CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

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4.1 INTRODUCTION

Potential environmental impacts cannot be determined without first understanding the existing conditions in the affected environment. For this reason, the impact analysis process involves two steps. First, this EA presented the existing environmental setting, or the "affected environment" (Chapter 3). Second, it used details of the Global Hawk alternatives (Chapter 2) to assess their impacts on the existing environment, or the "environmental consequences." This chapter (Chapter 4) presents that assessment of environmental consequences for all five base alternatives and the no-action alternative.

The resources analyzed in the EA are interdependent. For example, impacts to soils at a proposed construction site might affect local vegetation, which in turn could affect wildlife that depend on the plants for food. An increase in aircraft airfield operations might affect noise conditions around the base. Changes in noise could affect how the land is used or managed. These types of interrelationships are why the EA is prepared by an interdisciplinary team.

Analysis of the environmental consequences focused on those resources potentially affected by the proposed action.

Assessment of environmental consequences is also based on an understanding that different resources are not equally sensitive to all elements of an action. For example, cultural resources--especially archaeological sites--are most likely affected by activities that disturb the ground (such as facility or hangar construction) and are usually not affected by changes in noise (which could occur under the affected airspace). On the other hand, certain animal species may be more sensitive to aircraft noise than to short-term construction activities.

The environmental impact analysis process is designed to focus analysis on those environmental resources that could potentially be affected by the Global Hawk beddown proposal. Potential effects may result from different aspects of an alternative--flying activities, construction, or personnel changes.

In Chapter 4, the assessment compares what would occur if the proposed action were implemented at each base. This comparative approach is used as much as possible in the text, tables, and figures to allow the public and decisionmakers the ability to "rank" the bases according to the nature, magnitude, and duration of impacts.

4.2 AIRSPACE MANAGEMENT AND AIR SAFETY

Because the Global Hawk is an unmanned aerial vehicle, issues regarding airspace management and air safety are central to the analysis of the beddown. Concerns focus on how the Global Hawk would operate within the National Airspace System, particularly when the Global Hawk would fly without traditional “see and avoid” advantages. Concerns also arise about the Global Hawk's ability to deal with contingencies (e.g., bad weather and equipment failures) without increasing risks to people or property.

For unmanned aerial vehicles such as Global Hawk, the FAA, in Order 7610.4J, Special Military Operations, Chapter 2, Section 9, Remotely Operated Aircraft (FAA 1999), prescribes how these aircraft must be operated. These aircraft should

normally be flown within restricted areas or warning areas. However, for operations outside these special use areas, the Air Force must apply for a Certificate of Authorization (COA) to the Air Traffic Division of the appropriate FAA regional office. Within this application, the proponent must identify and define the specifics of the operation, such as proposed route of flight, requested altitudes, duration of the operation, and frequency of flights. A detailed description of air vehicle capabilities and ground segments are required along with the proposed method of providing an equivalent level of safety for see-and-avoid to that of manned aircraft. The operator must also propose and negotiate coordination, lost communication abort, and emergency or contingency procedures. Ongoing coordination between the Air Force and FAA will establish the procedures for the Global Hawk operating at any of the five alternative bases. This coordination has yielded the potential procedures analyzed below.

Airspace Management. Under all five action alternatives, the terminal (around the base) or en route airspace environments could be affected (or impacted) if Global Hawk aircraft operations did any of the following:

1. Restricted movement of other air traffic in the area (e.g., civilian or commercial aircraft).

2. Conflicted with air traffic control in the region (e.g., see and avoid as well as communications regulations).

3. Changed operations within airspace already designated and/or used for other purposes (e.g., conflict with operations within MOAs, restricted areas, and other special use airspace).

To evaluate the potential conflicts with existing air traffic for each of the alternatives, approach and departure procedures were discussed with FAA and base personnel at each location and existing airspace use and patterns were analyzed. Three blocks of airspace were examined: 1) surface to 18,000 feet MSL, 2) 18,000 feet MSL to 45,000 feet MSL, and 3) above 45,000 feet MSL. Overall, the Global Hawk operations would be consistent with the management and safety requirements for each of the three blocks (Figure 4.2-1). The Global Hawk aircraft would operate in the National Airspace System under IFR and comply with all applicable procedures and ATC clearances and instructions. The Global Hawk would use the same procedures required for commercial air carriers and all other air traffic operating under IFR. All aircraft control and communications would occur between air traffic control personnel and the pilot controlling the Global Hawk aircraft from either the LRE or MCE ground segment.

Air traffic control would monitor the Global Hawk throughout its flight to assist in safe interaction with other aircraft.

As mentioned in section 3.2, aircraft flying below 18,000 feet MSL can operate under visual or instrument flight rules (VFR or IFR). Pilots operating under VFR are responsible for complying with airport, structure, and aircraft separation criteria as specified in FAA orders. Aircraft operating at or above 18,000 feet MSL must operate under IFR and be equipped with the appropriate communications and navigation equipment. Air traffic control personnel control and separate all aircraft operating in this altitude block according to FAA-established altitude and horizontal clearance criteria.

In all airspace blocks, air traffic control personnel would continuously monitor the Global Hawk aircraft's position, altitude, airspeed, and direction of flight using its on-board transponder and ATC automation. The Global Hawk has the capability to

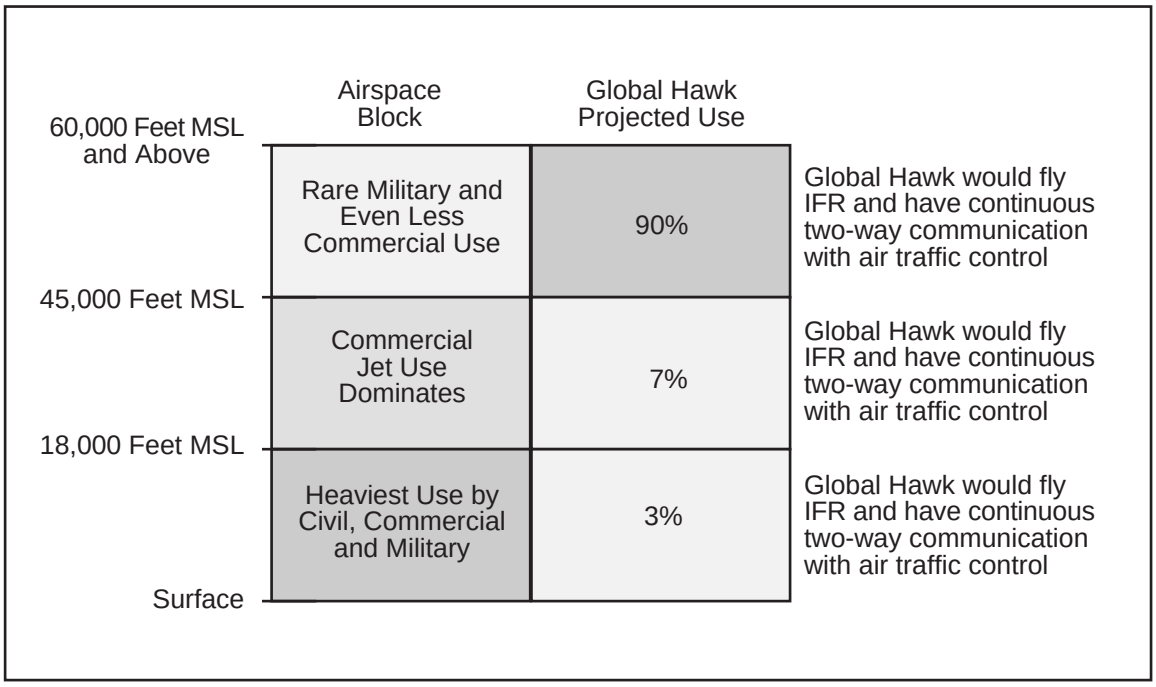

Figure 4.2-1 Global Hawk Flight Activities within Airspace Blocks

respond to ATC direction to change heading and altitude as required for traffic separation. The Global Hawk would spend little time in this altitude block (refer to Figure 4.2-1).

Surface to 18,000 feet MSL. The airspace block from the surface to 18,000 feet MSL includes the area used for departures and approaches, as well as the airspace used by the Global Hawk for climbing to cruise altitude. The Global Hawk aircraft would be under radar surveillance and control (IFR) throughout its flight.

Primary radar coverage would meet the FAA requirements for an equivalent level of safety.

For remotely operated aircraft flying outside of Restricted Areas and Warning Areas, an equivalent level of safety to see-and-avoid is especially important to ensure safe operations. To ensure an equivalent level of safety, Global Hawk must meet at least one of the following criteria:

1. Radar observation (i.e., primary radar coverage).
2. Forward or side-looking cameras.
3. Electronic detection equipment.
4. Visual observation from one or more ground sites.
5. Patrol or chase aircraft.

The Global Hawk would meet one of the criteria--primary radar coverage. The servicing Air Traffic Control facility would provide primary radar traffic advisories below 18,000 feet MSL. The Global Hawk is also equipped with a transponder and two-way radio communications, as required by the FAA.

For safety considerations, a traffic alert and collision avoidance system and forward or side-looking cameras should be installed. Cameras on board the Global Hawk would also help identify hazards during ground operations final approach to the airfield, and adverse weather conditions. An emergency transceiver should also be installed to back up two-way communications. In addition, to operate the Global Hawk worldwide, it must meet Global Air Traffic Management standards and have a see-and-avoid capability.

The following section describes general procedures on how the primary radar coverage would function for the Global Hawk between the surface and 18,000 feet MSL. Whatever base is selected as the main operating base, specific procedures and responsibilities regarding Global Hawk operations need to be developed by the Air Force and involved ATC facilities and outlined in agreements as required.

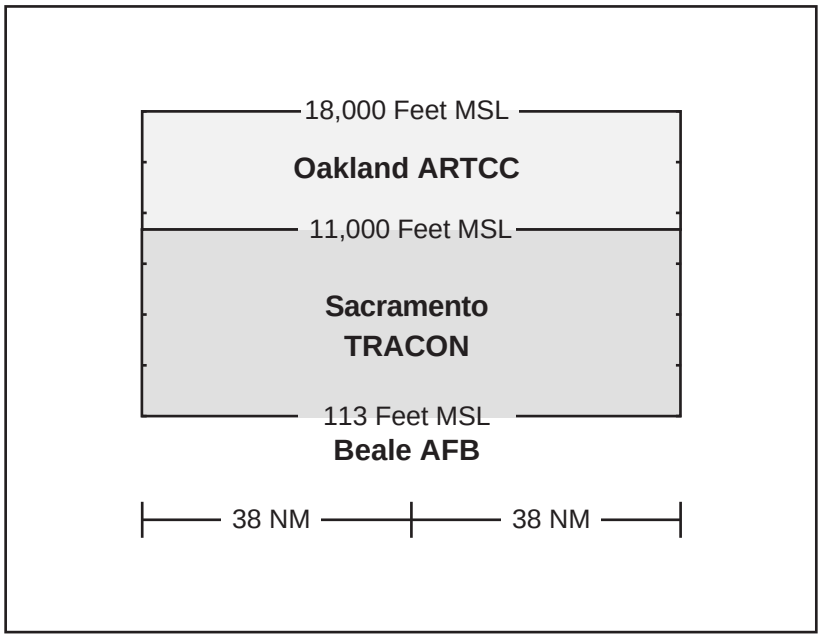

Figure 4.2-2 Radar Coverage and ATC for Global Hawk at Beale AFB

Beale AFB. At Beale AFB, the Global Hawk could use the straight-in approach currently flown by the U-2. Departures would also match a pattern currently proposed for U-2 use. Departures and arrivals at Beale AFB are controlled by the Sacramento Terminal Radar Approach Control (TRACON) facility from the surface to 11,000 feet MSL (Figure 4.2-2). Above 11,000 feet MSL, air traffic is controlled by Oakland Air Route Traffic Control Center (ARTCC). Both facilities indicated their willingness and ability to handle Global Hawk aircraft operations. Sacramento TRACON can identify aircraft operating under VFR through primary radar coverage. The Beale AFB control tower and radar facility also have primary radar capability and can help identify VFR traffic. Primary radar monitoring by Sacramento TRACON of VFR traffic would provide the equivalent level of safety for Global Hawk operations up to 18,000 feet MSL with the approval of Oakland ARTCC.

Edwards AFB. For Edwards AFB, the current spiral flight track used in the demonstration and evaluation phase of the Global Hawk could continue to be used. Currently, the Global Hawk aircraft take off from the runway and immediately climb in a spiral fashion within the restricted airspace (R-2515); for landing, the aircraft descend inside R-2515 for a straight-in approach. Edwards AFB is located entirely within restricted airspace, R-2515, that extends vertically to an unlimited altitude (Figure 4.2-3). However, a portion of the 38 NM arc south and west of the base is outside R-2515 airspace, but it would not be used for Global Hawk operations.

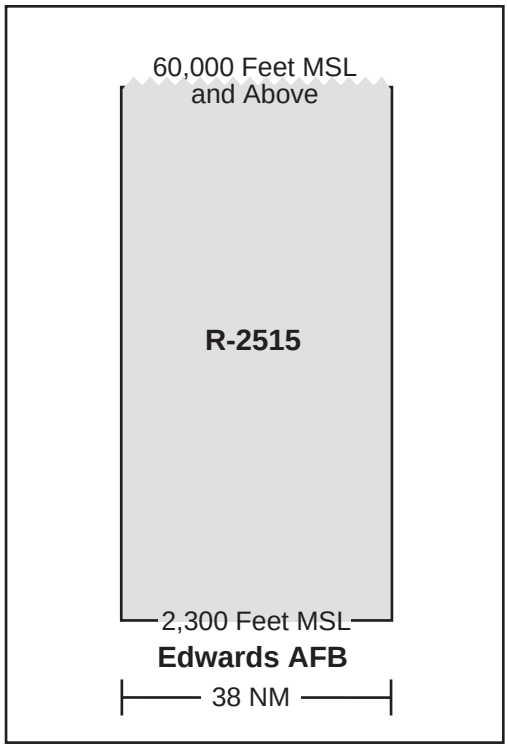

Figure 4.2-3 Edwards AFB Airspace for Global Hawk

Ellsworth AFB. At Ellsworth AFB, the Global Hawk would likely employ approach and departure procedures already established for the base. The Ellsworth AFB radar approach control (RAPCON) monitors airspace from the surface to 16,000 feet MSL out to approximately 38 NM from the base (Figure 4.2-4). Denver ARTCC controls the airspace above 16,000 feet MSL over Ellsworth AFB. The ARTCC has indicated that it could work Global Hawk operations into the existing airspace structure above Ellsworth. Denver ARTCC personnel were receptive to establishing an agreement to allow Ellsworth AFB personnel to retain control of Global Hawk operations up to 18,000 feet MSL. In that case, Ellsworth AFB would have continuous primary radar coverage from the surface to 18,000 feet MSL, thus providing an equivalent level of safety for Global Hawk operations.

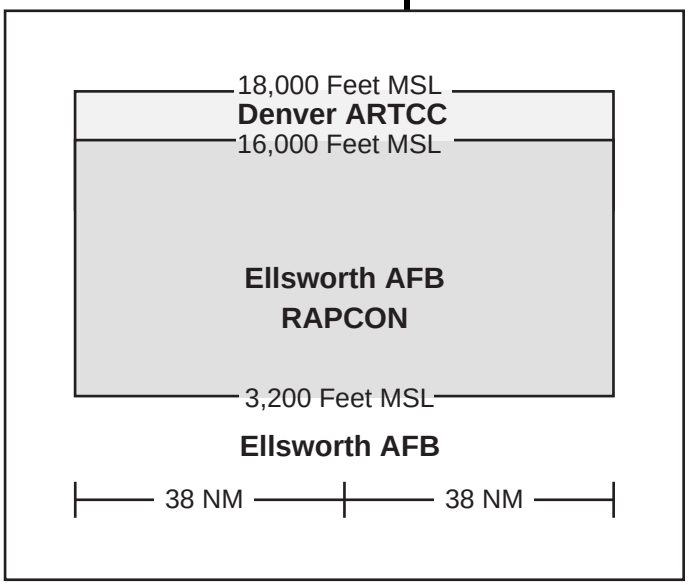

Figure 4.2-4 Radar Coverage and ATC for Global Hawk at Ellsworth AFB

Tinker AFB. At Tinker AFB, the Global Hawk would potentially use typical straight-in departures and arrivals. A spiral departure could also be used because of the heavily used airspace in the region (refer to Table 3.2-1). Spiral ascents and descents would likely be the least disruptive to existing traffic. Oklahoma City TRACON controls Tinker AFB's arrival and departure airspace from the surface to 11,000 feet MSL (Figure 4.2-5). TRACON personnel have shown a willingness to make Global Hawk operations at Tinker AFB a success. Fort Worth ARTCC controls the airspace directly above Tinker AFB from 11,000 to 18,000 feet MSL. Although traffic overhead Tinker AFB is very congested, Fort Worth ARTCC personnel believed they could support Global Hawk operations in an area west of Tinker AFB. Kansas City ARTCC controls the airspace starting approximately 5 NM north of Tinker AFB. Personnel at Kansas City ARTCC were less supportive of Global Hawk operations in the airspace north of Tinker AFB and in the densely congested area surrounding the base. However, continuous radar coverage could be provided throughout the Global Hawk's operations by Fort Worth ARTCC and Oklahoma City TRACON along prescribed departures and approaches in that airspace; therefore, an equivalent level of safety could be provided at Tinker AFB.

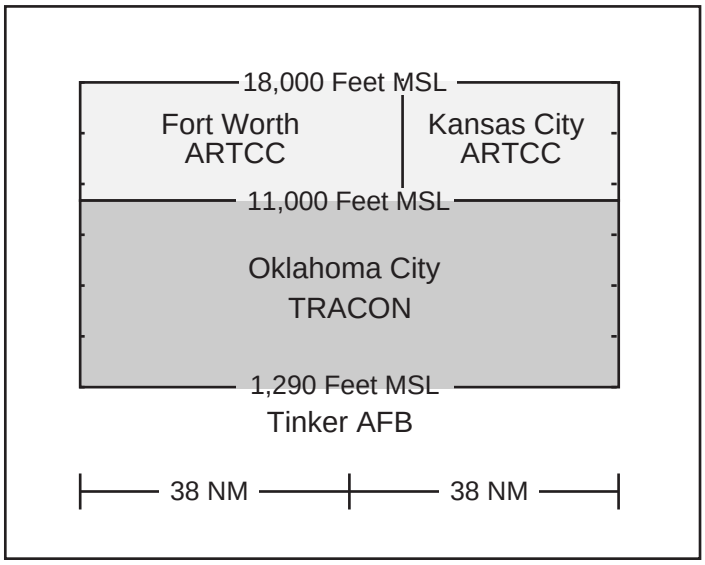

Figure 4.2-5 Radar Coverage and ATC for Global Hawk at Tinker AFB

Wright-Patterson AFB. At Wright-Patterson AFB, Global Hawk operations would likely use straight-in departures and arrivals. Dayton TRACON controls Wright-Patterson AFB's arrival and departure airspace from the surface to 10,000 feet MSL (Figure 4.2-6). Dayton TRACON could provide primary radar coverage, and its personnel were confident that they could support the Global Hawk mission. Indianapolis ARTCC controls the congested airspace directly above Wright-Patterson AFB and indicated that Global Hawk operations would disrupt the existing traffic flow.

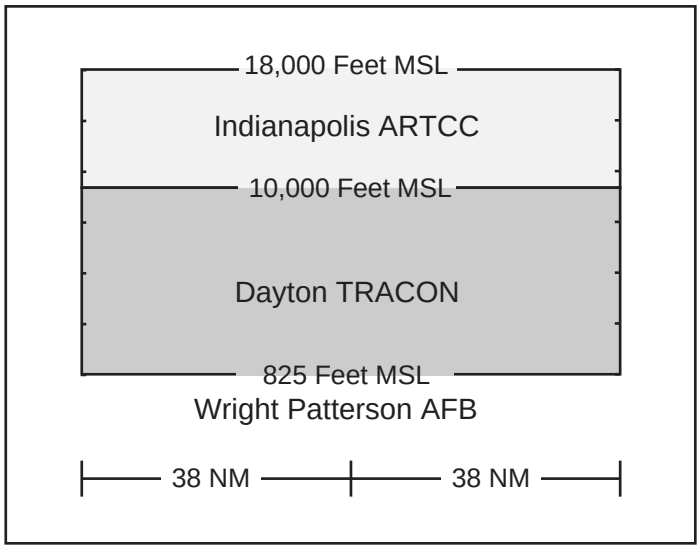

Figure 4.2-6 Radar Coverage and ATC for Global Hawk at Wright-Patterson AFB

The least disruptive departure procedure, an alternative suggested by Indianapolis ARTCC, would require the Global Hawk aircraft to fly below 10,000 feet MSL for about 40 NM west to the Buckeye MOA. In the Buckeye MOA, the aircraft would climb, under Blue Ash military radar unit monitoring, to 30,000 feet MSL. After 30,000 feet MSL, control would be transferred to Indianapolis ARTCC. On this route, the Dayton TRACON would provide primary radar coverage from the surface to 10,000 feet MSL, and Blue Ash could provide coverage up to 30,000 feet. Implementing this procedure would require approval from the Indianapolis ARTCC controller union. Personnel at the Great Lakes Region FAA Headquarters have substantial reservations about adding Global Hawk operations to the Dayton area. However, an equivalent level of safety would be provided at Wright-Patterson AFB following these procedures, though it would be difficult considering the level of air traffic congestion and the reservations of FAA regional staff.

Airspace between 18,000 feet MSL and 45,000 feet MSL. Global Hawk operations would interact with IFR air traffic, including commercial aircraft. The Global Hawk aircraft meets all the requirements to operate effectively and safely within this airspace. There are continuous two-way radio communications between the air traffic controller and the pilot who is in the LRE or MCE trailer flying the Global Hawk. In addition, all Global Hawk aircraft are equipped with an altitude-reporting transponder.

Global Hawk would fly 90 percent of the time at high altitudes not used by commercial or private aircraft.

Above 45,000 feet MSL to 60,000 feet MSL. This altitude block is well above any normal air traffic found around the world, and over 90 percent of the Global Hawk aircraft activities would take place at these altitudes. Therefore, few potential airspace management conflicts would exist between the Global Hawk and other military, commercial, or civilian activities.

In summary, Edwards AFB (which now supports the demonstration and evaluation phase for Global Hawk aircraft) offers protected special use airspace for Global Hawk operations. The Global Hawk would take off, climb to 50,000 feet MSL, and start its cruise climb to 65,000 feet MSL within restricted airspace (R-2515). Descents to the base would follow a similar pattern. As such, conflicts with other airspace users would be minimized because operations within restricted airspace are scheduled and closely controlled. Aircraft that are not scheduled for and authorized to use the airspace cannot enter restricted airspace.

Ellsworth and Beale AFBs would have a lower potential for airspace management conflicts than Tinker and Wright-Patterson AFBs studied because existing air traffic is less congested. Airspace above Tinker and Wright-Patterson AFBs is more congested; therefore, the potential for more management conflicts would be greater than at the other three alternative bases. However, selection of any of the alternative bases would require developing specific procedures for Global Hawk flight operations.

Air Safety. Examinations of aircraft safety must consider an aircraft's accident rate (i.e., mishap). However, the accident rate of new aircraft first entering the inventory is difficult to measure because of the lack of historical records. These aircraft often have a higher accident rate because they are typically new designs and are still in the test and evaluation phase. In addition, it is impossible to predict the actual potential mishap level because the aircraft has not flown enough times to accurately account for the mishap rate. Historic trends do, however, suggest that mishap rates for all types of aircraft decrease the more they are flown; over time, operations and maintenance personnel learn more about the aircraft's capabilities and limitations. Some of this experience has already been gained for the Global Hawk.

When the proposed Global Hawk operational missions begin at one of the five bases, the demonstration and evaluation phase of the aircraft and its systems will be completed (September 2000). By that time, significant knowledge will have been gained about the aircraft's operations and safety. As mentioned in section 1.2.1, the Global Hawk incorporates numerous features to ensure safe operations: redundant systems, pilot command and control, autonomous fail-safes, system reliability, and air safety components.

Redundant systems on the Global Hawk enhance safe operation.

Although no direct data exist on the mishap rate for this aircraft, the Advanced Research Project Agency's Reliability Analysis (Teledyne 1997) for the Global Hawk has measured the systems failure level. This report was used to estimate a rough equivalent to the potential for Class A mishaps for the Global Hawk. This reliability analysis predicted 1 aircraft loss per 541 missions. To calculate the mishap rate, the total number of hours for these missions had to be determined. Since a typical mission of the Global Hawk is an average of 30 hours, this number was multiplied by 541 (the number of missions), for a total of 16,230 hours. This total was then used to derive the equivalent "Class A mishap rate" for the Global Hawk. The average number of flying hours, 100,000, was divided by 16,230 to arrive at a 6.16 Class A mishap rate equivalent for the Global Hawk aircraft. Table 4.2-1 provides a comparison of Class A mishap rates for the Global Hawk and the predominant aircraft at each of the five alternative bases.

Table 4.2-1 Comparison of Class A Mishap Rates for Global Hawk and Dominant Aircraft

Base	*Dominant Aircraft*	*Class A Mishap Rate*[1]
	Global Hawk	6.162
Beale	U-2	7.17
Edwards	F-16	4.43
Ellsworth	B-1	3.75
Tinker	E-3	0.19
Wright-Patterson	C-141	0.33

[1] Per 100,000 flying hours.

[2] This represents aircraft loss rate based on the system reliability test and analysis; Global Hawk has insufficient flight time to calculate mishap rate.

The mishap rate would be higher for the Global Hawk at four bases (Edwards, Ellsworth, Tinker, and Wright-Patterson AFBs) than it is for the current predominant aircraft. These representative aircraft have logged more flying hours, are older, and have, through time and mission hours, gained a lower mishap rate. Beale AFB is the only alternative that would have an aircraft with a higher mishap rate than that estimated for the Global Hawk.

For each of the five alternative bases, the proposed action would increase airfield operations by 1,248 annually upon completion of the beddown of two squadrons by 2008. These proposed operations would represent a small increase of total activity at the five alternative bases. Therefore, the potential for bird strikes would increase only minimally as well. Table 4.2-2 provides the estimated annual bird-aircraft strikes based on the addition of 1,248 Global Hawk operations at the airfields (refer to section 2.2.1).

The potential for bird-aircraft strikes would increase minimally under the proposed action.

Table 4.2-2 Comparison of Projected Bird-Aircraft Strikes Among Alternative Bases[1]

Base	*Baseline Annual Airfield Operations*	*Baseline Average Bird-Aircraft Strikes/Year*	*Projected Global Hawk Airfield Operations*	*Projected Annual Bird-Aircraft Strikes/Year*
Beale	51,825	13.8	1,248	14.1
Edwards	52,607	17	1,248	17.4
Ellsworth	54,600	16	1,248	16.4
Tinker	57,000	45	1,248	46.0
Wright-Patterson	40,251	32	1,248	33.0

[1] 1995 to 1999 data including airfield and airspace bird strikes.

The small number of Global Hawk airfield operations relative to the total operations at each base would not measurably contribute to the potential for BASH at any location. The Global Hawk would spend minimal time below 3,000 feet AGL (approximately 4 minutes each for takeoff and landing). The aircraft would spend most of its time at or above 50,000 feet MSL, well above bird flight levels. As was mentioned in section 3.2, the Air Force uses the Bird Avoidance Model to define the

seasons, altitudes, and locations during which bird activity is heaviest. The Air Force would use these data to plan the Global Hawk flight route to avoid the potential for bird-aircraft strikes.

Under the no-action alternative, as described in section 3.2, baseline conditions would remain unchanged. Consequently, neither airspace management nor air safety would be impacted if the no-action alternative were implemented.

4.3 NOISE AND LAND USE

Implementing the proposed Global Hawk beddown at any of the five alternative bases would result in additional airfield operations and construction of facilities, but cumulative noise conditions for the bases would not change from present conditions and proposed construction would be consistent and compatible with base and land-use plans and constraints.

The analysis of noise from Global Hawk airfield operations considered the number of operations projected for the Global Hawk, its flight profiles, and the noise generated by an individual aircraft. For each of the five alternative bases, the proposed action would increase airfield operations by 1,248 annually once the beddown of the two squadrons was completed in 2008. These proposed operations would represent a small percentage (about 2 to 3 percent) of the total activity at the five alternative bases (refer to Figure 2.2-2).

The small number of Global Hawk airfield operations relative to the total operations at each base would not measurably contribute to the cumulative (DNL) noise levels for any location. The Global Hawk would not perform flights within a pattern over the airfield, low-approaches, or "touch and go" maneuvers as many of the other aircraft using these bases do. Global Hawk operations also minimize the potential to increase noise levels since the aircraft would spend relatively little time (about 4.5 minutes per mission) flying in the airfield environment.

Beddown of the Global Hawk would not increase cumulative noise levels at any of the bases.

The Global Hawk aircraft generates relatively low noise levels in comparison with other aircraft using these bases. Table 4.3-1 shows a comparison of SELs for the Global Hawk at various altitudes with SELs for the dominant aircraft performing the most operations at each of the five bases. Each of these dominant aircraft generates SELs 18 to 27 dB higher than the Global Hawk does, depending on the altitude.

Table 4.3-1 SELs (dB) for Various Altitudes (feet AGL) for Representative Aircraft at each Alternative Base[1]

Base	*Aircraft Type*	*500*	*1,000*	*2,000*
	Global Hawk	92	87	81
Beale	U-2	116	110	104
Edwards	F-16	116	110	104
Ellsworth	B-1	119	113	106
Tinker	E-3	115	109	102
Wright-Patterson	C-141	112	106	99

[1]Uses takeoff power settings

Due to the logarithmic nature of dB (refer to Appendix A), an aircraft generating noise levels 10 dB or more below another aircraft in the same area would not be discernable to the human ear, nor contribute to the cumulative noise levels (DNL). Given that the Global Hawk would account for such a small proportion of the total operations at any of the five bases and that its SEL is more than 10 dB lower than other major users of the airfields, no perceptible change to the overall noise environment would result from the proposed beddown. The noise contours (refer to Table 3.3-2) for each of the bases would not change either under the proposed action or no-action alternative.

On-Base Land Use. Land use on the bases would not be negatively impacted by the proposed beddown. Cumulative (DNL) noise levels for the bases would not change from baseline conditions. Global Hawk airfield operations would not require alterations to the size, location, or orientation of the CZs or APZs.

Proposed construction of facilities to support the beddown would vary among the five bases. Tinker AFB would require the most construction, with eight proposed facilities affecting 0.11 percent of the base. The least construction and disturbance would occur at Ellsworth AFB, where one new facility would affect about 0.02 percent of the base. Since such small areas of each base would be altered by new construction, sufficient space would remain for future development, and existing land uses would not be encroached upon.

No conflicts with existing on-base land uses would result from the proposed construction at any of the bases. The proposed facilities would be located within areas with compatible and functionally related land uses (refer to section 2.2-3). These locations would be consistent with the requirements of base land-use plans (refer to Table 3.3-1) and avoid areas designated for the preservation or management of natural and cultural resources.

Off-base land use would not be impacted by the proposed beddown.

Under the no-action alternative, no construction or effects on land use would occur.

Off-Base Land Use. As noted above, cumulative noise levels and the areas they currently affect would not change at any of the five bases under the proposed action or no-action alternative. Neither Beale, Edwards, nor Wright-Patterson AFBs have or would have issues with incompatible land uses and noise levels. Land-use plans and zoning ordinances protect the areas around Beale and Wright-Patterson AFBs from encroachment, and the affected area for Edwards AFB lies wholly within base boundaries.

At Ellsworth AFB, the current issue with incompatible land use (Box Elder) southeast of the base would continue under the Global Hawk until the actions defined in the *Ellsworth AFB Joint Land Use Study* are completed. However, the noise levels affecting the off-base commercial and residential land uses near Ellsworth AFB result from B-1 aircraft activity; noise from Global Hawk operations would be imperceptible.

If the proposed action occurs at Tinker AFB, residential areas and mobile home parks north and northwest of the base would continue to be affected by noise levels of 70 DNL or more. Once again, the Global Hawk operations would not contribute measurably to this existing compatibility issue.

4.4 HUMAN RESOURCES

Analysis indicates that the one-time cost of construction and yearly expenditures on Global Hawk aircraft operations and maintenance for personnel, equipment, and facilities would not adversely affect local economies and jurisdictions associated with the five bases. For this analysis, the primary measures by which socioeconomic impacts were assessed include changes to population, employment, and income associated with the proposed alternatives. The details of the methodology, assumptions, and calculations are discussed in Appendix B. This analysis was based on a conservative approach; actual impacts on socioeconomics would likely be less.

Potential impacts to the primary population-driven resources, housing and schools, were also assessed. Local real estate agents, school district staff, and community leaders were interviewed to determine existing housing market and educational system capacities and constraints.

Construction. As described in section 2.2.3 and Table 2.2-6, various construction projects would be necessary at each base to support the action alternatives. Those bases requiring more construction (Tinker and Beale) would generate greater construction revenues and higher indirect revenues than would the other three bases (Table 4.4-1). Overall, in the short term (2 to 7 years depending on the base), construction activities would benefit the local economies associated with the five bases.

Table 4.4-1 Comparison of Economic Effects of Proposed Construction

Base	*Square Feet Construction*	*Duration*	*Construction Expenditures*	*Construction Jobs*	*Indirect Jobs*	*Indirect Output*	*Indirect Earnings*
Beale	102,000	2004-2007	$21.3M	25	301	$36.2M	$9.1M
Edwards	73,500	2004-2006	$16.5M	16	327	$35.6M	$10.0M
Ellsworth	55,000	2004	$10.0M	23	265	$18.3M	$5.7M
Tinker	241,500	2004-2007	$32.0M	43	931	$66.5M	$21.2M
Wright-Patterson	77,000	2004-2006	$19.0M	18	391	$35.0M	$10.0M

Construction activities would generate between $10 million (Ellsworth) and $32 million (Tinker) in the affected areas. These activities would employ an average of 16 (Edwards) to 43 (Tinker) construction workers at any one time. For all five alternatives, sufficient skilled workforce and capabilities exist to meet construction labor needs; direct construction labor would represent from less than 0.01% to 0.03% of current employment. Population would not be expected to increase from

construction activities. Indirect short-term jobs (such as those in the service industry) would range from 265 (Ellsworth AFB) to 931 (Tinker AFB) and would also come from the local labor pool. No in-migration to fill these few jobs would be anticipated.

Indirect short-term jobs would range from 265 at Ellsworth AFB to 931 at Tinker AFB.

Indirect output, consisting of goods and services and other related revenues associated with construction expenditures and earnings, varies in direct relationship to construction expenditures. Ellsworth AFB would have the lowest ($18.3M), with Tinker AFB generating the highest ($66.5M). Construction at the other three bases would result in similar amounts of indirect output (around $35M).

Indirect jobs would generate additional earnings in the affected area for each base. These earnings would represent less than 1 percent of total current personal income for each area. This temporary increase in economic activity would be easily absorbed by the local economies.

Operations. The Global Hawk beddown would create 918 new positions. The number of dependents accompanying these new workers would be 1,652 (including 367 school-age children). Therefore, the total number of personnel and dependents would be 2,570 (Table 4.4-2).

Table 4.4-2 Total Personnel and Dependents[1]

Personnel	918
Under School-age and Adult Dependents	1,285
School-age Children Dependents	367
Total Dependents	1,652
Total Personnel and Dependents	2,570

[1] Appendix B includes detailed support data.

Annual salaries would be approximately $22.6 million. Operations and maintenance costs would average $47.2 million annually.

New employment positions would enter the economy over a 12-year period. Approximately 50 to 200 new positions would be filled each year until beddown is complete in 2012 (see Table 2.2-1). Such increases would result in approximately 140 to 560 new people moving to the area each year, including 20 to 80 school-age children. Expenditures for salaries and operations and maintenance costs would be phased over the twelve-year period. These expenditures would continue through the life of the proposed Global Hawk program.

In the long term, operations and maintenance expenditures would increase revenues, direct and indirect job growth, direct and indirect output, and direct and indirect earnings (Table 4.4-3).

Total increases in population would range from 0.3 percent to 2.4 percent, depending upon the base. Such increases fall well below the current growth rate for the affected areas for the bases except Tinker AFB. In the communities around Tinker AFB, population growth is static. However, the addition of up to 2,570 people would still represent only 0.3 percent of the total population in the area.

Table 4.4-3 Comparison of Economic Effects of Operations [1]

Base	*Population Increase (%)*	*Direct Jobs*	*Indirect Jobs*	*Direct and Indirect Output ($)*	*Direct and Indirect Earnings ($)*
Beale	0.6	918	755	146.3M	46.7M
Edwards	0.5	918	1,144	172.8M	59.2M
Ellsworth	2.4	918	1,580	150.1M	55.8M
Tinker	0.3	918	1,738	170.4M	61.4M
Wright-Patterson	0.3	918	1,186	148.0M	53.2M

[1] See Appendix B for detailed analysis.

Given the phasing of the proposed action over 12 years, the minimal increases in population would not be expected to affect local housing markets or school districts. The influx of new households and children would be within normal demographic fluctuations for the affected areas associated with the five bases.

The number of indirect jobs (such as those in a retail and service industries) would increase by about 1 to 2 percent in the affected areas for the bases. The local labor pool would be expected to absorb this additional demand, especially when it is phased over 12 years. Unemployment rates are not expected to change, nor is labor expected to be brought in.

Beddown of the Global Hawk would generate long-term earnings ranging from about $47M to $61M.

Long-term increases in direct and indirect output and earnings would occur as a result of the beddown. The affected areas for Tinker and Edwards AFBs would receive the largest amounts of earnings and output, whereas the area around Beale AFB would receive the least. In all cases, the increased amount of earnings (under either staffing option) would represent less than 1 percent of current personal income for the affected areas. The local communities would easily absorb these additional revenues into their economies.

Under the no-action alternative, these increases to revenue, jobs, and earnings would not occur due to Global Hawk construction and operations.

4.5 PHYSICAL RESOURCES

AIR QUALITY

Criteria to determine the significance of increases in air emissions are based on federal, state, and local air pollution standards and regulations. The emissions would be significant from any alternative of the proposed action if they: 1) increase ambient pollution concentrations from below to above any applicable NAAQS, 2) contribute to an existing violation of any NAAQS, 3) impair visibility within federally mandated Prevention of Significant Deterioration (PSD) Class I areas, or 4) result in nonconformance with the Clean Air Act or a SIP.

Determining the effects of the proposed action on air quality and visibility involved two basic steps. First, aircraft emissions were calculated for the affected areas in each alternative base (in tons per year) to determine increases or decreases relative to the baseline conditions and to qualitatively assess the potential for exceedances of the NAAQS. Second, these total emissions were compared to *de minimis* levels in regions and districts either in nonattainment or in a maintenance area. By evaluating projected emissions generated at each base, it was possible to compare the results to

the regional air emissions or *de minimis* levels. If these emissions did not exceed *de minimis*, no significant affects to air quality were anticipated because the proposed action would not violate the SIP. If the base was in an attainment area, then the increased emission were compared to regional air emissions for the surrounding area. Existing ambient criteria pollutant concentrations in the air districts are measured using air quality monitoring stations operated by EPA or by local air pollution or air quality management districts. The degree of monitoring and the levels of additional pollutants necessary to cause a significant effect to air quality depends upon whether the region or district is in attainment.

Both direct and indirect emissions were calculated to analyze the impact of the proposed action. Potential sources of direct emissions include facility construction, maintenance activities, on-site government vehicle travel, and aircraft operations. Flight operations occurring below the mixing height (assumed 5,000 feet AGL, except at Edwards AFB assumed at 3,000 feet AGL) would generate air emissions as a result of takeoffs and landings, taxiing, and idling. Emission estimates have been based on the following assumptions. The proposed action would involve a buildup of 18 Global Hawk UAVs with single Rolls Royce Allison AE3007 engines for a total of 624 sorties by 2012. It is estimated that approximately 5 minutes out of the total 30 hours of flight time would occur below 5,000 feet AGL.

Analysis of air quality impacts evaluated emissions from aircraft, construction, and motor vehicles.

Indirect emissions were calculated from personally owned vehicles added to the bases as part of the increase in personnel. Commuting emissions associated with the 918 additional personnel account for a large portion of the total emissions from the proposed action. Differences in final build-up emissions by base are due primarily to differences in commuting distances for personnel at the various bases. The longest off-base commute distance is for Edwards AFB (with daily commutes of 50 miles roundtrip), with Beale AFB requiring a 30-mile roundtrip. Ellsworth, Tinker and Wright-Patterson AFBs all have plentiful housing in nearby towns (within a 15-mile roundtrip commute). On-base commuting distances from base housing to the flight line at Edwards and Beale AFBs were also significantly higher than for other bases. One-way distances from base housing to the flight line were estimated as 7 miles for Beale AFB and 8 miles for Edwards AFB.

Air emissions from the various sources were calculated for all years of the beddown transition as well as for the final build-up in 2012. Detailed calculations and emissions for each year are included in Appendix C. A short-term degradation in air quality may be experienced during construction activities. Fugitive dust emissions (i.e., PM_{10}) could be generated by grading areas or driving off established paved roadways. Use of associated motor vehicles and construction equipment could cause degradation in air quality from engine emissions.

Table 4.5-1 summarizes the total air emissions for the Global Hawk proposed action upon final build-up at all bases. The total direct and indirect emissions from the action alternative(s) are below the *de minimis* thresholds specified in 40 CFR 93.153 (b)(1) (Table 4.5-1) for all areas in nonattainment or maintenance for criteria pollutants. Therefore, a conformity determination in accordance with 40 CFR 91.153 (c) (1) is not required.

Emissions from Edwards AFB occur within three air quality districts: the Kern County APCD, Mojave Desert AQMD, and Antelope Valley APCD. The proposed action has stationary source emissions and aircraft emissions that are under the jurisdiction of Kern County APCD and mobile source emissions, which affect both the Antelope Valley APCD and the Mojave Desert APCD. Since a large portion of

Table 4.5-1 Total Air Emissions for Global Hawk atFinal Build-up at all Bases (tons/year)

Base	*CO*	*NO_x*	*VOCs*	*SO_x*	*PM_{10}*
Beale	86.9	16.4	10.6	0.8	0.5
Edwards					
Kern County APCD	62.8	16.3	8.3	0.7	0.5
Mojave Desert AQMD	3.4	0.9	0.5	0.04	0.03
Antelope Valley APCD	28.6	7.4	4.2	0.3	0.3
Ellsworth	46.4	11	4.9	0.4	0.3
Tinker	44.6	12.7	5.1	0.4	0.3
Wright-Patterson	48	10.8	5.1	0.4	0.5

the emissions from the proposed action is from mobile sources, emissions for Edwards AFB are apportioned among the affected air quality jurisdictions and then compared to *de minimis* thresholds for each district. All stationary sources, construction operations, and flight activities are assumed to occur within the boundaries of Kern County APCD. Emissions from personal vehicles are apportioned based on residency of base employees by county (USAF 1997g). An estimated 34.6 percent of employees reside in Los Angeles County Antelope Valley APCD, 4.1 percent reside in San Bernadino County Mojave Desert AQMD, and the remaining 61.3 percent live in Kern County APCD.

Emissions from the proposed action would fall below de minimis thresholds at all five bases.

Emission calculations for each base by year (2001 through 2012) can be found in Appendix C and are summarized for the final build-up year (2012) in Table 4.5-2. Total emissions at the bases would increase from 1 to 17 percent depending upon the pollutant in 2012. The greatest increases in pollutants occur in CO and NO_x at Beale AFB and CO at Ellsworth AFB. These increases are primarily derived from visitor vehicle emissions. When the increases in CO and NO_x are compared to the regional emissions for their respective counties, these increases only comprise 0.2% of the regional emissions inventories (EPA 2000b).

Table 4.5-2 Summary of Projected Total Emissions (tons/year)

Base	*CO*		*NO_x*		*VOCs*		*SO_x*		*PM_{10}*	
	Total	*Increase*	*Total*	*Increase*	*Total*	*Increase*	*Total*	*Increase*	*Total*	*Increase*
Beale	1,074.7	8.8%	233.1	7.6%	713.9	1.5%	27.6	2.9%	24.1	2.1%
Edwards[1]	1,582.5	4.1%	393.3	4.3%	401.3	2.1%	38.6	1.8%	19.4	2.6%
Ellsworth	312.9	17.4%	316.4	3.6%	37.5	14.9%	8.2	4.7%	16.2	1.9%
Tinker	1,559.8	2.9%	434.2	3.0%	621.1	0.8%	10.5	3.9%	53.4	0.6%
Wright-Patterson	3,154.8	1.5%	398.4	2.9%	1,174.2	0.4%	31.9	1.3%	210.2	0.2%

[1]Kern County APCD Emissions

Because of the current and potential future power shortage in California, Beale AFB and Edwards AFB have initiated energy conservation measures at all facilities and readied backup generators at mission-critical facilities (e.g. airfield lighting, control tower, hospital). If necessary, electrical outages would be covered for the mission-critical facilities with standby generators at both bases. Non-mission-critical facilities (commissary, gym, theater) could be closed if necessary for the duration of any outages. All of these generators produce air emissions.

Beale AFB and Edwards AFB have air quality permits for monthly testing of equipment and for emergency operations such as those described above. Larger on-

base power plants at PAVE PAWS and Building 2145 at Beale AFB also have permits to support additional hours of operation if required. Edwards AFB would need air nonattainment permit waivers if it exceeded allotted hours per year. Use of these generators is closely monitored to ensure that current air permits are not exceeded. Additional Global Hawk operations would not result in the need to operate generators for mission-critical facilities beyond the levels currently permitted.

The proposed action would comply with all applicable federal, state, and local laws and regulations. Compliance with standard Air Force policies relating to best management practices further reduce potential effects due to criteria pollutant air emissions. Therefore, no significant impacts are expected.

The proposed action would also generate small quantities of HAPs from maintenance, operations, and construction. Compliance with Title V of the CAA, all CAA Title III, Hazardous Air Pollutant requirements or any more stringent State or local requirements, and California AB 2588 would reduce any impacts to insignificant levels.

No impairment of visibility in PSD Class I areas would occur as a result of the Global Hawk beddown. Criteria to determine significant impacts on visibility usually apply to stationary sources; mobile sources are generally exempt from permit review. The negligible potential for the aircraft to contribute to existing air quality in the area above 5,000 feet AGL and the small amount of time spent below 60,000 feet MSL make the possibility of visible atmospheric discoloration at the Class I areas within 40 miles of Ellsworth AFB extremely remote.

Under the no-action alternative, none of the construction activities, personnel relocation, or aircraft operations proposed for the Global Hawk program would occur at any of the bases considered in this EA. Air pollutant emissions would remain unchanged from baseline conditions described in section 3.5.

HAZARDOUS MATERIALS AND WASTE

A potentially significant impact from hazardous materials and/or hazardous waste would only be expected if hazardous materials used or generated by the project constitute a substantial increase in human health risk or threat to the environment. An increase in the quantity or toxicity of hazardous materials and/or hazardous waste handled by a facility may also signify a potentially significant impact, especially if a facility was not equipped to handle the new waste streams. All bases considered in this EA are large-quantity generators of hazardous waste, and all bases generate waste (in excess of 24,000 lbs of hazardous waste per year) streams typical of aircraft operations and maintenance activities. Therefore, this assessment of impacts focuses on what degree the alternatives would affect hazardous materials management practices, hazardous waste generation rates, and waste handling and disposal compared to current practices. A comparative analysis between existing and proposed hazardous materials and waste management practices was used to evaluate impacts.

Specific hazardous waste generation rates were not currently available for the Global Hawk. However, data on hazardous materials usage were obtained from Global Hawk personnel at Edwards AFB (personal communication, MSgt. Jordan, September 2000). The Global Hawk UAV uses very small quantities of hazardous materials and generates minimal hazardous waste. Table 4.5-3 summarizes the

Table 4.5-3 Hazardous Materials List for the Global Hawk Aircraft[1]	
Item Name	*Use Per Year*
Isopropyl alcohol	20 gallons (130 lbs)
Anti-seize lubricant	12 pints (9.75 lbs)
Sealant and accelerator	12 kits
Grease aircraft	12 tubes
Accelerator (diethylene triamine)	10 kits
Acetone	20 gallons (130 lbs)
Lubricant organic mixture	12 cans
Sealant and accelerator	12 kits
Epoxy resin	10 gallons
Thread locker	12 bottles
Sealant and accelerator	36 kits
Liquid acrylic adhesive	7 bottles
Super glue adhesive remover	2 bottles
Petroleum grease	12 tubes
Pump spray cleaner	12 each
Filler	12 kits
Hardener (cream)	12 kits
Sandable primer (white)	24 cans
Semi flat black paint	24 cans
Quick dry spray lacquer gloss white	24 cans
Anaerobic thread sealant	3 cans
Rubber and gasket adhesive	24 cans
Protective coating	12 pints
Anti-seize and lubricating compound	12 cans
Water-based sprayable silver	12 pints
Multi-purpose sealant, clear white	12 tubes
Adhesive	6 cans
Leak detector	12 quarts
Adhesive and accelerator	12 kits
Putty	5 cans
M-bond 200 adhesive kit	12 kits
Rosin solvent	3 cans
Silicone primer	12 cans
Hydraulic fluid	12 pints (9.75 lbs)
Engine oil	12 cases (36 gallons, 234 lbs)
Aircraft gas	As required for flight

[1] Hazardous waste = 513.5 lbs/4 aircraft = 128 lbs per aircraft

hazardous materials utilized by the Global Hawk testing project at Edwards AFB. Hazardous waste potentially generated by the Global Hawk maintenance activities include small quantities of fuel- and/or solvent-laden rags/absorbent and used oil and/or hydraulic fluid. While used oil is not an EPA-classified hazardous waste, it is considered a hazardous waste in California.

A conservative estimate of 128 pounds per aircraft per year was calculated as the maximum amount of hazardous waste generated from the Global Hawk mission if all hazardous materials resulted in hazardous waste. The quantity per aircraft per year was developed based on the hazardous material purchase records for the four existing Global Hawk aircraft located at the Edwards AFB testing center. The estimate was based on solvent (isopropyl alcohol and acetone), lubricant, engine oil, and hydraulic fluid usage, assuming that the entire quantity of the materials used were subsequently manifested as hazardous waste.

The Global Hawk would generate between .02 and 5 percent of total base hazardous waste, depending on location.

The Global Hawk beddown is scheduled to support up to 18 aircraft; a conservative estimate of Global Hawk hazardous waste generation is 2,304 lbs per year (128 lbs times 18 aircraft). Each base considered in this EA generates between 45,000 and over 9,000,000 lbs per year of hazardous waste. Beale AFB and Tinker AFB both generate quantities in excess of 1,000,000 lbs per year. The amount of hazardous waste generated by the Global Hawk program would be conservatively estimated at between a 0.02 and 5 percent increase for the bases considered in this EA (Table 4.5-4).

Table 4.5-4 Summary of Hazardous Waste Generated by the Proposed Action

Base	*Total Annual Waste (lbs/year)*	*Percent Increase*
Beale	1,145,789	0.20%
Edwards	604,014	0.40%
Ellsworth	45,838	5.00%
Tinker	9,337,400	0.02%
Wright-Patterson	379,179	0.60%

In addition, all Air Force bases have active recycling programs for oil, rags, batteries, and petroleum products. Recycling these materials further reduces hazardous waste. Personnel at Wright-Patterson AFB were contacted regarding hazardous material usage and generation for the 47th Alpha C-21 (Learjet) operations. Hazardous material usage for the C-21 mission is similar in nature to usage for the Global Hawk with small amounts of touch up paint, solvent, grease, engine oil, and hydraulic fluid being used. It is reported that no EPA hazardous materials are generated for the C-21 mission (personal communication, John Banford, September 2000).

No new types of waste are anticipated from this program and the added hazardous waste would not affect current hazardous waste management procedures or generator status for any of the bases.

Management protocols for hazardous substances related to Global Hawk would follow existing regulations and established procedures. If any new waste streams are identified after the Global Hawk beddown program is finalized, the appropriate transportation, storage, and disposal procedures would be implemented; modification of the selected base's RCRA Part B permit may be necessary.

Under the no-action alternative, the bases would continue to use hazardous materials in essentially the same manner and quantity as is their current practice. Existing procedures for the centralized management, procurement, handling, storage, and disposal of hazardous materials used on each base would remain unchanged. The types and amounts of hazardous waste generated by each base would continue without change under this alternative.

SOILS AND WATER

Construction activities involve removal of vegetation or paved surfaces and exposure of underlying soil to wind or water erosion. Wind erosion can cause nuisance or unhealthful fugitive dust, while water erosion can result in sedimentation in streams or surface impoundments (ponds and lakes). Sediment released into waterways can degrade water quality by releasing nutrients, metals, and organic matter into solution and impede water flow or inundate biological habitat.

Based on soil types and weather conditions, differences in erosion potential between areas within each base, and between bases, do occur. On-base drainages also differ in the degree to which they contain sensitive wetland habitat. Erosion during construction and subsequent sedimentation in downgradient drainages could be a significant impact at any of these five bases. The Air Force has policies and procedures to minimize erosion and prevent adverse effects to drainages and wetlands.

The area of disturbance for the proposed project is greater than 5 acres, and on-base construction is subject to conditions of existing basewide National Pollutant Discharge Elimination System (NPDES) permits. Therefore, preparation of a *Storm Water Pollution Prevention Plan* (SWPPP) specific to the project would be required. The SWPPP would be prepared prior to construction of the chosen alternative and would specify BMPs to reduce or eliminate significant erosion and sedimentation impacts. Similarly, BMPs will be implemented pursuant to the SWPPP to reduce fugitive dust during construction.

Under the no-action alternative there would be no additional construction or modification of structures and no impacts to soils and water quality.

4.6 NATURAL RESOURCES

The area analyzed for potential impacts from the Global Hawk beddown include the bases and a 5-mile radius around the runways. Potential impacts at the base include habitat and wetlands disturbance or destruction. In the overflight (5 NM radius) region, impacts would be limited to those associated with the visual effect of the approaching and departing aircraft and with associated subsonic noise. Plant species or wetlands would not be impacted since no ground-disturbing activities are associated with overflights.

In the overflight region, plants and wetlands would not be impacted, since no ground disturbance would occur.

Any visual impacts would be most likely to occur for flights below 1,000 feet AGL, the altitude accounting for most reactions to visual stimuli by wildlife (Lamp 1989, Bowles 1995). The USFWS also considers aircraft flight below 2,000 feet AGL a potential concern for listed species or species of concern. The 5-mile radius is the distance (in any direction from the base) that the Global Hawk would need to reach an altitude of 2,000 feet AGL after takeoff or landing; this area encompasses areas with which the USFWS are concerned and those areas potentially affected by noise or visual impacts.

Studies on the effects of noise on wildlife have been predominantly conducted on mammals and birds. Studies of subsonic aircraft disturbances on ungulates (e.g., pronghorn, bighorn sheep, elk, and mule deer) in both the laboratory and the field have shown that effects are transient and short lived. They suggest that animals habituate to the sound (Workman *et al.* 1992; Krausman *et al.* 1993, 1998; Weisenberger *et al.* 1996). Similarly, the impacts to raptors and other birds from low-level flights by aircraft were found to be brief and insignificant and not detrimental to reproductive success (Smith *et al.* 1988, Lamp 1989, Ellis *et al*. 1991, Grubb and Bowerman 1997).

In addition, even at peak operational activity, the Global Hawk is not expected to average more than two flights per day, six days per week, at any of the proposed locations. Based on the speed and angle of departure and landing, the average amount of time the Global Hawk would spend at or below 2,000 feet AGL would be approximately 8 minutes a day. Furthermore, the Global Hawk aircraft would generate noise levels at least 20 dB below other military aircraft at any of these bases (section 3.3) and would not significantly contribute to the noise environment already found at any of the five proposed locations. Therefore, the Global Hawk would not adversely affect wildlife, threatened or endangered species, or species of concern within the 5-mile radius, 2,000 feet AGL affected environment.

Flight operations and associated noise would not impact wildlife on or near the bases.

Table 4.6-1 shows a comparison of natural resources that are found within approximately 3,000 feet of construction sites. These resources are noted because of

Table 4.6-1 Possibility for Construction Impacts to Natural Resources

Base	*T & E Species*	*Species of Concern*	*Wetlands*	*Sensitive Habitats*	*Comments*
Beale	No	No	No	No	Construction to take place in developed areas with landscaping or intensive mowing.
Ellsworth	No	Yes	Yes	No	Possible disturbance to burrowing owl, a species of concern, if construction doesn't take place on the pavement. Wetlands located adjacent, but not on construction areas.
Edwards	Yes	No	No	No	No known tortoise populations on the construction site; however, a final site survey would be performed.
Tinker	No	No	No	No	Species of concern located one mile away and not on the construction site.
Wright-Patterson	Yes	Yes	No	No	Upland sandpiper nesting area located adjacent to construction area. Indiana bat habitat located north of construction area along river.

their location, and they may not be impacted at all by implementation of the Global Hawk beddown.

Vegetation and Wildlife. Potential impacts to vegetation, wetlands, and wildlife would be limited to areas affected by construction on base. No species of concern, wetlands, or sensitive habitats are located on any of the proposed construction sites.

All of the areas considered for construction at Beale AFB are developed areas with landscaping or mowed grass. The site by Building 1086 is surrounded by other facilities, and renovation is not expected to significantly affect vegetation and wildlife. The site on the western edge of the main base and in the center of the housing area is mowed grassland. None of these sites contain wetlands or sensitive species. Therefore, impacts from construction activities would be negligible.

No species of concern, wetlands, or sensitive habitats are located on the proposed construction sites.

Construction at Edwards AFB would take place in developed or disturbed areas on the base, weedy fields, landscaped areas, and scattered saltbush scrub. These areas provide little value to wildlife in the region. Therefore, no significant impacts due to construction activities are anticipated.

The area proposed for construction at Ellsworth AFB is paved or has mown grasses by the runway. This area could be visited by sensitive species travelling through the area. Sensitive species are unlikely to be affected by the action if all construction occurs on the pavement. However, if off-pavement construction occurs, the burrowing owl could be impacted by nesting habitat loss due to prarie dog burrow disturbance. A site inspection prior to construction would eliminate this concern.

Two wetlands have been identified at Ellsworth AFB in the vicinity of the flight line apron where there is planned Global Hawk construction. However, these areas are not located on the construction site and would be avoided.

Tinker AFB has remnant prairie grassland and woodlands in the family housing area. Efforts would be taken to avoid these areas, if possible, when siting the facilities to preserve these resources that are no longer relatively plentiful in the area. If these areas are to be used, consideration would be given to mitigating the loss of this habitat by replacing it elsewhere on a one-to-one basis.

Construction on the alert apron of the flight line is likely to have no effect on natural resources, as long as careful construction practices are used to keep construction runoff from flowing into Crutcho Creek to the southwest of the runway if the work is to be accomplished in adjacent areas.

Construction is planned for urban and grassland areas on the base. No known wetlands exist on either of these sites. Erosion-control measures would keep all construction-related effects from flowing into the surrounding habitats, including the river habitat that runs along the northern boundary of the base. Therefore, no important vegetation or wildlife impacts are expected to result from the construction activities.

Threatened and Endangered Species. As previously stated, because of the small amount of time spent in the airspace and noise generated relative to already occurring flights, the Global Hawk program would not adversely affect any threatened or endangered species during operations of the aircraft.

No threatened or endangered species are currently known on any of the proposed construction sites. However, at Edwards and Wright-Patterson AFBs, species are adjacent to or could travel through construction areas.

Construction activities are unlikely to affect the desert tortoise at Edwards AFB due to the lack of suitable habitat around the sites. However, because of the mobility of the species, there is a slight possibility that a transient tortoise may wander near the dormitory construction site. Therefore, to prevent any potential effect on a transient tortoise, an approved biologist would survey the site prior to construction. All construction personnel are also required to attend a desert tortoise education briefing. The briefing would cover adherence to the terms and conditions of the "Biological Opinion of Routine Operations and Facility Construction within the Cantonment Areas of Main and South Bases, Edwards Air Force Base, California" (USFWS 1991). This training helps to ensure compliance with the ESA and avoid any potential effects from contruction activities and aircraft operations within the flight-line area.

No threatened or endangered species occur in areas of proposed construction.

At Wright-Patterson AFB, the upland sandpiper, a state-listed threatened species, is known to occur in an area adjacent to where the Global Hawk construction activities would occur (refer to Figure 3.6-5). The airfield is ideal habitat for this rare summer migrant, and it historically nested in the area. This species should not be disturbed from May to July during construction activities. If a nest is established near the construction site, a qualified biologist would survey the site to see whether construction activities are disturbing the nest site. If the adult birds are agitated because of the construction activities in the area, work would stop until the young fledged.

The Indiana bat, a species federally listed as endangered, has habitat adjacent to the construction site along the river. Although the bats were observed further south on Wright-Patterson AFB, personnel would be instructed to avoid Indiana bat habitat near the construction site so that the bats would not be disrupted. If these cautions are followed, no adverse effects would occur from the Global Hawk activities.

Additional listed species are known to occur on Wright-Patterson AFB. However, these species are present despite the daily aircraft overflight operations occurring there. The addition of two sorties per day by the relatively quiet Global Hawk would not noticeably change the biotic environment of the region. Therefore, the Global Hawk operations would not have an adverse effect on sensitive species in the area.

Under the no-action alternative, baseline conditions, as described in section 3.6, would remain unchanged. Consequently, no natural resources would be negatively affected (or impacted) if the no-action alternative were implemented.

4.7 CULTURAL RESOURCES

Procedures for assessing adverse effects to cultural resources are discussed in 36 CFR 800, regulations for the National Historic Preservation Act. An action results in adverse effects to a cultural resource eligible to the National Register when it alters the resource's characteristics that qualify it for inclusion in the National Register. Adverse effects are most often caused by physical destruction, damage, or alteration of a resource; alteration of the character of the surrounding environment that contributes to the resource's significance; introduction of visual, audible, or atmospheric intrusions out of character with the resource or its setting; neglect of the resource that leads to its deterioration or destruction; or transfer, lease, or sale of the property out of federal ownership.

For this EA, impacts to cultural resources are evaluated for areas in the vicinity of construction on the bases and for the area within 5 NM of the flight line. The proposed action is most likely to affect cultural resources during proposed construction. Overflight of aircraft below 2,000 feet AGL could affect the audible or visual setting of the significant resource, but the probability of adverse effects is slight. The Global Hawk generates little noise compared with other aircraft at the base and flies below 2,000 feet AGL less than 1 percent of the time. Damage to resources from vibrations is unlikely. Aircraft must generate a maximum sound level of at least 120 dB from a distance of no more than 150 feet to potentially damage structures (Battis 1988). The Global Hawk would generate about 100 dB at 150 feet.

Ground-disturbing activities would occur in areas already disturbed, usually adjacent to existing structures (refer to Figures 2.2-1 through 2.2-5). At each of the bases, certain buildings would be used in their current condition. At Beale AFB, two buildings would be renovated (Table 4.7-1).

Table 4.7-1 Reused or Renovated Structures for Global Hawk	
Base	*Structures and Facilities*
Beale	1025, 1086: to be renovated 1023, 1200, 1074: used in current condition
Edwards	1207, 1250, 1260, 1217, 151: used in current condition
Ellsworth	901, 902, 903, 1009, 1010, 1012, 7504 (PRIDE Hangar), 7510: used in current condition
Tinker	AWACS Apron: used in current condition
Wright-Patterson	93, 101, 105, 206, 268: used in current condition

Significant cultural resources would not be adversely affected at any of the five bases.

Beale AFB. No adverse impacts to significant cultural resources would occur under this alternative. The buildings to be renovated or reused are not historically significant. The ground would not be disturbed in areas with significant archaeological resources. No Native American concerns have been expressed although consultation is ongoing. No properties listed in the National Register occur in the area around the base.

Edwards AFB. No adverse impacts to significant cultural resources would occur under this alternative. The buildings to be reused are not historically significant. The ground would not be disturbed in ares with significant archaeological resources. No Native American concerns have been expressed although consultation is ongoing. Any properties listed in the National Register found in the area around the flight line are currently overflown by aircraft.

Ellsworth AFB. No adverse impacts to significant cultural resources would occur under this alternative. One of the buildings (7504) is considered to be historically significant. However, the use of the structure would not change, nor does the Air Force propose to renovate the building for Global Hawk use. The ground would not be disturbed in areas with significant archaeological resources. No Native American concerns have been expressed although consultation is ongoing. No properties listed in the National Register occur in the area around the flight line.

Tinker AFB. No adverse impacts to significant cultural resources would occur under this alternative. The buildings to be reused are not historically significant. The ground would not be disturbed in areas with significant archaeological resources. No Native American concerns have been expressed although consultation is ongoing. Any properties listed in the National Register occurring in the area around the flight line are currently overflown by aircraft.

Wright-Patterson AFB. No adverse impacts to significant cultural resources would occur under this alternative. One of the buildings (30206) is considered to be historically significant. However, the use of the structure would not change, nor does the Air Force propose to renovate the building for Global Hawk use. The ground would not be disturbed in areas with significant archaeological resources. No Native American concerns have been expressed although consultation is ongoing. Any properties listed in the National Register occurring in the area around the flight line are currently overflown by aircraft.

In the no-action alternative, no construction, additional airfield operations, or increase in personnel would occur. Therefore, no impacts to significant cultural resources would occur.