

ICAO CAR/SAM

Seminario sobre Sistemas de Gerencia de Pavimentos

**Benefits of implementing PMS
in a multi-airport agency
a 24-year case study**

by

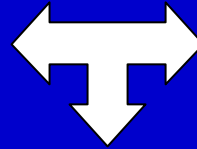


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Lieut.-Cel. @ Brazilian Air Force**

Lima - Peru, Nov./2003



Managing airports...





Airport Management in Brasil...



INFRAERO

- 67 main airports
- 97% of air traffic passengers (75 000 000 passengers) (2 000 000 operations)



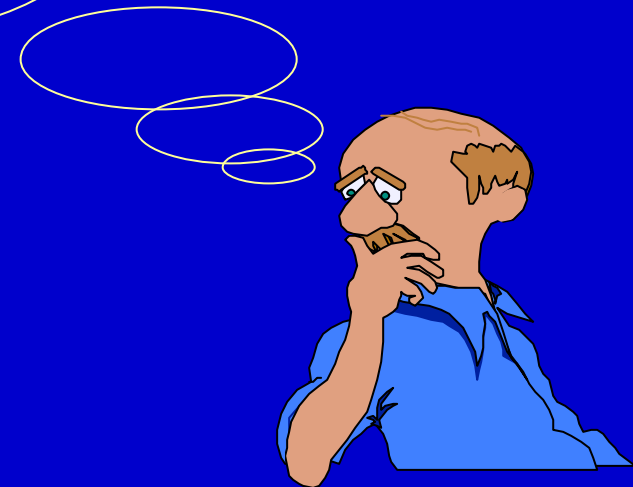
AIRPORT NETWORK - INFRAERO





Pavement Deterioration...

**How to maintain, plan, program
M&R activities and best allocate
resources so as to ensure that
operational conditions, revenues and
profits are achieved?**





Benefits of implementing PMS in a multi-airport agency a 24-year case study

Objective

Identify benefits and challenges within the evolutionary process by which implementation of PMS for a network comprised of 67 airports run by a state agency in Brazil has gone through along the last 24 years.



Benefits of implementing PMS in a multi-airport agency a 24-year case study

Outline

- **Historic perspective**
- **First Pavement Management (PM) activities**
- **Incrementing PM activities**
- **Evaluating PM activities**
- **Taking PM to the Information Age**
- **Restructuring PM to match agency needs and resource capabilities**



Benefits of implementing PMS in a multi-airport agency a 24-year case study

Historic perspective

- **INFRAERO created in 1970's under the control of the Aeronautical Command.**
- **PMS implementation efforts first carried out from 1979 until 2000 by members of the Aeronautical Command.**
- **After 2000, INFRAERO reached relative administrative autonomy.**



First Pavement Management (PM) activities

- **79/80/81** ☉ **pavement structures (mat'l layer types & thicknesses)**
construction history
pavement sampling and lab tests
basic mat'l properties
geometry and drainage conditions
current traffic

Data Base / Technical Reports ☉ **project needs for airport investigated**
58 airports contemplated ☉ **1 airport/year using in-house personnel**
(1 engineer and 2 auxiliars)

- **Data available expedited analyses of 3 overlay projects**
- **Data registers not updated due to subsequent M&R intervention carried out by airport administrators**



Incrementing PM activities

- **1985** **☉** **Surface Condition**

Functional evaluation (Aquaplaning Potential, QI)

Structural evaluation (NDT - Benkelman Beam)

Economic and Political Importance indicators

Data Base / Technical Reports

18 airports - 54 airports/year for each in-house personnel team comprised of 1 engineer and 6 auxiliars

- **Techniques to monitorize and provide safe runway surfaces (rubber removal by high-pressure water jet; operations of B-737 on a 1260 m-runway - 4135 ft - at Santos Dumont airport in Rio de Janeiro)**
- **Network level technique for roughness evaluation and monitorization**



Evaluating PM activities

- **Advancements in the functional aspects of pavement performance analysis;**
- **NDT backcalculation highly dependent on subjective idealization by the analyst;**
- **NDT measurement philosophy proved not adequate to deal with structural performance analyses;**
- **Labor intensive PM activities not compatible with available resources to survey data;**
- **Need for adjusting data detail to network size and personnel availability (resource optimization)**



Evaluating PM activities

- **A PMS was developed for the São Paulo international airport as part of an academic study, making use of the PCI method and involving computational coding (1987/1990 - ITA);**
- **PM activities emphasized particularly the runways (1991/1992);**

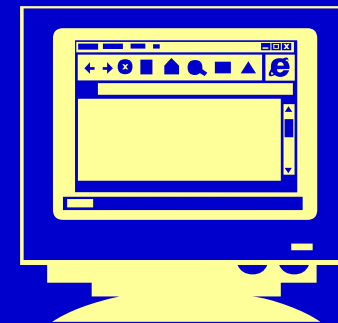
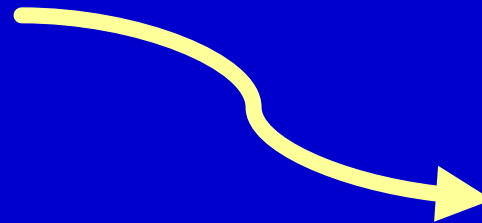
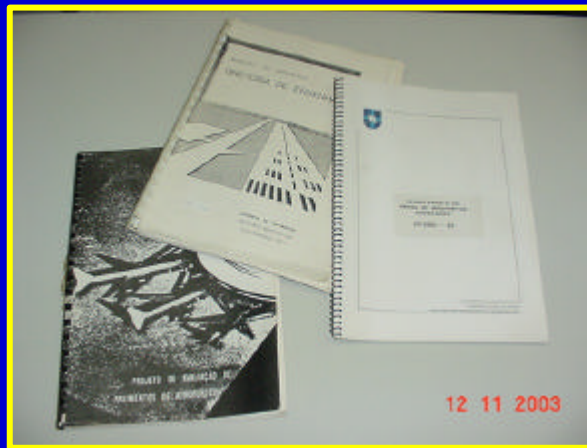
**Data Base / Technical Reports / Individual Runway Condition Sheet
53 airports - aprox. 4 airports/year for each in-house personnel
team led by 1 engineer**

- **Summary Individual Runway Condition Sheets showed to be extremely useful for top administration decisions on where to allocate M&R resources (3 projects contemplated)**



Taking PM to the Information Age

- **Advances in PC enabled administrative personnel to deal directly with the computer technology;**



- **Pavement specialists and high technology institutions worked as primary developers of PMS auxiliary software**

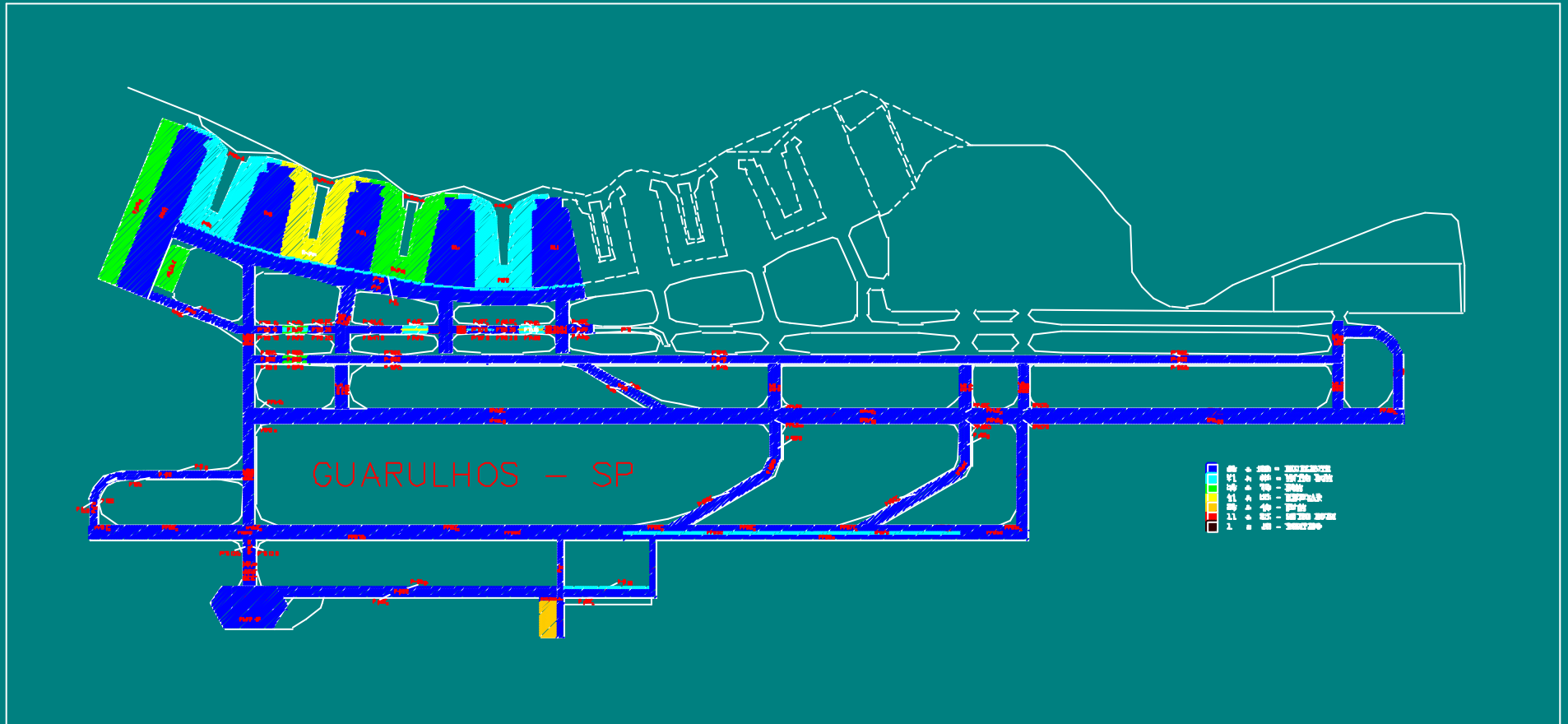


Taking PM to the Information Age

- **91/93** ☺ **PMS conception for the agency and acquisition of a ready-made PMS auxiliary software (project and network level analyses)**
- **93/95** ☺ **Data survey and data input for 17 of the 67 airports of the agency;**
PMS auxiliary software implemented at the agency;
- **96/97** ☺ **Software adjustments;**
Workshop at the agency to help simulate different scenarios and to begin exploratory use of software



Taking PM to the Information Age



São Paulo International Airport - Guarulhos - SP

PCI - Results 1999



Taking PM to the Information Age

- Few people in the agency was assigned to the implementation process;
- Concurrent demand of agency PM personnel for more urgent tasks;
- Agency personnel still not familiar with computer use at that time;
- Data set involved significant level of detail and manipulation before becoming input;
- High expectations from overall agency personnel



Taking PM to the Information Age

- Need for alternative evolutionary steps in PM system philosophy and software conception;
- Need to consider reality of local agency capabilities and resources;
- Physical characteristics of the paved network



- Definition of data types and survey procedures (inventory monitorization and updating);
- Segmentation of analysis levels;
- Establishment of a staged implementation plan the agency can afford



Restructuring PM to to match agency needs and resources capability

- **Alternative accessory package developed in 1999/2000 focusing network level top management decisions only;**
- **Package allowed for simulation of different condition and resource scenarios, providing aggregated information necessary for M&R recommendations and macro resource allocation;**
- **A larger PM group was created within agency involving multidisciplinary people;**
- **Group was trained on understanding the philosophy, scope, limitations, stage objectives and results to expect from the accessory package;**
- **a firm was contracted for data gathering and input (2002)**

Análise CNRJ

Período 2001 a 2005

Data 09/06/00

- Tipo
- Sem Restrição
 - Restrição de Condição
 - Restrição Orçamentária

Incluir Restrições

Excluir Confirmar

Consultar Cancelar

Voltar

Centros de Negócios

CNBE		CNRJ
CNNE	>	
CNRS	>>	
CNSP	<	
CNTT	<<	

Volume de Tráfego

- Leve
- Médio
- Pesado

Área Típica

- Pátio
- Táxi
- Pista

Aeroportos

SBBH		SBRJ
SBCF	>	
SBCP	>>	
SBME	<	
SBMK	<<	
SBVT		
SNCH		

Seções

SBGL-PA-5A		
SBGL-PA-5B	>	
SBGL-PA-5C	>>	
SBGL-PA-5D	<	
SBGL-PA-5E	<<	
SBGL-PA-5F		
SBGL-PA-5FC		
SBGL-PA-5FD		
SBGL-PA-5FE		
SBGL-PA-7A		
SBGL-PA-7B		
SBGL-PA-7C		
SBGL-PA-7D		
SBGL-PA-7E		
SBGL-PA-7F		
SBGL-PA-7G		
SBGL-PA-7H		
SBGL-PA-7I		
SBGL-PA-7J		
SBGL-PA-7K		
SBGL-PA-7L		

Selecionar Seções

Confirmar Seções

Verificar Seleção

Análise

Período a

Tipo

Sem Restrição

Restrição de Condição

Incluir

Restrições

Excluir

Confirmar

Restrição de Condição

Valores Mínimos de PCI Desejáveis

ANO

Área Típica

Tráfego	Pista	Táxi	Pátio
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Médio	<input type="text" value="70"/>	<input type="text" value="56"/>	<input type="text" value="56"/>
Leve	<input type="text" value="56"/>	<input type="text" value="56"/>	<input type="text" value="40"/>

Ano Anterior

Próximo Ano

Retorna

Análise

Período a

Tipo

Sem Restrição

Restrição de Condição

Incluir

Restrições

Excluir

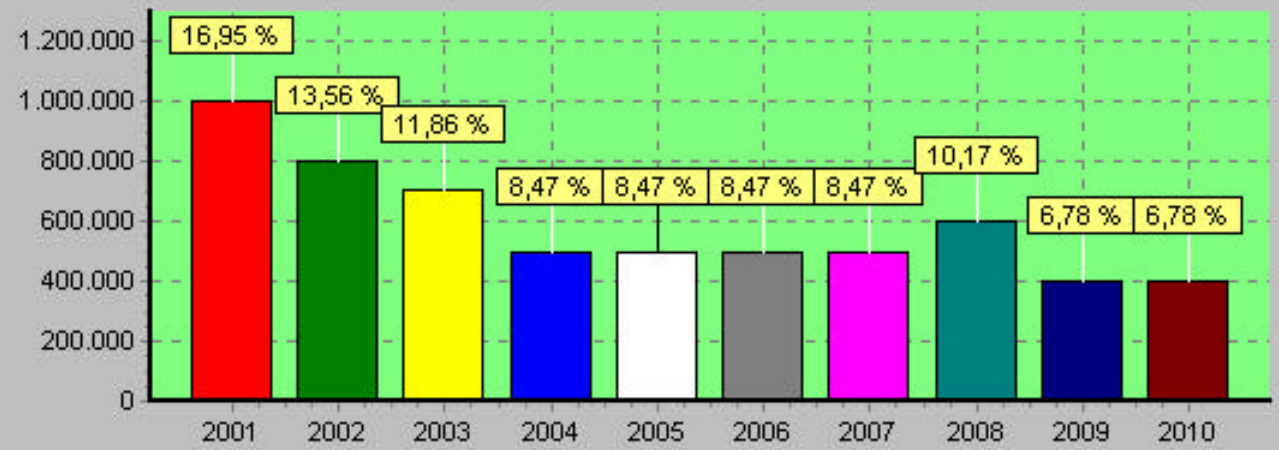
Confirmar

Restrição Orçamentária [Minimizar] [Maximizar] [Fechar]

Análise	Ano	Orçamento
▶ URB-RJ-O	2001	1.000.000,00
URB-RJ-O	2002	800.000,00
URB-RJ-O	2003	700.000,00
URB-RJ-O	2004	500.000,00
URB-RJ-O	2005	500.000,00



Orçamento distribuído no período de Análise



- 2001 1.000.000
- 2002 800.000
- 2003 700.000
- 2004 500.000
- 2005 500.000
- 2006 500.000
- 2007 500.000
- 2008 600.000
- 2009 400.000
- 2010 400.000

Fechar



Sistema de Gerência de Pavimentos

Página : 1

Análise : URB-RJO

Período 2001 a 2010

Data : 09/06/00 23:15:16

Tipo : Restrição Orçamentária

Ano : 2001

Prior.	Aeroporto	Seção	PCI	Traf.	Área(m2)	Sup.	Serviço	PCIfinal	Valor
1	SBBH	PT 1.5	0	L	144	CAF	Remoção e Reconstrução do Pavimento	100	7.200,00
2	SBBH	PT I	0	L	450	CAF	Remoção e Reconstrução do Pavimento	100	22.500,00
3	SBBH	PT J	0	L	800	CAF	Remoção e Reconstrução do Pavimento	100	40.000,00
4	SBBH	PT M	14	L	850	CAF	Recapeamento Médio	100	17.000,00
5	SBBH	PT L	15	L	600	CAF	Recapeamento Médio	100	12.000,00
6	SBBH	PT N	22	L	500	CAF	Recapeamento Médio	100	10.000,00
7	SBRJ	PA 4	49	M	4.328	CCP	Substituição de Placas	99	64.920,00
8	SBRJ	PA 16	52	M	12.462	CCP	Substituição de Placas	100	186.930,00
9	SBRJ	PA 15	54	M	20.839	CCP	Substituição de Placas	100	312.585,00
10	SBVT	PT B2E	24	L	492	CAF	Recapeamento Médio	100	9.840,00
11	SBRJ	PA 3	60	M	9.992	CCP	Remendos	85	79.936,00
12	SBBH	PA 5.1	61	M	156	CAF	Rejuvenescimento	71	1.092,00
13	SBBH	PA 5.3	61	M	156	CAF	Rejuvenescimento	71	1.092,00
14	SBBH	PA 5.2	61	M	156	CAF	Rejuvenescimento	71	1.092,00
15	SBBH	PA 5.4	61	M	156	CAF	Rejuvenescimento	71	1.092,00
16	SBBH	PA 5.5	61	M	156	CAF	Rejuvenescimento	71	1.092,00
17	SBRJ	PT D2	34	M	1.417	CAF	Recapeamento Médio	100	28.340,00
18	SBBH	PA 1.1	56	L	144	CAF	Reparos	66	144,00
19	SBBH	PA 1.2	56	L	156	CAF	Reparos	66	156,00



Restructuring PM to to match agency needs and resources capability

- **A simpler software was designed to contemplate airports in the amazon region conveying essential airfield data**
- **It was developed as an undergraduate paper at ITA (2003);**
- **It provides immediate information for managerial purposes**



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Conclusions

- The characteristics of a multi-airport agency in Brazil related to PMS implementation was presented.
- A flashback review showed the initial benefits of expediting airport pavement M&R services from PM activities (data gathering and registering).
- Need to bridge the IT gap (beginning 1990's).



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Conclusions

- Initial IT benefits slightly overshadowed by normal drawbacks, now being overcome.
- Techniques for user-friendly software development are available and of public domain.
- Alternative PMS approaches developed that can be applied both to state and private agencies, as well as to military airfields.

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