an aircraft that accounted for more downed Japanese aircraft than any other American plane. Its revolutionary design—a twin engine, twin boom, and single nacelle cockpit—provided for an extremely powerful but lightweight aircraft.

There was apparently a significant amount of innovation by the members of the base unit assigned to the Daggett Army Airfield. Many improvements were made to various aspects of the gunnery systems on the P-38 aircraft, as well as other aircraft used at the base. The use of rockets in air-to-ground combat was also studied

and practiced by units at Daggett. The potential for target practice on gunnery ranges on nearby dry lakes was studied by Army Air Force personnel at Daggett. The use of rocketry in combat was relatively new, and a great deal was learned from experiments performed at the ranges and at the airport.

IV. AIRCRAFT MODIFIED AT DAGGETT BY THE DOUGLAS AIRCRAFT CORPORATION

A. Douglas A-20 Havoc

One of the most extensively built light bombers of World War II, the A-20 was used in a variety of roles in several theaters.

Originally conceived in 1936, the A-20 was the first attack airplane to utilize a twin-engine design. The USAAC's requirements for the airplane, as related to performance and gun/weapon carrying capacity, however, left no alternative other than a twin-engine design. When it was reconfigured in 1938, one of the most unusual features of the airplane was the presence of an interchangeable fuselage nose section. The aircraft could be relatively easily changed from a bomber to an attack plane by using different nose sections. In the attack configuration, a solid nose piece fitted with four .30-caliber guns, along with ventral and dorsal guns, was installed. In the bomber configuration, the nose was equipped with a bomb-aiming panel.

The first order for the airplane came in 1939 from the French, who realized the potential its speed and maneuverability offered. The German Luftwaffe's high-performance, advanced aircraft proved the military efficacy of these new types of planes during the Spanish Civil War. The French required many changes to the original airplane, which Douglas hurriedly completed just in time for the German attack in early 1940. Only 60 DB-7s (as the plane was originally known), however, were operational by this time, and only 12 were actually used in attacks against German armored columns. When France fell shortly thereafter, Great Britain took over the balance of the orders.

Subsequent modifications to the A-20 to meet the Royal Air Force's (RAF) need for a night fighter included the inclusion of airborne interception radar, additional armor, eight machine guns in the nose, flame-damping exhaust systems, and a black finish. These reconfigured airplanes were given the name Havoc I. The Havoc II was equipped with 12 machine guns in the nose, and dual flight controls for the gunners. Previously, the gunners could not come to the pilot's aid in an emergency. In December 1940, these aircraft became operational. Subsequent improvements to the aircraft led to the designation DB-7B. These were used extensively in North Africa, largely replacing the RAF's Bristol Blenheims.

The first bomber version to serve with the USAAC was the A-20A, similar to the DB-7B. Douglas granted a license to the Boeing Company to produce 140 A-20Cs for supply to the RAF. Versions of this plane were built for the Soviet Union under Lend-Lease in 1942.

The largest production model was the A-20G, which was built by Douglas in Santa Monica. The A-20G was slightly longer than earlier models, and contained two .50-caliber machine guns, four 20-mm cannon in the nose, and two .50-caliber guns in the rear cockpit. The first group of A-20Gs was supplied to the Soviet Union. Subsequent variations allowed for additional bomb-carrying capabilities, extra fuel tanks, and stronger armor.

Additional models included improved A-20Gs, H, J, and K models. A total of 7,385 A-20s was built by the time production ended in September 1944. The planes had served the United States, Great Britain, the Soviet Union, Brazil, the Netherlands, Australia, New Zealand, and South Africa (Mondey 1996:100–105).

B. Douglas C-47 Skytrain

Designed from the Douglas Company's successful commercial transport airplane, the DC-2, the C-47 entered production in 1940. Produced in greater number than any other transport airplane, the C-47 was labeled with many names, including Skytrain, Skytrooper, Dakota, and Gooney Bird. Because Douglas's Santa Monica factory was already overcrowded with A-20s, a second facility was built in Long Beach to handle the USAAC's contract for the C-47. Unlike so many other World War II–era planes, the C-47 remained largely unchanged throughout its production.

The C-47's crew consisted of pilot and co-pilot/navigator in a forward compartment and a radio operator in a separate compartment. The plane could carry up to 6,000 pounds of cargo, or 28 fully armed paratroopers, or 18 stretchers and a medical team of three.

C-47s began to supply the USAAC in 1941. Production orders increased so rapidly that a second production line was established at Tulsa, Oklahoma. C-47Bs, with slightly improved engines, were used to supply allied bases in India and China, where flying over the Himalayas was required.

The formation of the USAAC's Air Transport Command saw the increased use of the C-47 as a cargo transport aircraft in many theaters of the war. Beginning in mid-1942, the USAAC's Troop Carrier Command also used the planes for carrying airborne troops. Thousands of paratroopers were carried by C-47s during the

invasion of Sicily and the D-day operation. Additional roles for this aircraft included towing gliders, serving as electronic countermeasure aircraft, and ferrying a variety of specialized equipment. Over 11,000 C-47s were built during the aircraft's production history (Mondey 1996:114–119).

C. North American P-51 Mustang

Conceived late in comparison to other fighters used during World War II, the P-51 was developed following a contract between the RAF and North American Aviation for an advanced fighter in 1940. By May 1, 1941, only seven months from the prototype's maiden flight, the first production model was flown.

Delivered to the RAF, and soon thereafter named the Mustang, the P-51 was fast and maneuverable at low altitudes. Unfortunately, the engines in the P-51 decreased in output as the plane climbed in altitude. In September 1942, the USAAC received its first batch of Mustangs, which would go on to serve in the invasions of Sicily and Italy. These planes were equipped with four .50-caliber machine guns and underwing racks to accommodate up to 1,000 pounds of bombs.

The performance problem at high altitudes was solved in late 1942, with the installation of an improved engine that produced approximately 1,400 horsepower at 19,800 feet. The earlier engines could muster only 1,325 horsepower at 3,000 feet, decreasing rapidly after 12,000 feet. These new P-51B and C models were manufactured at the North American factory in Inglewood, California, and at a second facility in Dallas, Texas. The major production model became the P-51D, which included a bubble canopy for improved pilot view, modified rear fuselage, and six machine guns.

A total of over 14,000 Mustangs was built during the project's life, and these were supplied to China, France, Netherlands, United Kingdom, Canada, New Zealand, and Australia (Mondey 1996:196–204).

V. BUILDING DESCRIPTION

A. Hangar Sheds at Barstow-Daggett Airport

The hangar sheds at the Barstow-Daggett Airport were designed by Lippincott, Bowen, and Rowe Engineers of Los Angeles, and built by the USACE, Los Angeles District. The buildings were originally used by the Douglas Aircraft Company. Built in the summer of 1942, the hangar sheds were part of a large construction program at the Daggett airfield. The cost of the sheds was approximately $705,000. The hangar sheds were

also utilized by the Fourth Air Force when they began their occupancy of the facility in 1944. Throughout the late 1940s, the hangar sheds were numbered T30, T50, T70, T90, from west to east. Hangar Shed T90 (now No. 4) is the subject of the current investigation.

Measuring 1,350 feet long, with a 40-foot-overhang roof, these sheds: "contained 35 to 40 stalls for working on planes, each equipped with a bench, a vise, and some tools; and a complete air-pressure system throughout" (Figure 14) (USAAF 1944b). The four hangar sheds were identical in size and dimension, and were all of frame construction (San Bernardino County 1959).

Because time was so limited, painting was kept to a minimum at Daggett during the initial construction of the facility. Unless essential for functional reasons, paint was not to be applied to interior surfaces (U.S. Engineer Office 1944). This was certainly the case for the hangar sheds.

The Douglas Aircraft Company used the hangar sheds for the modification of a variety of aircraft. Some of the aircraft modified included Douglas A-20 Havocs, C-47 Skytrains, and North American P-51 Mustangs. Little information could be obtained regarding specific modifications made to these aircraft. Apparently, they were modified for "combat use." It has also been reported that many of these airplanes' final destination was Russia (Johnson 1976:67).

Along with maintenance functions, the Fourth Air Force also utilized the sheds for storage and supply for several segments of the command. "Hangar Three," for example, was assigned to the base's supply division. Ordnance armament and automotive parts were among some of the divisions making use of the storage space provided by the hangar sheds. In some cases, the hangars were subdivided among various units (USAAF 1945d:22). A new operations building was also constructed in Hangar Shed No. 3, which was used by visiting organizations. A post carpenter's shop, blueprint room, and a classroom were all installed into "Shed Two." Three of the bays on Hangar Shed No. 2 were enclosed into order to provide more storage space (USAAC 1944c).

During the Navy's occupation of the facility, the hangar sheds were numbered T708, T709, T710, and T711, from west to east (San Bernardino County 1959). The hangar sheds during this period were used primarily for storage, a capacity in which they largely serve today. There were also three traditional hangar buildings at the base, measuring 160 x 123 x 52 feet, also built during the summer of 1942, which are still standing today.

Consultation with the USACE's Construction Engineering Research Laboratories (CERL) by the USACE Los

Angeles District indicates that the hangar sheds at the Barstow-Daggett Airport are the only such buildings on Department of Defense property within the United States (Joe 1998:2). It is not currently known if there were similar such buildings built at other locations during the war. However, there do not appear to have been any other like buildings constructed at the other modification centers across the country (Toole 1945:118–124).

B. Hangar Shed No. 4

Measuring 1,350 feet long, 40 feet wide, and 50 feet high, Hangar Shed No. 4 was originally one of four such buildings constructed at the Daggett Airport. Built on a concrete foundation, the building consisted of three walls, with the entire eastern face open (Figure 15). Because the prevailing winds in the California high desert come from the west, this configuration makes functional sense. The building provided over 55,000 square feet of work space (Figure 16).

The building was supported by 36 concrete beams that supported wood beams holding the roof trusses in place (Figure 17). The spaces created between these concrete beams, measuring 37 feet 6 inches, were utilized as bays for the modification of aircraft (Figure 18). These bays were termed nose docks by some of the occupants of the facility. In each bay there was also one doorway, equipped with a sliding wood door, in the west wall (Figure 19). Above the doors was a series of four ventilators, complete with flaps that could be opened or closed (Figure 20). The ventilators came in two designs. One set of double ventilators existed above each of the doors, and two single ventilators were placed on either side of the set of double ventilators (Figure 21).

Hangar Shed No. 4, like the other three, was constructed almost entirely of redwood. Wall cladding consisted of horizontal shiplap, also milled from redwood lumber (Figure 22). The majority of the structural elements and cladding is original.

The roof consisted of a side-gable, wood truss (Figure 23), with composition material on top. The gabled ends were cladded with redwood shiplap siding, layed vertically, as opposed to the walls, which were layed horizontally. Also included in the roof construction was a continuous ventilator, extending along the length of the top of the building (Figure 24).

Aside from doorways on the west side of the building, there was a wood sliding door on the north end and one three-panel door on the south end. There was also one small, single-pane window adjacent to the door on the south end. Two sheds were constructed on the outside of the building, on the west side (Figure 25). In addition, rooms were constructed in the interior of the building, all of which exist today (Figures 26 and 27).

The rooms on the north and south ends of the building were originally used as "warm-up" rooms. The other two spaces were washrooms and toilets. The room on the south end is the most altered portion of the building today (see below).

The Douglas Aircraft Company installed various equipment in the hangar sheds, including benches, vises, and tools. The hangar sheds were also equipped with air-pressure hookups, water, and electricity.

Hangar Shed No. 4 clearly reflects its historic role of airplane modification and repair. Built for a specific use, the building served this role in exemplary fashion. The building's construction also reflects its historical association. Due to a shortage of metal products during the war, the hangar shed, like many other buildings constructed during the same period, was built almost entirely of redwood. Like so many other functional buildings constructed during the war, the hangar sheds were well built, although they were designed to last only temporarily. It is a testament to their construction that so many World War II temporary buildings still exist today.

C. Modifications

Perhaps the least altered of the four hangar sheds, No. 4 is largely in its original form. The superstructure is original. However, many of the doorways have been covered over, and many others lack their doors altogether (Figure 28). In addition, many of the ventilators have been covered over. Isolated support beams have been replaced in places, along with a few pieces of wall cladding. Two intrusive modern doors have been constructed in the west wall, one in Bay 2, and the other in Bay 9 (Figure 29).

The only significant alteration to the hangar shed was in 1994 when the Air Force installed toilets and office spaces in two different places. The original warm-up room located at the south end of the shed was reconfigured on the interior at this time. A two-story office building largely supplanted the room that existed there originally (Figure 30). This reconfiguration included construction of an additional story and replacement of the original door on the exterior of the hangar shed with a modern, single-panel wood door. Two new windows were installed in the south end of the hangar in the second story of the office, along with a modern, 1-over-1-light sash window on the first floor. New windows have also been installed in the inside portion of the office, not cut into the hangar shed's walls.

A second, one-story washroom, located between Bays 9 and 10 was also reconfigured to serve as toilets at the same time, also in 1994 (Figure 31).

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VII. INFORMATION SOURCES

The documentation project began with a review of materials collected by previous USACE investigations at Daggett as well as sources located in archives in Tucson. Additional archival research was conducted on-site at the Barstow-Daggett Airport, in private collections in Barstow, at various USACE offices, and at the National Archives, Pacific Region, Laguna Niguel Office, Laguna Niguel, California. The research aimed at developing a historic context for the building as well as documenting the building as it currently exists.

The Boeing Companies (which now include Douglas Aircraft) in Long Beach, California, was contacted for archival material. Public Affairs personnel searched Douglas Company archives, but found only a few historic photographs and one newspaper article on the Daggett facility. The Daggett Historical Society was contacted for information, but was unable to provide assistance, as their collections are currently undergoing reorganization and are not open for public review. Archival research was also performed at the U.S. Air Force Historical Research Agency, Maxwell Air Force Base (AFB), Montgomery, Alabama. Research at Maxwell AFB focused on locating photographs of Daggett Army Airfield (1942–1944) and Daggett Municipal Airport (1944–1945), dating to the World War II period.

Archival sources used in developing the historic context consisted of official Army Air Force histories of the Daggett Municipal Airport; newspaper articles from the *Barstow-Printer Review*; letters and other correspondence from airport officials; selected secondary sources (i.e., Johnson 1976); and official county documents such as leases and deeds. One article published by the Douglas Aircraft Company was also located, providing much information on the Douglas occupation of the airfield. The Mojave River Valley Museum was contacted for information on the history of the Daggett facility, and museum staff referred the author to local historian Mrs. Germaine L. Moon. Mrs. Moon provided copies of several contemporary newspaper articles concerning the Daggett airfield.

Information on building construction history was obtained from two as-built drawings located at the Barstow-Daggett Airport. In addition, period photographs were examined, and building descriptions were gleaned from reports and assessments dating to the war years. Because little has been done to alter Hangar Shed No. 4, there are few subsequent drawings for the building. In addition, because building occupancy has changed so many times (Douglas Company, USAAF, U.S. Navy, San Bernardino County, Fort Irwin-NTC), building vouchers and other architectural documents were difficult to locate. One set of plans, completed in 1995 by the Barstow-Daggett Airport, provided information on recent alterations made to the building.

VIII. PROJECT INFORMATION

A. Project Purpose

The current documentation project is a result of the proposed Barstow-Daggett Heliport Project, proposed by the U.S. Army's Fort Irwin-NTC. The NTC currently leases a portion of the Barstow-Daggett Airport from the County of San Bernardino (who owns the facility). The NTC utilizes the airport for helicopter operations, but has found that many of the facilities in use are inadequate and require modernization. The Heliport Project would result in the following changes to the airport: (1) demolition and removal of Hangar Shed No. 4; (2) construction of a new Helicopter Hangar and Flight Operations Buildings; (3) construction of a new Wash Rack and Industrial Waste Treatment Plant; (4) removal and replacement of 225,000 square feet of concrete apron; (5) construction of a new Waste Water Treatment Plant; (6) upgrade and installation of new utility lines; (7) installation of three new water-supply wells; and (8) paving of an existing gravel parking lot and access road.

Hangar Shed No. 4 was determined eligible for listing in the National Register of Historic Places (NRHP) by USACE archaeologists during a previous investigation. Because demolition and removal of Hangar Shed No. 4 would constitute an adverse impact to this National Register–eligible resource, a Memorandum of Agreement (MOA) was prepared among the California State Historic Preservation Officer, the Advisory Council on Historic Preservation, the USACE, and San Bernardino County. The MOA stipulated certain mitigation measures that would be required to provide compliance with Section 106 of the NHPA.

One condition stipulated in the MOA was documentation of the hangar using standards set forth in the National Park Service's HAER program. To comply with these measures, Hangar Shed No. 4 was documented through the use of large-format photography (see Index to Photographs) and archival research. Work was performed by SRI for the USACE, Los Angeles District, under contract DACW09-98-D-0004, Delivery Order No. 2. SRI's Contracting Officer's Technical Representative was Mr. Roderic McLean.

B. Personnel Involved

Historical research and field studies for this project were conducted in May 1998 by SRI Historian Mr. Matt Bischoff, the project director and principal author, and Dr. Teresita Majewski, the principal investigator. Dr. Majewski also provided overall management of the project and editorial oversight of the report. Mr. David De Vries, of Mesa Technical, under contract to SRI, completed large-format photodocumentation of Hangar

Shed No. 4 and also photographed two of the original building plans, which were located at Barstow-Daggett Airport. Mr. Mark Swanson, under contract to SRI, performed archival research at the Air Force Historical Research Agency, Maxwell AFB, Montgomery, Alabama. SRI's production and graphics staff contributed to the successful completion of this project by formating and editing figures, photographs, and the report itself.

Several individuals at various locations provided invaluable assistance during the research for this project. Ms. Connie F. Vojkufka, Airport Manager of Desert Airports for the County of San Bernardino, provided access to the building, as-built drawings, archival materials, building information, as well as general overall help during the fieldwork phase. Ms. Dorita Williams, at the Barstow-Daggett Airport, also greatly assisted by locating building information and documents related to airport history. Mrs. Germaine L. Moon, of the Mojave River Valley Museum, Barstow, provided access to her personal collection of materials relating to regional history.

Mr. Don Hansen, Public Affairs officer with the Boeing Companies, scoured the Douglas Company Archives in Long Beach, California, for information on the Daggett facility during the period 1942–1944.

Several individuals with the USACE, Los Angeles District, also provided invaluable assistance. Mr. Roderic McLean, Archeologist, was particularly helpful in organizing meeting times, dates, and places at the Barstow-Daggett Airport. Mr. McLean also made available numerous historical documents collected from a variety of other archives. He also went out of his way to locate sources of additional information by providing contacts at the USACE Survey/Mapping Department in El Monte, California. Mr. Don Hermanson, Mr. Jesse Hernandez, and Ms. Barbara Root, all of the USACE Survey/Mapping (Baseyard), were extremely helpful in our search for historic maps, photographs, and drawings. Several other USACE employees in the Los Angeles and Sacramento District offices also assisted in locating historic materials.

Researchers at the U.S. Air Force Historical Agency at Maxwell AFB, Montgomery, Alabama, assisted in locating historic photographs and were diligent in attempting to make these materials available to SRI. Ms. Suzanne Dewberry, Archivist at the National Archives, Pacific Region, Laguna Niguel Office, Laguna Niguel, California, lent her expertise and incredible familiarity with the archives to our research efforts.