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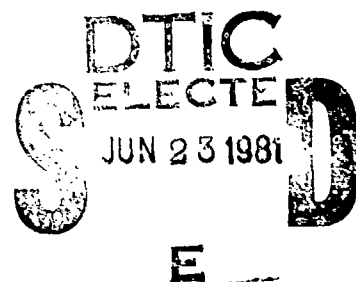
LEVEL II



PACER LIME: An Environmental Corrosion
Severity Classification System

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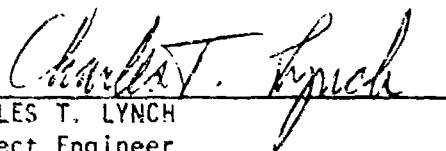
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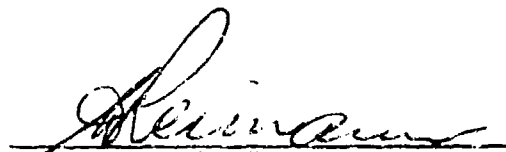
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A system has been developed for rating the corrosivity of aircraft operational environments. This system takes account of weather, atmospheric pollutant, and geographical factors to compute a severity index for three aspects of corrosion maintenance: aircraft washing, repainting, and repair needs. Computed ratings are in good agreement with aircraft corrosion experience and atmospheric testing programs at several locations.		

This is the Final Report for USAF Aeronautical System Division Contract No. F33615-78-C-5224 (Project 3930 Task 00, Work No. 01) with Michigan State University. The Program described was initiated by personnel of Warner-Robins Air Logistics Center Corrosion Management Office (WR-ALC/MMETC). Its objective is to develop an environmental corrosion severity classification system and to calibrate this system by means of an atmospheric testing program. After several years of development and testing by WR-ALC, analysis of the results was completed by MSU. The Final Report is divided into two parts which are issued separately. This, the first part, discusses the environmental classification system and the second part treats the experimental phase.

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1. INTRODUCTION

Several studies have centered on the total costs of corrosion prevention and control within the past few years.¹⁻⁵ The inescapable conclusion is that total corrosion costs for aircraft maintenance and management are an intolerable burden to the Air Force in terms of maintaining force effectiveness at reasonable cost to the taxpayer. Direct costs of corrosion maintenance for major aircraft systems in the field and at depot level have been estimated to be in excess of \$750 million per year, and total corrosion costs, including those for airbase facilities, are estimated to be in excess of \$1 billion per year.⁴ A key factor in controlling these costs is the ability to optimize corrosion repairs based upon need, rather than the current practice to perform them at fixed time intervals, and, in the field or at depot, based upon optimized inspection, need, and time of repair. The current program of fixed time interval depot maintenance of aircraft, under Programed Depot Maintenance (PDM), does not correspond to the actual corrosion damage level of individual units.⁶ Thus, the method results in inefficient and uneconomical use of facilities and resources. The scheduling of depot maintenance could be based, however, on the cumulative exposure to corrosion risks if the risk factors were identified and quantified and the relations between exposure and damage were known.

One approach to quantifying risk factors is to classify the environmental severity according to the nature and intensity of ambient corrosive factors. It has long been acknowledged that some environments are more corrosive than others, and environments are commonly classified as industrial, urban, or marine, thus indicating their approximate severity.^{7,8} It also is established that certain environmental constituents, e.g., sea salt and sulfur dioxide, increase the relative aggressiveness of the environment.^{9,10} An environmental classification, based on the atmospheric

constituents present, might be used as a guide in establishing the maintenance schedules required for complex systems, such as aircraft.

In response to the needs of the Strategic Air Command (SAC), the AF Logistics Command (AFLC) implemented a program* to develop a corrosion severity classification for each operational airbase as part of the Corrosion Prevention and Control (COPCON) program (redesignated as Project RIVET BRIGHT in 1971). Program development began in 1965 and implementation was achieved in 1971. The program was designated PACER LIME in 1972 as an element of RIVET BRIGHT. PACER LIME is a two phase effort: (1) Development of an equation or algorithm for computing a priori a numerical corrosion factor which combines weather and other environmental factors; (2) experimental measurement of corrosion severity at selected locations through atmospheric corrosion tests. The experimental data would be used to "calibrate" the computed corrosion factor.

An initial corrosion factor equation, combining certain weather and geographical factors, was developed in 1971. Interim numerical classifications were published for 39 SAC airbases in 1972, and for 95 USAF and 27 ANG airbases in 1973. A complete list was distributed in 1974 under the title "PACER LIME Interim Corrosion Severity Classification." These interim values were to be compared with corrosion maintenance experience and the results of the PACER LIME atmospheric testing program. The corrosion factor equation then would be modified and used to compute working corrosion severity classifications. The experimental phase produced useful data very slowly, however, and analysis of maintenance experience proved to be more complex than expected. Consequently, revision of the corrosion factor equation has been delayed considerably.

*Records of the Program were the source for the following discussion. These records are the property of USAF Corrosion Management Office, MMETC, Robins AFB, GA.

The need for environmental guidelines was so great, however, that the Interim Classifications were soon used to develop maintenance interval guidelines, e.g., for washing and corrosion inspections. In several cases these guidelines correlated poorly with field-level experience and a few computational errors had occurred. Thus, the validity of the guidelines and the corrosion factor equation was severely questioned.

The experimental phase of PACER LIME would provide a calibration reference point for the corrosion factor equation by measuring corrosion rates at several airbases. The test sites were selected in order to span the range of environments from mildest to most severe. Alloys representative of those used in modern airframe construction were chosen for outdoor exposure. Program planning was completed in 1971, most test stands were installed in 1972, while the remaining stands were installed in 1973 and 1975. Despite numerous difficulties and misfortunes, considerable data was accumulated between 1972 and 1978. Analysis of the data, in terms of environmental parameters, however, proved to be more complex than expected.

In 1978 it was determined that adequate in-house USAF resources could not be made available for the completion of PACER LIME, and the Program was assigned under contract to Michigan State University. The objectives of the MSU effort were to complete the program by analyzing results of the corrosion exposure test program, the Base Corrosion Severity Classification System, and to develop an improved classification system. This improved system was to be applied to the environments of all USAF, AFRES, and ANG airbases in order to provide ratings for each. These objectives have been accomplished and are discussed in this Final Report.

The Report is divided into two parts, which are being published separately. The first part discusses the Corrosion Severity Classification System and the second part the Corrosion Exposure Test Program.

II. THE CORROSION SEVERITY CLASSIFICATION SYSTEM

1. Environmental Variability

The variability of environmental corrosion severity has been well established by atmospheric testing programs.^{8,11-14} Relative severity is commonly indicated by designating an environment as rural, urban, industrial, marine, or an appropriate combination of these terms. Moreover, many studies^{7,9} have shown that certain environmental factors, e.g., moisture, salt, and pollutants, are responsible for the more rapid corrosion observed in environments containing them. Consequently an environmental rating scale which takes into account those factors could provide a more useful indication of relative severity which could be used in management of aerospace systems.*

It would be difficult to devise a general rating system which would predict the corrosion damage to every metal. Different metals display widely diverse behavior in a given environment and also from one environment to another. Some alloys are more resistant in marine locations than industrial, and the reverse is true for others. The several factors which influence corrosion are present in a unique combination for a given site, and precise information relating the corrodibility of a specific alloy to every environmental factor is not available. In the case of aircraft, however, one is concerned with a limited number of alloys, a few each of aluminum, steel, titanium, and magnesium.** In addition, a precise rating scale is not needed for logistic decisions, but merely a relative rating. It is commonly known that aircraft - like automobiles - are corroded more severely in some environments than others. Finally, since military aircraft spend most of their lifetime on the ground at the

*And other systems as well, cf. Scheffer¹⁵.

**The scope of this study is restricted to corrosion of structural alloys, excluding engines and avionics. Materials of these latter systems, however, probably will respond to environmental corrosive factors in a similar way¹⁶.

home airbase,⁶ a system for classifying the severity of air-base environments is quite reasonable.

2. Atmospheric Corrosion in Aircraft

Tomashov⁷ distinguishes the following types of atmospheric corrosion:

(1) "Wet atmospheric corrosion" caused by visible droplets of condensed moisture on the surface. Such moisture may result from dew, frost, rain, snow, or spray;

(2) "Moist atmospheric corrosion", which occurs at relative humidity less than 100%, and proceeds under a very thin, invisible layer of electrolyte formed on the surface by capillary action, physical, or chemical adsorption;

(3) "Dry atmospheric corrosion" which occurs in the complete absence of a moisture film.

Both wet and moist atmospheric corrosion occur in aircraft. Water accumulates on metal surfaces as condensation (dew, fog, from humid air on cold post-flight surfaces), rainfall on exterior surfaces and through open hatches, and various inadvertant spills. Dry atmospheric corrosion, however, is unimportant because aircraft alloys do not corrode in the absence of moisture.

Thus the range of corrosion problems in aircraft may be categorized as:

(1) Wet and moist corrosion of bare, unprotected metal surfaces;

(2) Wet and moist corrosion of protected metal surfaces subsequent to failure of protective coatings. Protective coatings fail because of solar radiation, atmospheric contaminants (mainly ozone and other oxidants, particulates, fuels, and exhaust gases), high speed air ablation, and mechanical abrasion and flexure;

(3) Corrosion caused by contaminants of human origin including spilled beverages, human waste, hydraulic fluids, and battery acids.

The first and second categories of corrosion may be related to the ambient environmental factors which accelerate

corrosion of metals or degradation of protective coatings, hence an environmental rating system would be relevant to them. The third category is a housekeeping problem. Although it should be relatively easy to control and prevent such damage, it is in fact a serious problem in USAF aircraft. The quality of housekeeping varies from one airbase to another⁶ and thus conceivably might be considered an environmental variable. Since it is not easily measured, and it varies unpredictably from time to time, it cannot be considered in a rating system.

3. Factors Affecting the Rate of Corrosion

The rate of metallic corrosion in the atmosphere is determined by three sets of variables:

- (1) Weather conditions, especially those relating to moisture;
- (2) Atmospheric pollutants, both natural and anthropogenic;
- (3) The nature of the metal.

The relationship of weather and pollutants to the corrosion of aircraft alloys of interest in PACER LIME will be discussed in some detail.

a. Weather

Weather parameters include temperature, precipitation, solar radiation, wind direction, wind speed, relative humidity, dew point, cloud cover, and fog.¹⁰ All can affect the rate of corrosion, but water (and therefore those parameters related to water) will produce the largest influence. Vernon^{17,18} has shown that a given metal corrodes rapidly when the relative humidity exceeds a critical value, but corrodes slowly or not at all at lower humidity. The value of the critical humidity varies from one metal to another, and the presence of various pollutants can change the value as well as the corrosion rate. The critical humidity for ferrous alloys is about 70% in the absence of other factors; in the presence of sulfur dioxide, however,

it is reduced to about 60%. Similarly in the presence of SO_2 , the critical RH is about 70% for aluminum. Unfortunately very few data are available for other metals.

A film of moisture will deposit from humid air on metal surfaces of aircraft¹⁹ under several conditions: if the metal is colder than the air (immediately following high altitude flight), if hygroscopic salts (corrosion products, pollutant deposits) are present, or through adsorption. The film thickness, from two or three to several hundred molecular layers, will be determined by the humidity value as well as the nature of the adsorption process.⁷ Consequently, the relative humidity alone is not sufficient to determine completely relative corrosivity, but it can provide a good first approximation.

Dew, fog, and rain, on the other hand, wet exposed surfaces immediately. Dew condensation occurs when air cools to its dew point temperature, corresponding to 100% RH. The air itself need not cool to this point, however, before moisture accumulates. The only requirement is that the metal surface be sufficiently cooler than the surrounding air. At 80% RH, for example, the surface need be only 6°F cooler than the air.¹⁹

There has been much discussion¹⁰ on the effects of rainfall. Rain is thought to promote corrosion by providing moisture and washing away soluble corrosion products. It also is believed to retard corrosion by washing away pollutant deposits. Thus light rain would be harmful, but heavy rain would be beneficial.

The beneficial effects appear to be unimportant in aircraft corrosion, because, generally, paint protects aircraft surfaces exposed to the washing effects of rain, whereas corrosion occurs underneath the paint at cracks, etc., where the washing is ineffective. Interior surfaces carelessly exposed to rain, however, are wetted and not washed, and water is harmful to the less well protected surfaces. Accordingly, rain should be considered a harmful source of moisture.

Air temperature, humidity, solar radiation, cloud cover, and wind speed affect the rate of water evaporation. Also, temperature strongly influences the rate of corrosion reactions, thus corrosion rates would be expected to increase as the temperature rises. But oxygen, dissolved in the water electrolyte, is required for most corrosion reactions and the solubility of gases decreases with increasing temperature.

Rozenfeld⁹ considers in some detail the interaction of temperature and moisture, and points out that the time of wetness will vary with temperature. Thus corrosion rates are greater in northern regions, where temperatures are low, than in warmer southern regions because moisture remains on metal surfaces longer at the cooler northern temperatures, but evaporates faster in southern warm temperatures. A combination of high temperature with prolonged moisture contact, however, will result in severe corrosion. For example, corrosion of marine pilings in summer is rapid near the water surface where they are wetted continually, but quite low at higher points where they are wetted only occasionally by rain. It remains difficult to predict, though, the effect of temperature on corrosion processes in the atmosphere.

b. Pollutants

Atmospheric pollutants are natural and anthropogenic airborne substances present at harmful concentrations. These substances usually are described as follows,²⁰ including only those known to contribute to corrosion:²¹

(1) "Particulates" includes both solid and liquid material in particle sizes from 0.1 to 100 μm . Dust, grit, fly ash, and visible smoke particulates larger than 20 μm settle to the ground somewhat quickly. Smaller particles remain suspended much longer and may be dispersed over extremely wide areas. Thus large particulates potentially might cause corrosion problems close to the source (sea salt-spray is a special case), whereas small particulates

can be important factors at great distances from their source, e.g., dust storms, and farming activities in the U.S. Great Plains result in elevated particulate concentrations downwind in the north east.

Particulates vary widely in chemical composition. They generally are classified according to the source:²² (1) salts from sea spray and salt flats; (2) dusts from agricultural lands; (3) soots from the incineration of agricultural wastes and the burning of fuels; (4) agricultural and industrial dusts. Ninety per cent of airborne particulates originate from natural sources. Very few monitoring stations report the chemical compositions of particulates, but provide only total concentrations. Thus, although the corrosiveness of various particulates may vary widely, there is no way to take account of the differences, because data are not available. Geographical proximity to salt, however, is a notable exception. The corrosivity of salt is well established, but for other particulates, there exist only a few studies²² which show corrosion to be more severe in industrialized areas with high particulate concentrations. These studies are ambiguous, however, because other corrosive factors are present.

The presence of salt greatly increases corrosion rates for nearly all metals,^{7,9} hence the proximity of salt sources will be of much concern. Environments where airborne salt concentrations are high will be high risk environments. When soluble salts, e.g., sodium chloride or ammonium sulfate, are present, corrosion products usually are water soluble and readily removable. Corrosion products which form in the presence of water only, however, usually are weakly soluble, thus not readily removed, and serve a protective function to the underlying metal. In addition, many anions remove primary oxide films or displace oxygen layers which are passivating.⁹

There is a synergistic effect between salt deposits and the atmospheric water content. The deliquescent salts

undergo a phase transformation from dry crystal to a solution droplet when the ambient water vapor pressure exceeds that of a saturated solution of the highest hydrate.⁷ The relative humidities at which this transformation occurs for ammonium sulfate, sodium sulfate, sodium chloride, and ammonium nitrate are 80, 86, 75, and 62 per cent, respectively. Thus salt deposits both attract moisture to metal surfaces and provide the electrolyte solution required for corrosion.

(2) Sulfur, another atmospheric pollutant, enters the atmosphere in a variety of forms, including sulfur dioxide, SO_2 , hydrogen sulfide, H_2S , and sulfate salt particulates.²³ About two thirds of all atmospheric sulfur comes from natural sources, mainly as H_2S from bacterial action which later is converted to sulfur dioxide. Estimates of world-wide emissions of sulfur dioxide emitted initially as SO_2 , both man-made and natural, show that more than 80% (or 16% of the total in the air at any given time) comes from combustion of sulfur-containing fuels. The smelting of nonferrous metals and petroleum refining account for most of the remaining 20%. The only apparent natural source of sulfur dioxide is a small contribution from volcanoes.

Sulfur dioxide initially is oxidized photochemically to sulfur trioxide, which then combines with water to form sulfuric acid. The primary oxidation process may follow several different paths and can proceed rapidly in polluted atmospheres. In air containing nitrogen dioxide and certain hydrocarbons, sulfur dioxide is oxidized in a photochemical reaction process that produces aerosols containing sulfuric acid. Also, sulfur dioxide can be oxidized in water droplets that contain ammonia, the end product being ammonium sulfate aerosol. Both sulfuric acid and sulfate salts thus formed are removed by precipitation and, to a lesser extent, by gravitational settling.

A large part of the sulfur in the global atmosphere is emitted as hydrogen sulfide produced naturally by decaying organic matter on land and in the oceans and by volcanoes.

Hydrogen sulfide also is emitted by some industrial operations and by catalytic converter-equipped automobiles. Hydrogen sulfide, like sulfur dioxide, is oxidized in the air and eventually converted to sulfur dioxide, sulfuric acid, and sulfate salts.

On a local or regional basis, the mechanisms by which sulfur compounds are removed from the air may produce significant effects. In the early 1960's as the concentration of sulfur compounds in air over Europe began to rise, so did the acidity of precipitation.²⁴ Both phenomena are attributed to increased use of sulfur-containing fuels.

Many materials, in addition to metals, deteriorate in the presence of atmospheric sulfur in one form or another.²³ Ferrous alloys, in particular, corrode more rapidly in the presence of SO_2 , the effect apparently being synergistic with moisture. Hydrogen sulfide attacks copper and silver to form a nonconductive sulfide film, causing electrical contacts to fail.

In the U.S., ambient SO_2 levels have decreased in recent years because of reduced usage of coal and enforcement of "environmental protection" legislation.²⁵ It appears likely however, that energy considerations will force the U.S. to use more coal, and SO_2 concentrations probably will reach levels no lower than they are today and may even increase.

(3) Hydrocarbons²⁶ mostly come from natural decomposition of organic matter. Anthropogenic sources are important, however, because they may be highly concentrated geographically where they are not rapidly dispersed. The most notable example is the Los Angeles basin, where the sources are automobile gasoline engines. The fate of the hydrocarbon pollutants involves the reaction with oxides of nitrogen to form photochemical smog, which include a variety of secondary pollutants such as ozone, nitrogen dioxide, and peroxyacetyl nitrates. Hydrocarbons themselves are not

damaging either to metals or protective coatings, but photochemical oxidants are harmful to both.²⁷

(4) Nitrogen oxides,²⁸ NO_x , arise from both natural and anthropogenic sources. The former mainly are organic decomposition, the latter the internal combustion engine. Internal combustion initially yields nitric oxide, NO which by itself is relatively harmless. In the atmosphere, however, NO oxidizes to nitrogen dioxide, NO_2 , which is harmful both directly as an irritant and indirectly in the formation of photochemical smog. The chemical reactions occurring in the presence of NO_2 , hydrocarbons, and sunlight are complex but yield an atmosphere which is aggressive in the destruction of organic materials such as paint films and protective coatings.

The corrosive effects of NO_x and photochemical oxidants^{27,28} probably are indirect. These pollutants may decompose protective finishes on aircraft resulting in premature failure of the coating and exposure of underlying metal. It should be remembered that the nature of local pollutants is relevant to the type of aircraft corrosion problems to be expected. In the industrial eastern U.S., smog containing SO_2 will produce direct metal corrosion to the interior and exposed exterior metal parts of an aircraft, whereas a Los Angeles photochemical-type smog will damage finishes and seals, followed by corrosion of underlying metal.

4. Establishing Environmental Quality Standards For Corrosion

Corrosion accelerates when the following environmental factors are present:

- (1) Humidity, rainfall, and solar radiation;
- (2) Proximity to the sea or other salt sources; and
- (3) Pollutants, mainly sulfur oxides, particulates, photochemical oxidants, and nitrogen dioxide.

The prevalence of these environmental factors varies widely from one geographical location to another and even within

relatively small areas.²⁹ Moreover, there is much empirical and experimental evidence to show that environmental corrosivity becomes increasingly severe as these factors increase, but at low values, their effects on corrosion are negligible. Thus, it is reasonable to assume the existence of a critical value for each factor, either alone or in combinations, which then could be used to establish environmental severity. The critical value may sharply divide slow and rapid corrosion, such as for iron and aluminum in the presence of SO_2 versus humidity (cf. Rozenfeld⁹, pp. 106 and 109). Alternately the variation of damage with the environmental parameter may be gradual, such as the repainting of houses vs. particulate concentration (cf. Stoker and Seager³⁰, p. 98), thus the critical value is less precisely defined. Where such critical values are known, they can be utilized directly as environmental quality standards.

Unfortunately, such data are nearly nonexistent for all environmental factors except possibly humidity. Most laboratory studies of pollutant effects on corrosion have used concentrations much higher than any found in even the most polluted environments, hence, it is difficult to establish their relevance in real environments. Much effort^{22,23,26-28} has been devoted to establishing critical concentration levels with respect to human health, plant, and animal welfare which form the basis of ambient air quality standards. A critical concentration for materials damage, however, may be higher or lower than these. Thus the problem of establishing environmental standards for corrosion is neither simple nor straightforward.

A set of working environmental corrosion standards (WECS) might be developed by consideration of the following:

- (1) The range of values for the several ambient parameters, which will establish the limits of environmental exposure, if not the damage to be expected. Such data include maxima, minima, medians, and percentiles for the

measured parameter. Since the actual environments are known to vary in corrosion severity, it follows that critical concentrations for practical use must be within the range of ambient levels, perhaps near the median values or higher.

(2) Ambient air quality standards established by the Environmental Protection Agency are concerned primarily with human health, as noted above. Nevertheless, they do summarize (presumably) careful consideration of all available evidence by a host of scholars and bureaucrats. The values represent the highest levels believed safe for human health and comfort. Although materials may endure higher concentrations or may suffer damage from long term exposure to lower concentrations, these values are a bench mark for damage to something.

(3) Experimental studies which relate corrosion damage with pollutant concentrations and weather variables may provide information for establishing WECS. Several studies, using both real and simulated environments, have been published.

a. Ranges of Ambient Parameters

Within the United States, a number of weather and air quality parameters are measured by several agencies. Weather data are collected by the National Weather Service, the USAF Environmental Technical Applications Center (ETAC), and others, and summaries are available. Weather data most commonly are measured at aerodromes because weather is a critical factor in aircraft operational safety. Air quality data - measurements of a limited number of pollutants - are collected by federal, state, municipal, and private air monitoring stations, and the results are compiled by state agencies and, nationally, by the U.S. Environmental Protection Agency. The purpose of this program is to evaluate air quality primarily in the most densely populated regions of the country. Thus the results are representative of the population distribution rather than geography. They would not necessarily represent the environments to which aircraft

may be exposed and may not be directly relevant to aircraft corrosion. Moreover, many monitoring stations - especially private ones - were established to track specific pollution sources, e.g., certain manufacturing operations, thus their data may reflect highly localized conditions. Despite these limitations, the national data as compiled by EPA are the only data available to assess the range of exposure.

Graedel and Schwartz³¹ analyzed ambient atmospheric conditions and quality based on National Weather Service and EPA data. Weather data spanned 30 years from more than 200 measuring sites, and air quality data, mostly from CY 1973, represented as few as 82 to as many as 3760 measuring sites for the several pollutants. Graedel and Schwartz's objective was to determine the range of environmental parameters to which materials are exposed in the U.S. and thus establish "bench marks" for laboratory or field testing. Weather data analyzed by the authors were mean annual temperature and mean annual absolute humidity. Pollutant data were the annual median of hourly averaged continuous data for each measuring site.

We note three results of Graedel and Schwartz for each atmospheric parameter: the median of the 50th percentiles, the median of the 99th percentiles, and the maximum value reported (Table 1). The 50th percentile median represents "average of averages" values reported, whereas the 99th percentile median is the level exceeded at only 1% of all air quality sites. Graedel and Schwartz define the 99th percentile medians as Atmospheric Upper Limit Values, AULV, or "mean high water marks" which may be used for design purposes with the expectation that 99% of the applications will encounter levels below the AULV. The maximum value was the highest mean reported.

The distribution of means as shown by Graedel and Schwartz is more-or-less Poisson-like for all factors except ozone and SO₂. For ozone, a large number of sites reported values below 20 µg/m³ and a substantial number were grouped

TABLE 1. RANGES OF ENVIRONMENTAL
 AMBIENT PARAMETERS, CONTINENTAL U.S.³¹

	50th Percentile	99th Percentile	Maximum Reported
Total Suspended Particulates, $\mu\text{g}/\text{m}^3$	61	185	500
Sulfur Dioxide, $\mu\text{g}/\text{m}^3$	43	186	410
Photochemical Oxidants, as ozone, $\mu\text{g}/\text{m}^3$	36	90	110
Nitrogen Oxides as NO, $\mu\text{g}/\text{m}^3$	25	88	98
as NO ₂ , $\mu\text{g}/\text{m}^3$	72	135	150
Temperature, °C	11.8	23.3	25.7
Humidity, absolute, g/m^3	7.1	16.5	18.3

between 30 and 60 $\mu\text{g}/\text{m}^3$. Nevertheless, the median, 36 $\mu\text{g}/\text{m}^3$, probably is a valid demarcation between high and low concentration sites. Sulfur dioxide data from 447 monitoring sites, however, was highly skewed toward low values. Indeed, the maximum number of sites reported values at the median and mean value of 43 $\mu\text{g}/\text{m}^3$, and only 17% of monitoring stations reported means greater than 53 $\mu\text{g}/\text{m}^3$. Because of this, the significance of the median value for SO_2 is placed in a different light than for the other parameters. This is especially unfortunate because of the peculiar role of SO_2 in corrosion.

Critical levels of atmospheric factors probably are somewhere between the median values and the worst-case maxima or even the AULV's. Clearly the AULV's represent the most hostile environments for individual atmospheric factors in the CONUS, and this worst 10% level would be inappropriate to use in a practical environmental rating scale. To be sure, a design engineer might wish to plan for all but the most hostile environments, as Graedel and Schwartz suggest, but experience shows that this has not been the case in the past. It may be noted that the list of monitoring stations (their Table 2) which exceed the AULV's includes San Bernardino, CA only once (for nitrate ion particulates), whereas Travis, CA and Charleston, SC are not mentioned. All three of these have been shown to be severe environments, the first for paint degradation and the latter two for metallic corrosion.^{6,32}

b. Proximity to the Sea and Other Sources of Salt

Several studies^{8,11,13,33,34} have shown that accelerated atmospheric corrosion near the seashore is correlated with airborne sea salt. Establishing a critical distance from the shore, however, is difficult because there is little quantitative information relating corrosion to atmospheric

*The corrosive severity of Travis and Charleston has been attributed primarily to their proximity to salt water, which in turn should indicate high concentration of sea salt. Graedel and Schwartz's list does include several sites near the ocean which exceed their particulate AULV.

salt concentrations, or even relating salt concentrations to distance from the shore. Sea salt is a primary concern because there are few other sources of airborne salt. Coastal salt flats, however, such as those south of Brownsville, TX, have been shown to contribute atmospheric chloride downwind.³⁵

The study of atmospheric aerosols³⁶ has centered mostly on the distribution of particle sizes, rather than the mass of aerosol per unit volume, i.e., micrograms per cubic meter of particulate, as measured at air monitoring stations. The upper limit of aerosol particle size is determined by sedimentation processes. Particles larger than 20 μm radius remain airborne for a short time and are found only in the vicinity of their source. Hence, an atmospheric aerosol by definition consists of particles between 0.1 μm and 20 μm radius. Aerosol particles commonly are classified as "Aitken" particles, $\leq 0.1 \mu\text{m}$ radius, "large" particles, 0.1 - 1.0 μm radius, and "giant" particles $> 1 \mu\text{m}$ radius in size. Larger particles settle from the air rapidly whereas smaller particles persist in the atmosphere for long times and travel large distances, and serve as condensation points for rainwater precipitation. Consequently, chloride in rainwater is correlated with small particles, whereas direct settling of large particles occurs near the shore. Thus measurements of sodium chloride in rainwater and of atmospheric sodium chloride particulates vs. distance from the sea may suggest values for the critical distance.

(1) Salt in Rainwater

The concentration of sodium chloride in rainwater is high near and over the ocean, but diminishes inland,³⁵ as would be expected. Concentrations over the sea are 8.0 $\mu\text{g/l}$, and over land in the central U.S. are 0.1 $\mu\text{g/l}$.³⁵ The concentration decreases logarithmically with distance from the sea up to 500 km in the U.S., and is constant at greater distances. In Europe, the concentration decreases logarithmically up to 300 km, but increases slightly beyond that.

distance apparently because of the influence of the Baltic Sea.

It is unlikely, however, that chloride in rainwater is relevant to aircraft corrosion. The exterior surfaces of aircraft exposed to rain are protected by paint, whereas most interior surfaces are not exposed to rain. Moreover, the decrease of chloride in rainwater occurs over large distances, whereas the decrease in corrosion damage is quite abrupt.^{9,11} Corrosion rates 10 km from the shore are approximately the same as corrosion rates far inland. Consequently, the critical proximity should not be determined from rainwater chloride concentrations.

(2) Particulate Sodium Chloride

Duce et al.³⁷ have measured the concentration of particulate sodium chloride and other ions in the air at various elevations and distances from the sea-shore on Hawaii Island, HI. All measuring sites were downwind of offshore trade winds. Their results show chloride concentrations at all sites varying widely with ambient weather conditions. Their primary interest was the variation of chloride and other ionic components with elevation above sea level, rather than distance from shore. Nevertheless, the results show a consistent, monotonic decrease in chloride concentration with increasing distance from the shore.

The results of Duce et al. are reproduced in part in Figure 1. Also included are two additional reported values for giant particle chloride concentrations, one over the ocean and one near the shore in Massachusetts. The over-ocean values should be compared with Junge's summary³⁶ (p. 162) of salt concentration vs wind velocity measurements, which illustrate the wide variability of such data.

Hudson and Stanner³⁴ found in Nigeria that sodium chloride concentration in the air varies within wide limits and depends strongly on the distance from the shore. The sodium chloride content in the air is about .22 milligrams per cubic meter. The amount of salt that settles out on

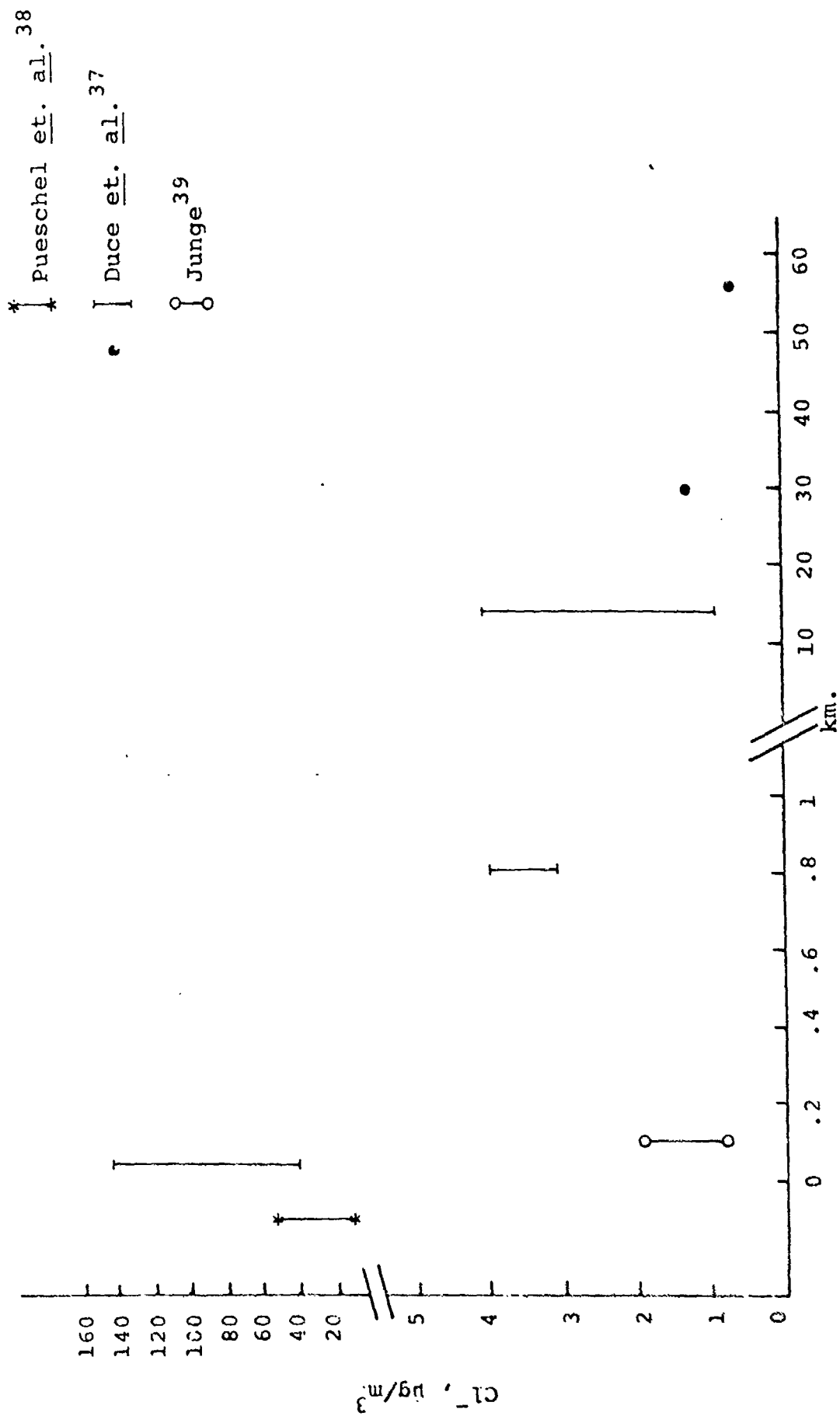


Figure 1. Atmospheric Salt Particle Concentration vs. Distance From Seashore

the surface under these conditions reaches values from 10 to 1000 milligrams per square meter per year. Corrosion tests were conducted at various distances from the shore with simultaneous determination of airborne salt concentration. The relationship between salt deposits and distance from the sea as well as corrosion rates vs. distance from the sea are shown in Figure 2.

Available evidence shows that giant particle chloride concentrations in the atmosphere are reduced by about 1 order of magnitude at a distance of 3/4 km from breaking surf. At distances of about 15 km the concentration reaches a value which remains nearly constant further inland.

Junge³⁶ (p. 176) has drawn together the available data on giant salt particulates vs. distance from sea. Values of $5 \mu\text{g}/\text{m}^3$ correspond to near-shore and approach $0.5 \mu\text{g}/\text{m}^3$ at distant points inland.

The available data on atmospheric corrosion near marine environments suggests that the decrease in corrosion rate parallels this decrease in giant salt particulates, and "marine atmospheres are aggressive in direct proportion to the concentration of (airborne) NaCl particles" (Rozenfeld⁹).

Most studies suggest a critical distance of less than 1.5 km for sites where strong off-shore winds are not prevalent. Allowing for the variability of weather, however, it seems prudent to extend this to 4.5 km.

c. U. S. National Ambient Air Quality Standards (NAAQS)

The Federal Clean Air Act (Public Law 91-640) directed the Environmental Protection Agency (EPA)

"to publish proposed national primary and secondary ambient air quality standards based upon air quality criteria [also issued by EPA]. Primary ambient air quality standards define levels of air quality which [the EPA judges] necessary, based on the air quality criteria and allowing an adequate margin of safety, to protect the public health. Secondary ambient air quality standards define levels of air quality which [EPA] judges necessary, based on the air

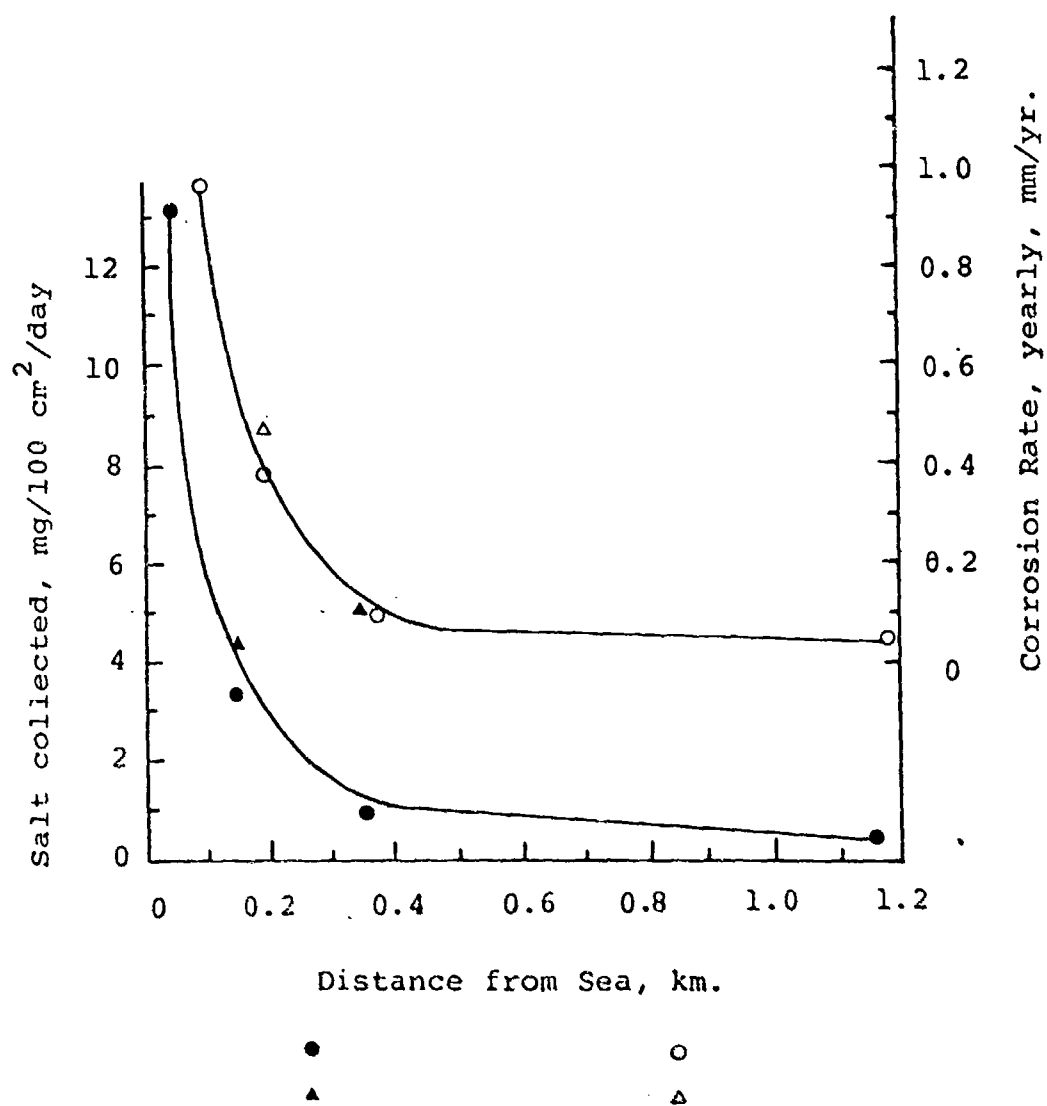


Figure 2. Surface Salt Deposits and Corrosion of Iron vs. Distance From Sea, Nigeria (after Rozenfeld 1972, p. 122)

quality criteria to protect the public welfare from any known or anticipated adverse effects of an air pollutant."⁴⁰

Air quality criteria published by EPA summarize the scientific knowledge relating pollutant concentrations and their adverse effects. They were issued to assist the development of air quality standards. Air quality criteria merely describe effects that have been observed when the ambient air level of a pollutant has reached or exceeded a specific value for a specific time interval. In developing criteria many factors were considered, including the chemical and physical characteristics of the pollutants, the techniques available for measuring them, exposure time, relative humidity, and other conditions of the environment. The criteria attempted to consider the contribution of all variables to the effect of air pollution on human health, agriculture, materials, visibility, and climate. Air Quality Standards on the other hand legislate pollutant concentrations that the government determines should not be exceeded in a specified geographic area. Primary standards were intended to protect public health, whereas secondary standards were intended to protect public welfare. Public welfare includes effects of pollutants on soil, water, vegetation, materials, animals, weather, visibility, and human comfort. (Materials significantly are not important.) In the case of some pollutants, the primary and secondary standards are the same, whereas for others, notably sulfur oxides and particulates, the secondary standards are lower. These standards are listed in Table 2.

It is difficult to determine how EPA based the NAAQS on the respective Air Quality Criteria.^{22,23,26-28} Comments submitted to EPA, subsequent to the first publication of standards, "reflected divergences of opinion among interested and informed persons as to the proper interpretation of available data on the public health and welfare effects of the six pollutants . . . "⁴¹, suggesting that others

TABLE 2. NATIONAL AMBIENT AIR
QUALITY STANDARDS⁴¹

	<u>Primary</u>	<u>Secondary</u> ^a
Sulfur dioxide	80	60 $\mu\text{g}/\text{m}^3$, annual arithmetic mean
	365	260 ^b $\mu\text{g}/\text{m}^3$, 24-hour maximum
		1300 $\mu\text{g}/\text{m}^3$, 3-hour maximum
Particulate matter	75	60 $\mu\text{g}/\text{m}^3$, annual geometric mean
	260	150 ^c $\mu\text{g}/\text{m}^3$, 24-hour maximum
Carbon monoxide	10	10 mg/m^3 , 8-hour maximum
	40	40 mg/m^3 , 1-hour maximum
Photochemical oxidants	160	160 $\mu\text{g}/\text{m}^3$, 1-hour maximum
Hydrocarbons	160	160 $\mu\text{g}/\text{m}^3$, 6 to 9 AM maximum
Nitrogendioxide	100	100 $\mu\text{g}/\text{m}^3$, annual arithmetic mean

^aMaximum values are not to be exceeded more than once per year.

^b"... as a guide to be used in assessing implementation plans to achieve the annual standard."

^c"... as a guide to be used in assessing implementation plans to achieve the 24-hour standard."

could not follow the logic used in developing standards. "In reviewing the proposed standards, the Environmental Protection Agency limited its consideration to comments concerning the validity of the scientific basis of the standards.

"Current scientific knowledge of the health and welfare hazards of these air pollutants is imperfect."⁴¹ Indeed! The Clean Air Act, however, required the promulgation of standards by a specific date. Accordingly EPA had no choice but to base these standards on the available data. That data as quoted in the Air Quality Criteria are sketchy and contradictory. Using the available scientific evidence, any standard value could be established within a wide range.

In responding to comments on the initial standards, EPA did state the basis for setting several of the standards. The standard for carbon monoxide

"was based on evidence that low levels of carboxyhemoglobin in human blood may be associated with impairment of ability to discriminate time intervals . . . In the comments, serious questions were raised about the soundness of this evidence [and] extensive consideration was given to this matter. The conclusions reached were that the evidence regarding impaired time-interval discrimination have not been refuted and that a less restrictive national standard for carbon monoxide would therefore not provide the margin of safety which may be needed to protect the health of persons especially sensitive to the effects of elevated carboxyhemoglobin levels. The only change made in the national standards for carbon monoxide was a modification of the 1-hour value. The revised standard affords protection from the same low levels of blood carboxyhemoglobin as a result of short-term exposure. The national standards for carbon monoxide, as set forth below, are intended to protect against the occurrence of carboxyhemoglobin levels above 2%.

"National standards for photochemical oxidants have also been revised. The revised national primary standard of 160 micrograms per cubic meter is based on evidence of increased frequency of asthma attacks in some asthmatic subjects on days when estimated hourly average concentration of photochemical oxidant reached 200 micrograms

per cubic meter. A number of comments raised serious questions about the validity of data used to suggest impairment of athletic performance at lower oxidant concentrations. The revised primary standard includes a margin of safety which is substantially below the most likely threshold level suggested by this data.

"National standards for hydrocarbons have been revised to make these standards consistent with the above modifications of the national standard for photochemical oxidants. Hydrocarbons are a precursor of photochemical oxidants. The sole purpose of providing a hydrocarbon standard is to control photochemical oxidants. Accordingly the above described revision of the national standards for photochemical oxidants necessitated a corresponding revision of the hydrocarbon standards.

"National standards for nitrogen dioxide have been revised to eliminate the proposed 24-hour average value. No adverse effects on public welfare have been associated with short term exposure to nitrogen dioxide at levels which have been observed to occur in the ambient air. Attainment of the annual average will, in the judgment of the EPA, provide an adequate safety margin for the protection of public health and will protect against known and anticipated adverse effects on public welfare."

We conclude that the NAAQS are of little relevance to corrosion in aircraft.

d. Experimental Studies Relating Corrosion to Environment

Several studies have attempted to develop quantitative relations between corrosion and environmental parameters. These will be discussed as possible indications of critical values.

Upham⁴² conducted atmospheric exposure studies at established air monitoring sites in St. Louis and Chicago. His results showed approximately linear relationships between corrosion rates and SO_2 , TSP, and surface sulfation rates for low-carbon, low-copper mild steel panels. Mansfield^{43,44} has extended this work to a wider variety of

materials at St. Louis sites, but analysis of the results is not complete.

Guttman²¹ conducted a long term exposure program using zinc at a single site and compared the results with environmental conditions. He showed that the most important factors are time of wetness and the atmospheric concentration of SO_2 , and, further, that the time of wetness is a consequence of ambient relative humidity. He found temperature not to be important. Using a curve-fitting technique, Guttman obtained an empirical equation

$$y = 0.00546 A^{0.815} (B + 0.0289),$$

where

y = corrosion loss, mg/3x5-in panel,

A = time of wetness, hr., and

B = SO_2 concentration during the time panels were wet, ppm.

This equation suggests a linear dependence of corrosion damage on SO_2 concentration, which would imply that there is no critical concentration. Guttman did not relate time of wetness to weather parameters, thus it doesn't help this study.

Haynie and Upham⁴⁵, in an extension of Guttman's work with zinc, assumed a linear dependence of corrosion on mean relative humidity and mean SO_2 concentration. Zinc specimens were exposed at a number of U.S. Public Health Service Continuous Air Monitoring Program (CAMP) sites. Corrosion damage to the samples was compared with CAMP pollutant data and weather data from the nearest weather station. Statistical analysis yielded

$$y = 0.00104 (RH - 49.2) \text{SO}_2 - 0.00664 (RH - 76.5)$$

where

y = zinc corrosion rate, $\mu\text{m}/\text{yr.}$,

RH = mean relative humidity, %, and

SO_2 = mean SO_2 concentration, $\mu\text{g}/\text{m}^3$.

This equation suggests that zinc will not be wet below RH of 76.5% in the absence of SO_2 and, furthermore, increasing humidity above that point inhibits corrosion. Haynie and Upham view this as consistent with the formation of a protective carbonate film. In the presence of SO_2 , however, their equation indicates a linear dependence on the product of RH with SO_2 and a linear dependence on SO_2 . Again, critical values of each parameter are not indicated.

Equations such as these can be used to predict the useful life of galvanized iron products which are scrapped when the zinc coating is perforated. Haynie and Upham have made such predictions for various environments and their results compare well with experience.

Haynie and Upham⁴⁶ conducted a more extensive study of the corrosion of enameling steel and atmospheric factors. Specimens were exposed at 57 sites of the National Air Sampling Network (NASN) coordinated by the EPA. Weight loss data were obtained at one year and two years and were correlated with mean weather data (RH and temperature) and pollutant concentrations (SO_2 , TSP, sulfate ion $\text{SO}_4^{=}$, and nitrate ion NO_3^-). Correlation analysis identified the variable set which was used in multiple regression analysis. Haynie and Upham found that corrosion of steel is a function primarily of $\text{SO}_4^{=}$, NO_3^- , RH, and time. Temperature, TSP, and SO_2 appeared to be insignificant. Because of an observed covariance between $\text{SO}_4^{=}$ and SO_2 , together with many other studies which had shown a relation between corrosion and SO_2 , Haynie and Upham suggested that $\text{SO}_4^{=}$ may be merely a "proxy" variable for SO_2 . When $\text{SO}_4^{=}$ data were excluded from their analyses, the empirical fit was nearly as good with SO_2 as with $\text{SO}_4^{=}$.

The relation between corrosion for this steel and the environmental factors considered was best expressed as

$$\text{corr.} = 183.5 \sqrt{E} \exp(0.0642 \text{ Sul} - 163.2/\text{RH}),$$

where

t = time, yr.,
 S_{ul} = mean concentration $SO_4^{=}$ or SO_2 , $\mu g/m^3$, and
 RH = relative humidity, per cent.

By transposing the time factor to the left hand side, Haynie and Upham show the dependence of "pseudocorrosion rate", $corr./\sqrt{t}$, on SO_2 concentration and relative humidity.

Environments where RH and SO_2 are high should be more corrosive and maintenance to equipment will be required more frequently. The frequency of a given maintenance operation would be inversely proportional to the time required for corrosion to reach a specified depth. Thus a crude estimate of the ratio of maintenance frequency in a SO_2 polluted environment to that in a cleaner environment is given by Haynie and Upham as

$$MFR = \exp(.006 SO_2),$$

or

$$MFR = \exp[.006 (SO_{2a} - SO_{2b})],$$

where MFR - maintenance frequency ratio, and a, b refer to two different environments.

Haynie, Spence, and Upham⁴⁷ have studied the corrosion of weathering steel and galvanized steel in a laboratory chamber with various combinations of humidity, radiation, and pollutants. Experiments were conducted in atmospheres containing SO_2 , NO_2 , O_3 , and water vapor, each at two different concentrations as listed in Table 3, and the results were compared with corrosion rates in clean humid air. This two-level factorial arrangement was selected to identify environmental factors statistically. It may be noted from Table 3 that the three "low" pollutant concentrations are essentially equal to the primary NAAQS values, and considerably higher than the 50th percentiles of Graedel and Schwartz³¹. Absolute humidities are very high compared with the ambient 50th percentiles. The "high" values of the several factors are many times greater than the extreme values of the U.S.

TABLE 3. ENVIRONMENTAL FACTORS AND
LEVELS USED BY HAYNIE, SPENCE,
AND UPHAM⁴⁷

Environmental Factors	<u>Level</u>	
	Low	High
Sulfur dioxide, $\mu\text{g}/\text{m}^3$	79	1310
Nitrogen dioxide, $\mu\text{g}/\text{m}^3$	94	940
Ozone, $\mu\text{g}/\text{m}^3$	157	980
Absolute humidity, g/m^3	19.8	35.7
RH (at 35°C)	50	90

Analyzing the results, Haynie et. al. conclude that only SO_2 humidity, and their interaction are significant factors in the corrosion of weathering steel. For galvanized steel, only the direct effects of the two were of importance. Thus, they view NO_2 and O_3 as having little or no effect on the corrosion of these alloys.

Their corrosion rate results, reproduced in part in Table 4 however, suggest otherwise. (We must admit we do not have access to their complete analysis.) Corrosion rates in the atmospheres containing the three pollutants and moisture are significantly increased over those in humid air alone. Raising each pollutant to the "high" value one at a time again results in strikingly increased corrosion rates, the largest increase being for SO_2 . From these data, it appears that NO_2 and O_3 do accelerate corrosion rates, although not as much as SO_2 .

e. Working Environmental Corrosion Standards (WECS)

After considering the existing literature on materials degradation and environmental factors, we conclude that there are no firm guidelines for setting WECS, with the exception of humidity. Metallic corrosion is definitely accelerated in the presence of SO_2 and high humidity, and probably accelerated by NO_2 , oxidants, and many particulates. Organic protective finishes are deteriorated by solar radiation, oxidants, some particulates, and possibly by NO_x and SO_2 . Published research does not tell us, however, at what level these factors become significantly damaging.

Accordingly, we adopt the view that critical values lie within the range of ambient values, because accelerated corrosion has been observed in existing environments. We adopt two sets of WECS based on the analysis of Graedel and Schwartz⁷¹. The first set are their 50th percentile values and the second set are the 50th percentile values plus 20 percent of the difference between the 99th and 50th percentiles. These are listed in Table 5. The values for proximity to salt or sea are based on the analysis presented

TABLE 4. CORROSION RATES ($\mu\text{m}/\text{YEAR}$) OF
WEATHERING STEEL IN DESIGNATED
CONTROLLED ATMOSPHERES (AFTER
HAYNIE, SPENCE, AND UPHAM⁴⁷)

<u>Low RH Only</u>	<u>Low RH, O₃, NO₂, and SO₂</u>	<u>High, Others Low</u>	
		RH	
28	84		147
		O ₃	123
		NO ₂	162
		SO ₂	371
<u>High RH Only</u>	<u>High RH, low O₃, NO₂, and SO₂</u>	<u>High RH, High , Others Low</u>	
		O ₃	
86	147		230
		NO ₂	178
		SO ₂	656

TABLE 5. WORKING ENVIRONMENTAL
CORROSION STANDARDS (WECS)

	Annual Mean		<u>Secondary</u>
	I	II	
Suspended Particulates, $\mu\text{g}/\text{m}^3$	61	86	
Sulfur dioxide, $\mu\text{g}/\text{m}^3$	43	72	
Ozone, $\mu\text{g}/\text{m}^3$	36	47	79
Nitrogen dioxide, $\mu\text{g}/\text{m}^3$	64	78	122
Absolute humidity,* g/m^3	7.1	9.0	
Proximity to sea or salt source, km.	4.5	2	
Solar radiation, July (Langleys)	600	650	
Rainfall, cm. total	125	150	

*Absolute humidity is the product of relative humidity and the mass of water in one cubic meter of water-saturated air⁴⁸ at a given temperature.

earlier of published data. The solar radiation values are based on the mean (July) values for the continental U.S.

These WECS have been used in the Corrosion Severity Index Algorithms (described in a subsequent section) and the results compared with experimental environmental ratings. The agreement is sufficiently good that the values of Table 5 together with the Algorithms may be used to compute accurate relative environmental severity for corrosion in aircraft.

5. Corrosion Severity Algorithms

a. The 1971 Corrosion Factor Equation

Evolution of the 1971 CF equation spanned several years. Many factors were considered (Table 6) which might be used to derive a three-step rating scale (mild, moderate, severe).

"Parameter limits were established by relating 10-20 years of corrosion data for nonferrous metals from ASTM to the appropriate parameter. The air pollutant data was obtained from the Department of HEW and is representative of five year averages. We also used six months of air frame corrosion data...The most weight in the rating is given to relative humidity..."⁴⁹

Other parameters considered were general climate rating, prevailing wind, water content of the air, number of days with dense fog, the amount of precipitation, the number of thunderstorms, and the number of cloudy days. Foggy, wet days were considered harmful, but heavy thunderstorms in arid areas as beneficial.

The 1971 CF equation, however, did not include pollutant data, probably because the information available at that time was inadequate or unreliable.

The 1971 CF equation is

$$CF = [2(RH) + 2(PS) + DP + NC + HR + WV] / 6,$$

where the several factors are related to relative humidity, proximity to the sea, dew point, no ceiling (sunshine), heavy rain, and wind velocity, respectively. Each factor is an integer (1, 2, or 3) representing a range of values for the relevant parameters; they do not represent the parameters directly. These value ranges are detailed in Table 7.

Interim numerical classifications were derived from the CF equation from nine years of climate data (1961-1970) compiled by USAF Environmental Technical Application Center (ETAC).⁵⁰ Numerical indices were published for 39 SAC airbases in 1972, and for 95 USAF and 27 ANG airbases in 1973. A complete list was distributed in 1974 under the title "PACER LIME Interim Corrosion Severity Classification." These values are reproduced in Appendix A.

TABLE 6. ENVIRONMENTAL FACTORS CONSIDERED IN DEVELOPING
A CORROSION SEVERITY INDEX ALGORITHM

Moisture

Relative humidity
Water content of air
Thunderstorms
Amount of precipitation
Fog

Airborne contaminants

Proximity to sea (salt)
 $\text{SO}_4^{=}$, SO_2
Suspended particulates (hygroscopic)

Climate (other than moisture)

Cloud cover
Wind direction, speed

Local geographical factors

Soil type
Topography (plains, mountains, swamp)
Nearest city, its size, direction

TABLE 7. THE CORROSION FACTOR EQUATION AND PARAMETER RANGES

$$CF = \frac{2(RH) + 2(PS) + DP + NC + HF + WV}{6}$$

CF = Corrosion Factor: Value Rating
 1.00-2.00 Severe
 2.01-2.85 Moderate
 2.85-3.75 Mild

Average Rel. Humidity RH

RH is the average relative humidity parameter under all weather conditions.

1 100-70.01%

2 70.00-50.00

3 49.99-0

Days Per Month NC

NC is the no ceiling (sunshine) value determined by the number of days per month with six or more hours of no ceiling.

1 5 or less

2 5.10-12

3 more than 12

Distance PS

PS is the proximity to the sea parameter.

5 miles or less

5 to 80 miles

greater than 80 miles

Days Per Month HR

HR is the moderate to heavy precipitation parameter. Moderate precipitation is 0.11 to 0.3 inches of rain in the preceding hour or 0.01 to 0.03 inches in a 6 minute interval.

0-1.50

1.51-6

6.01 or more

Days Per Month DP

DP is the dew point parameter, determined by the number of days per month when the temperature is within 4°F of the dew point for three or more consecutive hours.

more than 10

more than 5 but less than 10

fewer than 5

Average Wind Velocity WV

WV is the average wind velocity parameter.

1-1.50 mph

1.51-6.00

6.01 or more

TABLE 8
RANGE OF COMPUTED PACER LIME CORROSION SEVERITY INDEX

<u>Scale</u>	<u>CSI</u>	<u>Classification</u>	<u>Number in Atmospheric Exposure Test</u>
		3.75	
0	3.33		1
1	3.17	mild	
2	3.00		1
		2.86	
		2.85	
3	2.83		3
4	2.67		1
5	2.50	moderate	3
6	2.33		
7	2.17		
		2.01	
8	2.00	2.00	
9	1.83	severe	2
10	1.67		
		1.00	

The CF values were calculated to two decimal places. Since the independent parameters in the equation are integers, however, the CF equation is in fact an integral scale of seventeen steps. The computed list for actual airbase environments includes only eleven steps. Thus the CSI scale could be represented by a zero to ten scale (CF Table 8), but was compressed to a three-step scale:

CF = 1.00 to 2.00*	Severe
2.01 to 2.85	Moderate
2.86 to 3.75*	Mild.

The CF equation ranks the following factors as harmful:

- (a) Relative humidity above 70%;
- (b) location within five miles of the sea, without reference to wind direction;
- (c) temperature within 4°F of dew point for three or more consecutive hours and more than ten days per month;
- (d) five days or fewer per month with six or more hours of no ceiling (sunshine), without reference to temperature;
- (e) five days or fewer per month with moderate or heavy rain;
- (f) wind velocity less than 1.5 mph.

*The minimum and maximum values the CF equation can yield are 1.33 and 4.00, which correspond to the following climates:

- 1.33--High humidity, the temperature is frequently close to the dew point, location near the sea, winds nearly calm, generally cloudy and overcast, but heavy rainfalls are infrequent, and
- 4.00--Arid, windy, skies clear, more than 80 miles from the sea, but heavy rainfalls are frequent.

Thus heavy rains are considered beneficial because of washing effects, and high winds and sunny days are beneficial because of their drying effects.

b. Comments on the CF Equation

The manner in which humidity, dew point, and rainfall data are included in the CSI is contradictory, since, as discussed earlier, all three contribute moisture and promote corrosion in aircraft. All moisture sources should be considered harmful to aircraft, particularly rainfall since it frequently finds its way into areas where it should not be. Dew point and relative humidity are related; temperatures at or near the dew point result in condensation on aircraft surfaces, and moisture will condense from humid air on cold aircraft surfaces.

Proximity to the sea considers distances up to 80 miles as harmful, but significant airborne salt concentrations are found only quite near the shore in normal weather, and the concentration decreases rapidly with distance from the sea up to about 15 km and is constant beyond that point. Heavy storms can carry salt considerably farther inland, but these are relatively infrequent, so that aircraft washing and corrosion treatment schedules could be changed temporarily following such an event. Thus, emphasis on PS can be reduced, considering it harmful only if aircraft are normally within 1 to 4 km of sea water. At greater distances it may be neglected.

It is difficult to assess the value of sunshine as in the use of a no ceiling, NC, factor. It is true that direct sunshine accelerates moisture evaporation, but its efficacy also depends strongly on temperature. Further, intense solar radiation is highly damaging to protective finishes, so much that solar damage vs the benefits of solar drying may be an unequal tradeoff.

The value of wind as a drying agent also must be weighed against the harm it may cause by transporting pollutants to aircraft. In the CF equation, wind is beneficial because of its moisture removal effect. Only the aircraft exterior is accessible to such wind effects, whose surfaces are protected by paint. Moisture inside the aircraft, where it is most

damaging, would be affected little by wind.

Wind could have a damaging abrasive effect through the action of airborne sand. Wind velocities are negligible, however, compared with takeoff and landing speeds, the damaging effects of which are visible on the leading surfaces and obviously are a more serious corrosion threat than surface winds.

In summary, the CF equation centers almost entirely on the atmospheric conditions which produce or remove moisture. The only other corrosion-related factor is sea salt, included indirectly via proximity to the sea. In addition to the contradictory use of rainfall, moisture factors are over-emphasized in some cases and, in others, included in a form that is not related clearly to corrosion. As a moisture-plus-sea-salt parameter, the CF equation was a reasonable first step toward the development of a corrosion severity rating system. The next steps would have included:

- comparing the CF results with maintenance experience--both field and depot--via AFM 66-1 data;
- comparing the CF results with atmospheric test data which, as noted, have not been available in usable form until now;
- modifying the equation to include the now-available pollutant data.

c. Environmental Severity Algorithms for Aircraft Corrosion

We propose an alternative set of algorithms, based on locally-measured environmental factors and which rely in part on maintenance experience as contained in AFM 66-1 records. A particular feature of this approach is that the authority to set maintenance intervals is left in the hands of local management. These decisions would be based on locally measured meteorologic and pollutant conditions and would be subject to changes dictated by local experience. Effective use of the decision-making tools could be monitored easily by MAJCOM and AFLC analysis of MDCS data.

(1) Corrosion Maintenance in Aircraft

Excluding housekeeping, corrosion maintenance involves

- (1) washing of exterior surfaces,
- (2) repair or replacement of protective coatings and sealants, and
- (3) treatment and repair of corroded components.

Environmental elements which corrode metal are not necessarily the same as those which deteriorate paint and sealants. Humidity, SO_2 , and certain other contaminants corrode bare metal,²¹ whereas paint films deteriorate under the action of sunlight, photochemical oxidants, and a few other pollutants.^{22, 26-28} Soil deposits also are harmful to paint films, are related to suspended particulates, and their damaging effects are accelerated by contaminants such as SO_2 .⁵¹

Consequently, no single algorithm can classify an environment with respect to all three corrosion problems. Instead three decision algorithms are required to determine intervals for:

- aircraft washing
- complete repainting, and
- corrosion inspection/maintenance.

Each algorithm would assess the level of local contaminants and, via a decision-map, lead to recommended intervals for each maintenance cycle.

(2) Aircraft Washing

Aircraft are washed both to maintain appearance and to remove soil deposits which may damage the paint. There are several sources of soil: engine exhausts, fuels, and lubricants; airborne particulates; and the workers' shoesoles during maintenance and servicing operations. Soil deposits will attract and retain moisture from humid air and gaseous pollutants, particularly SO_2 . Thus, the damaging effects of soil are compounded by high humidity and pollutant concentrations. It is not likely that surface soils accelerate paint degradation by sunlight or gaseous oxidants, but there is no evidence to support this view. Thus, aircraft washing intervals selected to protect

the paint and exposed metal should be related to particulates (and proximity to the sea), SO_2 , (possibly) NO_2 , and humidity. It is likely that cosmetic purposes will be served by the same intervals. USAF recommended washing intervals, for several years, have been 45, 60, and 90 days, depending on local conditions. At many airbases, where indoor washing facilities are not available and winters are severe, even the 90 day wash interval is impractical. Other airbases plan 30-day intervals. Practical washing intervals, which are consistent both with environmental risk factors and rigorous climates, are 30, 60, and 120 days. We designate these as A, B, and C, respectively.

The Washing Algorithm (Figure 3) first determines if the distance to the sea is less than the WECS distance. If it is, washing interval A is recommended; if not, particulate concentrations are compared with WECS. If the ambient level exceeds the standard, then the ambient SO_2 concentration is checked. If SO_2 is higher than WECS, interval A is recommended; if lower, interval B.

If particulates are below the standard, SO_2 concentration again is queried: If high, interval B is recommended; if low, moisture factors are considered. High moisture values--either RH or rainfall greater than WECS--lead to interval B recommendation; low values yield interval C.

(3) Painting

Aircraft are painted primarily to protect metal surfaces, although operational and cosmetic factors are significant. Protective finish maintenance is effected at three levels: (a) minor touchup; (b) major touchup; and (c) complete strip-repaint. Minor and major touchup are effected at field or intermediate level maintenance, whereas complete repaint is authorized only at depot-level for large aircraft.⁵² Minor touchup is accomplished to repair ablation and similar damage. Major touchup is applied to fasteners, runway-damaged lower surfaces, and solar-damaged upper surfaces. The need for touchup painting must be determined at field-level inspections: an environment-based algorithm should not be used. The following

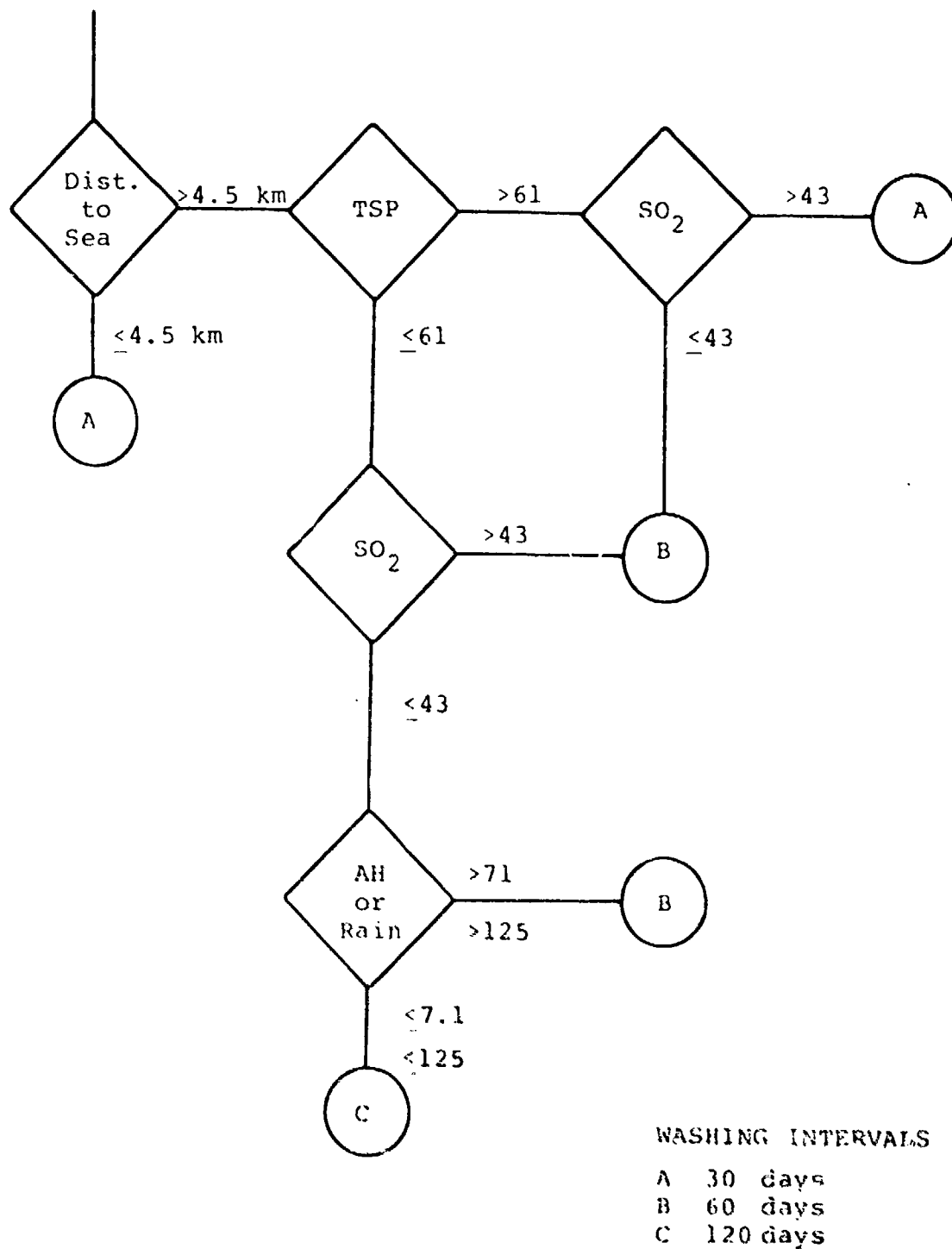


Figure 3. Aircraft Washing Interval Algorithm. Working Environmental Corrosion Standards I (see Table 5) Are Used. Units For TSP, And SO_2 Are $\mu\text{g}/\text{m}^3$, For AH g/m^3 , And For Rainfall, Annual Total cm.

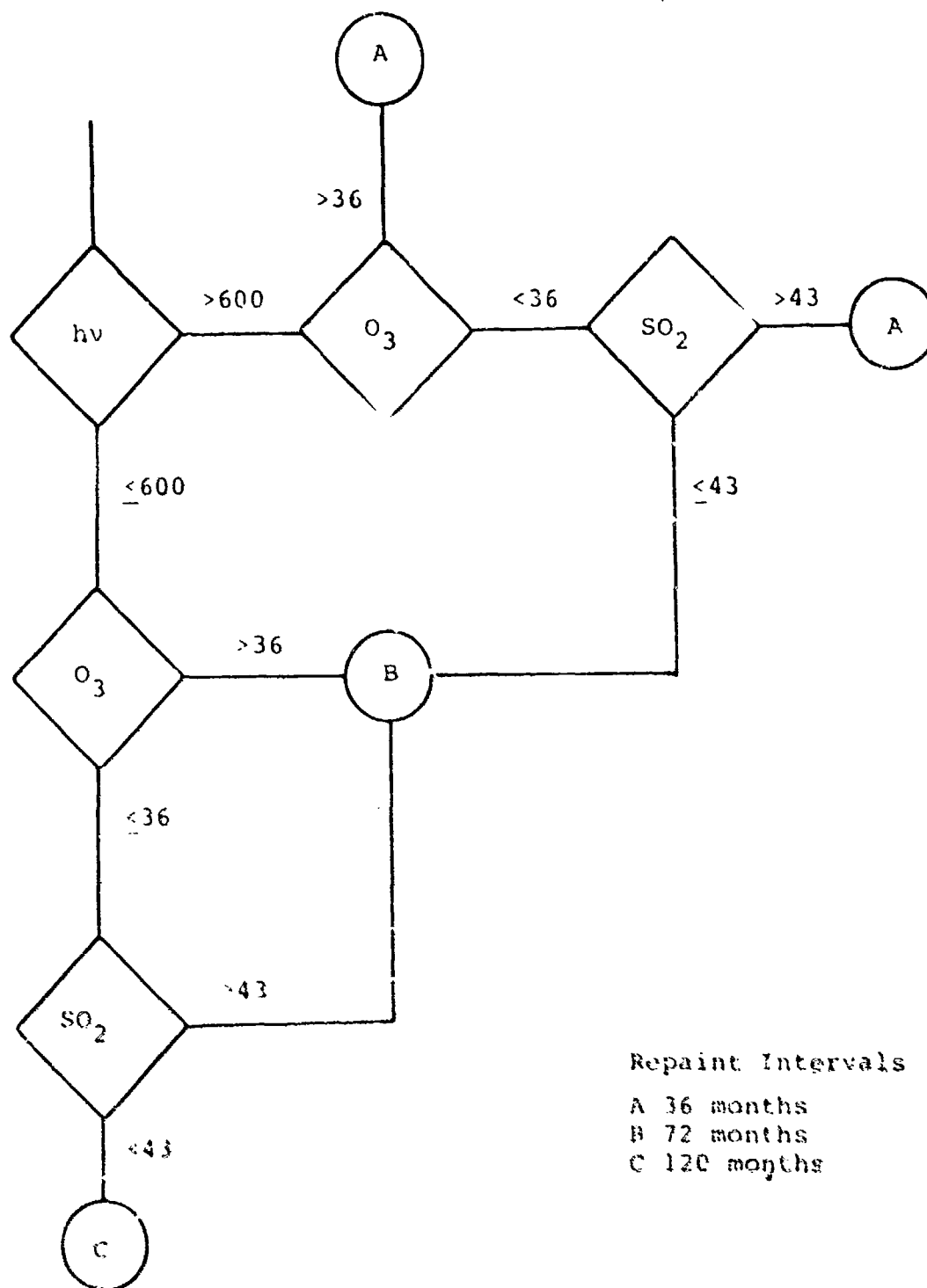
paint-interval algorithm refers to complete strip/repaint maintenance.

As before, three intervals, A, B, and C, are recommended. Paint systems currently in use--epoxy or polysulfide primers and polyurethane finish coat--should provide a service life of 10+ years in the mildest environments.⁵³ Consequently, the A, B, and C intervals may be equated to 36, 72, and 120 months, respectively. These intervals may not correspond to the PDM intervals for a particular aircraft system. For example, C-141A aircraft currently are on a 42 month cycle, and B-52's are on 48 months. Consequently, repaint schedules should be coordinated with the PDM cycle established for each aircraft fleet/force by the appropriate Maintenance Requirements Review Board. If 120 months is the maximum expected service life for the paint finish, and the PDM interval is y months, then y should be compared with the intervals recommended by the Repaint Algorithm, i.e., 36, 72, or 120 months. The interval closest to the PDM interval should be selected.

Environmental factors which deteriorate paint are, in order of severity, solar radiation, oxidants, and sulfur dioxide absorbed on soil deposits. Soil deposits themselves might be included, but there is insufficient information to relate repaint schedules to the nature of the soils. Thus, only sunlight, oxidants, and SO_2 are considered. The repaint algorithm (Figure 4) compares the solar radiation level, ozone, and sulfur dioxide concentrations with the WECS values. High values for all three result in the A interval recommendation, whereas low values for all three lead to the C interval. Various combinations of high values lead to the B interval.

(4) Corrosion Damage

The Corrosion Damage algorithm (CDA) is of a different nature than those for washing and repainting, which recommend maintenance intervals appropriate to the environment. Although CDA might be used in this same way, such use is unlikely. Corrosion repairs routinely are effected simultaneously with phased and isochronal maintenance efforts, and it would be



Repaint Intervals

- A 36 months
- B 72 months
- C 120 months

Figure 4. Aircraft Complete Repaint Interval Algorithm. Working Environmental Corrosion Standard I (see Table 5) Are Used. Units For radiation, hv, Are Langleys (J/Ly), For Ozone And SO₂, µg/m³.

both undesirable and difficult to impact their scheduling.

Accordingly, the CDA is intended as a guide for anticipating the extent of corrosion damage and for planning the personnel complement and time required to effect their repairs. The guidelines at this point are of a general nature. Eventually they should be incorporated into the Reliability Centered Maintenance phase schedules for specific aircraft systems.

The Algorithm (Figure 5) considers first distance to salt water (or slat flats), leading either to the very severe (AA) rating or a consideration of moisture factors. After moisture factors, pollutant concentrations are compared with WECS either for SO_2 , TSP, or O_3 . High values for any one of the three pollutants together with a high moisture factor leads to the A rating, but if all are low, together with high moisture factor, the severe (B) rating results. Low moisture factors with a high pollutant value result in the moderate (B) rating, whereas if all are low, rating (C) results.

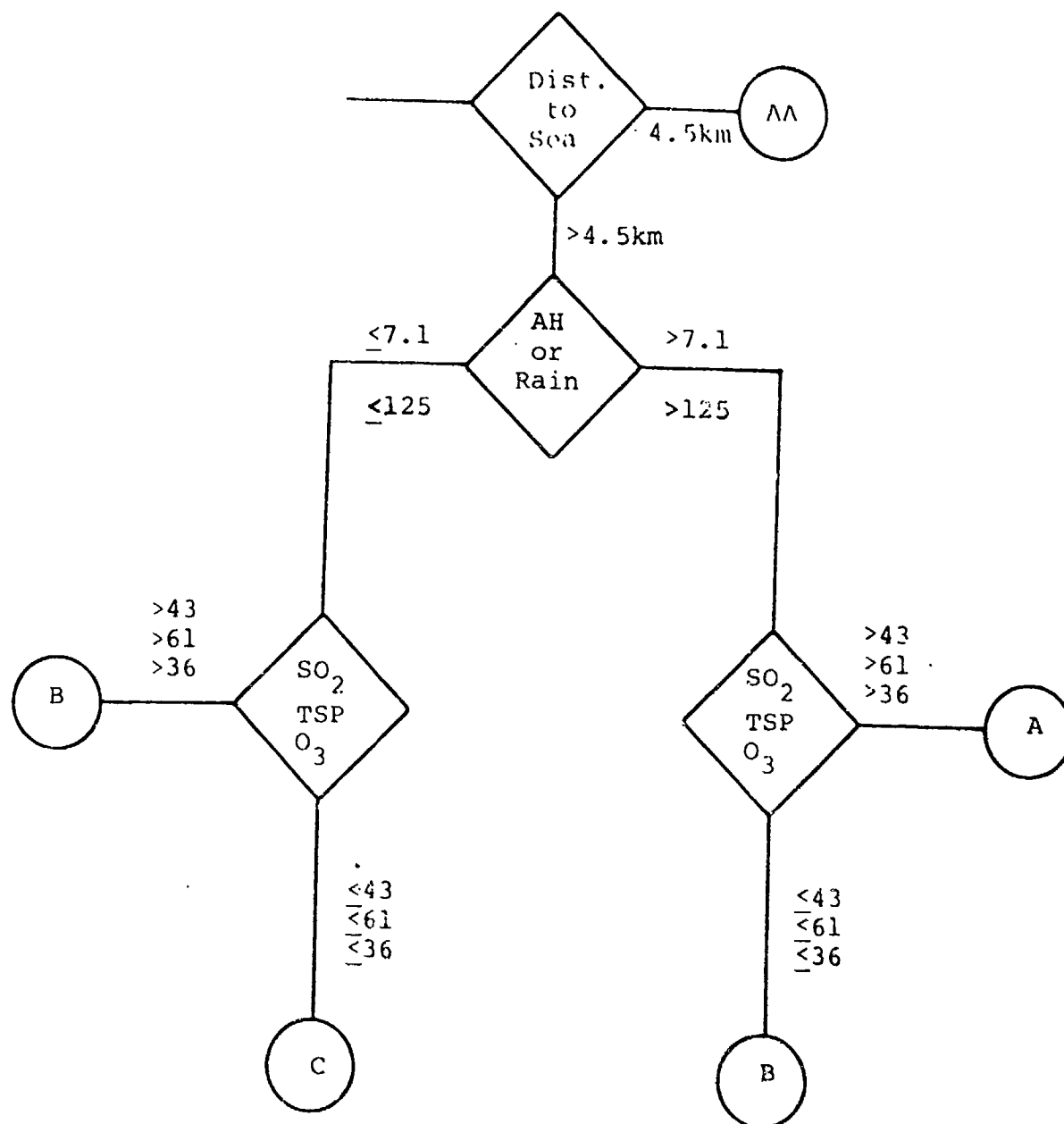
(5) Use of Environmental Algorithms

The above algorithms are readily compared with the appropriate local environmental parameters to yield corrosion maintenance ratings; the use of a computer obviously is not necessary. The algorithms could be used in modified form within the base-level computer system and, with appropriate automatic data input, can provide monthly revisions for maintenance needs recommendations.

To complete this study, it was necessary to develop ratings for a substantial number of airbases. Since the task would be more easily performed by computer, the algorithms have been programmed for such use. The relevant programs together with the necessary documentation, are included in Appendix 2.

(6) Environmental Applications

Environmental Severity Algorithms have been used to establish preliminary ratings for most airbases of interest to USAF. These ratings are listed in Appendix 3. These ratings are based essentially on comparisons of the Working Environmental



Expected Corrosion Damage

AA very severe
 A severe
 B moderate
 C mild

Figure 5. Aircraft Corrosion Damage Algorithm. Working Environmental Standard I (see Table 5) Are Used. Units For RH And 7.1 g/m³, For Rainfall, Total Annual cm, For SO₂, O₃, And TSP, ug/m³.

Corrosion Standards with local geographical and environmental data. Slight modifications to the algorithms were necessary in order to use the available data format, but the results are not significantly affected. The ratings published herein are based on the most complete data available to us. No responsibility is assumed for the accuracy of the data, particularly with respect to its relevance to a specific airbase, since the monitoring site may have been located at some distance from the airbase in question. If more accurate and reliable data should become available, they may be used to compute more appropriate ratings.

These algorithms rate environments for maintenance purposes under the assumption that aircraft are parked outdoors and are exposed to all risk factors. Wherever these conditions are different, appropriate consideration should be given. For example, hangared aircraft are exposed to minimal solar damage and rainfall, consequently the ambient solar radiation level and rainfall are not relevant.

(7) Environmental Data

The following environmental data were collected for USAF, AFRES, and ANG airbases, from the sources indicated.

- (1) Mean annual relative humidity, mean annual temperature, mean annual rainfall. Source: USAF Environmental Technical Applications Center, "Worldwide Airfield Climatic Data," Vols. I-VIII, 1970.⁵⁴
- (2) Mean solar radiation for July.
Source: Baldwin, J. L., "Climates of the United States," U.S. Department of Commerce, Washington, D.C., 1973.⁵⁵
- (3) Ambient concentrations of SO₂ particulates, NO₂, and O₃.
Source: U.S. Environmental Protection Agency, "Air Quality Data--1976 Annual Statistics," March 1978, EPA-450/2-78-009.⁵⁶

- (4) Distance to salt water or other salt source and prevalent wind direction with respect to nearest urban/industrial area.

Source: U.S. Department of Commerce, "Sectional Aeronautical Charts," Washington, D.C., 1979.⁵⁷

Additional discussion of some of these points is required. Data were collected only for continental US airbases because pollutant data were available only for them. The algorithms could be used in abbreviated form with only weather and geographical data. In some cases this would lead to useful results. For example, Anderson AFB, Guam would receive A, (probably) B, and AA ratings for washing, repaint, and corrosion severity, respectively, based only on these parameters. Ratings for less unique environments, however, would be ambiguous, and we chose not to compute them.

Weather data reported by ETAC are variable-year averages of hourly measurements and were obtained by weather stations located at the specific airbase in question. These stations did not report solar radiation measurements, hence the source listed in item (3) was used. These latter data are mean values for wide geographical regions and were computed from US Weather Bureau measurements. Values for July are used because these are near the maximum for the northern hemisphere. July values would be inappropriate elsewhere. Mean annual RH and temperature were used to compute mean annual absolute humidity.

Sulfur dioxide and particulate concentrations were available in the cited EPA documents as mean annual values and thus are directly compared with WECS. In the case of the NO_2 and O_3 , however, available data frequently provided only first and second hourly maxima, which cannot be compared with the WECS annual mean values. Accordingly, we have substituted for these pollutants a secondary WECS equal to the 50-th percentile of Graedel and Schwartz²⁹ plus 0.8 of the difference between their 99-th and 50-th percentiles. The modified algorithm compares this secondary WECS with the reported hourly maximum.

Unlike the ETAC data, EPA's pollutant data were not measured at the airbase in question. We have selected data from the nearest EPA monitoring station and upwind of the airbase wherever possible. In the data listings (Appendix 3), latitude and longitude of both the relevant monitoring station and the airbase are included, together with the wind direction from the airbase.

d. Comparison of Algorithm Results with Corrosion Maintenance Experience

In-service testing usually involves a single component or test coupon and is conducted to evaluate: (a) the corrodibility of candidate alloys, (b) environmental corrosiveness, or (c) the effectiveness of maintenance. It is possible to derive similar information from the operational corrosion experience of complete systems, provided sufficiently detailed records of corrosion maintenance and repair are collected. Over the years, the U.S. Air Force has developed an extensive Maintenance Data Collection System (MDCS)⁵⁸ which routinely documents virtually every facet of maintenance on its aerospace systems. The resultant data files are a rich source of information for failure analysis, particularly with respect to corrosion. The maintenance and operational histories of the USAF C-141A Force have been analyzed.^{6,30} The major thrust was a determination of relative environmental corrosiveness.

As of January 1976, 271 of these aircraft in the Military Aircraft Command were stationed at Altus OK, Charleston, SC, McChord, WA, McGuire, NJ, Norton, CA, and Travis, CA. Formerly, some were stationed at Dover, DE and Robins, GA. Occasionally individual aircraft are transferred from one airbase to another, but frequent or large reassignments are rare. Within the time period of study, transfer of significant numbers of units occurred twice as a result of reorganizations. Individual unit transfers are effected in order to spread the wear and tear of training-base missions over the entire force. Despite these transfers, approximately 250 units were stationed at not more than two airbases, and more than 100 at a single airbase during the same time period under study. The number of aircraft at

any particular airbase ranges from fewer than twenty to as many as sixty.

With the exception of a training squadron, the bulk of the C-141A Force is oriented to airlift missions. Such missions account for about 80% of flying hours, while training and miscellaneous missions account for 9% and 11%, respectively. A comparison of cumulative flying hours with age shows that these aircraft spend at least 80% of their time on the ground, most of that at the home station airbase. Accordingly, environmental factors at the home station will dominate the corrosion experience of these aircraft.

(1) Environmental Factors at C-141A Airbases

Environmental factors for the six current C-141A airbases from Appendix 4 are compared with the WECS values in Table 9. From this comparison and the use of the Corrosion Damage Algorithm, the relative corrosion severity of these airbases would be ranked as:

Travis, Charleston > McChord > Norton, Altus > McGuire

where Travis is the most severe and McGuire is the mildest. Those separated by commas are relatively close in their ratings. A combined average severity, using the results from all three algorithms yields the rankings

Travis, Charleston, Norton > McChord > Altus > McGuire

The increased severity of Norton results from the Los Angeles based smog factors.

(2) The USAF Maintenance Data Collection System

Thoroughly detailed records are kept by the Air Force for a wide variety of maintenance actions. Generally, actions which correct failures or defects and those which modify aircraft are documented. Routine servicing, e. g., washing, cleaning, touchup painting, is not. The data used in this study were extracted from the permanent maintenance records maintained on magnetic tape by the AF Logistics Command. Procedures and rules for data collection are detailed in the relevant AF manuals.⁵⁸

An aircraft maintenance action begins with a discrepancy

TABLE 9. ENVIRONMENTAL FACTORS FOR C-141A AIRBASES COMPARED WITH WORKING ENVIRONMENTAL CORROSION STANDARDS AND ENVIRONMENTAL RATINGS

Airbase	Environmental Factors ¹						Environmental Ratings ²			
	D2C	TSP	SO ₂	PCOX	AH	RF	h	wash	repaint	corrosion
Altus OK	>4.5	67	?	?	9.1	(610)	600	B	(C)	A
Charleston SC	4	53	5	?	12.3	1196	500	A	(C)	AA
McChord WA	10	69	17	59	7.9	1043	550	B	B	A(A)
McGuire NJ	>4.5	(<75)	?	(320)	7.7	1105	500	B	B	B
Norton CA	>4.5	113	23	588	16.1	293	650	B	A	A
Travis CA	4	(<75)	?	255	9.0	(410)	424	A	B	AA

¹ Environmental Factors D2C, TSP, SO₂, PCOX, AH, RF, and hv are distance to sea (km), total suspended particulates (µg/m³, annual mean), sulfur dioxide (µg/m³, annual mean), photochemical oxidants as ozone (second 1-hour maximum), absolute humidity (g/m³), rainfall (mm, annual mean), and solar radiation (Langley's, mean, July). WECS values are listed at the top of each column. Question marks indicate no data available. Values in parentheses are estimates from Reference 55 or 56.

² Environmental Ratings are based on the algorithms of Figures 3, 4, and 5.

report (or a modification technical order), the majority of which are generated at a regularly-scheduled inspection. These inspections occur at isochronal intervals varying from 15 days to 36 months. They also vary in the depth of inspection, the most thorough being the Programmed Depot Maintenance and the Mid-Interval inspection.

A discrepancy report and subsequent maintenance events are recorded on AFTO form 349 (Figures 6, 7). Periodically these are key-punched and entered into the airbase computer system. Portions of this data are forwarded to AFLC where they are analyzed and deposited into the permanent record files. Certain categories of maintenance data, essentially those which can be considered as "overhead" costs and not failure-related, are not entered into the permanent files. Information entered on the AFTO 349 form which reaches the permanent files and is relevant are discussed as follows:

(1) The Work Unit Code identifies the system, subsystem, and component on which maintenance is effected. Certain work unit codes identify tasks of a general "overhead" nature and are used to record labor costs only and have only base-level significance.

(2) Action Taken Code indicates the specific kind of maintenance action effected, e.g., removal and replacement.

(3) How-malfunctioned Code identifies the nature of the defect rather than the cause of the discrepancy. Thus maintenance personnel are required to perform a certain amount of diagnosis.

In general, these records provide the journalists' "what, where, when, why, and how" answers with respect to maintenance actions on aircraft. Of particular interest is the opportunity to perform cost-analyses based on the manhours expended for various tasks at a given airbase and to make comparisons from one airbase to another. These comparisons in turn can be coupled with the relevant environmental factors to determine the relative corrosivity of a given airbase.

1. JOB CONTROL NO.		2. WORK CENTER		3. L. B. NO./SERIAL NO.		4. MOS		5. D. O. NO. PREFIX		6. TIME		7. PRI		8. SORTIE NO.		9. LOCATION					
10. TIME		11. CASUAL I.D.		12. INST. C.G. TIME		13. INST. C.G. I.D.		14.		15.		16.		17. TIME SPEC REQ		18. JOB STD.					
19. ISC		20. PART NUMBER		21. BBA. NO./OPER. TIME		22. TAG NO.		23. INST. ILM PART NO.		24. SERIAL NUMBER		25. OVER. TIME									
26. DISCREPANCY		27. PART NO.		28. UNIT CODE		29. ACTION TAKEN		30. WHEN DISC		31. HOW BAL		32. UNITS		33. START DAY		34. STOP DAY		35. CREW SIZE		36. MAN NUMBER	
1		11CAA		2		170		3													
2																					
3																					
4																					
5																					
fasteners corroded																					
replaced fasteners, treat corrosion																					
AFTO FORM 349																					
MAINTENANCE DATA COLLECTION RECORD																					
M & W INC. 4 58-160MM																					

Figure 6. USAF AFTO Form 349 Maintenance Data Collection Record.

TABLE 10. DISTRIBUTION OF C-141A FORCE-WIDE CORROSION MAINTENANCE
MANHOURS AMONG ACTION TAKEN CODES.³²

<u>Action Taken</u>	<u>4Q70-4Q74%</u>	<u>1Q75-4Q76%</u>
Repairs and/or Replacement of minor parts, etc.	45.2	41.4
Corrosion (Repair)	11.0	14.3
Clean	8.9	12.8
Repair	8.5	3.8
Remove and Replace	17.7	18.1
Removed	5.7	5.4

TABLE 11. DISTRIBUTION OF C-141A FORCE-WIDE CORROSION
MAINTENANCE MANHOURS AMONG HOW-MALFUNCTION CODES.³²

<u>How Malfunction</u>	<u>4Q70-4Q74%</u>	<u>1Q75-4Q76%</u>
Corrosion*	37.4	42.2
Cracked	34.1	36.3
Coating, sealant failure	17.9	7.7
Other related codes	8.7	10.9

*Includes corroded, deteriorated, and delaminated.

Data base. The permanent maintenance records of C-141A aircraft were provided on magnetic tape and spanned two time periods: fourth calendar quarter 1970 through fourth quarter 1974; and first quarter 1975 through fourth quarter 1976. These records included both organizational (field) level and depot-level maintenance. The two data sets were analyzed separately using the second to check predictions made from the first.

Two smaller files of corrosion-related data were created from these data files by selecting records containing one of several corrosion how-malfunctioned codes or action-take codes. The resulting corrosion data base, in two-parts, consisted of

- (a) 4Q70-4Q74, 234, 046 records, 890, 502 manhours, and
- (b) 1Q75-4Q76, 90, 933 records, 273, 555 manhours

As discussed earlier, aircraft corrosion maintenance may be divided into three distinctly different categories: (a) washing and cleaning as preventive maintenance; (b) maintenance of protective coatings and repainting; (c) repair of corrosion damage. The permanent files of the USAF MDCS should not contain any records relating to the first two categories because corrosion prevention, in effect, is not documented. The distribution of the data base among major corrosion how-malfunction codes is shown in Table 10, and among action taken codes in Table 11.

In addition to the maintenance data files, operational histories of each aircraft were provided. These histories detailed chronologically airbase assignments and flight information over the same time periods.

(3) Results

One would expect the maintenance manhours to be distributed among the several airbases more or less in proportion to the number of aircraft assigned to each base. Airbase assignments for each aircraft, which were included in the operational histories, were available on a calendar quarter basis. Reassignments did not occur exactly at the end of any given quarter, of course, but the calendar quarter possessions for each airbase were used for comparative purposes. Thus the percent of aircraft possession quarters for a given airbase represents that

airbase's share of maintenance responsibility for the C-141A force, all other factors being equal. If its actual share of the maintenance effort is larger or smaller than its responsibility, then one would look for other factors, e.g., environmental, which would cause the discrepancy.

Possession quarters and corrosion manhours are listed in Table 12 as percents of the totals for the two time periods considered. In three cases, e.g., Altus, McGuire and McChord, the actual figures are quite close to the responsibility values. In the other three, Travis, Charleston, and Norton, there are considerable differences. Thus there is clear indication of base-to-base variations in the amount of corrosion maintenance effort expended per aircraft. Airbase comparisons using the data format of Table 10 are not useful, however, because of distortions introduced when one or two airbases contribute an abnormally high or low input to the data files. This occurred in the second time period where large amounts of data turned out to be missing for Norton AFB. The result is to inflate the apparent share of the data base for every other airbase.

The rate of field corrosion maintenance, i.e., the slope of manhours vs. time Figure 8, was found to be essentially linear. Moreover, the rate was constant for all aircraft assigned to a given airbase, but varied from one airbase to another. Average repair rates for all aircraft assigned to a given airbase were computed and are shown in Table 13 where the data are listed as manhours per aircraft per calendar quarter. Repair rates and their trends of slight change were used to compute predicted repair rates for the second time period. These predicted values are also listed in Table 14. Actual values and predicted values are in quite good agreement, with the exception of Norton AFB, for which, as has been noted, large gaps were found in the data files.

A statistical comparison was made of maintenance efforts on those individual aircraft which were stationed continuously at a given airbase, the results of which are shown in Figures 9 and 10. These figures show corrosion manhours per quarter

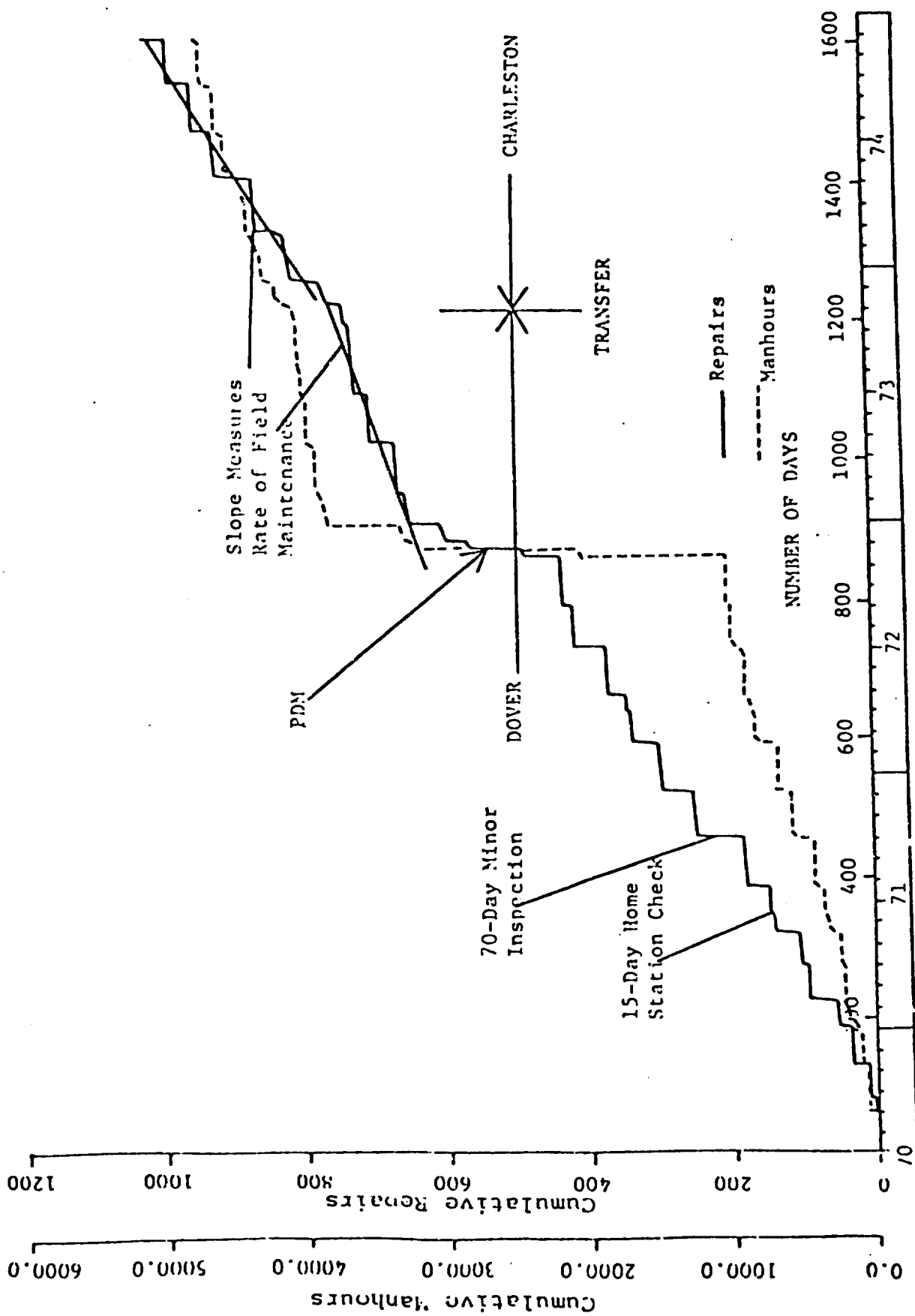


Figure 8. Cumulative Corrosion Maintenance History of C-141A Serial Number 650266

TABLE 12. C-141A AIRBASE POSSESSION QUARTERS COMPARED WITH
FIELD LEVEL CORROSION MAINTENANCE MANHOURS.³²

<u>Airbase</u>	<u>4Q70-4Q74*</u>		<u>1Q75-4Q76</u>	
	<u>Possession</u> <u>Quarters, %</u>	<u>Corrosion</u> <u>Manhours, %</u>	<u>Possession</u> <u>Quarters, %</u>	<u>Corrosion</u> <u>Manhours, %</u>
1. Altus	6.7	6.5	6.4	5.2
2. Charleston	16.9	18.5	21.8	30.4
3. McChord	14.6	14.4	13.9	12.5
4. McGuire	21.2	18.1	20.7	20.0
5. Norton	19.1	15.5	22.2	8.4
6. Travis	16.4	21.8	15.0	23.6

*Total is less than 100% because Dover AFB data is not listed.

TABLE 13. C-141A CORROSION MAINTENANCE EFFORT BY AIRBASE.³²

	<u>Manhours per Aircraft per Quarter</u>	
	4Q1970-4Q1974	1Q1975-4Q1976*
1. Altus, OK	98.8	63.7 (84.3)
2. Charleston, SC	113.2	110.0 (105.6)
3. McChord, WA	101.2	70.8 (52.8)
4. McGuire, NJ	87.7	76.1 (79.5)
5. Norton, CA	84.4	29.7** (58.8)
6. Travis, CA	133.0	124.0 (101.4)

*Values in parentheses were projected from those of first time period.

**Data files were incomplete.

for individual aircraft vs. the percent of total population. Variations from one airbase to another are clearly apparent, with Travis aircraft showing the highest and Norton the lowest maintenance efforts. (Altus AFB is not included because only one aircraft was stationed there continuously during either time period.) Indeed, the one aircraft at Travis which received the fewest maintenance manhours, received more than that at Norton receiving the largest in the first time period (for which Norton data were complete). In other words, the most poorly-maintained Travis airplane received more corrosion repair maintenance than the best-maintained Norton unit. Moreover, the average Travis aircraft received, in 1970-74, approximately 150 manhours per quarter--more than any airplane received at McGuire, McChord, and Norton, and more than 90% of the airplanes at Charleston! The results for 1975-76 are essentially the same.*

Field maintenance effort also was compared for selected areas of the aircraft (according to work unit codes). Shown in Table 14 are the average corrosion manhours per aircraft per quarter spent on forward and center fuselage, center wing-box beam, and wings. These regions were selected for illustration here so that mission-related damage is separated. For example, training-oriented missions at Altus AFB are especially severe on components related to take off and landing such as landing gear and wing flaps. The same general patterns of maintenance effort are observed.

In summary, field maintenance data consistently rank these six airbases as

Travis, Charleston > McChord, McGuire > Altus > Norton, from highest to lowest. Some minor shuffling is observed between McGuire and McChord, and Norton, Altus, and McGuire is rated

*The value of Figures 9 and 10 differ slightly from those of Table 13 because the latter includes all aircraft stationed at a given airbase, whereas the figures include only those continuously stationed (i.e., not transferred) during the respective time periods. Maintenance rates are distorted slightly at transfer.

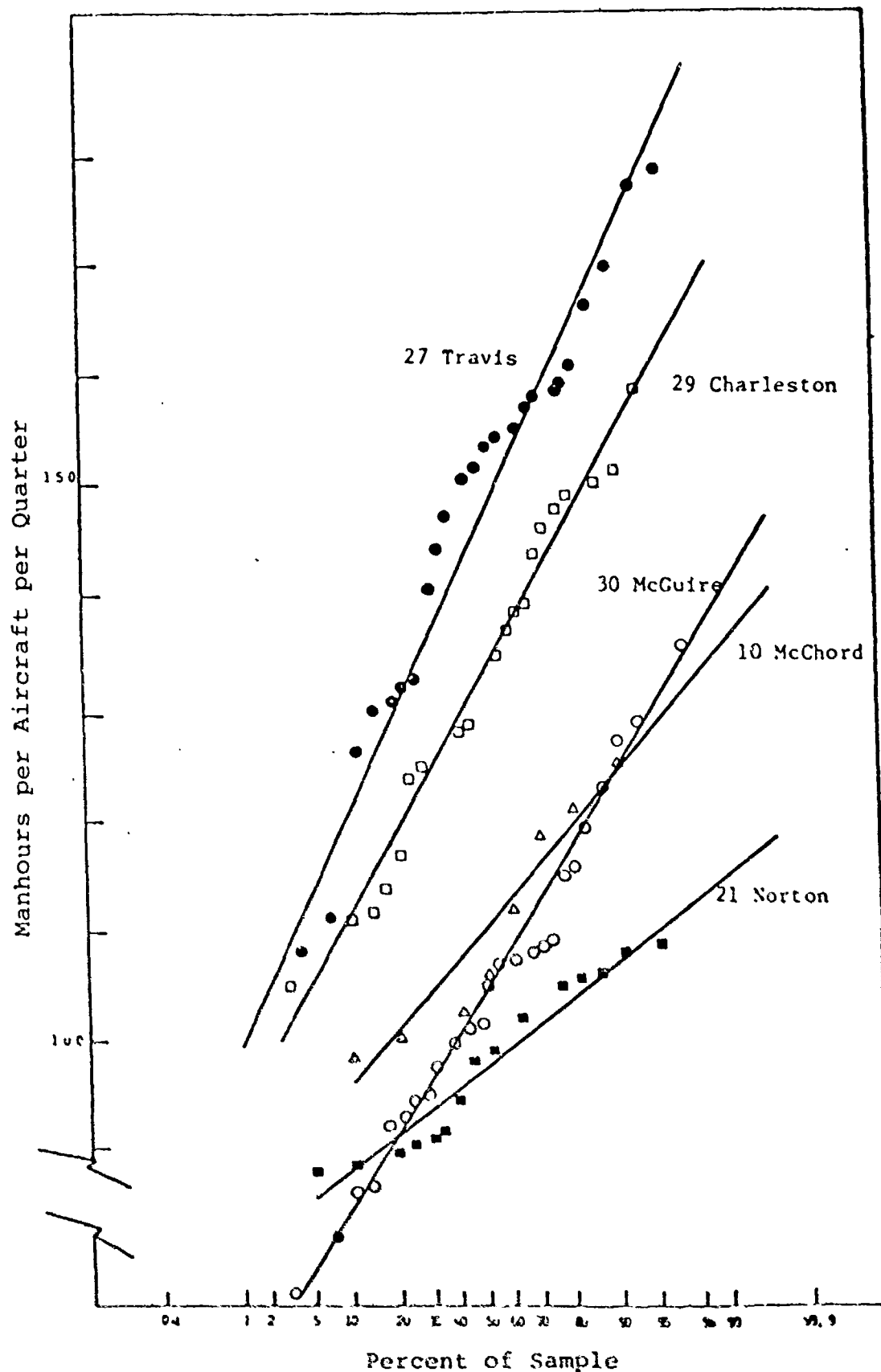


Figure 9. Distribution of Field-level Corrosion Maintenance Among Aircraft Continuously Assigned to an Airbase 4Q70-4Q74. Numbers Indicate Size of Sample.³²

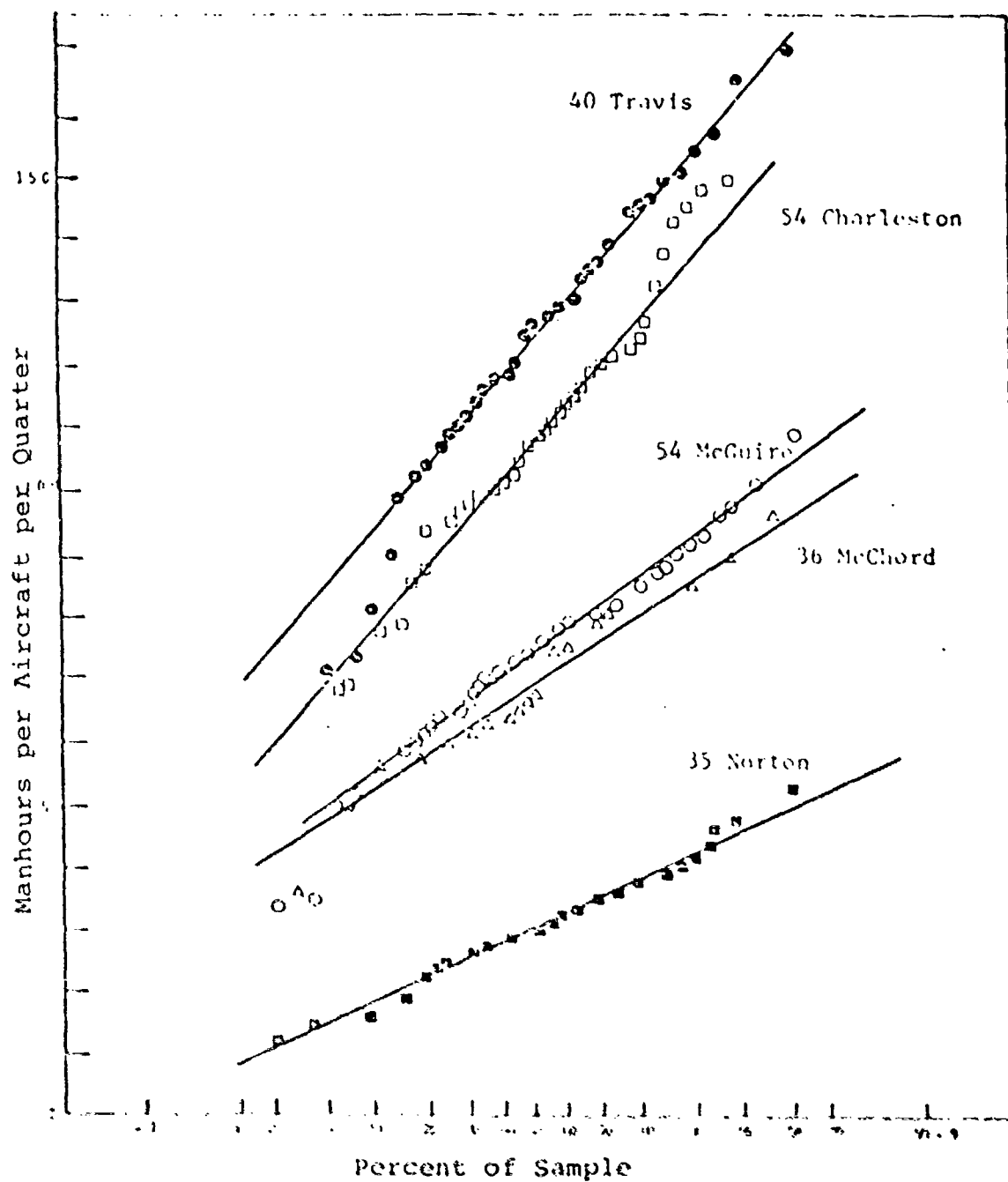


Figure 10. Distribution of Field-level Corrosion Maintenance Among Aircraft Continuously Assigned to an Airbase 1Q75-4Q76. Numbers Indicate Size of Sample³²

TABLE 14. C-141A CORROSION MAINTENANCE EFFORT* ON SELECTED
AIRCRAFT SECTIONS BY AIRBASE.³²

	<u>Forward and Center Fuselage</u>		<u>Wing and Wing Box Beam</u>		<u>Totals</u>	
	<u>4Q70- 4Q74</u>	<u>1Q75- 4Q76</u>	<u>4Q70- 4Q74</u>	<u>4Q74- 4Q76</u>	<u>4Q70- 4Q74</u>	<u>4Q75- 4Q76</u>
1. Altus, OK	7.6	5.0	6.7	10.6	14.3	15.6
2. Charleston, SC	20.1	23.5	14.0	19.6	34.1	43.1
3. McChord, WA	17.3	7.3	11.1	19.2	28.4	26.5
4. McGuire, NJ	13.0	7.1	7.5	10.4	20.5	17.5
5. Norton, CA	12.9	**	6.4	**	19.3	**
6. Travis, CA	19.8	17.6	15.0	22.1	34.8	39.7

*Manhours per aircraft per quarter.

**Datafiles incomplete.

lower by the algorithms than by maintenance. The listing based on environmental parameters as discussed earlier. The maintenance data could be used in a quantitative comparison, but the environmental ratings are not directly suitable for such treatment.

(4) Conclusions

The results show clearly that detailed corrosion maintenance records of complex systems correlated well with environmental severity indexes derived from the CSI Algorithm based on the known corrosive factors. Indeed it appears that a numerical corrosion severity index can be formulated from such data. Such an index would be at least as precise as any developed from atmospheric testing of alloys. Moreover, it should be possible to focus attention on specific alloys in the system rather than applying to a variety of alloys as we have done so far.

There are a few problems relating to the USAF Maintenance Data Collection System, however, which make further progress difficult at this time. These problems mainly are the loss of certain kinds of data which, in most cases, is inherent to the system itself. Another problem is the variability of data reporting practices from one repair facility to another. These problems are the subject of continuing study at Michigan State University.

e. Comparison With PACER LIME Experimental Results

The experimental phase of PACER LIME was expected to provide test data for "calibrating" the Corrosion Factor equation. Alloys representative of airframe construction were fastened to outdoor test racks at several airbases spanning the range of mildest to most severe environments. These alloy panels were removed and weighed at six month intervals. The data from these tests have been analyzed and the results are reported in Part II of this report.

The experimental results are not as useful as one might have hoped..

(1) Some of the alloys tested were not suitable for the program. Specifically, the aluminum alloys (2024-T3 alclad,

7075-T6, and 7079-T6 alclad) are relatively resistant to general corrosion and weight losses over the time period tested were quite small, thus subject to large experimental error. The titanium alloy (Ti-6Al-4V) was essentially corrosion resistant and thus provided no useful data.

(2) The environments for which data were available are fairly comparable; no data were obtained from the most severe environments.

(3) Methods for cleaning panels prior to weighing (mechanical scrubbing) are not reproducibly effective in removing corrosion products, thus results are widely variable from one technician to another.

(4) Although this was a large and complex program, a disproportionate share of misfortune plagued it.

When all these factors are considered, it is difficult to give serious weight to the apparent relative corrosivity of each testing site as reflected in these test data. Nevertheless, these results show the sites tested to be ranked as

Andrews, Wright-Patterson, Barksdale > Robins > F.E. Warren, from worst to mildest, for those sites which yielded any data.

These experimental corrosion severity rankings should be most comparable with the rankings obtained from the Corrosion Damage Algorithm. Using that algorithm, the same airbases are ranked as

Andrews, Wright-Patterson, Robins, > Barksdale > F.E. Warren

The rankings based on the experimental test program and those based on the Corrosion Damage Algorithm are seen to be in excellent agreement, except for the reversal of Barksdale and Robins. While we find this agreement comforting, at the same time we are aware of the severe confidence limitations that must be placed on the experimental results. It is our view that the experimental test results should not be interpreted as strongly supportive of the algorithm rankings, but, nevertheless, do not present contradictory evidence which must be "explained away." Therefore, the experimental and algorithm are considered to be in good agreement.

6. Conclusion

The concept of an Environmental Corrosion Severity Classification was proposed by USAF AFLC personnel at Warner-Robins AMA in 1971. This classification was to be used for anticipating corrosion damage to aircraft and scheduling appropriate repairs. The USAF Interim classification method has been extended to the algorithm format described in this report. Using these algorithms, airbase classifications have been obtained which are in excellent agreement with USAF maintenance experience, as contained within the AFM 66-1 maintenance records, and in good agreement with an experimental testing program conducted by USAF. As research on aircraft corrosion problems continues, modifications to these algorithms can be expected. At this time, they are considered to be the best tools available for relating environmental risk to aircraft maintenance, and, accordingly are recommended to USAF as working tools for corrosion management.

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APPENDIX A

PACER LIME Interim
Corrosion Severity Classification

PACER LINE INTERIM CORROSION SEVERITY CLASSIFICATION

1= AL ANG BIRMINGHAM MUNI APRT AL	2.50 MOD
2= ALBROOK AFB BALBOA CANAL ZONE	1.67 SEV
3= ALTUS AFB OK	2.83 MOD
4= ANDERSEN AFB GUAM	2.17 MOD
5= ANDREWS AFB WASHINGTON DC	2.50 MOD
6= AR ANG FORT SMITH MUNI APRT AR	2.33 MOD
7= BARKSDALE AFB LA	2.83 MOD
8= BEALE AFB CA	2.83 MOD
9= BERGSTROM AFB AUSTIN TX	2.50 MOD
10= BLYTHEVILLE AFB AR	2.50 MOD
11= BUCKLEY ANGB DENVER CO	3.00 MIL
12= CA ANG FRESNO CA	2.67 MIL
13= CA ANG OAKLAND CA	1.67 SEV
14= CA ANG VAN NUYS CA	2.33 MOD
15= CANNON AFB CLOVIS NM	3.17 MIL
16= CARSWELL AFB TX	3.00 MIL
17= CASTLE AFB CA	2.83 MOD
18= CHARLESTON AFB SC	2.50 MOD
19= COLUMBUS AFB MS	2.50 MOD
20= CRAIG AFB SELMA AL	2.67 MOD
21= CT ANG BRADLEY FLD WINSOR LOCKE CT	2.50 MOD
22= DAVIS MONTHAN AFB AZ	3.33 MIL
23= DE ANG GREATER WILMINGTON APRT NEW CASTLE DE	2.17 MOD
24= DOBBINS AFB GA	2.50 MOD
25= DOVER AFB DE	1.83 SEV
26= DULUTH INTL APRT MN	2.67 MOD
27= DYESS AFB TX	3.17 MIL
28= EDWARDS AFB CA	3.33 MIL
29= EGLIN AFB VALPARAISO FL	1.83 SEV
30= EIELSON AFB AK	2.67 MOD
31= ELLSWORTH AFB SD	2.67 MOD
32= ELMENDORF AFB ANCHORAGE AK	1.83 SEV

33=	ENGLAND AFB ALEXANDRIA LA	2.50 MOD
34=	FAIRCHILD AFB WA	2.67 MOD
35=	FL ANG JACKSONVILLE FL	2.17 MOD
36=	FORBES AFB TOPEKA KS	2.67 MOD
37=	FRANCIS E WARREN AFB WY	3.00 MIL
38=	GA ANG TRAVIS FLD SAVANNAH GA	2.17 SEV*
39=	GEORGE AFB VICTORVILLE CA	3.33 MIL
40=	GOODFELLOW AFB SAN ANGELO TX	2.83 MOD
41=	GRAND FORKS AFB ND	2.50 MOD
42=	GRIFFISS AFB NY	2.50 MOD
43=	GRISSON AFB IN	2.33 MOD
44=	HAMILTON AFB SAN RAFAEL CA	1.67 SEV
45=	HANSCOM AFB BEDFORD MA	2.00 SEV
46=	HICKAM AFB HI	2.50 MOD
47=	HILL AFB OGDEN UT	3.33 MIL
48=	HOLLOMAN AFB ALAMOGORDA NM	3.33 MIL
49=	HOMESTEAD AFB FLA	2.00 SEV
50=	HOWARD AFB CANAL ZONE	1.83 SEV
51=	IA ANG DES MOINES IA	2.33 MOD
52=	IA ANG SIOUX CITY MUNI APRT SERGEANTS BLUFF IA	2.33 MOD
53=	ID ANG BOISE ID	2.83 MOD
54=	IL ANG CAPITAL MUNI APRT SPRINGFIELD IL	2.50 MOD
55=	IL ANG GREATER PEORIA APRT IL	2.50 MOD
56=	IL ANG OHARE INTL APRT CHICAGO IL	2.33 MOD
57=	IN ANG BAER FLD FT WAYNE IN	2.17 MOD
58=	IN ANG HULMAN FLD TERRE HAUTE IN	2.50 MOD
59=	K I SAWYER AFB MI	2.33 MOD
60=	KEESLER AFB BILOXI MS	1.83 SEV
61=	KELL FLD WICHITA FALLS TX	3.00 MIL
62=	KELLY AFB SAN ANTONIO TX	2.83 MOD
63=	KINCHELOE AFB HI	2.17 MOD
64=	KINGSLEY FLD KLAMATH FALLS OR	2.83 MOD
65=	KIRTLAND AFB ALBUQUERQUE NM	3.33 MIL
66=	KY ANG LOUISVILLE KY	2.33 MOD
67=	LA ANG NEW ORLEANS NAS LA	1.83 MOD
68=	LANGLEY AFB HAMPTON VA	1.83 SEV

69=	LAREDO AFB TX	2.67 MOD
70=	LAUGHLIN AFB DEL RIO TX	3.00 MIL
71=	LITTLE ROCK AFB JACKSONVILLE AR	2.83 MOD
72=	LOCKBOURNE AFB OH	2.67 MOD
73=	LORING AFB ME	2.50 MOD
74=	LOS ANGELES INTL APRT CA	2.00 SEV
75=	LUKE AFB PHOENIX AZ	3.33 MIL
76=	MA ANG BARNES MUNI APRT WESTFIELD MA	2.50 MOD
77=	MACDILL AFB TAMPA FL	1.83 SEV
78=	MARCH AFB CA	2.50 MOD
79=	MATHER AFB CA	2.83 MOD
80=	MAXWELL AFB MONTGOMERY AL	2.50 MOD
81=	MCCORD AFB TACOMA WA	2.00 SEV
82=	MCCLELLAN AFB SACRAMENTO CA	2.50 MOD
83=	MCCONNELL AFB KS	3.00 MIL
84=	MCCOY AFB FL	2.17 MOD
85=	MCGUIRE AFB WRIGHTSTOWN NJ	2.33 MOD
86=	MD ANG BALTIMORE MD	2.17 MOD
87=	ME ANG BANGOR INTL APRT ME	1.83 SEV
88=	MI ANG BATTLE CREEK MI	2.17 MOD
89=	MI ANG SELFRIDGE ANG BASE MI	2.17 MOD
90=	MINOT AFB ND	3.17 MIL
91=	MN ANG MINN-ST PAUL INTL APRT MN	2.67 MOD
92=	MO ANG ROSECRANS MEMORIAL APRT MO	2.67 MOD
93=	MOODY AFB VALDOSTA GA	2.50 MOD
94=	MOUNTAIN HOME AFB ID	2.83 MOD
95=	MS ANG JACKSON MUNI APRT MS	2.33 MOD
96=	MS ANG KEY FLD MERIDIAN MS	2.50 MOD
97=	MT ANG GREAT FALLS INTL APRT MT	3.17 MIL
98=	MYRTLE BEACH AFB SC	1.83 SEV
99=	NC ANG DOUGLAS MUNI APRT CHARLOTTE NC	2.83 MOD
100=	ND ANG STATE UNIVEKITY STN FARGO ND	2.67 MOD
101=	NE ANG BASE LINCOLN NE	2.33 MOD
102=	NELLIS AFB LAS VEGAS NV	3.33 MIL
103=	NJ ANG ATLANTIC CITY NJ	1.83 SEV
104=	NORTON SAN BERNADINO CA	2.50 MOD

105=	NV ANG RENO MUNI APRT NV	2.17 MOD
106=	NY ANG HANCOCK FLD SYRACUSE NY	2.33 MOD
107=	NY ANG NIAGARA FALLS INTL APRT NY	2.17 MOD
108=	NY ANG SCHENECTADY CO APRT NY	2.33 MOD
109=	NY ANG SUFFOLK CO ANG BASE NY	2.17 MOD
110=	NY ANG WESTCHESTER CO APRT NY	2.00 SEV
111=	OFFUTT AFB NE	3.00 MIL
112=	OH ANG MANSFIELD LAHM APRT OH	2.17 MOD
113=	OH ANG TOLEDO EXPRESS APRT SWANTON OH	2.33 MOD
114=	OK ANG TULSA OK	2.83 MOD
115=	OR ANG PORTLAND INTL APR' OR	2.00 SEV
116=	OTIS AFB FALMOUTH MA	1.83 SEV
117=	PA ANG GREATER PITTSBURGH APRT PA	2.17 MOD
118=	PA ANG MIDDLETOWN PA	2.83 MOD
119=	PA ANG WILLOW GROVE NAS PA	2.50 MOD
120=	PATRICK AFB COCOA BEACH FL	2.00 SEV
121=	PEASE AFB NH	2.00 SEV
122=	PETERSON FLD COLORADO SPRINGS CO	3.17 MIL
123=	PLATTSBURGH AFB NY	2.67 MOD
124=	POPE AFB FAYETTEVILLE NC	2.83 MOD
125=	RANDOLPH AFB SAN ANTONIO TX	2.83 MOD
126=	REESE AFB LUBBOCK TX	3.33 MIL
127=	RI ANG THEODORE GREEN APRT WARWICK RI	1.83 SEV
128=	RICHARDS GEBEUR AFB GRANDVIEW MO	2.83 MOD
129=	ROBINS AFB GA	2.83 MOD
130=	SC ANG MCENTIRE ANG BASE EASTOVER SC	2.50 MOD
131=	SCOTT AFB BELLEVILLE IL	2.50 MOD
132=	SD ANG JOE FOSS FLD SIOUX FALLS SD	2.67 MOD
133=	SEYMOUR JOHNSON AFB NC	2.33 MOD
134=	SHAW AFB SUMTER SC	2.83 MOD
135=	SHEMYA AFB AK	1.67 SEV
136=	TINKER AFB OKLAHOMA CITY OK	2.83 MOD
137=	TN ANG MCGHEE TYSON APRT KNOXVILLE TN	2.50 MOD
138=	TN ANG MEMPHIS MUNI APRT TN	2.83 MOD
139=	TN ANG NASHVILLE APRT STN TN	2.50 MOD
140=	TRAVIS AFB CA	2.50 MOD

141= TX ANG HOUSTON TX	2.17 MOD
142= TYNDALL AFB PANAMA CITY FL	1.83 SEV
143= VA ANG BYRD FLD SANDSTON VA	2.17 MOD
144= VANCE AFB ENID OK	2.83 MOD
145= VANDENBERG AFB CA	1.67 SEV
146= VT ANG BURLINGTON INTL APRT VT	2.33 MOD
147= WA ANG SPOKANE INTL APRT WA	2.67 MOD
148= WEBB AFB BIG SPRING TX	3.00 MIL
149= WESTOVER AFB MA	2.50 MOD
150= WHITEMAN AFB MO	2.83 MOD
151= WI ANG GEN MITCHELL ANG BASE MILWAUKEE WI	2.33 MOD
152= WI ANG MADISON WI	2.33 MOD
153= WI ANG VOLK FLD ANG BASE CAMP DOUGLAS WI	2.33 MOD
154= WILLIAMS AFB CHANDLER AZ	3.33 MIL
155= WRIGHT PATTERSON AFB OH	2.67 MOD
156= WURTSMITH AFB MI	2.17 MOD
157= WV ANG KANAWHA CO APRT CHARLESTON WV	2.17 MOD
158= WV ANG MARTINSBURG MUNI APRT WV	2.17 MOD

APPENDIX B

Programs developed to calculate
Washing and Repaint intervals
and Expected Corrosion Damage
severity using the Working
Environmental Corrosion Standards

1	PROGRAM WASHER(INPUT,OUTPUT,PARAMS,	100
2	TAPE1=INPUT,TAPE2=OUTPUT,TAPE3=PARAMS)	110
3		120
4	C-----C	130
5	C	140
6	C	150
7	C	160
8	C	170
9	C	180
10	C	190
11	C	200
12	C	210
13	C	220
14	C	230
15	C	240
16	C	250
17	C	260
18	C	270
19	C	280
20	C	290
21	C	300
22	C	310
23	C	320
24	C	330
25	C	340
26	C	350
27	C	360
28	C	370
29	C	380
30	C-----C	390
31	C	400
32	C	410
33	C	420
34	C	430
35	C	440
36	C	450
37	C	460
38	C	470
39	C	480
40	C	490
41	C	500
42	C	510
43	C	520
44	C	530
45	C	540
46	C	550
47	C	560
48	C	570
49	C	580
50	C	590
51	C	600
52	C	610
53	C-----C	620
54	C	630
55	C	640
56	C	650
57	C	660
58	C	670
59	C	680
60	C	690
61	C	700
62	C	710
63	C	720
64	C	730
65	C	740
66	C	750
67	C	760
68	C	770
69	C	780
70	C	790
71	C	800
72	C	810
73	C	820
74	C	830

75	C	HUMIDITY.	840
76	C		850
77	C	18-APR-80 DJB	860
78	C	ADD CODE FOR REPAINT AND CORROSION SEVERITY ALGORITHMS	870
79	C	EXISTING PROGRAM.	880
80	C		890
81	C	06-MAY-80 MR/DJB	900
82	C	ADD CODE TO PROCESS BOTH SETS OF THRESHOLD VALUES.	910
83	C		920
84	C	-----C	930
85			940
86	C	-----C	950
87	C		960
88	C	VARIABLE DECLARATIONS	970
89	C		980
90	C	-----C	990
91			1000
92		IMPLICIT INTEGER (A-Z)	1010
93			1020
94		REAL TSP(3),SO2(3),PCOX(2),NO2(3),RH,HV,RAIN,D2C,DEWPT,TEMP	1030
95		REAL TSPT(2),SO2T(2),PCOXT(2),NO2T(2),RHT(2),HVT(2),RAINT(2),D2CT(2),DEWPTT(2),TEMPT(2)	1040
96		REAL AH,AHT(2),ABSHUM	1050
97			1060
98			1070
99		CHARACTER*30 BASENAM,STATE,COUNTY,EPAST,STATYPE	1080
100		CHARACTER*20 PLATLOW,FLATLOW	1090
101		CHARACTER*10 WASHINT(2),REPAINT(2),CORSEV(2),GELOC	1100
102			1110
103		LOGICAL NEARSEA,SULFOX,SUSPART,WET	1120
104		LOGICAL SUNNY,OZONE,ANYPOLL	1130
105		LOGICAL EOF	1140
106			1150
107		PARAMETER (PARMU=3,PRINTU=2,DATAU=1)	1160
108			1170
109		COMMON/EXECMSG/DUMMY	1180
110		COMMON/PARMS/TSPT,SO2T,PCOXT,NO2T,RHT,HVT,RAINT,D2CT,DEWPTT,TEMPT	1190
111		COMMON/PARM2/AHT	1200
112		COMMON/INREC1/BASENAM,STATE,COUNTY,PLATLOW,EPAST,STATYPE	1210
113		COMMON/INREC2/WBAN,TSP,SO2,PCOX,NO2	1220
114		COMMON/INREC2S/ELATLOW	1230
115		COMMON/INREC3/RH,AH,HV,RAIN,D2C,DEWPT,TEMP	1240
116		COMMON/INREC3S/GELOC	1250
117			1260
118		DATA BASECT/0/	1270
119			1280
120	C	-----C	1290
121	C		1300
122	C	PROCEDURE	1310
123	C		1320
124	C	-----C	1330
125			1340
126		C READ THRESHOLDS FROM PARAMETER FILE	1350
127			1360
128		CALL READPAR(PARMU,PRINTU)	1370
129			1380
130		C READ DATA FOR BASE	1390
131			1400
132			1410
133		100 CALL READIN(DATAU,EOF)	1420
134		IF (EOF) GOTO 990	1430
135			1440
136		C PERFORM DECISION ALGORITHMS ON BOTH SETS OF PARAMETERS	1450
137			1460
138		DO 110 I=1,2	1470
139			1480
140		C DEFINE PREDICATES	1490
141			1500
142		NEARSEA=D2C,IE,D2CT(I)	1510
143		SUSPART=TSP(3),GT,TSPT(I)	1520
144		SULFOX=SO2(3),GT,SO2T(I)	1530
145		WET=(AH,GT,AHT(I)),OR,(RAIN,GT,RAINT(I))	1540
146		SUNNY=HV,GT,HVT(I)	1550
147		OZONE=PCOX(2),GT,PCOXT(I)	1560
148		ANYPOLL=SULFOX,OR,SUSPART,OR,OZONE	1570

149		1580
150	C SET DEFAULT WASHING INTERVAL	1590
151		1600
152	WASHINT(I)='B'	1610
153		1620
154	C TEST FOR EXCEPTIONS	1630
155		1640
156	IF (NEARSEA) WASHINT(I)='A'	1650
157		1660
158	IF (.NOT.NEARSEA.AND.SUSPART.AND.SULFOX) WASHINT(I)='A'	1670
159		1680
160	IF (.NOT.NEARSEA	1690
161	+ .AND..NOT.SUSPART	1700
162	+ .AND..NOT.SULFOX	1710
163	+ .AND..NOT.WET) WASHINT(I)='C'	1720
164		1730
165	C SET DEFAULT REPAINT INTERVAL	1740
166		1750
167	REPAINT(I)='B'	1760
168		1770
169	C TEST FOR EXCEPTIONS	1780
170		1790
171	IF (.NOT.SUNNY	1800
172	+ .AND..NOT.OZONE	1810
173	+ .AND..NOT.SULFOX) REPAINT(I)='C'	1820
174		1830
175	IF (SUNNY.AND.OZONE) REPAINT(I)='A'	1840
176		1850
177	IF (SUNNY	1860
178	+ .AND..NOT.OZONE	1870
179	+ .AND.SULFOX) REPAINT(I)='A'	1880
180		1890
181	C DEFINE CORROSION SEVERITY	1900
182		1910
183	IF (NEARSEA) CORSEV(I)='AA'	1920
184		1930
185	IF (.NOT.NEARSEA	1940
186	+ .AND.WET	1950
187	+ .AND.ANYPOLL) CORSEV(I)='A'	1960
188		1970
189	IF (.NOT.NEARSEA	1980
190	+ .AND.WET	1990
191	+ .AND..NOT.ANYPOLL) CORSEV(I)='B'	2000
192		2010
193	IF (.NOT.NEARSEA	2020
194	+ .AND..NOT.WET	2030
195	+ .AND.ANYPOLL) CORSEV(I)='B'	2040
196		2050
197	IF (.NOT.NEARSEA	2060
198	+ .AND..NOT.WET	2070
199	+ .AND..NOT.ANYPOLL) CORSEV(I)='C'	2080
200		2090
201	110 CONTINUE	2100
202		2110
203	C PRINT RESULTS	2120
204		2130
205	CALL WRITOUT(PRINTU)	2140
206		2150
207	WRITE(PRINTU,9000) WASHINT,REPAINT,CORSEV	2160
208		2170
209	BASECT=BASECT+1	2180
210	IF (MOD(BASECT,6).EQ.0) CALL LINES(PRINTU,16)	2190
211		2200
212	C LOOP BACK FOR NEXT BASE	2210
213		2220
214	GOTO 100	2230
215		2240
216	C-----C	2250
217	C	2260
218	C EXCEPTION PROCESSING	2270
219	C	2280
220	C-----C	2290
221		2300
222	C END-OF-FILE ON INPUT	2310

223		2320
224	990 CALL LINES(PRINTU,88)	2330
225	CALL EXIT	2340
226		2350
227	C-----C	2360
228	C	2370
229	C FORMAT STATEMENTS	2380
230	C	2390
231	C-----C	2400
232		2410
233	9000 FORMAT ('0','WASHING INTERVAL= ',A2,' ',A2,	2420
234	+T40,'REPAINT INTERVAL= ',A2,' ',A2,	2430
235	+T80,'EXPECTED CORROSION DAMAGE= ',A2,' ',A2,	2440
236	+/'0')	2450
237		2460
238	END	2470

1	SUBROUTINE READPAR(IUNIT,OUNIT)	100
2	C-----C	110
3	C	120
4	C SUBROUTINE TO READ AND PRINT PARAMETERS FROM DATA FILE	130
5	C GIVEN BY IUNIT UPON OUNIT.	140
6	C	150
7	C WRITTEN BY MATT RIZAI AND DAVID J. MURSIN	160
8	C MICHIGAN STATE UNIVERSITY	170
9	C 08-APR 80	180
10	C	190
11	C-----C	200
12	C	210
13	C VARIABLE DECLARATIONS	220
14	C	230
15	C-----C	240
16	C	250
17	IMPLICIT INTEGER (A-Z)	260
18	REAL TSF(3),SO2(3),PCOX(2),NO2(3),RH,HV,RAIN,D2C,DEWPT,TEMP	270
19	REAL ARSHUM,AR,AHT(2)	280
20	REAL TSPT(2),SO2T(2),PCOXT(2),NO2T(2),RHT(2),HVT(2),RAINT(2),D2CT(2),	290
21	DEWPTT(2),TEMPT(2)	300
22	C	310
23	C	320
24	CHARACTER*30 BASENAM,STATE,COUNTY,EPAST,STATYPE	330
25	CHARACTER*20 BLATLON,ELATLON	340
26	CHARACTER*10 WASHINT,GELOC	350
27	CHARACTER*60 TITLE,UNDER	360
28	C	370
29	LOGICAL EOF	380
30	C	390
31	PARAMETER (PARMU=3,PRINTU=2,DATAU=1)	400
32	C	410
33	COMMON/PARMS/TSPT,SO2T,PCOXT,NO2T,RHT,HVT,RAINT,D2CT,DEWPTT,TEMPT	420
34	COMMON/FARM2/AHT	430
35	COMMON/INREC1/BASENAM,STATE,COUNTY,BLATLON,EPAST,STATYPE	440
36	COMMON/INREC2/WRAN,TSF,SO2,PCOX,NO2	450
37	COMMON/INREC2S/ELATLON	460
38	COMMON/INREC3/RH,AR,HV,RAIN,D2C,DEWPT,TEMP	470
39	COMMON/INREC3S/GELOC	480
40	C	490
41	C-----C	500
42	C	510
43	C PROCEDURE	520
44	C	530
45	C-----C	540
46	C	550
47	REWIND IUNIT	560
48	C	570
49	READ(IUNIT,*)TSPT,SO2T,PCOXT,NO2T,AHT,HVT,RAINT,D2CT,DEWPTT,TEMPT	580
50	C	590
51	AHT(1)=ABSNUM(AHT(1),TEMPT(1))	600
52	AHT(2)=ABSNUM(AHT(2),TEMPT(2))	610
53	C	620
54	CALL LINES(OUNIT,10)	630
55	C	640
56	TITLE='ATMOSPHERIC DATA AND SEVERITY CALCULATIONS'	650
57	UNDER='-----'	660
58	WRITE(OUNIT,9010) TITLE,TITLE,UNDER,UNDER	670
59	C	680
60	CALL LINES(OUNIT,13)	690
61	C	700
62	WRITE(OUNIT,9000)TSPT,SO2T,PCOXT,NO2T,AHT,HVT,RAINT,D2CT,DEWPTT,TEMPT	710
63	#PRT	720
64	C	730
65	CALL LINES(OUNIT,58)	740
66	C	750
67	9000 FORMAT(10X,'THRESHOLD VALUES:')	760
68	#10Y,'-----'	770
69	#10X,'TOTAL SUSPENDED PARTICULATES (TSF, US/M**3):',F7.1,' ',F7.1/780	
70	#10X,'SULFUR DIOXIDES (SO2, US/M**3):',F7.1,' ',F7.1/790	
71	#10X,'PHOTOCHEMICAL OXIDANTS (PCOX, US/M**3):',F7.1,' ',F7.1/800	
72	#10X,'NITROGEN OXIDES (NO2, US/M**3):',F7.1,' ',F7.1/810	
73	#10X,'ABSOLUTE HUMIDITY (AH, G/M**3):',F7.1,' ',F7.1/820	
74	#10X,'SUNLIGHT (HV, LANGLEYS):',F7.1,' ',F7.1/830	

75	+10X,'RAINFALL (RAIN, MM):',F7.1,' ',F7.1/	840
76	+10X,'DISTANCE TO SEA (D2C, KM):',F7.1,' ',F7.1/	850
77	+10X,'DEWPOINT (DEWPT, DEG-C):',F7.1,' ',F7.1/	860
78	+10X,'TEMPERATURE (TEMP, DEG-C):',F7.1,' ',F7.1)	870
79		880
80	9010 FORMAT (T38,A60/'+',T38,A60/T38,A60/'+',T38,A60)	890
81		900
82	RETURN	910
83	END	920

1		SUBROUTINE READIN(UNIT,EOF)	930
2	C	-----C	940
3	C		950
4	C	SUBROUTINE TO READ ATMOSPHERIC DATA RECORDS FROM FILE	960
5	C	GIVEN BY UNIT, ALSO RETURNING STATE OF EOF.	970
6	C		980
7	C	WRITTEN BY MATT RIZAI AND DAVID J. BURSİK	990
8	C	MICHIGAN STATE UNIVERSITY	1000
9	C	08-APR-80	1010
10	C		1020
11	C	-----C	1030
12	C		1040
13	C	VARIABLE DECLARATIONS	1050
14	C		1060
15	C	-----C	1070
16			1080
17		IMPLICIT INTEGER (A-Z)	1090
18			1100
19		REAL TSF(3),SO2(3),PCOX(2),NO2(3),RH,HV,RAIN,D2C,DEWPT,TEMP	1110
20		REAL ABSHUM,AH,AHT(2)	1120
21		REAL TSPT(2),SO2T(2),PCOXT(2),NO2T(2),RHT(2),HVT(2),RAINT(2),D2CT(2),DEWPTT(2),TEMPT(2)	1130
22			1140
23			1150
24		CHARACTER*30 BASENAM,STATE,COUNTY,EPAST,STATYPE	1160
25		CHARACTER*20 BLATLON,ELATLON	1170
26		CHARACTER*10 WASHINT,GELC	1180
27		CHARACTER*10 NA	1190
28			1200
29		LOGICAL EOF	1210
30			1220
31		PARAMETER (PARM1=3,PRINTU=2,DATAU=1)	1230
32			1240
33		COMMON/PARMS/TSPT,SO2T,PCOXT,NO2T,RHT,HVT,RAINT,D2CT,DEWPT,TEMPT	1250
34		COMMON/PARM2/AHT	1260
35		COMMON/INREC1/BASENAM,STATE,COUNTY,BLATLON,EPAST,STATYPE	1270
36		COMMON/INREC2/WBAN,TSF,SO2,PCOX,NO2	1280
37		COMMON/INREC2S/ELATLON	1290
38		COMMON/INREC3/RH,AH,HV,RAIN,D2C,DEWPT,TEMP	1300
39		COMMON/INREC3S/GELC	1310
40			1320
41	C	-----C	1330
42	C		1340
43	C	PROCEDURE	1350
44	C		1360
45	C	-----C	1370
46			1380
47		C RESET DATA TO DEFAULT VALUES	1390
48			1400
49		EOF=.FALSE.	1410
50		RH=-1.	1420
51		HV=-1.	1430
52		RAIN=-1.	1440
53		D2C=9999.99	1450
54		DEWPT=-1.	1460
55		TEMP=-1.	1470
56		NA='NA'	1480
57		BASENAM=NA	1490
58		STATE=NA	1500
59		COUNTY=NA	1510
60		EPAST=NA	1520
61		STATYPE=NA	1530
62		BLATLON=NA	1540
63		ELATLON=NA	1550
64		GELC=NA	1560
65		WBAN=-1	1570
66			1580
67		DO 10 I=1,3	1590
68			1600
69		SO2(I)=-1.	1610
70		NO2(I)=-1.	1620
71		TSF(I)=-1.	1630
72		IF (I.E.2) PCOX(I)=-1.	1640
73			1650
74	10	CONTINUE	1660

75		1670
76	C READ RECORD	1680
77		1690
78	READ(UNIT,*,END=999)BASENAM,STATE,COUNTY,PLATLON,EPAST,STATYPE,	1700
79	+ WRAN,ELATLON,TSP,SO2,PCOX,NO2,	1710
80	+ GELOC,RH,HV,RAIN,D2C,DENPT,TEMP	1720
81		1730
82	AH=AKSHUM(RH,TEMP)	1740
83		1750
84	RETURN	1760
85		1770
86	999 EOF=.TRUE.	1780
87		1790
88	RETURN	1800
89		1810
90	END	1820

1	SUBROUTINE WRITOUT(UNIT)	1830
2	C-----C	1840
3	C	1850
4	C	1860
5	C	1870
6	C	1880
7	C	1890
8	C	1900
9	C	1910
10	C	1920
11	C-----C	1930
12	C	1940
13	C	1950
14	C	1960
15	C-----C	1970
16	C	1980
17	IMPLICIT INTEGER (A-Z)	1990
18		2000
19	REAL TSP(3),SO2(3),PCOX(2),NO2(3),RH,HV,RAIN,D2C,DEWPT,TEMP	2010
20	REAL ARSHUM,AH,AHT(2)	2020
21	REAL TSPT(2),SO2T(2),PCOXT(2),NO2T(2),RHT(2),HVT(2),RAINT(2),D2CT(2),DEWPTT(2),TEMP(2)	2030
22		2040
23		2050
24	CHARACTER*30 BASENAM,STATE,COUNTY,EPAST,STATYPE	2060
25	CHARACTER*20 BLATLON,ELATLON	2070
26	CHARACTER*10 WASHINT,GELOC	2080
27		2090
28	LOGICAL EOF	2100
29		2110
30	PARAMETER (PARMU=3,PRINTU=2,DATAU=1)	2120
31		2130
32	COMMON/PARMS/TSPT,SO2T,PCOXT,NO2T,RHT,HVT,RAINT,D2CT,DEWPTT,TEMP	2140
33	COMMON/FARM2/AHT	2150
34	COMMON/INREC1/BASENAM,STATE,COUNTY,BLATLON,EPAST,STATYPE	2160
35	COMMON/INREC2/WBAN,TSF,SO2,PCOX,NO2	2170
36	COMMON/INREC2S/ELATLON	2180
37	COMMON/INREC3/RH,AH,HV,RAIN,D2C,DEWPT,TEMP	2190
38	COMMON/INREC3S/GELOC	2200
39		2210
40	C-----C	2220
41	C	2230
42	C	2240
43	C	2250
44	C-----C	2260
45		2270
46	WRITE(UNIT,9000)BASENAM,STATE,COUNTY,BLATLON,WBAN,GELOC,	2280
47	+EPAST,STATYPE,ELATLON,TSP,SO2,PCOX,NO2,AH,HV,RAIN,	2290
48	+D2C,DEWPT,TEMP	2300
49		2310
50	9000 FORMAT('0',A30,10X,'STATE: ',A2,3X,' COUNTY: ',A15,5X,' LOC: ',	2320
51	+A15/	2330
52	+1X,12('-----')//	2340
53	+1X,'WBAN: ',15,5,' GELOC: ',A4,126,'EPA STATION: ',A30,176,	2350
54	+ 'TYPE: ',A10,1100,'LOC: ',A15/	2360
55	+1X,'TSF: ',3F6.1,126,'SO2: ',3F6.1,152,	2370
56	+ 'PCOX: ',2F6.1,176,'NO2: ',3F6.1/	2380
57	+1X,'AH: ',F6.1,114,'HV: ',F5.1,126,'RAIN: ',F7.1,152,'D2C: ',F7.1,1390	2390
58	+ '176,'DEWPT: ',F5.1,1100,'TEMP: ',F5.1/	2400
59	+1X,12('-----'))	2410
60		2420
61	RETURN	2430
62		2440
63	END	2450

1		REAL FUNCTION ABSHUM(RH,TEMP)	2460
2	C	-----C	2470
3	C		2480
4	C	FUNCTION TO CONVERT RELATIVE HUMIDITY (RH, PERCENT) TO	2490
5	C	ABSOLUTE HUMIDITY (G/M**3) GIVEN TEMPERATURE (TEMP, DEG-C).	2500
6	C		2510
7	C	WRITTEN BY DAVID J. BURSİK	2520
8	C	MICHIGAN STATE UNIVERSITY	2530
9	C	08-APR-80	2540
10	C		2550
11	C	-----C	2560
12			2570
13		REAL RH,TEMP,XLATE(69)	2580
14			2590
15		INTEGER TADJ	2600
16			2610
17		DATA XLATE/	2620
18		+ .496,.542,.592,.646,.705,.768,.836,.909,.988,1.047,	2630
19		+1.165,1.264,1.369,1.483,1.605,1.736,1.876,2.026,2.186,2.358,	2640
20		+2.541,2.737,2.946,3.169,3.407,3.660,3.930,4.217,4.523,	2650
21		+4.847,	2660
22		+5.192,5.559,5.947,6.360,6.797,7.260,7.750,8.270,8.819,	2670
23		+9.399,10.01,10.66,11.35,12.07,12.83,13.63,14.84,15.37,16.21,	2680
24		+17.30,18.34,19.43,20.58,21.78,23.05,24.38,25.78,27.24,28.78,	2690
25		+30.38,32.07,33.83,35.68,37.61,39.63,41.75,43.96,46.26,48.67	2700
26		+/	2710
27			2720
28		C CONVERT TEMPERATURE TO INTEGER INDEX IN RANGE 1-69	2730
29			2740
30		TADJ=IFIX(TEMP+30.5)	2750
31			2760
32		IF (TADJ.LT.1) TADJ=1	2770
33			2780
34		IF (TADJ.GT.69) TADJ=69	2790
35			2800
36		C COMPUTE ABSOLUTE HUMIDITY	2810
37			2820
38		ABSHUM= (RH/100.) * XLATE(TADJ)	2830
39			2840
40		RETURN	2850
41		END	2860

APPENDIX C

Atmospheric Data and Severity Classifications U.S. Air Force and Air National Guard Airbases in the Continental U.S.: Environmental Data and Corrosion Maintenance Interval Recommendations.

Listed below are threshold values for the various environmental factors used in the corrosion maintenance algorithms. Following these are the reported values for each airbase and the computed maintenance intervals. The methods used to establish the First and Second threshold values are discussed in paragraph 4e. of the main text of this Report. Values in this Appendix, the source from which they were taken, the units, and other information included in the Appendix follows.

All airbases listed on the PACER LIME Interim Severity Classification list (Appendix A) are included in this Appendix with the exception of Albrook AFB Balboa Canal Zone, Anderson AFB Guam, Howard AFB Canal Zone, Kincheloe AFB MI, and Shemya AFB AK. Lockbourne AFB has been renamed Rickenbacker AFB. Base locations and WBAN numbers were taken from the WBAN Station Numbers Master List⁵⁹ prepared at the National Climatic Center, Asheville, NC, August 1978. Geographical Location Codes, GELOC, are from AFM 300-4 Volume XII pages 12-234.002 to 12-234.145.⁶⁰

Environmental Protection Agency, EPA, Monitoring Stations are from EPA-450/2-78-002 "Directory of Air Quality Monitoring Sites Active in 1976."⁶¹ Station type and station location are from the same source.

<u>Station types include:</u>		<u>Abbreviated as:</u>
Commercial	:	COMM
Downtown	:	DOWNTOWN
Industrial	:	IND
Mobile	:	MOBILE
Info. not available	:	NA
Residential	:	RES
Rural	:	RURAL

Values for pollutant data are from EPA-450/2-78-002 Part II. Total Suspended Particulates (TSP) values are the first and second 24 hour maximum, and the arithmetic mean in micrograms per cubic meter. Sulfur Dioxide (SO_2) values are the first and second 24 hour maximum, and the arithmetic mean in micrograms per cubic meter. Photochemical oxidants (PCOX) as ozone values are the first and second 1 hour maximum in micrograms per cubic meter. Mean values are not available. Nitrogen Dioxide (NO_2) values are the first and second 24 hour maximum, and the arithmetic mean in micrograms per cubic meter. In cases where only the arithmetic mean was available, the mean is recorded with 0.0 listed for the two maxima.

Absolute Humidity (AH) is the product of relative humidity and the mass of water per cubic meter of water-saturated air at a given temperature.⁴⁸ Mean annual relative humidity (%) and mean annual temperature ($^{\circ}\text{C}$) values are from USAF Environmental Technical Applications Center, "Worldwide Airfield Climatic

Data," Vols. I-VIII, 1970.⁵⁴ Dew point (DEWPT) °C values come from USAF ETAC.⁵⁴ Temperature (TEMP) °C, see Absolute Humidity above for source. Solar radiation (hv) is the mean solar radiation for July in Langley, and values are from Baldwin, J.L., "Climates of the United States."⁵⁵ Rain data is in millimeters. See Absolute Humidity for source.

Distance to the sea (D2C), kilometers, is from U.S. Department of Commerce, "Sectional Aeronautical Charts."⁵⁷ The value 10,000 is entered if the distance is greater than 4.5 km for computational purposes.

Wherever data was not available, -1.0 is listed for numeric fields and NA for alpha fields.

Maintenance Recommendations:

WASHING INTERVAL = The first letter is the calculated interval using threshold values I. The second letter is the calculated interval using threshold values II.

REPAINT INTERVAL = Same as above.

EXPECTED CORROSION DAMAGE = Same as above.

N.B. These recommendations are based on the listed data, and their validity is subject to the accuracy and availability of such data. If more accurate or more complete data are available, they may be used directly in the Maintenance Algorithms to compute revised recommendations.

ATMOSPHERIC DATA AND SEVERITY CALCULATIONS

THRESHOLD VALUES:

TOTAL SUSPENDED PARTICULATES (TSP, UG/M³): 61.0 , 86.0
SULFUR OXIDES (SO₂, UG/M³): 43.0 , 72.0
PHOTOCHEMICAL OXIDANTS (PCOX, UG/M³): 36.0 , 47.0
NITROGEN OXIDES (NO₂, UG/M³): 64.0 , 78.0
ABSOLUTE HUMIDITY (AH, G/M³): 7.1 , 9.0
SUNLIGHT (HV, LANGLEYS): 599.0 , 649.0
RAINFALL (RAIN, MM): 1250.0 , 1500.0
DISTANCE TO SEA (D2C, KM): 4.5 , 2.0
DEWPOINT (DEWPT, DEG-C): -1.0 , -1.0
TEMPERATURE (TEMP, DEG-C): 11.0 , 13.0

AL ANG BIRMINGHAM

STATE: AL COUNTY: JEFFERSON

LOC: 03335N 08645W

UBAH: 13818 GELOC: BRKR EPA STATION: BIRMINGHAM

TSP: 268.0 232.0 93.0 SO2: 52.0 15.0 6.0 PCOX: 298.0 298.0
AH: 10.6 HV: 500.0 RAIN: 1346.0 D2C: 10000.0

TYPE: DOWNTOWN

LOC: 03331N 08648W

NO2: 147.0 145.0 60.0
DEMPT: 11.0

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , A

ALTUS AFB

STATE: OK COUNTY: JACKSON

LOC: 03440N 09916W

UBAH: 13902 GELOC: AGGW EPA STATION: ALTUS

TSP: 142.0 128.0 67.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 9.1 HV: 600.0 RAIN: -1.0 D2C: 10000.0

TYPE: CONN

LOC: 03438N 09920W

NO2: -1.0 -1.0 -1.0
DEMPT: 10.0

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , B

ANDREWS AFB

STATE: MD COUNTY: PRINCE GEORGES

LOC: 03849N 07652W

UBAH: 13705 GELOC: AJOX EPA STATION: DC

TSP: 354.0 189.0 89.0 SO2: 273.0 246.0 108.0 PCOX: 392.0 333.0
AH: 7.8 HV: 500.0 RAIN: 1047.0 D2C: 10000.0

TYPE: CONN

LOC: 03701N 07454W

NO2: -1.0 -1.0 -1.0
DEMPT: 10.0

TEMP: 13.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

AR ANG FORT SMITH

STATE: AR COUNTY: SEBASTIAN

LOC: 03520N 09422W

UBAH: 03926 GELOC: HNRZ EPA STATION: FT SMITH

TSP: 161.0 112.0 61.0 SO2: 11.0 10.0 3.0 PCOX: -1.0 -1.0
AH: 10.2 HV: 550.0 RAIN: 1057.0 D2C: 10000.0

TYPE: CONN

LOC: 03523N 09435W

NO2: 75.0 74.0 36.0
DEMPT: 9.0

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

DARKSDALE AFB

STATE: LA COUNTY: CADDOROSSIER

LOC: 03230N 09340W

UBAH: 13944 GELOC: AMWB EPA STATION: SHREVEPORT

TSP: 160.0 145.0 75.0 SO2: 7.0 2.0 3.0 PCOX: -1.0 -1.0
AH: 11.3 HV: 550.0 RAIN: 1168.0 D2C: 10000.0

TYPE: CONN

LOC: 03229N 09343W

NO2: 73.0 58.0 29.0
DEMPT: 12.0

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

DEALE AFB

STATE: CA COUNTY: SUTTER

LOC: 03908N 12126W

UBAH: 93216 GELOC: BAEX EPA STATION: LIVE OAK

TSP: 242.0 187.0 121.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: -0.0 HV: -1.0 RAIN: -1.0 D2C: 10000.0

TYPE: RES

LOC: 03916N 12140W

NO2: -1.0 -1.0 -1.0
DEMPT: -1.0

TEMP: 0.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

BERGSTROM AFB

STATE: TX COUNTY: TRAVIS

LOC: 03013W 09740W

WMAN: 13904 GELOC: BJNZ EPA STATION: AUSTIN

TSP: 193.0 180.0 63.0 SO2: 146.0 76.0 6.0 PCOX: 286.0 271.0
AH: 12.1 HV: 600.0 RAIN: 772.0 D2C: 10000.0

TYPE: CONN

NO2: 93.0 79.0 24.0
DEWPT: 13.0

LOC: 03022W 09744W

TEMP: 21.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , A

BLYTHVILLE AFB

STATE: AR COUNTY: MISSISSIPPI

LOC: 03550W 08957W

WMAN: 13814 GELOC: BUKR EPA STATION: BLYTHVILLE

TSP: 215.0 147.0 74.0 SO2: 32.0 16.0 4.0 PCOX: -1.0 -1.0
AH: 7.0 HV: 550.0 RAIN: 1217.0 D2C: 10000.0

TYPE: CONN

NO2: 74.0 64.0 34.0
DEWPT: 9.0

LOC: 03554W 08354W

TEMP: 16.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

BUCKLEY ANG3 DENVER

STATE: CO COUNTY: DENVER

LOC: 03945W 10500W

WMAN: 93002 GELOC: CRMU EPA STATION: DENVER

TSP: 456.0 381.0 139.0 SO2: 162.0 158.0 29.0 PCOX: 329.0 292.0
AH: 4.6 HV: 550.0 RAIN: 381.0 D2C: 10000.0

TYPE: CONN

NO2: 204.0 185.0 67.0
DEWPT: 2.0

LOC: 03945W 10459W

TEMP: 9.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

CA ANG FRESNO

STATE: CA COUNTY: FRESNO

LOC: 03646W 11942W

WMAN: 23106 GELOC: HAYW EPA STATION: FRESNO

TSP: 307.0 285.0 132.0 SO2: 12.0 12.0 3.0 PCOX: 431.0 372.0
AH: 9.1 HV: 650.0 RAIN: 264.0 D2C: 10000.0

TYPE: CONN

NO2: 147.0 133.0 58.0
DEWPT: 10.0

LOC: 03646W 11945W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , A

EXPECTED CORROSION DAMAGE= A , A

CA ANG OAKLAND

STATE: CA COUNTY: ALABAMA

LOC: 03748W 12220W

WMAN: 23205 GELOC: SERH EPA STATION: OAKLAND

TSP: 167.0 166.0 63.0 SO2: 12.0 11.0 4.0 PCOX: -1.0 -1.0
AH: 8.8 HV: 650.0 RAIN: 439.0 D2C: 15

TYPE: CONN

NO2: 243.0 194.0 60.0
DEWPT: 8.0

LOC: 03748W 12216W

TEMP: 14.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= AA, AA

CA ANG VAN NUYS

STATE: CA COUNTY: LOS ANGELES

LOC: 03413W 11830W

WMAN: 23130 GELOC: XTBT EPA STATION: LOS ANGELES

TSP: 240.0 235.0 109.0 SO2: 195.0 194.0 52.0 PCOX: -1.0 -1.0
AH: 9.3 HV: 650.0 RAIN: 287.0 D2C: 10000.0

TYPE: CONN

NO2: 349.0 279.0 135.0
DEWPT: 10.0

LOC: 03403W 11815W

TEMP: 17.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , A

CANNON AFB

STATE: NM COUNTY: CURRY

LOC: 03425N 10305W

WMAN: 23077 GELOC: CZQZ EPA STATION: CLOVIS

TSP: 253.0 241.0 98.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 6.2 HV: 640.0 RAIN: 384.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEWPT: 2.0

LOC: 03424N 10312W

TEMP: 14.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , B

CARSWELL AFB

STATE: TX COUNTY: TARRANT

LOC: 03246N 09725W

WMAN: 13911 GELOC: DBPF EPA STATION: FTMORTH

TSP: 141.0 108.0 60.0 SO2: 5.0 7.0 3.0 PCOX: 363.0 353.0
AH: 10.1 HV: 600.0 RAIN: 772.0 B2C: 10000.0

TYPE: RES

NO2: 244.0 244.0 25.0
DEWPT: 11.0

LOC: 03248N 09721W

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , A

CASTLE AFB

STATE: CA COUNTY: MERCED

LOC: 03723N 12034W

WMAN: 23202 GELOC: MESR EPA STATION: MERCED

TSP: 293.0 266.0 132.0 SO2: -1.0 -1.0 -1.0 PCOX: 274.0 274.0
AH: 9.1 HV: 650.0 RAIN: 279.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEWPT: 8.0

LOC: 03719N 12030W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , A

EXPECTED CORROSION DAMAGE= A , A

CHARLESTON AFB

STATE: SC COUNTY: CHARLESTON

LOC: 03254N 08002W

WMAN: 03857 GELOC: BAFX EPA STATION: CHARLESTON

TSP: 124.0 99.0 53.0 SO2: 35.0 35.0 5.0 PCOX: -1.0 -1.0
AH: 12.3 HV: 500.0 RAIN: 1176.0 B2C: 4.0

TYPE: CONN

NO2: 99.0 91.0 44.0
DEWPT: 13.0

LOC: 03247N 08000W

TEMP: 19.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA , B

COLUMBUS AFB

STATE: MS COUNTY: LOWNDES

LOC: 03339N 08827W

WMAN: 13825 GELOC: EEPZ EPA STATION: COLUMBUS

TSP: 123.0 116.0 48.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 10.5 HV: 500.0 RAIN: 1245.0 B2C: 10000.0

TYPE: RES

NO2: -1.0 -1.0 -1.0
DEWPT: 11.0

LOC: 03329N 08825W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

CRAIG AFB

STATE: AL COUNTY: DALLAS

LOC: 03220N 06659W

WMAN: 13850 GELOC: EVMD EPA STATION: SELMA

TSP: 120.0 117.0 73.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 11.3 HV: 509.0 RAIN: 1298.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEWPT: 13.0

LOC: 03224N 08701W

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

CT ANG BRADLEY

STATE: CT COUNTY: HARTFORD

LOC: 04156N 07241W

WMAN: 14721 GELOC: CEKT EPA STATION: EAST WINDSOR

TSP: 144.0 115.0 75.0 SO2: 50.0 29.0 12.0 PCOX: -1.0 -1.0
AH: 6.3 HV: 450.0 RAIN: 1095.0 B2C: 10000.0

TYPE: IND

NO2: 123.0 96.0 60.0
DEMPT: 3.0

LOC: 04155N 07237W

TEMP: 10.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

DAVIS MONTHAN AFB

STATE: AZ COUNTY: PIMA

LOC: 03210N 11053W

WMAN: 23109 GELOC: FMV EPA STATION: TUCSON

TSP: 264.0 151.0 78.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 7.0 HV: 600.0 RAIN: 249.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMPT: 3.0

LOC: 03212N 11052W

TEMP: 21.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , C

DE ANG WILMINGTON

STATE: DE COUNTY: NEW CASTLE

LOC: 03941N 07536W

WMAN: 13708 GELOC: ZBDU EPA STATION: WILMINGTON

TSP: 165.0 131.0 92.0 SO2: 143.0 116.0 44.0 PCOX: -1.0 -1.0
AH: 8.1 HV: 500.0 RAIN: 1113.0 B2C: 2.8

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMPT: 7.0

LOC: 03944N 07533W

TEMP: 13.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= AA, B

DODDINS AFB

STATE: GA COUNTY: COBB

LOC: 03355N 08431W

WMAN: 13864 GELOC: FEMD EPA STATION: MARIETTA

TSP: 77.0 76.0 43.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 9.8 HV: 500.0 RAIN: 1171.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMPT: 10.0

LOC: 03357N 08432W

TEMP: 16.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

DOVER AFB

STATE: DE COUNTY: KENT

LOC: 03908N 07528W

WMAN: 13707 GELOC: FJXT EPA STATION: DOVER

TSP: 154.0 139.0 67.0 SO2: 15.0 15.0 6.0 PCOX: -1.0 -1.0
AH: 8.3 HV: 500.0 RAIN: 1128.0 B2C: 3.5

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMPT: 8.0

LOC: 03909N 07530W

TEMP: 13.0

WASHING INTERVAL= A , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, C

DULUTH ANG

STATE: MN COUNTY: ST LOUIS

LOC: 04650N 09211W

WMAN: 14913 GELOC: FHMN EPA STATION: DULUTH

TSP: 180.0 161.0 43.0 SO2: 11.0 10.0 6.0 PCOX: -1.0 -1.0
AH: 4.7 HV: 550.0 RAIN: 757.0 B2C: 10000.0

TYPE: CONN

NO2: 82.0 45.0 29.0
DEMPT: 1.0

LOC: 04647N 09206W

TEMP: 4.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

DYESS AFB

STATE: TX COUNTY: TAYLOR

LOC: 03226N 09951W

WMAN: 13910 GELOC: FMWZ EPA STATION: ADILENE

TSP: 137.0 133.0 60.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 8.8 HV: 600.0 RAIN: 643.0

DZC: 10000.0

TYPE: RES

MO2: 57.0 46.0 21.0

DEMT: 8.0

LOC: 03227N 09940W

TEMP: 18.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , C

EDWARDS AFB

STATE: CA COUNTY: KERN

LOC: 03454N 11752W

WMAN: 23114 GELOC: FSPH EPA STATION: BAKERSFIELD

TSP: 416.0 409.0 171.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 6.7 HV: 700.0 RAIN: 89.0

DZC: 10000.0

TYPE: COMM

MO2: -1.0 -1.0 -1.0

DEMT: 2.0

LOC: 03521N 11901W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

EGLIN

STATE: FL COUNTY: ESCAMBIA

LOC: 03040N 08622W

WMAN: 03842 GELOC: FTFA EPA STATION: PENSACOLA

TSP: 183.0 103.0 45.0 SO2: 202.0 179.0 26.0 PCOX: 314.0 306.0

AH: -0.0 HV: -1.0 RAIN: -1.0

DZC: 2.0

TYPE: COMM

MO2: 110.0 64.0 32.0

DEMT: -1.0

LOC: 03032N 08712W

TEMP: 0.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= AA, AA

EIELSON AFB

STATE: AK COUNTY: FAIRBANKS

LOC: 06440N 14706W

WMAN: 28407 GELOC: FTOW EPA STATION: FAIRBANKS

TSP: 284.0 251.0 123.0 SO2: 22.0 21.0 12.0 PCOX: -1.0 -1.0

AH: 6.4 HV: -1.0 RAIN: 376.0

DZC: 10000.0

TYPE: COMM

MO2: 110.0 103.0 59.0

DEMT: 8.0

LOC: 06450N 14743W

TEMP: 9.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

ELLSWORTH AFB

STATE: SD COUNTY: NEADE

LOC: 04405N 10305W

WMAN: 24006 GELOC: FXNN EPA STATION: RAPID CITY

TSP: 334.0 259.0 95.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 4.9 HV: 600.0 RAIN: 339.0

DZC: 10000.0

TYPE: COMM

MO2: -1.0 -1.0 -1.0

DEMT: 0.0

LOC: 04405N 10315W

TEMP: 6.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , B

ELMHORF AFB

STATE: AK COUNTY: ANCHORAGE

LOC: 06115N 14948W

WMAN: 24401 GELOC: FXSR EPA STATION: ANCHORAGE

TSP: -1.0 -1.0 -1.0 SO2: 32.0 25.0 7.0 PCOX: -1.0 -1.0

AH: 4.1 HV: -1.0 RAIN: 430.0

DZC: 1.0

TYPE: IND

MO2: -1.0 -1.0 -1.0

DEMT: 3.0

LOC: 06115N 14659W

TEMP: 2.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= C , E

EXPECTED CORROSION DAMAGE= AA, AA

ENGLAND AFB STATE: LA COUNTY: RAPIDES LOC: 03120N 09233W

UBAN: 13934 GELOC: GANH EPA STATION: ALEXANDRIA TYPE: CONN LOC: 03117N 09228W
TSP: 96.0 81.0 41.0 SO2: 10.0 8.0 3.0 PCOX: -1.0 -1.0 NO2: 54.0 53.0 23.0
AH: 11.7 HV: 500.0 RAIN: 1329.0 D2C: 10000.0 DEMPT: 13.0 TEMP: 19.0

WASHING INTERVAL= B , B REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= B , B

FAIRCHILD AFB STATE: WA COUNTY: SPOKANE LOC: 04738N 11739W

UBAN: 24114 GELOC: G.MZ EPA STATION: SPOKANE TYPE: RES LOC: 04740N 11725W
TSP: 235.0 228.0 99.0 SO2: 108.0 107.0 25.0 PCOX: 176.0 137.0 NO2: 0.0 0.0 48.0
AH: 5.5 HV: 650.0 RAIN: 363.0 D2C: 10000.0 DEMPT: 1.0 TEMP: 8.0

WASHING INTERVAL= B , B REPAINT INTERVAL= A , A EXPECTED CORROSION DAMAGE= B , B

FL ANG JACKSONVILLE STATE: FL COUNTY: DUVAL LOC: 03014N 08141W

UBAN: 93837 GELOC: LSGA EPA STATION: JACKSONVILLE TYPE: IND LOC: 03024N 08134W
TSP: 68.0 68.0 33.0 SO2: 207.0 141.0 28.0 PCOX: -1.0 -1.0 NO2: 50.0 35.0 23.0
AH: 14.4 HV: 500.0 RAIN: 1168.0 D2C: .5 DEMPT: 16.0 TEMP: 22.0

WASHING INTERVAL= A , A REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= AA, AA

FORBES AFB STATE: KS COUNTY: SHAWNEE LOC: 03857N 09540W

UBAN: 13920 GELOC: GUDK EPA STATION: TOPEKA TYPE: RES LOC: 03902N 09541W
TSP: 142.0 134.0 70.0 SO2: 9.0 9.0 3.0 PCOX: -1.0 -1.0 NO2: 74.0 43.0 24.0
AH: 7.6 HV: 550.0 RAIN: 755.0 D2C: 10000.0 DEMPT: 6.0 TEMP: 13.0

WASHING INTERVAL= B , C REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= A , C

FRANCIS E WARREN AFB STATE: WY COUNTY: LARAMIE LOC: 04109N 10448W

UBAN: 94006 GELOC: 8YHQ EPA STATION: CHEYENNE TYPE: CONN LOC: 04108N 10449W
TSP: 88.0 78.0 34.0 SO2: 18.0 16.0 4.0 PCOX: -1.0 -1.0 NO2: -1.0 -1.0 -1.0
AH: 4.5 HV: 600.0 RAIN: 386.0 D2C: 10000.0 DEMPT: 3.0 TEMP: 8.0

WASHING INTERVAL= C , C REPAINT INTERVAL= B , C EXPECTED CORROSION DAMAGE= C , C

GA ANG TRAVIS STATE: GA COUNTY: CHATHAM LOC: 03208N 08112W

UBAN: 03822 GELOC: XBBW EPA STATION: SAVANNAH TYPE: CONN LOC: 03205N 08103W
TSP: 158.0 119.0 64.0 SO2: 10.0 8.0 3.0 PCOX: -1.0 -1.0 NO2: 84.0 63.0 36.0
AH: -.0 HV: 500.0 RAIN: -1.0 D2C: 10000.0 DEMPT: -1.0 TEMP: 0.0

WASHING INTERVAL= B , C REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= B , C

GEORGE AFB

STATE: CA COUNTY: SAN BERNARDINO

LOC: 03435N 11723W

UBAN: 23131 GELOC: HUA EPA STATION: VICTORVILLE

TSP: 160.0 133.0 104.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 6.2 HV: 650.0 RAIN: 86.0 B2C: 10000.0

TYPE: CONN

MO2: 0.0 0.0 34.0
DEMT: 1.0

LOC: 03432N 11716W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

GOODFELLOW AFB

STATE: TX COUNTY: TOM GREEN

LOC: 03124N 10024W

UBAN: 23017 GELOC: JCSU EPA STATION: SAN ANGELO

TSP: 107.0 51.0 55.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0
AH: 2.6 HV: 600.0 RAIN: 376.0 B2C: 10000.0

TYPE: CONN

MO2: 36.0 34.0 14.0
DEMT: -1.0

LOC: 03128N 10026W

TEMP: 0.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= C , C

GRAND FORKS AFB

STATE: ND COUNTY: GRAND FORKS

LOC: 04757N 09724W

UBAN: 94925 GELOC: JFSD EPA STATION: FARGO

TSP: 125.0 123.0 67.0 SO2: 2.0 2.0 5.0 PCOX: -1.0 -1.0
AH: 4.5 HV: 550.0 RAIN: 77.0 B2C: 10000.0

TYPE: CONN

MO2: 56.0 56.0 53.0
DEMT: 2.0

LOC: 04652N 09647W

TEMP: 4.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

GRIFFISS AFB

STATE: NY COUNTY: ONEIDA

LOC: 04314N 07524W

UBAN: 14717 GELOC: JREZ EPA STATION: ROME

TSP: 163.0 105.0 59.0 SO2: 57.0 55.0 9.0 PCOX: -1.0 -1.0
AH: 6.2 HV: 450.0 RAIN: 1100.0 B2C: 10000.0

TYPE: CONN

MO2: -1.0 -1.0 -1.0
DEMT: 4.0

LOC: 04313N 07527W

TEMP: 8.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

GRISSON AFB

STATE: IN COUNTY: MIAMI

LOC: 04039N 08609W

UBAN: 94833 GELOC: CTGC EPA STATION: KOKOMO

TSP: 195.0 114.0 66.0 SO2: 74.0 51.0 15.0 PCOX: -1.0 -1.0
AH: 7.0 HV: 500.0 RAIN: 1100.0 B2C: 10000.0

TYPE: CONN

MO2: 56.0 40.0 28.0
DEMT: 5.0

LOC: 04030N 08607W

TEMP: 10.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

HAMILTON AFB

STATE: CA COUNTY: MARIN

LOC: 03904N 12230W

UBAN: 23211 GELOC: JYZJ EPA STATION: SAN RAFAEL

TSP: 170.0 111.0 48.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 9.1 HV: 650.0 RAIN: 659.0 B2C: 10000.0

TYPE: CONN

MO2: 0.0 0.0 54.0
DEMT: 9.0

LOC: 03758N 12231W

TEMP: 14.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

HAWSCOM AFB

STATE: MA COUNTY: MIDDLESEX

LOC: 04228N 07117W

WMAN: 14702 BELOC: BCNZ EPA STATION: WOPURN

TSP: 129.0 90.0 49.0 SO2: 18.0 13.0 8.0 PCOX: -1.0 -1.0
AH: 6.3 HV: 500.0 RAIN: 1199.0 BZC: 10000.0

TYPE: CONH

NO2: 85.0 64.0 35.0
DEMT: 4.0

LOC: 04229N 07109W

TEMP: 9.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

HICKAM AFB

STATE: HI COUNTY: HONOLULU

LOC: 02120N 15757W

WMAN: 22504 BELOC: KMD EPA STATION: HONOLULU

TSP: 113.0 95.0 52.0 SO2: 32.0 12.0 3.0 PCOX: -1.0 -1.0
AH: 16.1 HV: -1.0 RAIN: 467.0 BZC: .5

TYPE: CONH

NO2: 67.0 64.0 37.0
DEMT: 18.0

LOC: 02119N 15753W

TEMP: 25.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, AA

HILL AFB

STATE: UT COUNTY: WEBER

LOC: 04107N 11158W

WMAN: 24101 BELOC: KRSN EPA STATION: OSBEN

TSP: 320.0 301.0 102.0 SO2: 81.0 75.0 21.0 PCOX: -1.0 -1.0
AH: 5.2 HV: 600.0 RAIN: 427.0 BZC: 10000.0

TYPE: CONH

NO2: 0.0 0.0 49.0
DEMT: 1.0

LOC: 04113N 11158W

TEMP: 11.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , B

HOLLOWAY AFB

STATE: NM COUNTY: OTERO

LOC: 03251N 10606W

WMAN: 23002 BELOC: KMRD EPA STATION: ALAMOSORDO

TSP: 478.0 246.0 70.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 6.1 HV: 650.0 RAIN: 170.0 BZC: 10000.0

TYPE: CONH

NO2: -1.0 -1.0 -1.0
DEMT: 2.0

LOC: 03254N 10657W

TEMP: 17.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , C

HOMESTEAD AFB

STATE: FL COUNTY: DADE

LOC: 02529N 08024W

WMAN: 12826 BELOC: KYJL EPA STATION: HOMESTEAD

TSP: 78.0 72.0 42.0 SO2: 35.0 28.0 7.0 PCOX: -1.0 -1.0
AH: 15.6 HV: 500.0 RAIN: 1607.0 BZC: 2.5

TYPE: CONH

NO2: 40.0 36.0 16.0
DEMT: 19.0

LOC: 02528N 08029W

TEMP: 23.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, B

IA ANG DES MOINES

STATE: IA COUNTY: POLK

LOC: 04135N 09337W

WMAN: 14967 BELOC: FFAN EPA STATION: DES MOINES

TSP: 173.0 158.0 86.0 SO2: 97.0 93.0 6.0 PCOX: -1.0 -1.0
AH: 6.6 HV: 500.0 RAIN: 796.0 BZC: 10000.0

TYPE: IND

NO2: 47.0 45.0 26.0
DEMT: 4.0

LOC: 04135N 09336W

TEMP: 10.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

IA ANG SIOUX CITY

STATE: IA COUNTY: WOODBURY

LOC: 04224W 09623W

WBAN: 14906 GELOC: VSSB EPA STATION: SIOUX CITY

TSP: 190.0 142.0 72.0 SO2: 12.0 12.0 8.0 PCOX: -1.0 -1.0
AH: 6.5 HV: 550.0 RAIN: 670.0 B2C: 10000.0

TYPE: CONN

LOC: 04230W 09024W

NO2: -1.0 -1.0 -1.0
DEMT: 3.0

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

ID ANG BOISE

STATE: ID COUNTY: ADA

LOC: 04334W 11613W

WBAN: 24131 GELOC: BXRH EPA STATION: BOISE

TSP: -1.0 -1.0 -1.0 SO2: 51.0 49.0 18.0 PCOX: -1.0 -1.0
AH: 5.7 HV: 650.0 RAIN: 340.0 B2C: 10000.0

TYPE: CONN

LOC: 04337W 11612W

NO2: 96.0 83.0 50.0
DEMT: 1.0

TEMP: 11.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= C , C

IL ANG CAPITAL

STATE: IL COUNTY: SANGAMON

LOC: 03950W 08940W

WBAN: 93822 GELOC: BCF EPA STATION: SPRINGFIELD

TSP: 315.0 209.6 95.0 SO2: 352.0 131.0 27.0 PCOX: 214.0 208.0
AH: 7.5 HV: 500.0 RAIN: 854.0 B2C: 10000.0

TYPE: CONN

LOC: 03948W 08935W

NO2: 60.0 53.0 30.0
DEMT: 6.0

TEMP: 12.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

IL ANG CHARGE

STATE: IL COUNTY: COOK

LOC: 04159W 08754W

WBAN: 94846 GELOC: BFWB EPA STATION: CHICAGO

TSP: 451.0 259.0 74.0 SO2: 133.0 96.0 16.0 PCOX: -1.0 -1.0
AH: 6.3 HV: 500.0 RAIN: 746.0 B2C: 10000.0

TYPE: RES

LOC: 04159W 08747W

NO2: 350.0 184.0 72.0
DEMT: 3.0

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

IL ANG PEORIA

STATE: IL COUNTY: PEORIA

LOC: 04040W 08941W

WBAN: 14842 GELOC: TBBT EPA STATION: PEORIA

TSP: -1.0 -1.0 -1.0 SO2: 523.0 485.0 140.0 PCOX: 208.0 171.0
AH: 7.0 HV: 500.0 RAIN: 979.0 B2C: 10000.0

TYPE: CONN

LOC: 04042W 08935W

NO2: -1.0 -1.0 -1.0
DEMT: 5.0

TEMP: 11.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

IN ANG BAER

STATE: IN COUNTY: ALLEN

LOC: 04101W 06511W

WBAN: 14805 GELOC: ATQZ EPA STATION: FT WAYNE

TSP: 191.0 136.0 68.0 SO2: 94.0 84.0 25.0 PCOX: -1.0 -1.0
AH: 6.9 HV: 550.0 RAIN: 970.0 B2C: 10000.0

TYPE: RES

LOC: 04104W 08508W

NO2: 66.0 65.0 41.0
DEMT: 5.0

TEMP: 10.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

IN AMB HULMAN

STATE: IN COUNTY: VIGO

LOC: 03927N 08717W

WDAN: 03868 GELOC: LDXF EPA STATION: TERRE HAUTE

TSP: 150.0 144.0 75.0 SO2: 107.0 97.0 20.0 PCOX: -1.0 -1.0

AH: 7.7 HV: 550.0 RAIN: 1016.0

DZC: 10000.0

TYPE: COMM

NO2: 88.0 86.0 32.0

DEWPT: 6.0

LOC: 03928N 08724W

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

K I SAWYER AFB

STATE: MI COUNTY: MARQUETTE

LOC: 04621N 08724W

WDAN: 14851 GELOC: LIRC EPA STATION: MARQUETTE

TSP: 231.0 114.0 45.0 SO2: 62.0 57.0 18.0 PCOX: 372.0 294.0

AH: 4.8 HV: 500.0 RAIN: 790.0

DZC: 10000.0

TYPE: MA

NO2: 61.0 54.0 27.0

DEWPT: 1.0

LOC: 04632N 08723W

TEMP: 4.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

KEESLER AFB

STATE: MS COUNTY: JACKSON

LOC: 03025N 08853W

WDAN: 13820 GELOC: MMBG EPA STATION: BILOXI

TSP: 103.0 76.0 45.0 SO2: 45.0 41.0 8.0 PCOX: -1.0 -1.0

AH: 12.8 HV: 500.0 RAIN: 1527.0

DZC: 1.0

TYPE: RES

NO2: -1.0 -1.0 -1.0

DEWPT: 15.0

LOC: 03024N 08852W

TEMP: 20.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, AA

KELL FLD

STATE: TX COUNTY: WICHITA

LOC: 03358N 09858W

WDAN: 13966 GELOC: YXND EPA STATION: WICHITA FALLS

TSP: 201.0 161.0 71.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 8.9 HV: 600.0 RAIN: 684.0

DZC: 10000.0

TYPE: COMM

NO2: 53.0 49.0 21.0

DEWPT: 8.0

LOC: 03354N 09830W

TEMP: 18.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , C

KELLY AFB

STATE: TX COUNTY: BEXAR

LOC: 02923N 09035W

WDAN: 12909 GELOC: NRPB EPA STATION: SAN ANTONIO

TSP: 315.0 130.0 68.0 SO2: 14.0 7.0 3.0 PCOX: -1.0 -1.0

AH: 11.9 HV: 600.0 RAIN: 592.0

DZC: 10000.0

TYPE: COMM

NO2: 82.0 73.0 29.0

DEWPT: 13.0

LOC: 02925N 09029W

TEMP: 21.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , B

KINGSLEY FLD

STATE: OR COUNTY: KLAMATH

LOC: 04210N 12144W

WDAN: 94236 GELOC: NFMN EPA STATION: KLAMATH FALLS

TSP: 200.0 190.0 77.0 SO2: 65.0 15.0 14.0 PCOX: -1.0 -1.0

AH: 5.6 HV: 650.0 RAIN: 338.0

DZC: 10000.0

TYPE: COMM

NO2: -1.0 -1.0 -1.0

DEWPT: 0.0

LOC: 04212N 12144W

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , C

KIRTLAND AFB

STATE: NM COUNTY: BERNILLO

LOC: 03503N 10636W

UBAN: 23004 GELOC: NMV EPA STATION: ALBUQUERQUE

TSP: 197.0 169.0 89.0 SO2: 28.0 26.0 18.0 PCOX: -1.0 -1.0
AH: 5.4 HV: 650.0 RAIN: 153.0 D2C: 10000.0TYPE: CONN
NO2: 55.0 46.0 30.0
DEMT: 0.0LOC: 03504N 10634N
TEMP: 14.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

KY AND LOUISVILLE

STATE: KY COUNTY: JEFFERSON

LOC: 03815N 08545W

UBAN: 93893 GELOC: NSOM EPA STATION: LOUISVILLE

TSP: 211.0 175.0 96.0 SO2: 335.0 259.0 40.0 PCOX: 176.0 167.0
AH: 7.8 HV: 500.0 RAIN: 1102.0 D2C: 10000.0TYPE: CONN
NO2: 303.0 143.0 68.0
DEMT: 7.0LOC: 03815N 08545W
TEMP: 13.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

LA AND NEW ORLEANS

STATE: LA COUNTY: ORLEANS

LOC: 03002N 09004W

UBAN: 93906 GELOC: ROLH EPA STATION: NEW ORLEANS

TSP: 119.0 115.0 65.0 SO2: 6.0 6.0 3.0 PCOX: 231.0 214.0
AH: 13.8 HV: 450.0 RAIN: 1458.0 D2C: 3.0TYPE: CONN
NO2: 48.0 46.0 19.0
DEMT: 15.0LOC: 02957N 09004W
TEMP: 21.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= AA, A

LANGLEY AFB

STATE: VA COUNTY: NA

LOC: 03705N 07621W

UBAN: 13702 GELOC: HUNJ EPA STATION: HAMPTON

TSP: 109.0 103.0 50.0 SO2: 107.0 100.0 35.0 PCOX: 249.0 249.0
AH: 9.8 HV: 500.0 RAIN: 1041.0 D2C: .5TYPE: IND
NO2: -1.0 -1.0 -1.0
DEMT: 10.0LOC: 03700N 07624W
TEMP: 16.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= AA, AA

LAREDO AFB

STATE: TX COUNTY: WEBB

LOC: 02736N 09931W

UBAN: 12907 GELOC: HVJR EPA STATION: LAREDO

TSP: 190.0 144.0 79.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 13.5 HV: 600.0 RAIN: 473.0 D2C: 10000.0TYPE: CONN
NO2: -1.0 -1.0 -1.0
DEMT: 14.0LOC: 02733N 09936W
TEMP: 24.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , B

LAUGHLIN AFB

STATE: TX COUNTY: VAL VERDE

LOC: 02922N 10047W

UBAN: 22001 GELOC: KOMP EPA STATION: DEL RIO

TSP: 76.0 72.0 64.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 11.2 HV: 600.0 RAIN: 543.0 D2C: 10000.0TYPE: RES
NO2: -1.0 -1.0 -1.0
DEMT: 12.0LOC: 02922N 10055W
TEMP: 21.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , B

LITTLE ROCK AFB

STATE: AR COUNTY: PULASKI

LOC: 03453N 09209W

UBAN: 03930 GELOC: NNAK EPA STATION: JACKSONVILLE

TSP: 109.0 106.0 53.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 10.1 HV: 530.0 RAIN: 1278.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMT: 9.0

LOC: 03452N 09207W

TEMP: 17.9

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

LOCKPORTNE- SEE RICKENBACKER

STATE: MA COUNTY: MA

LOC: MA

UBAN: ##### GELOC: MA EPA STATION: MA

TSP: -1.0 -1.0 -1.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: -0 HV: -1.0 RAIN: -1.0 B2C: 10000.0

TYPE: MA

NO2: -1.0 -1.0 -1.0
DEMT: -1.0

LOC: MA

TEMP: -1.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

LORING AFB

STATE: ME COUNTY: ARDSTOCK

LOC: 04657N 06753W

UBAN: 14623 GELOC: NRCH EPA STATION: PRESQUE ISLE

TSP: 265.0 239.0 99.0 SO2: 59.0 51.0 9.0 PCOX: -1.0 -1.0
AH: 4.8 HV: 500.0 RAIN: 1005.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMT: 0.0

LOC: 04641N 06759W

TEMP: 4.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

LOS ANGELES AFS

STATE: CA COUNTY: LOS ANGELES

LOC: 03354N 11823W

UBAN: 23145 GELOC: NSAB EPA STATION: LOS ANGELES

TSP: 240.0 235.0 109.0 SO2: 51.0 45.0 19.0 PCOX: -1.0 -1.0
AH: 10.5 HV: 600.0 RAIN: 318.0 B2C: .5

TYPE: CONN

NO2: 349.0 279.0 135.0
DEMT: 11.0

LOC: 03403N 11815W

TEMP: 17.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= AA, AA

LUKE AFB

STATE: AZ COUNTY: MARICOPA

LOC: 03333N 11222W

UBAN: 23111 GELOC: NLEX EPA STATION: PHOENIX

TSP: 346.0 297.0 162.0 SO2: 27.0 23.0 6.0 PCOX: 265.0 235.0
AH: 7.8 HV: 600.0 RAIN: 163.0 B2C: 10000.0

TYPE: CONN

NO2: 199.0 187.0 82.0
DEMT: 5.0

LOC: 03327N 11204W

TEMP: 22.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , B

MA ANG BARNES

STATE: MA COUNTY: PIONEER VALLEY

LOC: 04210N 07243W

UBAN: 14775 GELOC: AXOD EPA STATION: HOLYOKE

TSP: 139.0 128.0 58.0 SO2: 117.0 86.0 25.0 PCOX: -1.0 -1.0
AH: 6.2 HV: 450.0 RAIN: 1174.0 B2C: 10000.0

TYPE: IND

NO2: 164.0 132.0 62.0
DEMT: 4.0

LOC: 04212N 07236W

TEMP: 9.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

MACDILL AFB

STATE: FL COUNTY: HILLSBOROUGH

LOC: 02751N 08231W

UBAH: 12810 GELOC: MVZR EPA STATION: TAMPA

TSP: 72.0 66.0 39.0 SO2: 28.0 21.0 6.0 PCOX: -1.0 -1.0
AH: 15.0 HV: 500.0 RAIN: 1130.0 B2C: 1.0

TYPE: MOBILE

NO2: 64.0 38.0 17.0
DEUPT: 17.0

LOC: 02750N 08228W

TEMP: 23.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, AA

MARCH AFB

STATE: CA COUNTY: RIVERSIDE

LOC: 03354N 11715W

UBAH: 23119 GELOC: PCZP EPA STATION: RIVERSIDE

TSP: 308.0 233.0 126.0 SO2: -1.0 -1.0 -1.0 PCOX: 666.0 627.0
AH: 8.5 HV: 600.0 RAIN: 224.0 B2C: 10000.0

TYPE: RES

NO2: 0.0 0.0 92.0
DEUPT: 6.0

LOC: 03354N 11723W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , B

MATHER AFB

STATE: CA COUNTY: SACRAMENTO

LOC: 03834N 12118W

UBAH: 23206 GELOC: PLXL EPA STATION: SACRAMENTO

TSP: 156.0 153.0 77.0 SO2: -1.0 -1.0 -1.0 PCOX: 255.0 235.0
AH: 9.3 HV: 650.0 RAIN: 447.0 B2C: 10000.0

TYPE: CONH

NO2: 0.0 0.0 50.0
DEUPT: 8.0

LOC: 03834N 12129W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , A

EXPECTED CORROSION DAMAGE= A , A

MAXWELL AFB

STATE: AL COUNTY: MONTGOMERY

LOC: 03223N 08622W

UBAH: 13821 GELOC: PWOS EPA STATION: MONTGOMERY

TSP: 89.0 80.0 46.0 SO2: 17.0 16.0 6.0 PCOX: -1.0 -1.0
AH: 11.2 HV: 500.0 RAIN: 1255.0 B2C: 10000.0

TYPE: CONH

NO2: 83.0 81.0 55.0
DEUPT: 13.0

LOC: 03223N 08619W

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

MCCORD AFB

STATE: WA COUNTY: PIERCE

LOC: 04709N 12229W

UBAH: 24207 GELOC: PBNY EPA STATION: TACOMA

TSP: 208.0 188.0 69.0 SO2: 78.0 76.0 17.0 PCOX: -1.0 -1.0
AH: 7.9 HV: 550.0 RAIN: 1043.0 B2C: 10000.0

TYPE: RES

NO2: -1.0 -1.0 -1.0
DEUPT: 6.0

LOC: 04714N 12226W

TEMP: 11.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

MCLELLAN AFB

STATE: CA COUNTY: SACRAMENTO

LOC: 03840N 12124W

UBAH: 23208 GELOC: PRJY EPA STATION: SACRAMENTO

TSP: 184.0 156.0 42.0 SO2: 13.0 11.0 4.0 PCOX: -1.0 -1.0
AH: 9.2 HV: 650.0 RAIN: 587.0 B2C: 10000.0

TYPE: RES

NO2: 188.0 141.0 63.0
DEUPT: 8.0

LOC: 03833N 12127W

TEMP: 17.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

MCCONNELL AFB

STATE: KS COUNTY: SEDGWICK

LOC: 03737N 09716W

WMAN: 03923 GELOC: PROE EPA STATION: WICHITA

TSP: 189.0 145.0 62.0 SO2: 20.0 11.0 4.0 PCOX: -1.0 -1.0
AH: 7.8 HV: 550.0 RAIN: 805.0 B2C: 10000.0

TYPE: COMM

NO2: 58.0 57.0 27.0
DEUPT: 6.0

LOC: 03739N 09718W

TEMP: 14.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

MCCOY AFB

STATE: FL COUNTY: ORANGE

LOC: 02827N 08118W

WMAN: 12841 GELOC: PSAX EPA STATION: ORLANDO

TSP: 94.0 86.0 51.0 SO2: 29.0 20.0 6.0 PCOX: 0.0 0.0
AH: 16.3 HV: 500.0 RAIN: 1161.0 B2C: 10000.0

TYPE: COMM

NO2: 91.0 76.0 32.0
DEUPT: 16.0

LOC: 02833N 08120W

TEMP: 24.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

MCSUIRE AFB

STATE: NJ COUNTY: BURLINGTON

LOC: 34331N 07436W

WMAN: 14773 GELOC: PTFE EPA STATION: NA

TSP: -1.0 -1.0 -1.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 7.7 HV: 500.0 RAIN: 1105.0 B2C: 10000.0

TYPE: NA

NO2: -1.0 -1.0 -1.0
DEUPT: 7.0

LOC: NA

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

MD ANG BALTIMORE

STATE: MD COUNTY: BALTIMORE

LOC: 03917N 07637W

WMAN: 13777 GELOC: AYCA EPA STATION: BALTIMORE

TSP: -1.0 -1.0 -1.0 SO2: 99.0 88.0 19.0 PCOX: 333.0 314.0
AH: 7.2 HV: 500.0 RAIN: 1087.0 B2C: 10000.0

TYPE: COMM

NO2: 0.0 0.0 38.0
DEUPT: 7.0

LOC: 03917N 07637W

TEMP: 13.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

NE ANG BANGOR

STATE: ME COUNTY: PENOBSCOT

LOC: 04448N 06849W

WMAN: 14606 GELOC: FROW EPA STATION: BANGOR

TSP: 202.0 191.0 71.0 SO2: 197.0 167.0 43.0 PCOX: -1.0 -1.0
AH: 5.7 HV: 500.0 RAIN: 1120.0 B2C: 10000.0

TYPE: COMM

NO2: 124.0 103.0 51.0
DEUPT: 2.0

LOC: 04448N 06846W

TEMP: 7.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

MI ANG BATTLE CREEK

STATE: MI COUNTY: CALHOUN

LOC: 04215N 08510W

WMAN: 94829 GELOC: AYZZ EPA STATION: BATTLE CREEK

TSP: 187.0 184.0 58.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 6.3 HV: 500.0 RAIN: 848.0 B2C: 10000.0

TYPE: COMM

NO2: -1.0 -1.0 -1.0
DEUPT: 4.0

LOC: 04219W 08511W

TEMP: 9.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

MI ANG SELFRIDGE			STATE: MI		COUNTY: MACLEND	LOC: 04234N 08250W		
WBAN: 14804 GELOC: USMC EPA STATION: MT CLEMENS			TYPE: MA		LOC: 04237N 08253W			
TSP: 148.0 125.0 55.0 SO2: 30.0 26.0 11.0			PCOX: -1.0 -1.0		NO2: 87.0 63.0 39.0			
AH: 6.3 HV: 550.0 RAIN: 717.0			B2C: 10000.0		DEWPT: 4.0 TEMP: 9.0			
WASHING INTERVAL= C , C			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= C , C			

MINOT AFB			STATE: ND		COUNTY: WARD	LOC: 04825N 10121W		
WBAN: 94011 GELOC: BAFV EPA STATION: MINOT			TYPE: CONN		LOC: 04815N 10118W			
TSP: 204.0 144.0 94.0 SO2: -1.0 -1.0 -1.0			PCOX: -1.0 -1.0		NO2: -1.0 -1.0 -1.0			
AH: 4.1 HV: 600.0 RAIN: 409.0			B2C: 10000.0		DEWPT: 2.0 TEMP: 4.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= B , C		EXPECTED CORROSION DAMAGE= B , B			

MN ANG MI STP			STATE: MN		COUNTY: RAMSEY	LOC: 04453N 09313W		
WBAN: 14922 GELOC: WDEY EPA STATION: ST PAUL			TYPE: INK		LOC: MA			
TSP: 272.0 192.0 85.0 SO2: 120.0 68.0 16.0			PCOX: -1.0 -1.0		NO2: 103.0 100.0 56.0			
AH: 5.3 HV: 550.0 RAIN: 727.0			B2C: 10000.0		DEWPT: 1.0 TEMP: 7.0			
WASHING INTERVAL= B , C			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= B , C			

MO ANG ROSECRANS			STATE: MO		COUNTY: BUCHANAN	LOC: 03946N 09435W		
WBAN: 13993 GELOC: WLYB EPA STATION: ST JOSEPH			TYPE: CONN		LOC: 03945N 09450W			
TSP: 233.0 204.0 89.0 SO2: 0.0 0.0 0.0			PCOX: 0.0 0.0		NO2: 0.0 0.0 0.0			
AH: 7.2 HV: 550.0 RAIN: 866.0			B2C: 10000.0		DEWPT: 5.0 TEMP: 12.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= A , B			

MOOSEY AFB			STATE: GA		COUNTY: LONGWES	LOC: 03058N 08312W		
WBAN: 13857 GELOC: GSEU EPA STATION: VALBOSTA			TYPE: RES		LOC: 03052N 08317W			
TSP: 87.0 78.0 42.0 SO2: 7.0 7.0 3.0			PCOX: -1.0 -1.0		NO2: 54.0 53.0 30.0			
AH: 12.3 HV: 500.0 RAIN: 1144.0			B2C: 10000.0		DEWPT: 13.0 TEMP: 20.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= B , B			

MS ANG JACKSON			STATE: MS		COUNTY: HINDS	LOC: 03228N 09013W		
WBAN: 13956 GELOC: LRLX EPA STATION: JACKSON			TYPE: CONN		LOC: 03218N 09011W			
TSP: 150.0 128.0 59.0 SO2: 41.0 39.0 17.0			PCOX: -1.0 -1.0		NO2: -1.0 -1.0 -1.0			
AH: 11.5 HV: 500.0 RAIN: 1287.0			B2C: 10000.0		DEWPT: 12.0 TEMP: 19.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= B , B			

MS ANG KEY FLB

STATE: MS COUNTY: LAUDERDALE

LOC: 03220N 08845W

WMAN: 18317 GELOC: MMAL EPA STATION: MERIDIAN

TSP: 92.0 85.0 46.0 SO2: 26.0 17.0 4.0 PCOX: -1.0 -1.0
AH: 11.2 HV: 500.0 RAIN: 1359.0 B2C: 10000.0

TYPE: RES

NO2: -1.0 -1.0 -1.0
BEUPT: 12.0

LOC: 03222N 08842W

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

MT ANG BT FALLS

STATE: MT COUNTY: CASCADE

LOC: 04729N 11122W

WMAN: 24143 GELOC: JKSE EPA STATION: BT FALLS

TSP: 124.0 124.0 45.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 4.5 HV: 600.0 RAIN: 369.0 B2C: 10000.0

TYPE: IND

NO2: -1.0 -1.0 -1.0
BEUPT: 3.0

LOC: 04729N 11117W

TEMP: 8.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= C , C

MT HOME AFB

STATE: ID COUNTY: ELMORE

LOC: 04303N 11552W

WMAN: 24106 GELOC: QYZH EPA STATION: MT HOME

TSP: 272.0 170.0 84.0 SO2: 8.0 6.0 3.0 PCOX: -1.0 -1.0
AH: 2.8 HV: -1.0 RAIN: 100.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
BEUPT: 1.0

LOC: 04306N 11541W

TEMP: 1.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

MYRTLE BEACH AFB

STATE: SC COUNTY: Horry

LOC: 03341N 07854W

WMAN: 13717 GELOC: RDRD EPA STATION: CONWAY

TSP: 99.0 78.0 43.0 SO2: 28.0 23.0 4.0 PCOX: -1.0 -1.0
AH: 11.4 HV: 500.0 RAIN: 1308.0 B2C: .5

TYPE: CONN

NO2: 64.0 48.0 20.0
BEUPT: 13.0

LOC: 03350N 07902W

TEMP: 17.0

WASHING INTERVAL= A , A

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, AA

NC ANG DOUGLAS

STATE: NC COUNTY: MECKLENBURG

LOC: 03513N 08066W

WMAN: 13881 GELOC: FJRP EPA STATION: CHARLOTTE

TSP: 81.0 79.0 43.0 SO2: 46.0 36.0 12.0 PCOX: -1.0 -1.0
AH: 9.3 HV: 500.0 RAIN: 1087.0 B2C: 10000.0

TYPE: IND

NO2: 77.0 68.0 39.0
BEUPT: 9.0

LOC: 03506N 08054W

TEMP: 16.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

ND ANG ST UNIV

STATE: ND COUNTY: CASS

LOC: 04654N 09648W

WMAN: 14914 GELOC: GMMN EPA STATION: FARGO

TSP: 125.0 123.0 67.0 SO2: 2.0 2.0 5.0 PCOX: -1.0 -1.0
AH: 4.8 HV: 550.0 RAIN: 543.0 B2C: 10000.0

TYPE: CONN

NO2: 56.0 56.0 53.0
BEUPT: 1.0

LOC: 04653N 09647W

TEMP: 5.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

NE ANG LINCOLN

STATE: NE COUNTY: LANCASTER

LOC: 04051N 09646W

UBAH: 14904 GELOC: NGB EPA STATION: LINCOLN

TSP: 190.0 160.0 78.0 SO2: 47.0 26.0 6.0 PCOX: -1.0 -1.0
AH: 6.8 HV: 550.0 RAIN: 747.0 D2C: 10000.0

TYPE: CONN

NO2: 112.0 91.0 46.0
DEMT: 4.0

LOC: 04058N 09642W

TEMP: 11.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

NELLIS AFB

STATE: NV COUNTY: CLARK

LOC: 03615N 11502W

UBAH: 23112 GELOC: RGHF EPA STATION: LAS VEGAS

TSP: 334.0 306.0 134.0 SO2: 49.0 42.0 10.0 PCOX: -1.0 -1.0
AH: 5.0 HV: 650.0 RAIN: 92.0 D2C: 10000.0

TYPE: CONN

NO2: 0.0 0.0 34.0
DEMT: 1.0

LOC: 03609N 11509W

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

NJ ANG ATLANTIC CITY

STATE: NJ COUNTY: MA

LOC: 03927N 07435W

UBAH: 13753 GELOC: AGRC EPA STATION: MA

TSP: -1.0 -1.0 -1.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0
AH: 8.0 HV: 500.0 RAIN: 1037.0 D2C: 10000.0

TYPE: NA

NO2: -1.0 -1.0 -1.0
DEMT: 6.0

LOC: NA

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

NORTON AFB

STATE: CA COUNTY: SAN BERNARDINO

LOC: 03406N 11714W

UBAH: 23122 GELOC: SCEY EPA STATION: SAN BERNARDINO

TSP: 242.0 232.0 113.0 SO2: 91.0 79.0 23.0 PCOX: 627.0 588.0
AH: 9.1 HV: 650.0 RAIN: 293.0 D2C: 10000.0

TYPE: CONN

NO2: 156.0 154.0 85.0
DEMT: 7.0

LOC: 03404N 11717W

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , A

EXPECTED CORROSION DAMAGE= A , A

NV ANG RENO

STATE: NV COUNTY: WASHOE

LOC: 03930N 11947W

UBAH: 23185 GELOC: UETL EPA STATION: RENO

TSP: -1.0 -1.0 -1.0 SO2: 28.0 13.0 4.0 PCOX: 186.0 173.0
AH: 5.3 HV: 650.0 RAIN: 180.0 D2C: 10000.0

TYPE: CONN

NO2: 0.0 0.0 139.0
DEMT: 2.0

LOC: 03931N 11948W

TEMP: 11.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= A , A

EXPECTED CORROSION DAMAGE= B , B

NY ANG HANDECK

STATE: NY COUNTY: ONONDAGA

LOC: 04307N 07607W

UBAH: 14720 GELOC: KHT EPA STATION: SYRACUSE

TSP: 199.0 142.0 70.0 SO2: 102.0 100.0 44.0 PCOX: 78.0 69.0
AH: 6.5 HV: 500.0 RAIN: 958.0 D2C: 10000.0

TYPE: MOBILE

NO2: 0.0 0.0 49.0
DEMT: 3.0

LOC: 04303N 07609W

TEMP: 9.0

WASHING INTERVAL= A , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

NY ANG NIAGRA FALLS

STATE: NY

COUNTY: NIAGRA

LOC: 04306N 07857W

UBAH: 04728 GELOC: RVJV EPA STATION: NIAGRA FALLS

TSP: 140.0 133.0 64.0 SO2: 175.0 149.0 30.0 PCOX: -1.0 -1.0
AH: 6.6 HV: 500.0 RAIN: 867.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEUPT: 4.0

LOC: 04304N 07903W

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

NY ANG SCHEMECTADY

STATE: NY

COUNTY: SCHEMECTADY

LOC: 04251N 07356W

UBAH: 04782 GELOC: VBDZ EPA STATION: SCHEMECTADY

TSP: -1.0 -1.0 -1.0 SO2: 139.0 134.0 38.0 PCOX: 98.0 92.0
AH: 6.3 HV: 450.0 RAIN: 901.0 B2C: 10000.0

TYPE: RES

NO2: 0.0 0.0 31.0
DEUPT: 3.0

LOC: 04248N 07356W

TEMP: 9.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

NY ANG SUFFOLK

STATE: NY

COUNTY: SUFFOLK

LOC: 04052N 07253W

UBAH: 94703 GELOC: MKVJ EPA STATION: SUFFOLK

TSP: 93.0 79.0 37.0 SO2: 18.0 18.0 6.0 PCOX: -1.0 -1.0
AH: 7.6 HV: 500.0 RAIN: 874.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEUPT: 3.0

LOC: 04102N 07157W

TEMP: 11.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

NY ANG WESTCHESTER

STATE: NY

COUNTY: WESTCHESTER

LOC: 04104N 07343W

UBAH: 94745 GELOC: YSSF EPA STATION: WT PLAINS

TSP: 115.0 110.0 53.0 SO2: 125.0 99.0 29.0 PCOX: -1.0 -1.0
AH: 7.2 HV: 450.0 RAIN: 1300.0 B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEUPT: 6.0

LOC: 04102N 07346W

TEMP: 11.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

OFFUTT AFB

STATE: NE

COUNTY: DOUGLAS

LOC: 04107N 09534W

UBAH: 14949 GELOC: SGBP EPA STATION: OMAHA

TSP: 211.0 145.0 90.0 SO2: 33.0 33.0 8.0 PCOX: -1.0 -1.0
AH: 6.9 HV: 550.0 RAIN: 740.0 B2C: 10000.0

TYPE: CONN

NO2: 72.0 71.0 33.0
DEUPT: 4.0

LOC: 04112N 09536W

TEMP: 11.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

OH ANG MANSFIELD

STATE: OH

COUNTY: RICHLAND

LOC: 04047N 08231W

UBAH: 14891 GELOC: PRXP EPA STATION: MANSFIELD

TSP: 193.0 189.0 69.0 SO2: 103.0 45.0 13.0 PCOX: -1.0 -1.0
AH: 6.7 HV: 500.0 RAIN: 654.0 B2C: 10000.0

TYPE: INS

NO2: 204.0 84.0 38.0
DEUPT: 5.0

LOC: 04047N 08231W

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

OH ANG TOLEDO

STATE: OH COUNTY: LUCAS

LOC: 04139N 08332W

WMAN: 14889 GELOC: WYTD EPA STATION: TOLEDO

TSP: 136.0 110.0 64.0 SO2: 144.0 75.0 32.0

AH: 6.4 HV: 550.0 RAIN: 732.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: COMM

NO2: 106.0 105.0 57.0
DEWPT: 4.0

LOC: 04139N 08332W

TEMP: 9.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

OK ANG TULSA

STATE: OK COUNTY: TULSA

LOC: 03612N 09554W

WMAN: 13968 GELOC: XHZ6 EPA STATION: TULSA

TSP: 192.0 123.0 61.0 SO2: 30.0 14.0 4.0

AH: 8.9 HV: 550.0 RAIN: 930.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: RURAL

NO2: 763.0 418.0 132.0
DEWPT: 8.0

LOC: 03607N 09551W

TEMP: 16.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

OR ANG PORTLAND

STATE: OR COUNTY: MULTNOMAH

LOC: 04532N 12240W

WMAN: 24274 GELOC: TGFJ EPA STATION: PORTLAND

TSP: 125.0 105.0 57.0 SO2: 119.0 86.0 19.0

AH: 8.0 HV: 550.0 RAIN: 1723.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: COMM

NO2: 102.0 98.0 57.0
DEWPT: 7.0

LOC: 04531N 12240W

TEMP: 12.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

OTIS AFB

STATE: MA COUNTY: SE MASS

LOC: 04139N 07031W

WMAN: 14704 GELOC: SPBW EPA STATION: FALMOUTH

TSP: 100.0 71.0 35.0 SO2: 28.0 28.0 7.0

AH: 7.7 HV: 500.0 RAIN: 1243.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: RES

NO2: 49.0 41.0 19.0
DEWPT: 6.0

LOC: 04133N 07136W

TEMP: 11.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

PA ANG MIDDLETOWN

STATE: PA COUNTY: DAUPHIN

LOC: 04012N 07645W

WMAN: 14711 GELOC: GERS EPA STATION: MIDDLETOWN

TSP: 183.0 157.0 66.0 SO2: -1.0 -1.0 -1.0

AH: 7.5 HV: 500.0 RAIN: 1016.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: COMM

NO2: -1.0 -1.0 -1.0
DEWPT: 6.0

LOC: 04012N 07644W

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

PA ANG PITTSBURGH

STATE: PA COUNTY: ALLEGHENY

LOC: 04030N 08013W

WMAN: 94823 GELOC: THGC EPA STATION: PITTSBURGH

TSP: 226.0 165.0 95.0 SO2: 168.0 139.0 54.0

AH: 6.9 HV: 450.0 RAIN: 890.0

PCOX: -1.0 -1.0
B2C: 10000.0

TYPE: COMM

NO2: 205.0 128.0 83.0
DEWPT: 4.0

LOC: 04026N 08000W

TEMP: 11.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= B , B

PA ANG WILLOW GROVE STATE: PA COUNTY: PHILADELPHIA LOC: 04012N 07508W

WBAN: 14793 GELOC: ZAWN EPA STATION: PHILADELPHIA TYPE: RES LOC: 04000N 07505W
TSP: 186.0 185.0 81.0 SO2: 291.0 291.0 63.0 PCOX: 333.0 333.0 NO2: 0.0 0.0 81.0
AH: 6.9 HV: 500.0 RAIN: 1310.0 D2C: 10000.0 DEPT: 6.0 TEMP: 12.0

WASHING INTERVAL= A , C REPAINT INTERVAL= B , B EXPECTED CORROSION DAMAGE= A , B

PATRICK AFB STATE: FL COUNTY: BREVARD LOC: 02814N 08036W

WBAN: 12867 GELOC: SXHT EPA STATION: MERRITT IS TYPE: CONN LOC: 02837N 08042W
TSP: 88.0 82.0 35.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0 NO2: -1.0 -1.0 -1.0
AH: 16.1 HV: 500.0 RAIN: 1184.0 D2C: .5 DEPT: 18.0 TEMP: 23.0

WASHING INTERVAL= A , A REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= AA, AA

PEASE AFB STATE: NH COUNTY: ROCKINGHAM LOC: 04305N 07049W

WBAN: 04743 GELOC: SZDT EPA STATION: PORTSMOUTH TYPE: RES LOC: 04305N 07047W
TSP: 76.0 74.0 35.0 SO2: 72.0 70.0 22.0 PCOX: -1.0 -1.0 NO2: 100.0 90.0 39.0
AH: 6.1 HV: 500.0 RAIN: 1123.0 D2C: 1.0 DEPT: 3.0 TEMP: 9.0

WASHING INTERVAL= A , A REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= AA, AA

PETERSON AFB STATE: CO COUNTY: EL PASO LOC: 03849N 10442W

WBAN: 23029 GELOC: TDKA EPA STATION: COLORADO SPRINGS TYPE: CONN LOC: 03849N 10530W
TSP: 254.0 236.0 92.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0 NO2: -1.0 -1.0 -1.0
AH: 4.8 HV: 600.0 RAIN: 369.0 D2C: 10000.0 DEPT: 1.0 TEMP: 9.0

WASHING INTERVAL= B , B REPAINT INTERVAL= B , C EXPECTED CORROSION DAMAGE= B , B

PLATTSBURGH AFB STATE: NY COUNTY: CLINTON LOC: 04441N 07331W

WBAN: 94733 GELOC: THWA EPA STATION: PLATTSBURGH TYPE: RES LOC: 04442N 07328W
TSP: 57.0 50.0 30.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0 NO2: -1.0 -1.0 -1.0
AH: 5.4 HV: 450.0 RAIN: 773.0 D2C: 10000.0 DEPT: 2.0 TEMP: 7.0

WASHING INTERVAL= C , C REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= C , C

POPE AFB STATE: NC COUNTY: CUMBERLAND LOC: 03500N 07853W

WBAN: 93740 GELOC: THWK EPA STATION: FAYETTEVILLE TYPE: RES LOC: 03505N 07850W
TSP: 283.0 158.0 81.0 SO2: 82.0 63.0 11.0 PCOX: -1.0 -1.0 NO2: 81.0 72.0 42.0
AH: 10.5 HV: 550.0 RAIN: 1210.0 D2C: 10000.0 DEPT: 11.0 TEMP: 17.0

WASHING INTERVAL= B , B REPAINT INTERVAL= C , C EXPECTED CORROSION DAMAGE= A , B

RANDOLPH AFB

STATE: TX COUNTY: BEXAR

LOC: 02932N 09817W

WDAM: 12911 GELOC: TYNX EPA STATION: SAN ANTONIO

TSP: 283.0 120.0 59.0 SO2: 3.0 3.0 3.0 PCOX: 370.0 347.0

AH: 12.1 HV: 600.0 RAIN: 676.0

D2C: 10000.0

TYPE: RES

MO2: 77.0 61.0 23.0

DEMT: 13.0

LOC: 02930N 09832W

TEMP: 21.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= A , B

EXPECTED CORROSION DAMAGE= A , A

REESE AFB

STATE: TX COUNTY: LUBBOCK

LOC: 03336N 10203W

WDAM: 23021 GELOC: UBNY EPA STATION: LUBBOCK

TSP: 199.0 190.0 81.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 7.2 HV: 600.0 RAIN: 406.0

D2C: 10000.0

TYPE: CONN

MO2: 47.0 40.0 18.0

DEMT: 4.0

LOC: 03335N 10151W

TEMP: 16.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , C

RI AND THEO GREEN

STATE: RI COUNTY: KENT

LOC: 04144N 07126W

WDAM: 14765 GELOC: WUAD EPA STATION: WARWICK

TSP: 80.0 56.0 50.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 6.6 HV: 500.0 RAIN: 1085.0

D2C: 3.5

TYPE: CONN

MO2: 22.0 17.0 12.0

DEMT: 4.0

LOC: 04144N 07126W

TEMP: 10.0

WASHING INTERVAL= A , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= AA, C

RICHARDS GEBBUR AFB

STATE: MO COUNTY: JACKSON

LOC: 03851N 09433W

WDAM: 03929 GELOC: UEDL EPA STATION: GRANDVIEW

TSP: 85.0 83.0 62.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 7.7 HV: 550.0 RAIN: 884.0

D2C: 10000.0

TYPE: CONN

MO2: -1.0 -1.0 -1.0

DEMT: 6.0

LOC: 03853N 09432W

TEMP: 13.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

RICKENBACKER AFB

STATE: OH COUNTY: FRANKLIN

LOC: 03949N 08255W

WDAM: 13812 GELOC: MLZT EPA STATION: COLUMBUS

TSP: 146.0 108.0 53.0 SO2: 0.0 0.0 0.0 PCOX: 0.0 0.0

AH: 7.7 HV: 500.0 RAIN: 871.0

D2C: 10000.0

TYPE: CONN

MO2: 0.0 0.0 0.0

DEMT: 6.0

LOC: 03955N 08253W

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

ROBINS AFB

STATE: GA COUNTY: BIBB

LOC: 03250N 08338W

WDAM: 93853 GELOC: UHYZ EPA STATION: MACON

TSP: 164.0 147.0 65.0 SO2: 25.0 21.0 5.0 PCOX: -1.0 -1.0

AH: 11.3 HV: 500.0 RAIN: 1005.0

D2C: 10000.0

TYPE: RES

MO2: 109.0 85.0 40.0

DEMT: 12.0

LOC: 03248N 08338W

TEMP: 19.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

SC ANG MCENTIRE

STATE: SC COUNTY: RICHLAND

LOC: 03358N 08048W

WBAN: 03858 GELOC: PSTE EPA STATION: COLUMBIA

TSP: 92.0 87.0 48.0 SO2: 75.0 6.0 4.0 PCOX: -1.0 -1.0
AH: 10.5 HV: 500.0 RAIN: 1092.0 D2C: 10000.0

TYPE: CONN

NO2: 73.0 73.0 37.0
DEMT: 11.0

LOC: 03400N 08103W

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

SCOTT AFB

STATE: IL COUNTY: ST CLAIR

LOC: 03833N 08951W

WBAN: 13802 GELOC: VDTD EPA STATION: E ST LOUIS

TSP: -1.0 -1.0 -1.0 SO2: 261.0 239.0 61.0 PCOX: 302.0 282.0
AH: 7.8 HV: 550.0 RAIN: 1008.0 D2C: 10000.0

TYPE: IND

NO2: 100.0 83.0 53.0
DEMT: 7.0

LOC: 03837N 09009W

TEMP: 13.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

SD ANG JOE FOSS

STATE: SD COUNTY: MINNEHAWA

LOC: 04334N 09644W

WBAN: 14944 GELOC: LUXC EPA STATION: SIOUX FALLS

TSP: 202.0 122.0 60.0 SO2: 49.0 42.0 6.0 PCOX: -1.0 -1.0
AH: 5.4 HV: 550.0 RAIN: 622.0 D2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEMT: 1.0

LOC: 04335N 09644W

TEMP: 8.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

SEYMOR JOHNSON AFB

STATE: NC COUNTY: WAYNE

LOC: 03520N 07758W

WBAN: 13713 GELOC: UKAB EPA STATION: GOLDSBORO

TSP: 170.0 133.0 74.0 SO2: 36.0 11.0 6.0 PCOX: -1.0 -1.0
AH: 9.7 HV: 500.0 RAIN: 1325.0 D2C: 10000.0

TYPE: CONN

NO2: 69.0 67.0 22.0
DEMT: 10.0

LOC: 03523N 07759W

TEMP: 16.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

SHAW AFB

STATE: SC COUNTY: SUMTER

LOC: 03358N 08028W

WBAN: 13849 GELOC: ULSB EPA STATION: SUMTER

TSP: 327.0 203.0 70.0 SO2: 74.0 43.0 4.0 PCOX: -1.0 -1.0
AH: 10.5 HV: 500.0 RAIN: 1092.0 D2C: 10000.0

TYPE: CONN

NO2: 76.0 62.0 33.0
DEMT: 11.0

LOC: 03355N 08020W

TEMP: 18.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

TINKER AFB

STATE: OK COUNTY: OKLAHOMA

LOC: 03525N 09723W

WBAN: 13719 GELOC: WMYK EPA STATION: OKLAHOMA CITY

TSP: 135.0 111.0 58.0 SO2: 5.0 5.0 5.0 PCOX: -1.0 -1.0
AH: 8.4 HV: 550.0 RAIN: 851.0 D2C: 10000.0

TYPE: CONN

NO2: 67.0 64.0 31.0
DEMT: 8.0

LOC: 03524N 09729W

TEMP: 16.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

TN ANG MCGHEE TYSON			STATE: TN COUNTY: KNOX		LOC: 03549N 08400W	
WBAN: 03851 GELOC: PGXE EPA STATION: KNOXVILLE			TYPE: IND		LOC: 03546N 08338W	
TSP: 163.0 138.0 78.0 SO2: 44.0 35.0 8.0 PCOX: -1.0 -1.0			NO2: 83.0 75.0 44.0		TEMP: 17.0	
AH: 10.2 HV: 500.0 RAIN: 1300.0 D2C: 10000.0			DEMT: 13.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= A , B	

TN ANG MEMPHIS			STATE: TN COUNTY: SHELBY		LOC: 03504N 08959W	
WBAN: 13862 GELOC: PYJX EPA STATION: MEMPHIS			TYPE: RES		LOC: 03508N 08959W	
TSP: 113.0 73.0 77.0 SO2: 50.0 33.0 30.0 PCOX: -1.0 -1.0			NO2: 123.0 171.0 68.0		TEMP: 17.0	
AH: 10.1 HV: 500.0 RAIN: 1300.0 D2C: 10000.0			DEMT: 10.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= A , B	

TN ANG NASHVILLE			STATE: TN COUNTY: DAVIDSON		LOC: 03610N 08647W	
WBAN: 93858 GELOC: RHDQ EPA STATION: NASHVILLE			TYPE: IND		LOC: 03611N 08648W	
TSP: 211.0 161.0 87.0 SO2: 49.0 44.0 16.0 PCOX: -1.0 -1.0			NO2: 115.0 107.0 65.0		TEMP: 16.0	
AH: 9.7 HV: 500.0 RAIN: 1156.0 D2C: 10000.0			DEMT: 9.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= A , A	

TRAVIS AFB			STATE: CA COUNTY: SOLANO		LOC: 03816N 12156W	
WBAN: 23202 GELOC: XDAT EPA STATION: VALLEJO			TYPE: CONH		LOC: 03806N 122.4W	
TSP: 176.0 136.0 69.0 SO2: 35.0 31.0 5.0 PCOX: 372.0 274.0			NO2: 0.0 0.0 59.0		TEMP: 16.0	
AH: 9.0 HV: 650.0 RAIN: 424.0 D2C: 4.0			DEMT: 8.0			
WASHING INTERVAL= A , B			REPAINT INTERVAL= A , A		EXPECTED CORROSION DAMAGE= AA, A	

TX ANG HOUSTON			STATE: TX COUNTY: HARRIS		LOC: 02946N 09522W	
WBAN: 12945 GELOC: CCNH EPA STATION: HOUSTON			TYPE: RES		LOC: 02946N 09513W	
TSP: 198.0 162.0 95.0 SO2: 56.0 38.0 5.0 PCOX: 582.0 523.0			NO2: 106.0 101.0 37.0		TEMP: 21.0	
AH: 13.6 HV: 550.0 RAIN: 1161.0 D2C: 10000.0			DEMT: 15.0			
WASHING INTERVAL= B , B			REPAINT INTERVAL= B , B		EXPECTED CORROSION DAMAGE= A , A	

TYNDALL AFB			STATE: FL COUNTY: BAY		LOC: 03004N 08565W	
WBAN: 13846 GELOC: XLWU EPA STATION: PANAMA CITY			TYPE: RES		LOC: 03012N 08541W	
TSP: 137.0 129.0 53.0 SO2: 128.0 20.0 7.0 PCOX: -1.0 -1.0			NO2: 81.0 28.0 11.0		TEMP: 21.0	
AH: 13.8 HV: 500.0 RAIN: 1359.0 D2C: 2.0			DEMT: 16.0			
WASHING INTERVAL= A , A			REPAINT INTERVAL= C , C		EXPECTED CORROSION DAMAGE= AA, AA	

VA ANG BYRD FLD

STATE: VA COUNTY: ROANOKE

LOC: 03730N 07720W

WBAN: 13703 GELOC: CVM EPA STATION: RICHMOND

TSP: 198.0 128.0 90.0 SO2: 65.0 57.0 27.0 PCOX: -1.0 -1.0

AH: 8.2 HV: 500.0 RAIN: 1052.0

B2C: 10000.0

TYPE: IND

NO2: 105.0 92.0 61.0

DEMT: 8.0

LOC: 03731N 07726W

TEMP: 14.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , B

VANCE AFB

STATE: OK COUNTY: GARFIELD

LOC: 03621N 09755W

WBAN: 13909 GELOC: XTLF EPA STATION: EMID

TSP: 140.0 137.0 73.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 8.7 HV: 600.0 RAIN: 714.0

B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0

DEMT: 7.0

LOC: 03623N 09754W

TEMP: 16.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , C

VANDENBERG AFB

STATE: CA COUNTY: SANTA BARBARA

LOC: 03443N 12034W

WBAN: 93223 GELOC: XUMU EPA STATION: SANTA MARIA

TSP: 161.0 133.0 89.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 8.9 HV: 650.0 RAIN: 315.0

B2C: 2.5

TYPE: CONN

NO2: -1.0 -1.0 -1.0

DEMT: 8.0

LOC: 03450N 12030W

TEMP: 13.0

WASHING INTERVAL= A , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= AA , B

VT ANG BURLINGTON

STATE: VT COUNTY: CHITTENDEN

LOC: 04428N 07309W

WBAN: 14742 GELOC: CURZ EPA STATION: BURLINGTON

TSP: 117.0 105.0 64.0 SO2: 107.0 94.0 24.0 PCOX: 196.0 196.0

AH: 5.9 HV: 450.0 RAIN: 859.0

B2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0

DEMT: 2.0

LOC: 04429N 07312W

TEMP: 8.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

WA ANG SPOKANE

STATE: WA COUNTY: SPOKANE

LOC: 04738N 11732W

WBAN: 24157 GELOC: VZBT EPA STATION: SPOKANE

TSP: 163.0 162.0 92.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 5.7 HV: 650.0 RAIN: 460.0

B2C: 10000.0

TYPE: MOBILE

NO2: -1.0 -1.0 -1.0

DEMT: 1.0

LOC: 04739N 11739W

TEMP: 9.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= B , B

WEBB AFB

STATE: TX COUNTY: HOWARD

LOC: 03213N 10131W

WBAN: 23005 GELOC: YQAZ EPA STATION: BIG SPRING

TSP: 200.0 119.0 68.0 SO2: 2.0 2.0 3.0 PCOX: -1.0 -1.0

AH: 8.1 HV: 600.0 RAIN: 422.0

B2C: 10000.0

TYPE: CONN

NO2: 40.0 36.0 19.0

DEMT: 6.0

LOC: 03215N 10128W

TEMP: 18.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , C

WESTOVER AFB

STATE: MA COUNTY: PIONEER VALLEY

LOC: 04212N 07232W

WBAN: 14703 GELOC: YTPH EPA STATION: CHICOPEE

TSP: 137.0 121.0 55.0 SO2: 94.0 76.0 27.0
AH: 6.2 HV: 450.0 RAIN: 1151.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: IND

NO2: 149.0 134.0 62.0
DEWPT: 4.0

LOC: 04211N 07236W

TEMP: 9.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

WHITEMAN AFB

STATE: MO COUNTY: BETTIS

LOC: 03843N 09333W

WBAN: 13930 GELOC: YWHS EPA STATION: SEDALIA

TSP: 256.0 146.0 63.0 SO2: -1.0 -1.0 -1.0
AH: 7.6 HV: 550.0 RAIN: 874.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: IND

NO2: -1.0 -1.0 -1.0
DEWPT: 6.0

LOC: 03841N 09317W

TEMP: 13.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= A , C

WI ANG GEN MITCHELL

STATE: WI COUNTY: MILWAUKEE

LOC: 04257N 08754W

WBAN: 14839 GELOC: HTUV EPA STATION: MILWAUKEE

TSP: 78.0 77.0 47.0 SO2: 8.0 5.0 5.0
AH: 6.0 HV: 500.0 RAIN: 747.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: CONN

NO2: 83.0 73.0 47.0
DEWPT: 3.0

LOC: 04302N 08755W

TEMP: 8.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

WI ANG MADISON

STATE: WI COUNTY: DANE

LOC: 04308N 08920W

WBAN: 94811 GELOC: NXHE EPA STATION: MADISON

TSP: 266.0 120.0 57.0 SO2: 27.0 20.0 12.0
AH: 5.9 HV: 500.0 RAIN: 780.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: CONN

NO2: 54.0 52.0 33.0
DEWPT: 3.0

LOC: 04304N 08922W

TEMP: 8.0

WASHING INTERVAL= C , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= C , C

WI ANG VOLK FLD

STATE: WI COUNTY: LA CROS

LOC: 04352N 09115W

WBAN: 14920 GELOC: YAGF EPA STATION: LA CROSSE

TSP: 375.0 314.0 101.0 SO2: 34.0 32.0 15.0
AH: 5.9 HV: 500.0 RAIN: 750.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: CONN

NO2: 76.0 67.0 42.0
DEWPT: 2.0

LOC: NA

TEMP: 8.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , B

WILLIAMS AFB

STATE: AZ COUNTY: MARICOPA

LOC: 03318N 11140W

WBAN: 23104 GELOC: YZJU EPA STATION: MESA

TSP: 264.0 233.0 101.0 SO2: 42.0 40.0 8.0
AH: 7.6 HV: 600.0 RAIN: 186.0PCOX: -1.0 -1.0
D2C: 10000.0

TYPE: CONN

NO2: -1.0 -1.0 -1.0
DEWPT: 4.0

LOC: NA

TEMP: 22.0

WASHING INTERVAL= B , B

REPAINT INTERVAL= B , C

EXPECTED CORROSION DAMAGE= A , B

WRIGHT PATTERSON AFB

STATE: OH COUNTY: MONTGOMERY

LOC: 03949N 08403W

WBAN: 13840 GELOC: ZHTV EPA STATION: DAYTON

TSP: 140.0 120.0 71.0 SO2: 205.0 182.0 22.0 PCOX: 372.0 353.0

AH: 7.5 HV: 550.0 RAIN: 879.0

B2C: 10000.0

TYPE: RES

NO2: 0.0 0.0 47.0

DEUPT: 6.0

LOC: 03949N 08411W

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= B , B

EXPECTED CORROSION DAMAGE= A , B

WURTSMITH AFB

STATE: MI COUNTY: OSCODA

LOC: 04427N 08324W

WBAN: 14808 GELOC: ZJXD EPA STATION: ALPENA

TSP: 440.0 307.0 76.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 5.9 HV: 500.0 RAIN: 750.0

B2C: 10000.0

TYPE: NA

NO2: -1.0 -1.0 -1.0

DEUPT: 3.0

LOC: 04504N 08325W

TEMP: 7.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

WV ANG KANAWHA CO APRT

STATE: WV COUNTY: KANAWHA

LOC: 03822N 08136W

WBAN: 13866 GELOC: LYDH EPA STATION: CHARLESTON

TSP: 124.0 106.0 54.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 8.3 HV: 500.0 RAIN: 1113.0

B2C: 10000.0

TYPE: MOBILE

NO2: -1.0 -1.0 -1.0

DEUPT: 7.0

LOC: 03822N 08135W

TEMP: 14.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C

WV ANG MARTINSBURG MUNI APRT

STATE: WV COUNTY: MINERAL

LOC: 03924N 07759W

WBAN: 13734 GELOC: PJUY EPA STATION: KEYSER

TSP: 104.0 93.0 51.0 SO2: -1.0 -1.0 -1.0 PCOX: -1.0 -1.0

AH: 7.7 HV: 450.0 RAIN: 923.0

B2C: 10000.0

TYPE: RES

NO2: -1.0 -1.0 -1.0

DEUPT: 6.0

LOC: 03926N 07859W

TEMP: 12.0

WASHING INTERVAL= B , C

REPAINT INTERVAL= C , C

EXPECTED CORROSION DAMAGE= B , C