AIRFIELD PAVEMENT EVALUATION

KING SALMON AIRPORT, ALASKA

MARCH 1992

AIR FORCE CIVIL ENGINEERING SUPPORT AGENCY
TYNDALL AIR FORCE BASE, FLORIDA 32403-6001
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AIRFIELD PAVEMENT EVALUATION
KING SALMON AIRPORT
ALASKA

PREPARED FOR
PACIFIC AIR FORCES

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EXECUTIVE SUMMARY

A Pavement Evaluation Team from HQ Air Force Civil Engineering Support Agency (HQ AFCESA) conducted a nondestructive, structural pavement evaluation at King Salmon Airport, Alaska, during 7-12 August 1991. The analysis indicated the pavements overall are structurally capable of handling the current level of aircraft traffic. Exceptions are the southeast touchdown area on the Runway, which is only likely to last 5 to 10 years, and the Transient Apron and access taxiways, which are overloaded by moderately to heavily loaded C-141, C-5, and KC-135 aircraft. Taxiway E on the civilian side is also very weak. Additional discussion regarding weak pavement features is provided on pages 14 and 15. The Allowable Gross Load Table contained in Appendix F of this report gives detailed information on allowable aircraft weights for given traffic volumes on each pavement feature. A separate list of AGLs is provided for use during the spring thaw. Most of the airfield pavements are in GOOD to VERY GOOD condition based on surface distresses. The most significant problem is cold temperature cracking of the asphalt pavements throughout the airfield. The cracks are generally well maintained, which is one reason for the high condition ratings of many features. For all asphalt paving projects, it is very important that the proper grade of asphalt cement be specified. Otherwise, premature cracking will occur during winter. Guidance is provided in Section VI of this report on selecting asphalt cement for cold regions. Also, the joints and cracks need to be resealed within one or two years for virtually all of the PCC pavement features, along with spall repairs and an occasional slab replacement in some areas. The northwest touchdown area on Runway 11-29 particularly needs maintenance.

The "Runway PCN" which is to be reported in the FLIP chart is 28/R/B/W/T.
SECTION I: INTRODUCTION

A. Scope

1. A pavement evaluation team from HQ Air Force Civil Engineering Support Agency (AFCESA) conducted a nondestructive structural pavement evaluation at King Salmon Airport, Alaska, during 7-12 August 1991. The primary objectives were to:

   a. Determine in-place physical properties of the pavement structure for each feature,
   
   b. Compute allowable gross loadings for those features,
   
   c. Rate the surface condition of each feature, and
   
   d. Identify causes for existing or potential pavement distresses and make subsequent recommendations.

2. This report provides operations and civil engineering functions with airfield pavement strength and condition information that can be used to manage and control an airfield system. Results of pavement evaluation studies can be used to:

   a. Determine sizes, types, gear configuration, and gross weights of aircraft that can safely operate from a given airfield feature without damage to the pavements or the aircraft.

   b. Develop operations usage patterns for a particular airfield pavement system (for example parking plans, apron usage patterns, traffic flow, etc.).

   c. Project or identify major maintenance or repair requirements for an airfield to support present or proposed aircraft missions. When pavement rehabilitations are needed, it can be used to furnish engineering data to aid in the project design.

   d. Help air base mission and contingency planning functions through the development of airfield layout and physical property data.

   e. Develop and validate pavement system profile information.

   f. Support programming documents that justify major pavement restoration projects.
3. Many detailed appendices are used for ease of reporting the vast amount of information gathered. A description of each appendix is provided below:

<table>
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<th>Appendix</th>
<th>Description</th>
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<td>Airfield Feature Layout Plan: Graphically depicts different pavement features of the airfield, and indicates the primary pavements.</td>
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<tr>
<td>B</td>
<td>Construction History: Contains an updated construction history for the evaluated features.</td>
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<tr>
<td>C</td>
<td>Field Test/Core Locations and Results: Documents the locations where Falling Weight Deflectometer (FWD) tests were conducted and cores extracted. Core thicknesses are recorded, along with portland cement concrete (PCC) flexural strengths. Dynamic Cone Penetrometer (DCP) results are displayed.</td>
</tr>
<tr>
<td>D</td>
<td>Condition Survey: Rates the surface condition of the airfield features. These ratings are a qualitative assessment based upon visual observations. The rating scale is the same as used in AFR 93-5.</td>
</tr>
<tr>
<td>E</td>
<td>Summary of Physical Property Data and Lab Testing Results: Physical properties of each pavement feature evaluated are tabulated in this appendix. Included are feature dimensions, material types, thicknesses of layers, and engineering properties.</td>
</tr>
<tr>
<td>F</td>
<td>Allowable Gross Loads (AGLs) and Pavement Classification Numbers (PCNs): A listing of the allowable magnitude of loads at four pass intensity levels for each aircraft group is shown. PCNs, a standardized method of reporting pavement strength, are also included.</td>
</tr>
<tr>
<td>G</td>
<td>Related Information: Included in this are climatic data, Aircraft Group Indices, Gross Weight Limits for Aircraft Groups, and Pass Intensity Levels.</td>
</tr>
</tbody>
</table>
B. Pavements Evaluated

The airfield pavements evaluated include Runway 11-29 and the aprons and taxiways used by the US Air Force. The east half of the cross runway and Taxiways C and E, which are used by the Air Force when taxiing to and from Taxiway 4, were also evaluated. The East Ramp and the Fish Ramp were not evaluated. Appendix A, sheet A-1, shows which pavements were evaluated.
SECTION II: BACKGROUND DATA

A. GENERAL DESCRIPTION OF AIRFIELD. The airfield layout and respective feature designations are presented in Appendix A, page A-1. Runway, taxiway, and apron names are included on sheet A-1.

The airfield consists of a NW-SE runway (Runway 11-29), 8,500 feet long by 150 feet wide. Both touchdown areas are constructed of PCC, and the interior is asphalt. The southeast end of Runway 11-29 has an overrun, but the northwest end does not. There is also a 5000 foot long by 100 foot wide cross runway which is mainly used by small, privately owned aircraft. That runway has 100 foot wide shoulders. The Air Force facilities are located east of the 11 end of the runway, and include alert hangars, aprons and access taxiways, and a small transient parking apron. West of the runway is a commercial passenger terminal and parking ramp, a fish shipping aerial port, and parking space for private aircraft. The majority of pavements at King Salmon Airport are asphalt.

B. AIRCRAFT TRAFFIC. Records documenting the type and frequency of aircraft traffic at King Salmon Airport were not available to the evaluation team. However, the Airfield Manager and Alaska Department of Transportation estimated the annual traffic. Listed below are estimated full stop landings for all using aircraft except for small general aviation type aircraft. There is a very large seasonal increase in traffic during summer due to tourism and the fishing industry.

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Estimated Annual Passes</th>
</tr>
</thead>
<tbody>
<tr>
<td>737</td>
<td>1000</td>
</tr>
<tr>
<td>F-15</td>
<td>400</td>
</tr>
<tr>
<td>C-12</td>
<td>300</td>
</tr>
<tr>
<td>C-130/L100</td>
<td>300</td>
</tr>
<tr>
<td>DC-6</td>
<td>150</td>
</tr>
<tr>
<td>727</td>
<td>50</td>
</tr>
<tr>
<td>L-188</td>
<td>50</td>
</tr>
<tr>
<td>C-5</td>
<td>10</td>
</tr>
<tr>
<td>C-141</td>
<td>8</td>
</tr>
<tr>
<td>KC-135</td>
<td>4</td>
</tr>
<tr>
<td>747</td>
<td>1</td>
</tr>
</tbody>
</table>

C. CONSTRUCTION HISTORY. A detailed construction history table is presented in Appendix B. An evaluation report published by the Army Corps of Engineers in 1963 (Reference 1) is the source of most of the earliest construction history. Additionally, a search was conducted during this evaluation to
identify airfield construction projects that have occurred since the 1963 report was published. The information obtained was used to prepare the construction history.

D. **CLIMATIC DATA.** Appendix G provides a detailed summary of climatic conditions, including data on temperatures, precipitation, wind, visibility, and other information. The Design Freezing Index at King Salmon Airport is 3326, so frost needs to be considered in design and evaluation of airfield pavements. The weather during the evaluation was generally overcast and cool, with some light rain.

E. **DRAINAGE.** The storm drainage system (if any) was not observed during the evaluation. Most of the pavements are drained by surface runoff to shallow swales which lead to natural surface drainages at the airfield perimeter. Shallow puddles were observed near Taxiway 1 (Photo 7 in Appendix D), and other locations, after a rainfall.
SECTION III: TEST PROCEDURES

A. Field Testing

1. Nondestructive testing was accomplished using the Dynatetst Falling Weight Deflectometer (FWD). The FWD test involves dropping a weight from a predetermined height and measuring the resulting pavement deflection with electronic sensors. A deflection basin is recorded for each test site. A total of 250 FWD tests were performed at representative locations throughout the airfield. The results of those tests, combined with other field and laboratory test results, aircraft load characteristics, and landing gear configurations, were used to calculate the allowable gross loads for each pavement feature.

2. Field testing included extraction of 60 pavement core samples from features throughout the airfield. All PCC core samples were 6 inches in diameter. The cores were used to verify pavement thickness and construction, as well as to help determine pavement flexural strength. At some test sites, the Dynamic Cone Penetrometer (DCP) was used to test the strength of subgrade layers. The DCP measures penetration resistance of subsurface soils to a depth of about 48 inches. The data obtained was correlated to CBR values and used to identify base course or soil layer thicknesses and strength. DCP results are provided in Appendix C.

B. Laboratory Testing

1. PCC cores were tested for strength by tensile splitting on a Universal Testing Machine (UTM) in accordance with ASTM's "Standard Test Methods." The core tensile strengths were then converted to flexural strengths using an empirical relationship (Reference 5). Flexural strengths are reported on the "Core/DCP Location Plan" in Appendix C and in the "Summary of Physical Property Data" in Appendix E.

2. Field inspection of the asphalt cores revealed no apparent problems with the physical properties of the asphalt, the mix design, or the density. Therefore, no laboratory work was performed on the cores.

3. Soils were classified in the laboratory in accordance with ASTM's "Standard Test Methods," using the Unified Soil Classification System (USCS). Grain size distribution curves are shown in Appendix E for each type of soil obtained from the core holes.
SECTION IV: METHODOLOGY OF ANALYSIS

A. Physical Property Data

The principal parameters used for determining AGLs are pavement type, thickness, flexural strength (for PCC only), and modulus of elasticity (Young’s Modulus, or E). These parameters are summarized in Appendix E. The values presented were selected as most representative of the pavement properties for the feature where they were obtained. The material type, thickness, and flexural strength were determined from the core samples as described in Section III. The modulus of elasticity, E, was calculated by computer based on the layered elastic theory. The computer assumes a modulus value for each layer in a modeled pavement system, and calculates pavement deflections for that model. The calculated deflections are compared to the deflections measured by the falling weight deflectometer, and a new set of E values are selected. The program continues until a set of modulus values are selected which result in calculated deflections that closely approximate the measured deflections. Pavement load carrying capacity can then be calculated based on the modeled pavement system.

Generally, flexible pavements are modeled as three layer systems while rigid and composite pavements are modeled as two layer systems. The failure criteria for rigid pavements is based on the limiting tensile stress in the concrete. For flexible pavements, failure criteria is based on compressive subgrade strain and limiting tensile strain in the asphaltic concrete.

B. Determination of Allowable Gross Loads (AGLs)

The AGLs were compiled by computer program based on procedures in AFM 88-24, and are listed in Appendix F. AGLs were reduced 25% for those features whose condition rating was POOR or worse. The data contained on the Related Data Sheet in Appendix G is essential to understanding the AGL tables. The AGLs are calculated from the physical properties of the pavement, and the aircraft gear characteristics. In addition, reduced AGLs were calculated for use during the frost melt period in spring based on the reduced subgrade strength that can be expected at that time each year. One AGL Table was prepared for normal conditions and another AGL Table was prepared for use during spring thaw.

A pavement system has a maximum value of stress (in PCC) or strain (in asphalt) which if exceeded, will result in failed pavement. But even if it is only loaded to a level causing, say 75% of the maximum stress or strain, the pavement will
experience fatigue, which will eventually lead to failure. Most loads that cause less than 50% of the limiting stress or strain will not shorten the pavement life. The pavement could theoretically withstand infinite passes without failure. But the closer the loading approaches the upper limit, the fewer the number of passes it will take to cause a fatigue failure. For Feature R1A, the AGL tables show that a C-141 loaded to 242 kips (242,000 pounds) can make 50,000 passes. By then the pavement will likely need a major repair or replacement project. As the aircraft weight goes up, the number of passes until failure goes down. For a 339 kip aircraft weight, the pavement can take only 500 passes, and at weights greater than 339 kips the pavement will take even fewer passes. Overloading the pavement will not necessarily cause an instant failure, but the pavement engineer must be aware that there will be some reduction in pavement life. Most pavements are subjected to many different types of aircraft, at various weights, and each one has its own unique impact on pavement life. When evaluating how much life a pavement feature has left, the engineer must consider all of the aircraft that will use the pavement, and the passes that have occurred since the evaluation was performed. Each AGL is based on the assumption that all of the pavement life is used by that one aircraft type. When several different aircraft use the airfield, each aircraft type uses a portion of the pavement life, and the combined effect on pavement life from all aircraft must be taken into account. An example of how the AGL tables can be used to determine the allowable gross load for any pass level is shown below. In similar fashion, the life of a pavement feature, or number of passes until failure, can be determined for a given aircraft weight.

EXAMPLE PROBLEM

Runway 11-29 will be used for increased C-141 operations. For the weakest runway feature (a) determine the number of passes a 300 kip C-141 can make before pavement failure. (b) What is the maximum load for 8000 passes of a C-141 on that feature?

SOLUTION

From the AGL Table in Appendix F, Feature R9A is the weakest feature on Runway 11-29, and the allowable gross loads for Group 9 aircraft on Feature R9A at Pass Intensity Level I-IV (50,000, 15,000, 3000, and 500 passes) are 218, 243, 285, and 354 kips, respectively. The weights and passes are plotted on semi-log paper as shown in Figure 1. (a) The completed graph indicates the pavement can safely support 2000 passes of a 300 kip C-141. (b) Also using Figure 1, the aircraft weight must
be limited to 260 kips if 8000 passes must be supported over the expected life of the pavement. In this example, it was assumed there are no other aircraft using the pavement. If there were, those other aircraft must be included in the analysis, and the C-141 would need to be limited to even lower numbers of passes and lower allowable weights.

KING SALMON AIRPORT, FEATURE R9A
AIRCRAFT GROUP INDEX 9
C-141

![Graph showing relationship between number of passes and allowable gross loads for C-141](image)

FIGURE 1
C. Pavement Classification Number

The International Civil Aviation Organization (ICAO) has developed and adopted a standardized method of reporting pavement strength. This procedure is known as the Aircraft Classification Number/Pavement Classification Number (ACN/PCN) method (Reference 6). The ACN is a number that expresses the structural effect an aircraft will have on a pavement. ACN values are published in References 6 and 7. The PCN is a number that expresses the capability of a pavement to support aircraft. Appendix F provides PCN values for each pavement feature. The reported PCN values are based on a standard pavement life of 50,000 passes of Group 9 aircraft. The PCNs will vary depending on which aircraft group it is based upon; however, the PCNs listed should be sufficient as a guide.

In the ACN/PCN method, the PCN, pavement type, subgrade strength category, tire pressure category, and evaluation method are all reported together. A code system has been implemented to allow an abbreviated presentation of the necessary information. The pavement type is abbreviated "R" for rigid (PCC), and "F" for flexible (asphalt) pavements. There are four subgrade categories: A, B, C, and D, for high, medium, low, and ultralow subgrade strengths respectively. The four tire pressures categories are W, X, Y, and Z, for high, medium, low, and very low tire pressures. The evaluation methods are technical, "T", or "U", which is based on the type aircraft that commonly use the airfield. The PCN number 31/R/C/W/T, for example, indicates a PCN of 31, a rigid pavement, a low strength subgrade, high pressure tires are allowed, and a technical evaluation was performed to determine the PCN. Each part of the code is important. The number "31" cannot be used properly without the letters that follow.

An ACN can be obtained from References 6 or 7 for any combination of pavement type, subgrade category, and aircraft weight. For a 345,000 pound C-141, the eight possible ACN values are listed below:

<table>
<thead>
<tr>
<th>RIGID PAVEMENT</th>
<th>FLEXIBLE PAVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/R/A</td>
<td>51/F/A</td>
</tr>
<tr>
<td>60/R/B</td>
<td>58/F/B</td>
</tr>
<tr>
<td>68/R/C</td>
<td>70/F/C</td>
</tr>
<tr>
<td>75/R/D</td>
<td>82/F/D</td>
</tr>
</tbody>
</table>

It is very important to be aware that the ACN number varies depending on pavement type and subgrade strength category. As shown above, for a 345,000 pound C-141, the ACN for rigid pavements varies from 50 for a high strength subgrade, to 75 for an ultralow strength subgrade. For a C-141 at the same
weight on a flexible pavement, the ACN ranges from 51 to 82 depending on the subgrade category. For lower aircraft weights, the ACNs are lower. When analyzing the effect of an aircraft on a specific pavement feature, the appropriate ACN must be selected. For example, from Appendix F, the PCN for Feature R1A is 46/R/B/W/T. To determine the effect of a 345,000 pound C-141 on Feature R1A, the correct ACN is 60/R/B. More details on the PCN nomenclature are provided in Appendix F and in the examples below.

A pavement will support operations of an aircraft if the PCN is equal to or greater than the ACN. If the PCN is less than the ACN, the pavement will be overloaded. There may be situations when operators decide it is acceptable to overload a pavement. Pavements can usually support some overload, however, pavement life is reduced. Appendix F contains four charts that will assist the airfield manager or pavements engineer in determining how much pavement life will be reduced by overloading the pavement. An example of how these charts are used is shown below.

EXAMPLE PROBLEM

A contingency plan calls for 500 passes of a 300 kip KC-135 on Runway 11-29. a) How much of the pavement life will be utilized for the weakest feature? b) How much of the pavement life would be utilized for 500 passes of a 300 kip KC-135 on Feature T3A?

SOLUTION

(a) From Appendix F, Feature R9A has the lowest PCN of the features on Runway 11-29. The PCN is 28/R/B/W/T. The full PCN code also indicates Feature R9A is a rigid pavement over a medium strength subgrade. The ACN of a 300 kip KC-135 on a rigid pavement of medium strength subgrade is 44, from Reference 6 or 7. Therefore, the ACN/PCN ratio is 1.6. Using Chart #1 in Appendix F, 40 percent of the pavement life is utilized for 500 passes of an ACN/PCN ratio of 1.6.

(b) Feature T3A has a PCN of 25/F/B/W/T. It is a flexible pavement on a medium strength subgrade, and the ACN for this case is 44. The ACN/PCN ratio is 1.76, and from Chart #2, 30 percent of the pavement life would be utilized.

Charts #3 and #4 are also for overloading, but in a different format based on finding the number of passes to failure for any given operating weight, using the ACN/PCN ratio again. As an example of how to use Chart #3, assume the same case as part (a) of the problem above. From Chart #3, for an ACN/PCN ratio of 1.6, a 300 kip KC-135 can make about 1250 passes before the pavement would be expected to fail.
SECTION V: PAVEMENT ASSESSMENT

A. Overall Visual Assessment

A visual survey was conducted on all airfield pavements to rate the surface condition for each feature. The survey was not as detailed as the procedure outlined in AFR 93-5, however, the same condition ratings were used. Appendix D-1, Condition Survey, shows the condition rating for each feature on an airfield map. Appendix E also lists these ratings in tabular form. Pavement condition ratings range from EXCELLENT (like new) to FAILED (unsafe for aircraft operations). They are a qualitative assessment of the pavement surface and should not be confused with the structural capacity of a pavement. For example, a relatively thin pavement may be structurally inadequate for heavier aircraft even if the PCI rating is EXCELLENT. On the other hand, a pavement that is strong enough to support any aircraft may still receive a low PCI rating due to surface defects such as FOD potential, spalling joints, or roughness. Identifying the type and severity of distresses can help provide an understanding of the pavement's response to current loads and for projecting its ability to handle future loads.

Airfield pavements at King Salmon Airport are mostly in GOOD to VERY GOOD condition, but there are some pavement features in POOR or FAIR condition. The most common distresses in the asphalt pavements are longitudinal and transverse cracks which are the result of the extremely cold winters for the most part, along with occasional overloading by heavy aircraft. The photos referenced below are shown in Appendix D.

1. Runways

Runway 11-29 has PCC touchdown areas at each end. The 11 end is in FAIR condition, with longitudinal cracks, spalling joints, a few shattered slabs, and joint sealant in poor condition (Photos 8 and 10). Most of the cracks have been sealed and the distresses are low severity, but there are several cases of high severity spalling and medium severity cracks. The cement paste on the surface of some slabs has eroded away, exposing the coarse aggregate (Photo 9).

The PCC touchdown area on the 29 end is in VERY GOOD condition. There are longitudinal cracks through some of the slabs, and two or three of the slabs are shattered. Most of the cracks have been sealed, and the sealant is in moderate condition (Photo 13).

The runway interior is asphalt. The northeast half is in VERY GOOD condition, with longitudinal and transverse cracks. A
small area with raveled asphalt was observed about 1300 feet from the 11 end (Photo 11). The other half of the runway is in GOOD condition, with block cracking (Photo 12). Most of the asphalt cracks were sealed recently, which is one reason the condition rating is as good as it is.

Runway 18-36 is a short runway used mostly by small civilian aircraft and occasionally used by the Air Force to taxi aircraft to Taxiway 4 and the Transient Apron. It is in EXCELLENT condition, with very few distresses of any kind.

There is an asphalt blast pad on the 11 end of Runway 11-29, but no overrun. The pad is in FAIR condition, with longitudinal and transverse cracks. The overrun at the 29 end is in POOR condition. The predominant distresses are block cracking and weathering. The northern 250 feet of Runway 18-36 was not reconstructed when the rest of the runway was. The old sand asphalt pavement was left in place to serve as an overrun in POOR condition and has severe block and alligator cracking (Photo 1). Aircraft must taxi across this overrun in order to reach Taxiway 4. Jet aircraft should not use this route because of the FOD hazard.

2. **Taxiways**

Taxiway 1 is in GOOD condition, with longitudinal and transverse cracks, and numerous voids in the surface where aggregate is missing (Photo 6). The cracks are well sealed. There is a large bird bath at the low spot of this taxiway near its junction with Taxiway 3 (Photo 7).

Taxiways 2 and 3 are in VERY GOOD condition. The pavement has the same distresses as Taxiway 1, except the longitudinal and transverse cracks are more widely spaced.

Taxiway 4 is in FAIR condition. The predominant distresses are low to medium severity block cracking, the beginning of alligator cracking, and slight rutting (Photo 2). Most of the cracks have been sealed, but the sealant is deteriorated or nonexistent in some areas. A utility patch crossing the taxiway near the Transient Apron is rutted and badly cracked, and needs to be repaired soon (Photo 3).

Taxiway C is in VERY GOOD condition, with widely spaced longitudinal and transverse cracks. The cracks have not been sealed, and a few are medium severity.

Taxiway A is in POOR condition. Distresses include longitudinal and transverse cracks ranging from low to high severity, weathering, alligator cracks near centerline, and vegetation growing in some of the cracks (Photos 15 and 16).
3. Aprons

The front and rear Alert Aprons are in VERY GOOD condition. There is a small amount of spalling along the joints, and about 10 to 20 percent of the slabs have low severity longitudinal cracks. The sealant is in moderate condition.

The new extension to the rear of the Alert Apron is in EXCELLENT condition for the PCC portion, and VERY GOOD condition for the asphalt portion. The asphalt portion has a few longitudinal cracks that have not been sealed (Photo 5).

The asphalt portion of the Transient Apron is in FAIR condition, with longitudinal and transverse cracks of low to medium severity, and weathering (Photo 4). The PCC portion is in GOOD condition, with longitudinal cracks, some spalling of the joints and cracks, and sealant in moderate condition.

The Elephant Ear Apron is in GOOD condition. The predominant distresses are the typical longitudinal and transverse cracks which have been sealed (Photo 14).

B. Field Tests

All field test results are summarized in Appendix C, Core/Test Location Plan, and Appendix E, Summary of Physical Property Data. Dynamic Cone Penetrometer (DCP) tests were conducted at several locations on the airfield to evaluate the subgrade soil strength. The results of the DCP tests are shown on sheet C-2 in the appendix. The tests indicated the base course and subgrade layers are quite strong, with a CBR generally over 50 percent within the depths tested.

C. Laboratory Tests

The concrete flexural strength used for each feature is the average value of all flexural strength tests for cores taken from that particular feature. The average flexural strengths ranged from 600 to 830 psi. No abnormalities in the core samples were observed by the technician during laboratory testing. Soil samples were classified in the laboratory using the Unified Soil Classification System. The flexural strength for each core is shown on the Core Location Plan, Appendix C. PCC core test results and soil grain size distribution graphs are also summarized in Appendix E.

D. Summary of Allowable Gross Loads

The AGLs are listed in Appendix F for each feature. The Related Data Table in Appendix G is needed to read and
understand the AGL Table. It describes the different Aircraft Group Indicies and Pass Intensity Levels. An "A" on the AGL Table indicates the AGL is below the minimum weight of any aircraft in that group. A "+" indicates the AGL is higher than the maximum weight of any aircraft in that group.

The airfield pavements generally have adequate structural capacity to support the current levels of aircraft traffic. However, many areas including some primary pavements have load limitations for some aircraft. The current traffic is roughly equivalent to 1200 passes per year of a 125,000 pound B-737. (An estimate of current traffic is given on page 4 of this report. The various aircraft passes were converted to equivalent passes of a B-737 using the computer program TRAFFIC). The runway will structurally support the current traffic except for the southeast touchdown area, Feature R9B, which is somewhat weak and is likely to only last five or ten years. The majority of the heavier aircraft belong to private companies and use the civilian aprons and taxiways. The Air Force pavements see much lower traffic levels. Some of the Alert Area taxiways and aprons are somewhat weak, and are overloaded by F-15 aircraft when those aircraft are loaded to 43 to 50 kips or more. Feature A3B is weak, but is likely to have very few passes over it because of its location. The asphalt taxiways are also weak, but could last another five to ten years at current low traffic levels. The Transient Apron and access taxiways (A4B, A5B, T3B, T5B) are all quite weak and are overloaded by cargo and tanker aircraft at their normal range of weights. Since there have been so few passes of heavier cargo aircraft in the past, these features have held up reasonably well. To prolong the pavement life, recommend the number of C-141, KC-135, and C-5 passes and/or gross weight be kept to a minimum. These pavements can support very few passes without significant reduction to the pavement life.

Appendix F contains a separate AGL Table for use during the spring thaw. The AGLs in that table take into account the detrimental effects of frost action and are significantly lower than the regular AGLs. The magnitude of the difference depends on the frost susceptibility of the soil layers within the pavement system. At King Salmon Airport, there are several areas where the soils are frost susceptible. The lower AGLs should be used during spring thaw to control overloading and damage to the pavements.
**PRIMARY PAVEMENT STRUCTURAL CAPACITY SUMMARy**

The Primary Pavement Structural Capacity Summary pertains only to those airfield pavements considered primary, or the minimum required for mission accomplishment. For the purposes of this report, the primary pavement features include:


**MAXIMUM ALLOWABLE GROSS LOADS (AGLs) IN KIPS FOR PASS INTENSITY LEVEL I OPERATIONS**

<table>
<thead>
<tr>
<th>AIRCRAFT*</th>
<th>INDEX</th>
<th>APRONS (A3B)**</th>
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<th>RUNWAYS (R9A)**</th>
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LEGEND

Pass Intensity Level I for Aircraft Group Indices 1-3 = 300,000 Passes

Pass Intensity Level I for Aircraft Group Indices 4-10 = 50,000 Passes

Pass Intensity Level I for Aircraft Group Indices 11-13 = 15,000 Passes

* A complete listing of aircraft groups, gear configuration, and controlling aircraft characteristics is provided in AFR 93-5, Chapter 2. A brief summary is provided in Appendix G.

** Structurally the weakest of the primary pavements and, therefore, the controlling feature for the indicated aircraft. See Appendix A for feature locations.

+ No weight restrictions apply. AGL exceeds the greatest possible gross weight of any aircraft in the group.

A Lowest possible gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for Pass Intensity Level I.
SECTION VI: CONCLUSIONS/RECOMMENDATIONS

A. General

1. The asphalt pavements should be maintained by sealing the new cracks each year and replacing existing sealant as needed. Crack sealing is very important because it increases pavement life and reduces the possibility of FOD damage to aircraft. Eventually the pavements will need to be resurfaced. For a resurfacing project, recommend as a minimum the existing surface be milled off to remove the old crack sealant and to smooth out the surface, followed by a two inch thick overlay. Severe cracks should be repaired prior to the overlay. With this type of repair, reflective cracks are likely to appear within a few years, and must be sealed at that time. A better option, although more expensive, is to remove all of the asphalt pavement and replace it with new or recycled asphalt. The pavement will then be likely to last as much as five years before cracking begins if the right grade of asphalt cement is used and the pavement is constructed properly.

2. The primary pavements should be the first priority for crack sealing. Once those areas are sealed, the secondary pavements and overruns should have the cracks sealed to prolong their life.

3. Many of the asphalt cracks appear typical of cracking caused by cold temperatures. Although cold temperature cracking of asphalt is common in Alaska, the problem can be controlled by using the proper grade of asphalt cement in paving projects. The Army Corps of Engineers Technical Letter 1110-1-129, dated 22 June 90, provides guidance on selecting asphalt for use in cold regions through use of the penetration-viscosity number (PVN) method. Use of asphalt meeting PVN requirements (minimum PVN of 0.2) is strongly recommended. For overlays, however, even if the proper grade of asphalt is used, the existing cracks will reflect through the pavement surface in a very short time. Tests of the asphalt cement to verify compliance should be done well in advance of a project so that alternate sources of asphalt cement can be obtained if necessary. When using the softer grades of asphalt, such as AC 2.5 or AC 5, the quality of the aggregate becomes important to prevent rutting problems during the summer. Using soft grades of asphalt generally will not result in a rutting problem if crushed aggregate is used with no natural sand, and the gradation is properly controlled.

B. Specific Recommendations

3. Recommend the utility patch on Taxiway 4 be repaired.
4. Recommend jet aircraft not taxi up Runway 18-36 and across the overrun to Taxiway 4 because of the FOD hazard

5. Recommend the PCC pavements be scheduled for a project consisting of spall repair, crack sealing, and joint seal replacement. The 11 end of Runway 11-29 is particularly in need of this type repair, but all of the PCC pavements at least need to have the joint sealant replaced within the next two years. The deterioration of the surface of some slabs on the 11 end of the runway should be monitored. If the condition continues to degrade, the affected slabs or the whole feature will have to be replaced.
GLOSSARY

Allowable Gross Load (AGL) - The maximum aircraft load that can be supported by a pavement feature for a particular number of passes.

Base or Subbase Courses - Natural or processed materials placed on the subgrade beneath the pavement.

Compacted Subgrade - The upper part of the subgrade, which is compacted to a density greater than the portion of the subgrade below.

Feature - A unique portion of the airfield pavement distinguished by traffic area, pavement type, pavement surface thickness and strength, soil layer thicknesses and strengths, construction period, and surface condition.

Frost Evaluation - Pavement evaluation during the frost-melting period, when the pavement load-carrying capacity will be reduced unless protection has been provided against detrimental frost action in underlying soils. Pass Intensity Levels V and VI are used with reduced subgrade strengths to determine the maximum allowable loads during the frost-melt period.

Pass - On a runway, the movement of an aircraft over an imaginary line 500 feet down from the approach end. On a taxiway, the movement of an aircraft over an imaginary line connecting an apron with the runway. AFR 93-5, Chapter 2.

Pass Intensity Levels (PIL) - Specific repetitions of aircraft over a pavement feature, regardless of time, that are dependent on aircraft design category. AFR 93-5, Chapter 2.

Pavement Condition Index (PCI) - A numerical indicator between 0 and 100 that reflects the surface operational condition of the pavement. AFR 93-5, Chapter 3.

Primary Pavements - Those features that are absolutely necessary for mission aircraft operations. AFR 93-5, Chapter 4.

Subgrade - The natural soil in-place, or fill material, upon which a pavement, base, or subbase course is constructed.

Type A Traffic Areas - Type A Traffic Areas are those pavement facilities that receive the channelized traffic and full design weight of the aircraft. AFM 88-6, Chapter 1.
Type B Traffic Areas - Type B Traffic Areas are considered to be those areas where traffic is more nearly uniform over the full width of the pavement facility, but which receive the full design weight of the aircraft. AFM 88-6, Chapter 1.

Type C Traffic Areas - Type C Traffic Areas are considered to be those on which the volume of traffic is low or the applied weight of the operating aircraft is less than the design weight. AFM 88-6, Chapter 1.

PAVEMENT CONDITION EVALUATION TERMINOLOGY

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<td>PAVEMENT HAS SCATTERED LOW SEVERITY DISTRESSES WHICH SHOULD NEED ONLY ROUTINE MAINTENANCE.</td>
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<td>PAVEMENT HAS A COMBINATION OF GENERALLY LOW AND MEDIUM SEVERITY DISTRESSES. MAINTENANCE AND REPAIR NEEDS SHOULD BE ROUTINE TO MAJOR IN THE NEAR-TERM.</td>
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<td>FAIR</td>
<td>PAVEMENT HAS LOW, MEDIUM, AND HIGH SEVERITY DISTRESSES WHICH PROBABLY CAUSE SOME OPERATIONAL PROBLEMS. MAINTENANCE AND REPAIR NEEDS SHOULD RANGE FROM ROUTINE TO RECONSTRUCTION IN THE NEAR-TERM.</td>
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CONVERSION FACTORS
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REFERENCES


5. Hammitt, G. M. III, Concrete Strength Relationships, Research Paper, Texas A&M University, College Station, Texas, December 1971.


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3909 Halls Ferry Road
Vicksburg MS 39180-6199

USACRREL-EG
72 Lyme Road
Hanover NH 03755-1290

USA-CERL-FOM
P.O. Box 4005
Champaign IL 61820-1305

HQ AFCESA/TIC
Tyndall AFB, FL 32403-6001

Defense Technical Information
Attn: DTIC-FDAC
Cameron Station
Alexandria VA 22304-6145

HQ AFCESA/DMP
Tyndall AFB FL 32403-6001
## Construction History

**KING SALMON AIRPORT, ALASKA**

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REMARKS
The image contains graphs and tables related to core holes and cone penetration tests, with depth and type of material data. The graphs show depth in inches and the type of material, with notes indicating test termination due to obstruction. The tables include CBR values from dynamic cone penetrometer tests.

**Legend**
- CBR: California Bearing Ratio
- DCP: Dynamic Cone Penetrometer
- AC: Asphaltic Concrete
- PCC: Portland Cement Concrete

**Notes**
1. Maximum cone penetration in 50 inches below pavement surface.

**Core Hole/Test Location Cross Sections**
- United States Air Force
- Tyndall Air Force Base, Florida
- Koko Salmon Airport, Alaska

**Sheet Information**
- Sheet 2 of 2
PHOTO 1: BADLY DETERIORATED PAVEMENT ON THE NORTH END OF RUNWAY 18-36. PAVEMENT HAS ALLIGATOR AND BLOCK CRACKING.

PHOTO 2: BLOCK CRACKING, SHALLOW RUTS, AND THE BEGINNING OF SPALLING.

PHOTO 3: RUTTED UTILITY PATCH ON TAXIWAY 4.

PHOTO 4: SPALLING TRANSVERSE CRACK ON TRANSIENT APRON.
PHOTO 2: BLOCK CRACKING, SHALLOW RUTS, AND THE BEGINNING OF ALLIGATOR CRACKS ON Taxiway 4.

PHOTO 3: SPALLING TRANSVERSE CRACK ON TRANSIENT APRON.
PHOTO 5: MEDIUM SEVERITY LONITUDINAL CRACK ON THE REAR ALERT APRON, WITH SEALANT IN POOR CONDITION.

PHOTO 6: VOIDS IN THE SURFACE OF THE PAVEMENT WHERE AGE OF TAXWAYS 1, 2, AND 3.

PHOTO 7: BIRD BATH AND SEALED CRACKS ON TAXWAY 1.

PHOTO 8: HIGH SEVERITY SPALLING AT THE 11 END OF RUNWAY 1.
PHOTO 6: VOIDS IN THE SURFACE OF THE PAVEMENT WHERE AGGREGATE IS MISSING. TYPICAL OF TAXWAYS 1,2, AND 3.

PHOTO 8: HIGH SEVERITY SPALLING AT THE 11 END OF RUNWAY 1-29.
PHOTO 9: ERODED PCC PAVEMENT SURFACE WITH A TYPICAL LONGITUDINAL CRACK ON THE 11 END OF RUNWAY 11-29.

PHOTO 10: SHATTERED SLAB AT THE EDGE OF THE NORTHWEST.

PHOTO 11: SMALL SECTION OF RAVELLED ASPHALT PAVEMENT ON RUNWAY 11-29.

PHOTO 12: TYPICAL BLOCK CRACKING ON THE RUNWAY.

PHOTO 12: TYPICAL BLOCK CRACKING ON THE RUNWAY. CRACKS HAVE BEEN SEALED.
PHOTO 13: TYPICAL LOW SEVERITY LONGITUDINAL CRACK ON THE 29 END TOUCHDOWN AREA OF RUNWAY 11-29.

PHOTO 14: SEALED TRANSVERSE AND LONGITUDINAL CRACKS ON...

PHOTO 15: HIGH SEVERITY TRANSVERSE CRACK ON THE EAST APRON TAXIWAY.

PHOTO 16: LONGITUDINAL, TRANSVERSE, AND ALLIGATOR CRACKS
TRANVERSE AND LONGITUDINAL CRACKS ON THE ELEPHANT EAR APRON.

LONGITUDINAL, TRANSVERSE, AND ALLIGATOR CRACKS ON THE EAST APRON TAXIWAY.
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*Denotes data taken from report archives
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SEE APPENDIX G FOR RELATED DATA.
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SEE APPENDIX G FOR RELATED DATA.

F-2
### SUMMARY OF ALLOWABLE GROSS LOADS IN BRITISH UNITS

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SEE APPENDIX G FOR RELATED DATA.

### NOTES

In reference to the allowable gross load (AGL) table:

- **A** Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.

- **+** Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.

The load carrying capacities of the pavements reported herein are based on material properties representative of the in-place conditions at the time this field investigation was conducted.
### Frost-Melt Period

#### Summary of Allowable Gross Loads in British Units

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### FROST-MELT PERIOD

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SEE APPENDIX G FOR RELATED DATA.

F-5
## FROST-MELT PERIOD

### SUMMARY OF ALLOWABLE GROSS LOADS IN BRITISH UNITS

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SEE APPENDIX G FOR RELATED DATA.

### NOTES

**IN REFERENCE TO THE ALLOWABLE GROSS LOAD (AGL) TABLE:**

- **A** Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.

- **+** Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.

The load carrying capacities of the pavements reported herein are based on material properties representative of the in-place conditions at the time this field investigation was conducted.
# Pavement Classification Numbers (PCNs)*

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*Based on Group 9 Aircraft, 50,000 Passes.
A brief explanation on the PCN code is shown below for PCN = 31/F/A/W/T.

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<td>D</td>
<td>Z</td>
<td></td>
</tr>
</tbody>
</table>

**EXPLANATION OF TERMS:**

**Subgrade Strength Codes**

<table>
<thead>
<tr>
<th>Code</th>
<th>Category</th>
<th>Flexible Pavement CBR, %</th>
<th>Rigid Pavement k, pci</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>High</td>
<td>Over 13</td>
<td>Over 400</td>
</tr>
<tr>
<td>B</td>
<td>Medium</td>
<td>9 - 13</td>
<td>201-400</td>
</tr>
<tr>
<td>C</td>
<td>Low</td>
<td>4 - 8</td>
<td>100-200</td>
</tr>
<tr>
<td>D</td>
<td>Ultralow</td>
<td>&lt; 4</td>
<td>&lt; 100</td>
</tr>
</tbody>
</table>

**Tire Pressure Codes**

<table>
<thead>
<tr>
<th>Code</th>
<th>Category</th>
<th>Allowable Tire Pressure, psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>High</td>
<td>No Limit</td>
</tr>
<tr>
<td>X</td>
<td>Medium</td>
<td>146 - 217</td>
</tr>
<tr>
<td>Y</td>
<td>Low</td>
<td>74 - 145</td>
</tr>
<tr>
<td>Z</td>
<td>Ultralow</td>
<td>0 - 73</td>
</tr>
</tbody>
</table>
RIGID PAVEMENTS

CHART 3
FLEXIBLE PAVEMENTS

ACN / PCN

PASSES TILL FAILURE

CHART 4
# Aircraft Group Index

<table>
<thead>
<tr>
<th>Light Load</th>
<th>Medium Load</th>
<th>Heavy Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- A-37
- A-7
- *F-111
- C-130
- C-7
- 737
- 727
- 757
- C-141
- C-5
- *KC-10
- 747
- B-52
- D10
- *E-4
- L1011
- VC-25
- C-17
- C-12
- A-10
- FB-111
- C-130
- C-7
- 737
- 727
- 757
- C-141
- C-5
- *KC-10
- 747
- B-52
- D10
- *E-4
- L1011
- VC-25
- C-17
- C-21
- F-4
- *C-23
- F-16
- F-10X
- T-33
- T-38
- T-39
- OV-10
- C-20
- C-130
- C-7
- 737
- 727
- 757
- C-141
- C-5
- *KC-10
- 747
- B-52
- D10
- *E-4
- L1011
- VC-25
- C-17

## Gross Weight Limits for Aircraft Groups

<table>
<thead>
<tr>
<th>Lowest Possible Gross Weight</th>
<th>Highest Possible Gross Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 7 49 69 22 61 92 60 150 325 240 334 180</td>
<td></td>
</tr>
<tr>
<td>25 81 114 175 121 125 210 400 477 840 590 850 488</td>
<td></td>
</tr>
</tbody>
</table>

## Pavement Capacity

<table>
<thead>
<tr>
<th>Lowest Possible Gross Weight</th>
<th>Highest Possible Gross Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 3 22 31 10 28 42 27 68 147 109 151 82</td>
<td></td>
</tr>
<tr>
<td>11 37 52 79 55 57 95 181 216 381 267 385 221</td>
<td></td>
</tr>
</tbody>
</table>

## Pass Intensity Level

<table>
<thead>
<tr>
<th>Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>-11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>300,000 Passes</td>
<td>50,000 Passes</td>
<td>15,000 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>50,000 Passes</td>
<td>15,000 Passes</td>
<td>3,000 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>15,000 Passes</td>
<td>3,000 Passes</td>
<td>500 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>3,000 Passes</td>
<td>500 Passes</td>
<td>100 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>300,000 Passes</td>
<td>50,000 Passes</td>
<td>15,000 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>50,000 Passes</td>
<td>15,000 Passes</td>
<td>3,000 Passes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Notes

- **A** Denotes lowest possible empty gross weight of any aircraft within the group which exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.
- **+** Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.
- Pass intensity levels **V** and **VI** are used with reduced subgrade strengths to determine the maximum allowable loads during the frost-melt period.

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**United States Air Force**

**Engineering & Services Center**

**Tyndall Air Force Base, Florida**

**Related Data**

**Sheet 1 of 1**
CLIMATOLOGICAL DATA

| TEMPERATURE (F) | J | F | M | A | M | J | A | S | O | N | D | ANN | TOT REC |
|-----------------|---|---|---|---|---|---|---|---|---|---|---|----|------|--------|
| HIGHEST         | 80 | 74 | 70 | 66 | 62 | 58 | 54 | 50 | 46 | 42 | 38 | 34 | 30 | 26 |
| MEAN DAILY MAX  | 21 | 23 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| MEAN DAILY MIN  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  | 7  |
| MAX TEMPERATURE | 90 | 86 | 82 | 78 | 74 | 70 | 66 | 62 | 58 | 54 | 50 | 46 | 42 | 38 |
| MIN TEMPERATURE | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| PRECIPITATION   | 1.07|0.87|1.09|0.96|1.14|1.58|2.10|3.15|2.82|2.05|1.44|1.22|0.95|0.66|

ANNUAL WIND COVERAGc TABULATION

<table>
<thead>
<tr>
<th>RUNWAY DIAGRAM</th>
<th>MAGNETIC MARK</th>
<th>TRUE BEARING</th>
<th>LENGTH IN FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-29</td>
<td>8500'</td>
<td>82.1</td>
<td>77.7</td>
</tr>
</tbody>
</table>

INSTRUMENT RUNWAY

(1) WIND COVERAGE % - ALL WEATHER
(2) WIND COVERAGE % - INSTRUMENT

ADDITIONAL DATA

FIELD ELEVATION 57 FEET MSL
MAGNETIC VARIATION 21"OOG
SOURCE FLIP
YEAR 1991

ENGINEERING WEATHER DATA

AIR CONDITIONING DESIGN AND CRITERIA DATA (SEE AFM 88-8, CHAP 6)
WINTER HEATING DESIGN TEMPERATURE (SEE AFM 88-8, CHAP 6)
MEAN WINTER WIND SPEED - 9 KNOTS
MEAN ANNUAL NUMBER OF HEATING DEGREE DAYS - 11,320 (SEE AFM 91-7)
PRESSURE ALTITUDE AND TEMPERATURE DATA FOR DETERMINING FEIGNED RUNWAY LENGTHS (SEE AFM 86-2)
EXTREME WIND DATA FOR CONSTRUCTION DESIGN (SEE AFM 88-3, CHAP 1)
SHOW LOAD DATA FOR ROOF CONSTRUCTION (SEE AFM 88-5, CHAP 1)
MAXIMUM FROST PENETRATION (SEE AFM 88-3, CHAP 1)
MEAN ANNUAL NUMBER OF COOLING DEGREE DAYS 002

NOTICE: WHEN NECESSARY, INTERPRETATIONS OF THESE DATA SHOULD BE SECURED THROUGH THE LOCAL STAFF WEATHER OFFICER

KING SALMON AFB, AK
58°41'N 156°39'W
57 FEET
PREPARED BY USAFETAC FEB 91

FORM REVISED 1 DEC 87

TAB D

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED.
KING SALMON, ALASKA

TOPOGRAPHY

King Salmon is located in southwestern Alaska near the eastern edge of the Alaskan Peninsula where it blends into the Alaskan mainland. The salient feature of the local area is water. Naknek Lake is ten miles east and the Naknek River flows out from the western edge of the lake and passes one quarter mile south of the base on its way to its mouth at Kvichak Bay 15 miles west. In addition there are hundreds of small lakes, ponds, rivers, and creeks surrounding the base. The land area consists of rolling tundra spotted with many small hills averaging 200 to 400 feet in height. The Aleutian Mountain chain runs northeast to southwest 60 miles east though south with a spur of that range coming within 20 miles of the base to the east through southeast. The highest elevation within 30 miles of the base is 2900 feet 25 miles southeast.

VISIBILITY

Fog is the major visibility problem at King Salmon. Fog will occur on 134 days per year reaching a peak during July with 17 days. Due to its location far from population centers, smoke and haze are rare. They occur on just one day per year. Home heaters and automobiles can cause localized pollution problems. Blowing snow is more common, occurring on 12 days per year, 3 days per month from December through March. Blowing dust is almost unknown at the base but has been reported. Visibilities will drop below ten miles on 73 days per year and below five miles on 28 days per year. Visibilities below three miles are more uncommon, occurring on 18 days per year, visibilities below one mile will occur on eight days per year either in dense fog or heavy snow. Visibilities below one half mile will occur on four days a year, primarily with fog during the summer.
SEVERE WEATHER

Thunderstorms in the King Salmon area are not a problem, they occur on only one day per year, with the best chance during June. Severe weather in the area is primarily a winter phenomena. There will be 102 days each year with snow, with 13 to 15 days per month from November through April. Freezing rain will occur on nine days a year, usually during the late fall or early spring. The wind chills at King Salmon can be severe with wind chills reaching -65 Farenheit and a mean wind chill of -5 Farenheit from December through February. From December through March the winds associated with the Aleutian low south of the station can be very strong, usually above 40 knots. The winds are strong year around however, 50 knots having been recorded during every month of the year with an extreme wind of 82 knots. With the high moisture content and extremely cold temperatures during the winter there will be large frost accumulations on outside objects. Some sort of precipitation will fall at King Salmon on 239 days each year, peaking during August with 24 days. Warm permafrost may be encountered in the King Salmon area to a depth of about 50 feet. If permafrost is present, the range in summer thaw depth will be about three to six feet. If permafrost is absent, winter frost will penetrate to a maximum depth of from three to eleven feet depending on surface cover, exposure and soil conditions.