Global Consulting
Division of Royal SunAlliance Insurance Agency, Inc.

SURVEY REPORT

Client:	Sample Account
Location:	Sample Location 123 Smith Road Hockeytown, Illinois 60543 United States
QRS ID Number:	1
Conferred With:	Ray Forester, Plant Engineer
Activity:	Survey - Initial - Property
Occupancy:	Aircraft Wheel and Brake Manufacturing Complex
Date of Visit:	12 October 2004 thru 15 October 2004
Office:	Global Consulting
Consultant:	Jeff Holman (QRS) Senior Consultant

SUMMARY & OPINION

The plant manufactures aircraft wheels, brakes, and wheel-brake assemblies for commercial, military, business, and regional aircraft. The operations are classified as light metal working with machining, heat treating, plating, painting, assembly, and certification operations. High piled storage exists in the adequately sprinkler protected Warehouse. Sprinkler systems protecting other areas of the complex are also adequately designed.

This aircraft wheel and brake-manufacturing complex is considered a moderately hazardous location due to the solvent-based painting operations and high piled storage. Positive features include nearly 100% sprinkler protection, a strong water supply and adequate alarm systems. Negative features include combustible construction. The complex currently rates "Above Average" and the rating could improve to "Good" upon completion of the submitted recommendations.

Changes

This site no longer uses Magnesium in its production.

The client is installing a new 84-inch Dynamometer Test Room along the east side of the plant. This 2500-ft² room is of non-combustible construction and will have sprinkler protection and a foam-water nozzle above its tire station.

Local management intends on replacing their electric fire pump in 2004. They will forward the plans for this project to the servicing engineer when they become available. The existing fire pump dates back to the 1960's.

RECOMMENDATIONS

Recommendation Summary

REC. NO.	DESCRIPTION	LOSS EXPECTANCY (USD NEAREST 1000'S)	ESTIMATED COST (USD)	CATEGORY
04-01	Automatic Sprinkler Protection	24,538,000	10,000	2
04-02	Automatic Sprinkler Control Valve Supervision			H.E.
04-03	Paint Bake Oven Maintenance			H.E.

Loss Expectancy: This is an estimate of the potential Property and Business Interruption loss associated with the recommendation.

Estimated Cost: This column relates only to capital expenditure items and gives an indication of the likely cost of the improvement recommended. Quotations can, however, vary greatly depending on market conditions. Our estimates should be regarded as an indication only and not used for formal budget purposes. Estimates are shown in the account currency (USD/Euro/GBP, etc.) and in bands of up to 1,000 / 10,000 / 100,000 / 250,000 / 500,000 / 750,000 / 1,000,000+.

Category 1: These are capital expenditure recommendations with a loss expectancy greater than 25% of the combined property damage and business interruption loss potential. Whilst funding for these items will normally require corporate approval, completion will significantly improve the risk profile of the site.

Category 2: These are recommendations either with a loss expectancy of less than 25% of the combined property damage and business interruption loss potential or that address important reliability issues. In some cases funding may require corporate approval.

Human Element (H.E.): These recommendations refer to management practice and procedures. Typically they carry no capital cost but address a wide range of local issues including the control of inception risks and training.

Recommendation Details

04-01 **Automatic Sprinkler Protection**

Category Category 2

Recommendation Extend sprinkler protection in the following areas.

a). Beneath the exhaust hood above the dynamometers (one head per hood).
b). Above the lube oil pit below the dynamometers (two heads per pit).
c). Below the filter press mezzanine (two heads).

Loss Scenario The above areas have combustible contents and no sprinkler protection. A fire developing in these areas would cause significant damage without the recommended protection.

Status Agreed - Completion > 90 Days

Potential LE 24,538,000 USD **Estimated Cost to Complete** 10,000 USD

04-02 **Automatic Sprinkler Control Valve Supervision**

Category Human Element

Recommendation Seal open the following valves and include them in the monthly sprinkler valve inspection.

a). Dust collector sprinkler lines.
b). Foam-water control valve serving the dynamometers
c). Fire pump pressure sensing line.

Loss Scenario The above valves are critical to the fire protection systems and should be checked regularly to ensure that they are in service.

Status Agreed - Completion < 91 Days

Potential LE 0 USD **Estimated Cost to Complete** 0 USD

04-03	**Paint Bake Oven Maintenance**
Category	Human Element
Recommendation	Inspect (and clean if necessary) the interior of the paint bake ovens' exhaust stack on an annual basis.
Loss Scenario	There are two, small paint bake ovens in the plant. Very little fumes are driven off during the baking process; however, the 1-ft diameter exhaust stacks have never been inspected to see if paint residue has built-up within their interior.
Status	Agreed - Completion > 90 Days

Potential LE	0 USD	**Estimated Cost to Complete**	0 USD

CONSTRUCTION

BUILDING	YEAR BUILT	TOTAL AREA (ft²)	% SPRINK.	% DEFICIENT	NON-COMB. AREA (ft²)	COMB. AREA (ft²)	FIRE RESISTIVE AREA (ft²)
Entire Complex	1941	392,000	100%	0%	0	392,000	0
TOTAL		**392,000**	**100%**	**0%**	**0**	**392,000**	**0**

Entire Complex

The original building has a wood joist roof and dates back to 1941. The remaining roofs are slightly sloped metal panel on steel frame with a built-up covering with gravel ballast. All buildings interconnect and there is only one firewall that separates a portion of the three-story Office Building from the rest of the plant. Exterior walls are concrete block and insulated metal panel. Much of the insulation is a spray-on type that will not support combustion by itself, but will smolder and give off an acrid smoke when exposed to flames.

OCCUPANCY

Process

Raw Stock consists of aluminum castings, carbon and steel plates and brake linings. The west half of the plant is divided into product lines, being large wheels, torque plates, small wheels and piston housings. Numerically controlled mills and lathes are throughout each production area. These machines do not involve high-pressure hydraulic oils and the lubricants are 95% water. Various finishing operations throughout the remainder of the plant include anodizing, heat treating, painting, assembly, and testing. The north half of the plant involves warehousing, shipping, and receiving. The east half involves offices and dynamometer testing and certification. There are no special atmosphere furnace nor quench oil tanks. All hydraulic machinery have oil reservoirs less than 100-gal.

The salt bath heat treatment uses several electric-heated, salt tanks ranging in temperature from 400 to 1650°F. These baths treat steel torque plates, plate segments and links over a two to three hour period. There is a low-pressure cooling water line circulating within each tank's shell and the high temperature interlocks use two probes in each tank. Sprinkler protection is not permitted above these tanks due to the potential for a steam explosion. There is sprinkler protection in the heat treat office and salt dust collectors, which use a combustible bag.

The anodizing room contains several process tanks containing acids, alkalis, and heavy metals (no flammable liquids) for plating purposes. Tanks are constructed of both metal and polypropylene. Adequate sprinkler protection is provided in this room and the tanks are provided with low liquid level interlocks and high coil temperature interlocks to shut off the electric heating elements.

The second anodizing area is near the wheel assembly area in the 1967 addition. Like the other anodizing operation, the process has several process tanks containing acids, alkalis, and heavy metals. The operation is used for plating metal. The plating tanks are polypropylene. This operation uses a small, gas-fired water heater to warm the plating tanks.

Flammable Liquids

Flammable Liquids Storage - Flammable paint and solvent storage are kept to a minimum. All of these containers are kept in safety cabinets.

There is a small area in the southwest comer of the production area that contains twelve 55-gal drums of various hydraulic and lube oils (Class IIIB). The drums are stored on side in racks with three tiers to 10-ft high. The installation has adequate dispensing valves, sight glasses and sprinkler protection.

Spray Finishing - Five, dry filter spray booths are along the north side of the plant. Employees use these manual booths to prime and paint various components of the wheel and brake assemblies. Each unit has automatic sprinklers inside the booth, plenum and exhaust duct. Plastic bags protect the sprinkler heads and control valves for each booth are locked and checked regularly. The spray guns are interlocked with the exhaust fan so that they can not operate unless the ventilation is on. Adequate electrical equipment is present in each booth and housekeeping is satisfactory.

Paint Bake Ovens - There are two ovens, one gas-fired and another electrically heated, near the spray finishing line. Painted metal components, conveyed by hooks from the spray booths, wait one to two hours before entering either oven. Once inside the oven, a 15-minute purge cycle ensues before heating begins. The operating temperature is 200°F and high temperature interlocks protect both ovens. The gas-fired unit has adequate combustion controls. There are very little fumes driven off and the ovens' 1-ft diameter, exhaust stack vents directly through the roof.

Dynamometer - There are seven rooms containing these dynamometer test machines, which simulate conditions for aircraft wheels and brakes. These machines have a hydraulic system that operates at 2000-psi fed by an 80-gal tank. In addition, the bearing lube oil system is fed from a 300-gal reservoir in a pit beneath the machine. Two of the dynamometers are RTO, which simulate take-offs and landings. The friction involved in these tests could ignite the tire used in the simulation. The tire is up to 4-ft. diameter.

There is an adjacent control room for each dynamometer, separated from the test room by a concrete block wall with observation glass. The rooms have video cameras, smoke detectors, sprinkler protection and a remote shut-off switch for the test machine, including the hydraulic unit. The RTO rooms have a remote activated foam-water extinguishing system over the test tire. Recommendation 04-01 requests sprinkler protection in the pit and below an exhaust hood.

Computer Rooms

Production scheduling, inventory and sales are computer dependent. There are two main computer rooms. The larger room, on the second floor of the Office Building, contains the main servers and has an independent HVAC system. Protection consists of a preaction sprinkler system, water detectors in the sub-floor and smoke detectors in the return air supply duct. The smaller room is on a mezzanine in the production area and has an independent HVAC system, a wet-pipe sprinkler system and an FM-200 extinguishing system. Employees make back-up records daily and store them off site. The servers in the smaller room could act as a hot site for some applications should the larger room be lost. In addition, servers at sister sites could be used in an emergency.

Storage

The Warehouse contains double-row rack with slatted, wood shelves containing cartoned work-in-progress and finished products (Class II commodity). There are six levels per rack with a maximum storage height of 16-ft. The existing sprinkler system can meet the required sprinkler design of 0.24-gpm/ft² over the most remote 2000-ft² along with one level of in rack sprinklers.

Utilities and Services

Waste Treatment
A small scrubber serves the anodizing line. Wastewater treatment includes neutralization, chrome removal and clarification. Employees transport machine turnings and waste chips to a well-detached shed. There is a large waste oil tank within a 3-ft high dike outside the southeast corner of the plant. There are neither fume incinerators nor oxidizers.

Power Supplies/Electrical Installation
The utility-owned 10,000 kVA transformer feeds the main outdoor disconnect. This in turn feeds several (non-PCB) sub-stations within the plant. There is no emergency generator.

Contractors perform annual oil analysis and infrared scans on transformers, switchgear, bus ducts, and equipment controls. Biannually, another outside contractor (Q.O.B. Electric) does performance testing on all electrical breakers, relays, trips, ground faults and cables

Space Heating
Small, gas-fired, space heaters warm the majority of the plant and roof-mounted air handlers warm and cool the Office Building. A gas-fired boiler in the fire pump house heats the suction tank. There are three large water heaters serving either the anodizing process or heating an older portion of the plant. All larger gas-fired equipment (> 500k-Btu/hr) have adequate combustion controls using the "double-block and bleed" arrangement. Employees tests these controls at least semi-annually.

Cooling
There are two cooling towers rated at 300-gpm and 160-tons each. One tower serves the HVAC system and the other serves the processes. Backup cooling is available from two well water pumps.

Compressed Air
There are four screw type air compressors rated at 200, 250 (2), and 300 HP. These feed a 30k-gal receiver tank. Normally the plant operates up to two compressors at a time. A rental unit could be connected into the existing piping system from outside the building.

PROTECTION

Human Element

Permit to Work Program/Hot Work
A formal permit program is in place for hot work procedures.

Management of Contractors
A formal contractor management policy is in effect at this facility.

Plant Emergency Organization
There is a formal plant emergency organization that receive annual training.

Smoking
Smoking is not permitted throughout the facility.

Change Management
Major changes with construction occupancy and protection have been well managed in the past.

Housekeeping
Housekeeping is adequate throughout the facility.

Self Inspections
Comprehensive weekly fire safety inspections are conducted.

Impairment Handling
Fire protection system impairments are well managed using a formal in-house procedure.

Plant Maintenance
General maintenance of the site is very good. The plant has a thorough preventative maintenance program and keeps many critical spare parts on site. Machine availability (not down for maintenance or repairs) is over 96%. Employees test combustion controls semi-annually.

Arson & Security

Physical Security
The 24-hour guard service maintains one guard in the security office at the main entrance on the south side of the property. During working hours, security makes three interior rounds during third shift only. During idle periods, the guards make five recorded rounds per shift throughout the entire premises.

Fixed Fire Protection

Automatic Sprinklers
There are a total of fifteen sprinkler systems on ordinary hazard pipe schedules or hydraulically designed as indicated in the table below. All installations are adequate for the areas that they protect.

Automatic Fire Detection

The plant has a local alarm system that is supplemented by their CSS (central station service), ADT. This service monitors: sprinkler water flow alarms, FM-200 activation (small computer room), manual pull stations, smoke detectors (HVAC and large computer room) and fire pump running, off and phase reversal. The local alarm system monitors suction tank low temperature and level. The CSS conducts monthly alarm tests. A sprinkler contractor conducts annual sprinkler certification and fire pump flow tests. Employees conduct monthly sprinkler 2-inch drain tests, fire pump and sprinkler valve inspections.

Fire Service/Department

The full-time, paid fire department is four miles away and has a ten-minute response time. The fire department visits the site at least annually. Accessibility and hydrant spacing are good.

EXPOSURES

External (Offsite) Exposures

The client's 15-acre site is in a secure industrial area 20 miles north of Dayton, OH. The complex consists of a Main Plant and attached Office Building. The total building area is 400,000-ft² and its construction is mostly combustible. ABC owns and occupies the entire site and there are no exposing structures within 100 ft.

Natural Catastrophe Exposures

Windstorm
No anticipated exposures. Based on the National Oceanic and Atmospheric Administration report, this region is in an area 3 (1 being slight and 9 being severe). For strong and violent tornadoes with wind speeds in excess of 112 miles per hour on a scale of 0 - 3, with 0 being slight and 3 being severe, this facility is located in a 1 area.

Earthquake
There is no significant earthquake exposure in this region.

Roof Load
As the buildings were built over a number of years and there is only one area with a significant roof elevation change. The elevation change in this area is over 15 ft and the lower roof was adequately designed. Local management indicate that snow accumulation on the roof is rare and they do make periodic inspections before and after severe winter storms.

Water Damage
No anticipated exposure. Based on a floodmap (# 390398 0090B) for the city of Troy, this site is outside the 500-year flood plain.

BUSINESS INTERRUPTION

Please note: This business interruption information has been gathered at this site only from information provided by site personnel. This information may be over-ridden by divisional or corporate level data. Reference should be made to the corporate offices if more specific information is required for any major risk management or underwriting decision. The information provided is also a snapshot in time at the date of this report and may change over the policy period.

There are a total of 750 employees working over three shifts, five days per week. Production is not seasonal and the plant currently operates at 60% of their capacity. There is a formal business contingency plan which prescribes the use of approved vendors for production assistance and the purchase of components and finished parts from "after market" distributors.

Key Products

Annual sales in 2002 for this division of ABC (which includes other plants, such as the one in Cleveland) were $ 1.03B. There are three product lines (brakes, nose and main wheels) for different aircraft, such as the Boeing 777. Component parts come from vendors and sister sites.

Critical Processes

There are several parallel production lines. The heat treating, anodizing and spray painting could be potential bottleneck areas. However, all of these activities could be subcontracted to outside vendors.

Critical Machinery

The Dynamometers are specialty equipment and used only for testing changes to products or processes. Only a small fraction of the products pass through these test machines. The rest of the production machinery are of standard design.

Special Interruption Features

There is adequate reserve capacity for the heating, cooling and air systems. There is no reserve power supply and there have been no significant power outages.

The machining and heat treat operations could be outsourced to approved contractors. Also, the parts manufactured here are also sold to distributors in the "aftermarket" for use in aircraft repairs and maintenance. Many components could be purchased from distributors to mitigate a business interruption loss.

External Dependence

There are normally two sources for most raw materials. An important exception is the steel friction material "cups" used in the brake assemblies. Should a source of these "cups" be lost, ABC would have to re-certify a new vendor. The ramp-up time for tools and dies would not be significant. Fortunately, there is a twelve week supply of these parts in the "pipeline" and a large aftermarket from distributors.

Boeing and Airbus are the largest customers. Other clients include McDonnell Douglas and the US government.

Internal Dependence

This plant receives different types of heat sinks for carbon brakes from ABC plants in California, Colorado and Washington. Since these heat sinks have long lead times, there are two plants qualified as suppliers for most items. These parts are also available in the aftermarket.

APPENDIX 1: VALUES & LOSS EXPECTANCIES

The sums insured below are based on information provided to Global Consulting.

This report describes only the loss estimates from direct property damage and business interruption for this location. The business interruption periods indicated are the 'Equivalent Days' -- i.e. the proportion of production lost over the reinstatement period.

Sums Insured

Buildings	USD	50,000,000
M&E	USD	40,500,000
S&S	USD	35,000,000
BI	USD	27,000,000
Reporting Period		12 months

Estimated Maximum Loss

"An estimation of the maximum loss which could be sustained, considered to be within the realms of probability, excluding losses which may be possible but which remain unlikely."
The main fire protection or detection system is ignored (e.g. sprinklers ignored but credit given for detection; if no sprinklers, detection is ignored). Excluded loss examples include: fire following aircraft impact; fire following earthquake; fire following flood; multiple seat arson."

EML US Dollars		
Property Damage		
Building	100.0 %	50,000,000
Stocks & Supply	100.0 %	35,000,000
Machinery & Equipment	100.0 %	40,500,000
Business Interruption	365 days	27,000,000
TOTAL		152,500,000

EML Block: The entire Plant and Office Building are within this block which encompasses all site values.

EML Scenario: The EML is based on a fire starting in the Warehouse while its sprinkler system is impaired. The fire would spread quickly throughout the Warehouse and eventually involve the combustible roof. Adjacent areas do not have combustible contents; however, the fire would continue spreading along the built-up roof and eventually involve the wood roof. This blaze would be difficult for the fire department to fight, as the flames would spread above the other sprinkler systems. This would result in a complete loss to the building and contents. The client would need one year to rebuild the lost structure and replace the lost machinery and equipment. In the meantime, they would contract out several operations and purchase finished product from distributors in the after market. The business interruption is estimated at 365 equivalent days to cover the ramp-up time and extra expense.

Current Loss Expectancy

The Current Loss Expectancy gives credit for operation of all fixed fire protection systems present; otherwise, it is calculated on the same basis as the EML.

Current Loss Expectancy US Dollars		
Property Damage		
Building	10.0 %	5,000,000
Stocks & Supply	20.0 %	7,000,000
Machinery & Equipment	20.0 %	8,100,000
Business Interruption	60 days	4,438,000
TOTAL		24,538,000

The areas mentioned in Recommendation 04-01 have combustible contents and no sprinkler protection. A fire developing in these areas would cause significant damage without the addition of sprinkler protection.

Normal Loss Expectancy (All Recommendations Complete)

The NLE gives credit for operation of all fixed fire protection systems present and assumes all recommendations presented are completed. The basis for damage assessments etc. is on the same basis as the EML.

Normal Loss Expectancy US Dollars		
Property Damage		
Building	0.1 %	50,000
Stocks & Supply	0.1 %	35,000
Machinery & Equipment	3.0 %	1,215,000
Business Interruption	0 days	
TOTAL		1,300,000

With adequate automatic sprinkler protection installed throughout any fire would be controlled with limited damage.

APPENDIX 2: QRA SUMMARY

Quantitative Risk Assessment (QRA) is a benchmarking tool developed by Royal & SunAlliance to provide an indication of how any particular location and occupancy rates against international best practice. One of the strengths of the system is its recognition of both the inherent hazards present as well as the controls in place. The table below is a summary of all the factors considered both at the time of survey and following completion of any recommendations made.

QRA Summary for: Entire Site (Processing)

Inherent Hazard Summary	At Survey	After LPP	Possible Score
Inherent Hazard Factors Total	**19**	**19**	**36**

Loss Control Summary	At Survey	After LPP	Possible Score
Construction Factor	15	15	15
Compartmentation Factor	15	15	15
Values Factor	3	3	10
Hardware Factors Total	12	12	27
Human Element Factors Total	16	19	40
Fire Fighting Factors Total (except F.F.P.)	8	6	20
Fixed Fire Protection Factors Total	14	38	64
Loss Control Factors Total	**83**	**108**	**191**

Overall Site Risk Quality Rating

At Survey	**Average**
After Completion of Human Element Recs	**Average**
After Full Completion of LPP	**Above Average**

APPENDIX 3: SPRINKLER SYSTEM & WATER SUPPLY DESIGN & TEST INFORMATION

Sprinkler Systems Table

System # / Type	Building / Area	Code	Design (gpm/ft²/ft²)	Demand (gpm @ psi)	Sprinkler Heads (inch, °F)	Spacing (sq. ft.)	Req'd. Density (gpm/ft²/ft²)	Avail. Density (gpm/ft²/ft²)	Assmnt.
3	Warehouse	NFPA	0.30/2000	760@103	1/2, 165	120	0.24/2000	0.30/2000	Adequate
1, 2, 4-10	Plant Offices	NFPA	0.30/2000	600@78	1/2, 165	120	0.20/2000	0.25/2000	Adequate
11, 12	Dynonometer	NFPA	0.27/entire	351@98	1/2, 165	100	0.27/entire	0.27/entire	Adequate

Type: W = Wet PR = Preaction
DR = Dry DI = Double Interlock
DE = Deluge FO = Foam

Sprinkler System Test Results

		No. of Risers		Test Data			Alarms Rec'd		Valves	
Date	By	# On Site	# Tested	Init. Static (psi)	Resid. (psi)	Final Static (psi)	Local	Central	# On Site	# Tested
10/2004	Jeff Holman	15	15	75	75	70	15	15	20	20
	Satisfactory									

Fire Pumps Table

Pump	100% Rating			Suction	Driver	Pressure Settings			
						Jockey (psi)		Fire Pump (psi)	
	(gpm)	(psi)	(rpm)	SOURCE		Start	Stop	Start	Stop
1	2000	100	1750	Tank	Electric	140	155	130	

Fire Pumps

The underground fire loop is fed by the fire pump, as well as two 8-inch connections to an eight-inch public water main grid. The 300k-gal, heated suction tank has cathodic protection and local alarms for level and temperature.

Fire Pump Test Results

Date	By	Pump	Flow Location	Test Data					Adjusted Data		Rating
				Flow (gpm)	Speed (rpm)	Suct. (psi)	Disch. (psi)	Net (psi)	Flow (gpm)	Net (psi)	
10/15/04	Jeff Holman	1	Header	0	1792	8	135	127	0	121	Good
10/15/04	Jeff Holman	1	Header	2056	1782	8	110	102	2,019	98	Good
10/15/04	Jeff Holman	1	Header	3105	1783	8	85	77	3,048	74	Good

APPENDIX 4: LOSS HISTORY

There has been no loss history in the past 5 years.

GLOBAL CONSULTING
LOSS PREVENTION PROGRAM RESPONSE FORM

Account Name:	QRS Demonstration (IT Only)	**Date of Visit:**	12 October 2004 thru 15 October 2004
QRS No:	1	**Consultant:**	Jeff Holman (QRS) Senior Application Technologist QRS
Location:	Sample Location 123 Smith Road Hockeytown, Illinois 60543 United States	**Conferred with:**	Ray Forester, Plant Engineer

The table below lists the recommendations made during our survey and their current status. Please advise the status of all outstanding recommendations in the 'Response/Comments' section and return the completed signed/dated form within 90 days of the visit date to:

Global Consulting
88 Pine Street, 17th Floor
New York, NY 10005

Rec No	Header	Category	Status	Response/Comments
04-01	Automatic Sprinker Protection	2	Agreed - Completion > 90 Days	
04-02	Automatic Sprinkler Control Valve Supervision	Human Element	Agreed - Completion < 91 Days	
04-03	Paint Bake Oven Maintenance	Human Element	Agreed - Completion > 90 Days	