Making the Connection Between Low Budgets and Pavement Maintenance Needs for Small Regional Airports In Southern Africa

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The Wright Stuff

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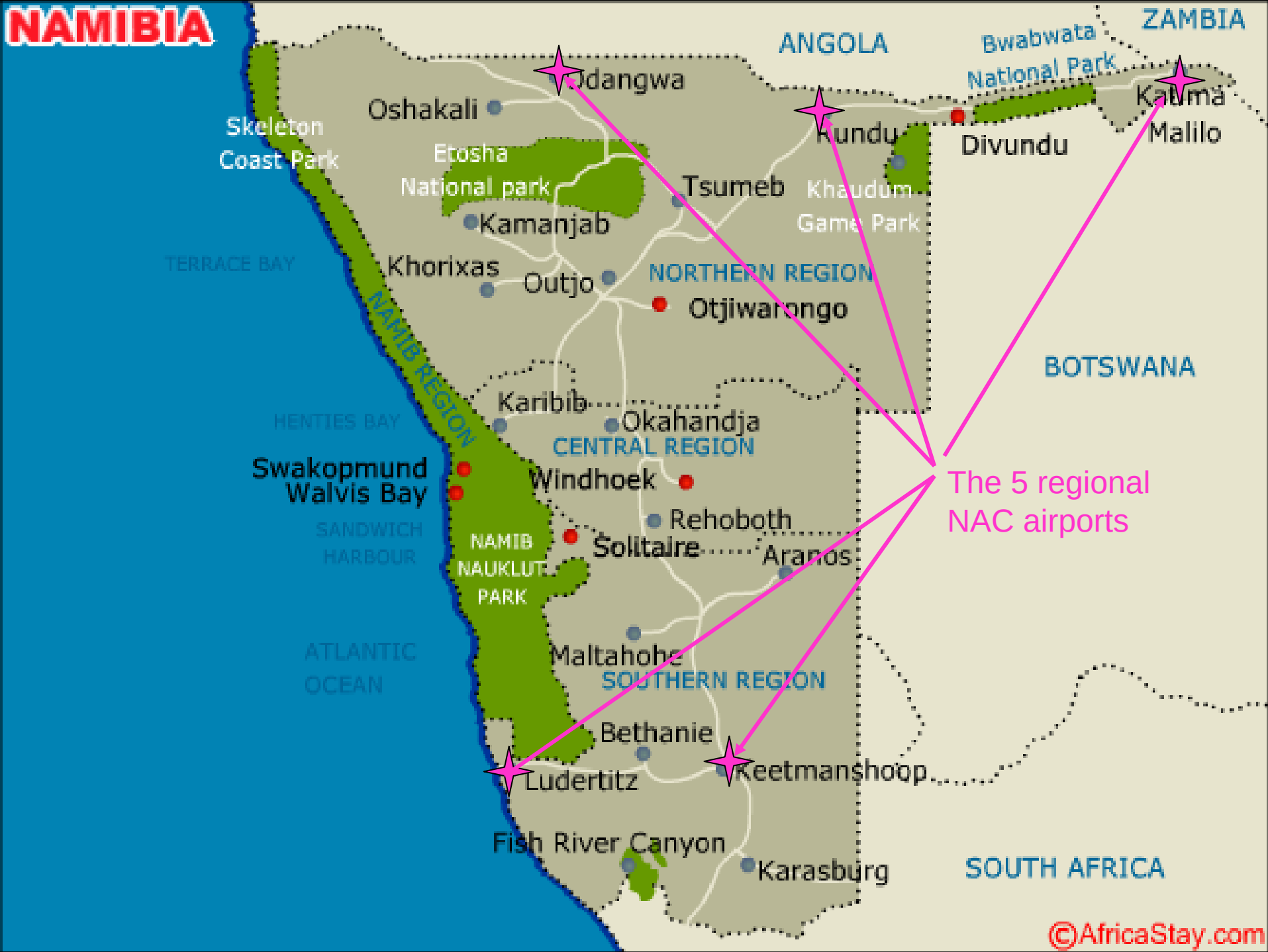
Recent work on major airports by KUBU as specialists

Airports	Involvement
Bloemfontein	Runway rehab and mothballing 2nd runway
Waterkloof	Reconstruct/Rehab dolomitic problems
Cape Town	New taxiways and apron
ORTIA	RET, holding area, rehab on main runway
Jebel Ali	New runway design and construction
Macau	ICAO compliance, 2nd runway planning, rehab existing runway, new apron
Broome	Terminal upgrade and re-modelling & MP
Walvisbay	ICAO compliance and design alternatives for salt problems
Hosea Kutako	Runway asphalt durability investigation and rehabilitation
Perth	Runway rehabilitation
Sydney	Asphalt overlay/ Rapid construction trials

Regional airports in the western part of southern Africa


NAMIBIA
ANGOLA
ZAMBIA
BOTSWANA
SOUTH AFRICA
Bwabwata
National Park
Katima
Malilo
Divundu
Kundu
Khaudum
Game Park
Odangwa
Oshakali
Skeleton
Coast Park
Etosha
National park
Tsumeb
Kamanjab
TERRACE BAY
Khorixas
Outjo
NORTHERN REGION
Otjiwarongo
NAMIB REGION
Karibib
Okahandja
CENTRAL REGION
HENTIES BAY
Swakopmund
Walvis Bay
Windhoek
Rehoboth
SANDWICH
HARBOUR
NAMIB
NAUKLUFT
PARK
Solitaire
Aranos
Maltahohe
SOUTHERN REGION
ATLANTIC
OCEAN
Bethanie
Keetmanshoop
Ludertitz
Fish River Canyon
Karasburg
The 5 regional
NAC airports
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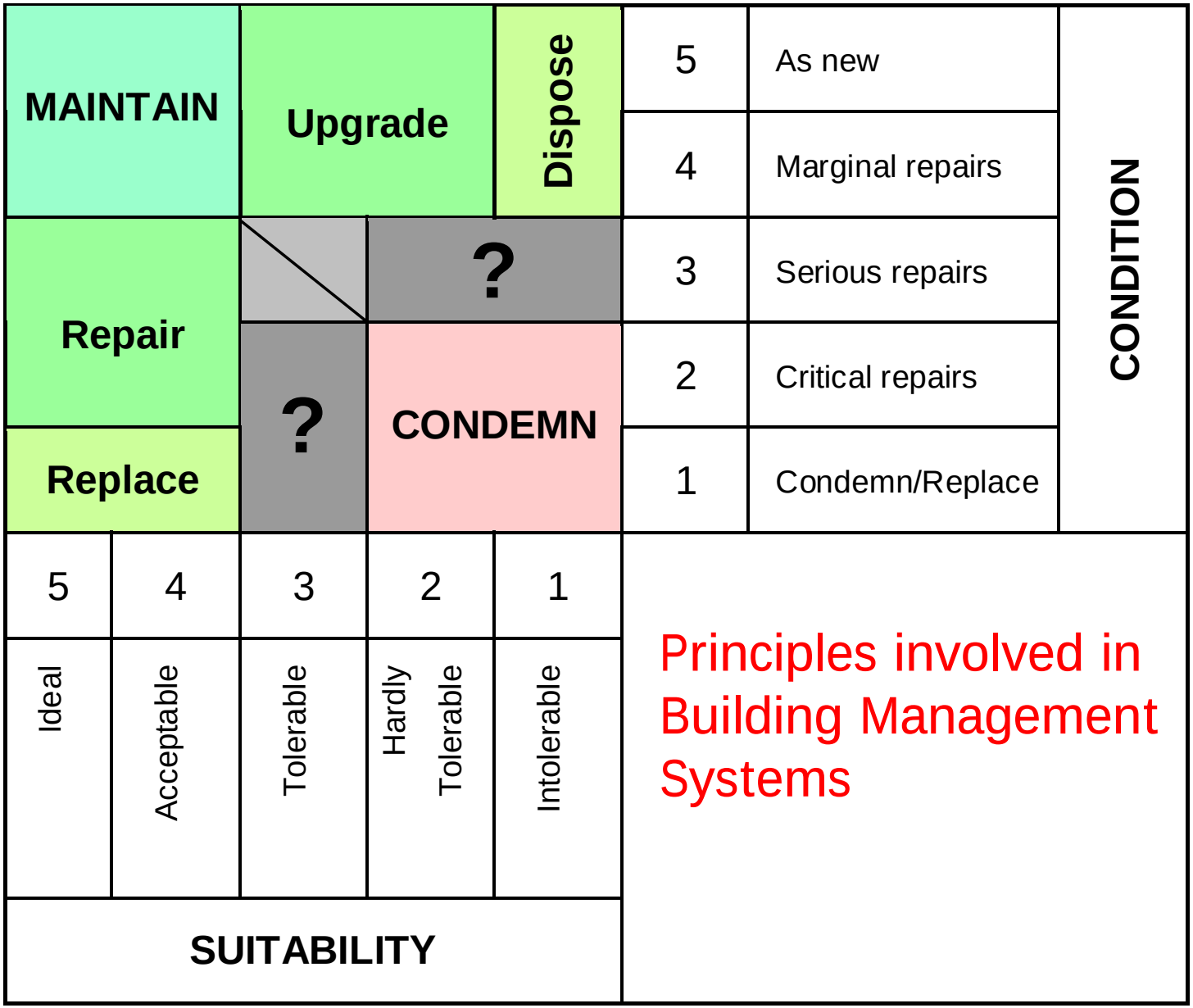
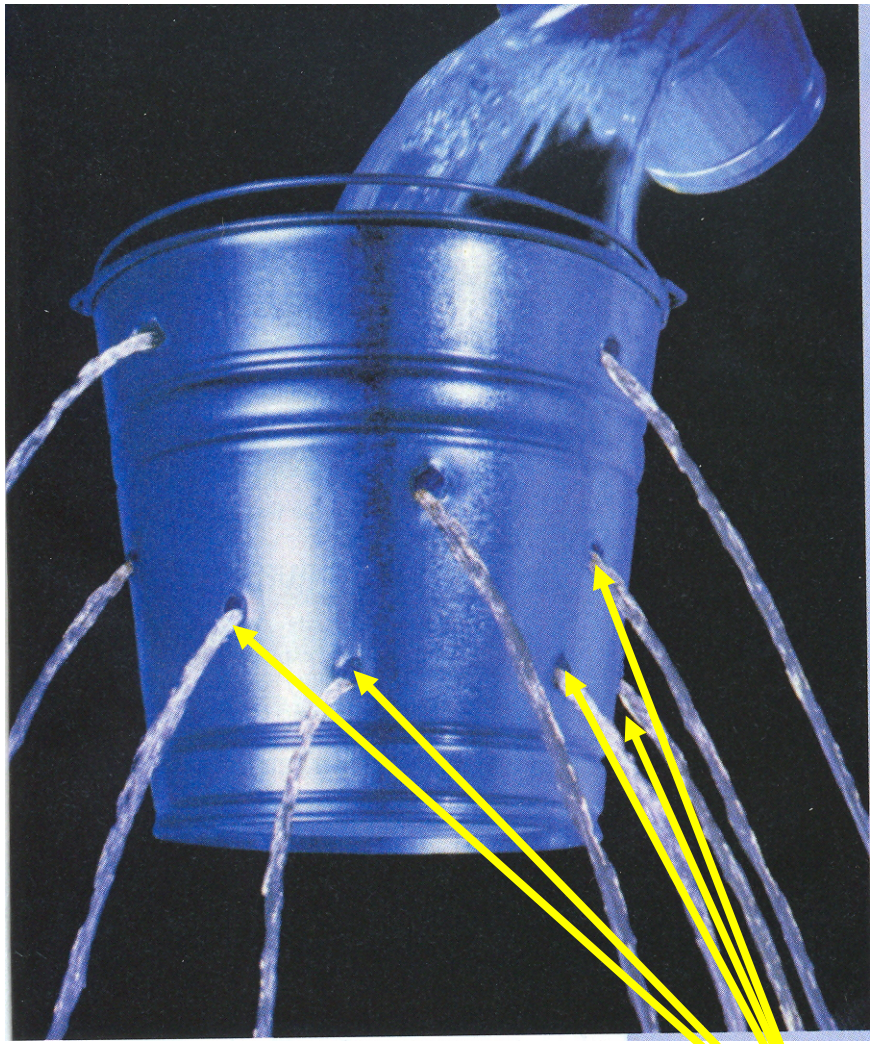
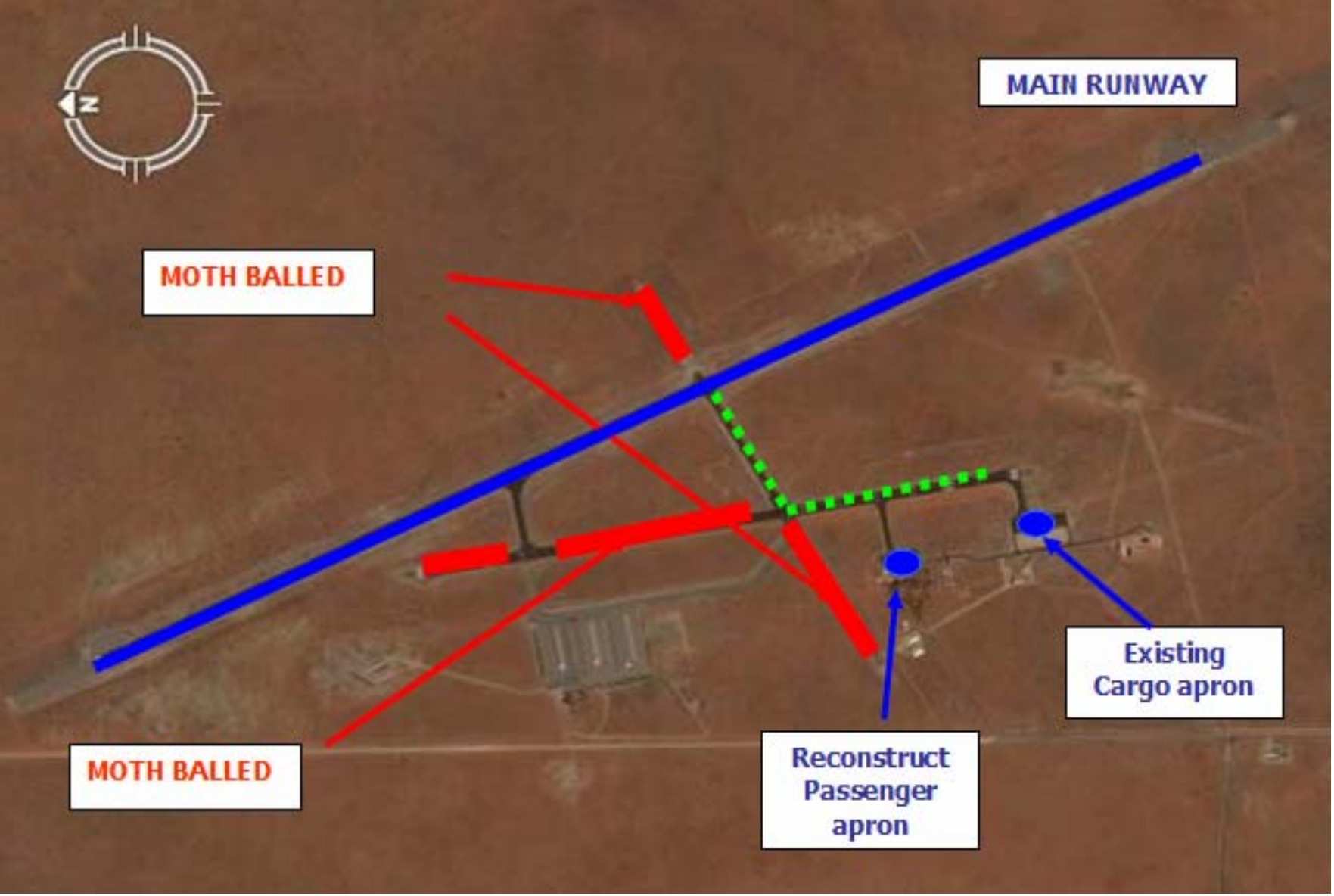
Suitability vs Condition Matrix (Abbott and Mc Duling, 2000)





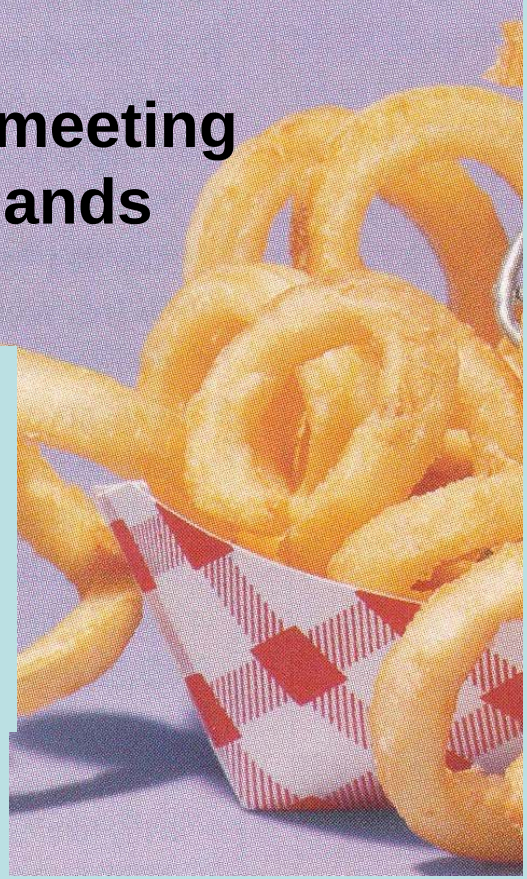
Most of these airports suffer from maintenance backlogs. Their functionality must be restored via “moth balling” of superfluous facilities and minimum prioritised emergency repairs and maintenance.

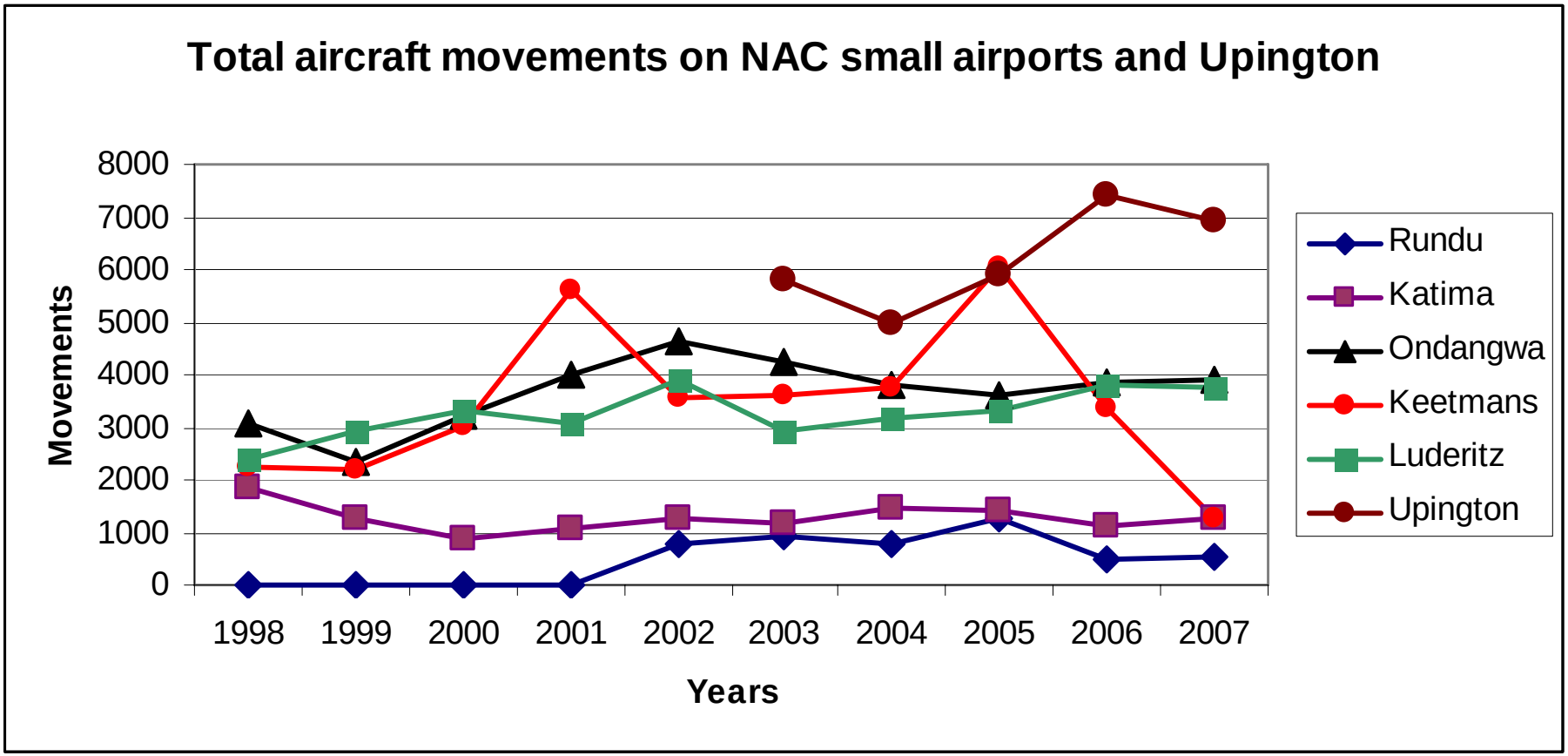
Plug the bottom holes!



Maintenance and mothballing plan for Upington Airport

Reduced capacity meeting user demands





- These airports has significant regional economic and strategic value
- These “loss leader” airports are clearly in need of regular routine and periodic maintenance.
- No chance that any of these airports will generate sufficient funds to be commercially viable or to self fund required maintenance needs.

Position, elevation and ICAO classification

Airport	ICAO Classification	Elevation (m above sea)	Position Coordinates	Main runway	Secondary runway
				Designation	Designation
Lüderitz	3 Non instrument landing. New lighting currently installed.	139	26º 41' 07" S 15º 14' 44" E	04/22	12/30
Keetmanshoop	4. Non-instrument landing with only daylight approach	1069	26º 32' 20" S 18º 06' 42" E	04/22	18/36
Rundu	3c. Non instrument landing with only daylight approach	1105	17º 57' 22" S 19º 43' 14" E	08/26	Closed
Ondangwa	3c. Non instrument landing with only daylight approach	1097	17º 52' 38" S 15º 57' 00" E	08/26	Closed.
Katima Mulilo	3. Non instrument landing with only daylight approach	958.2	17º 38' 03" S 24º 10' 36" E	09/27	None

The “Island style” airport needed

Main runway,

short taxiway link

2nd runway optional

LA 13: Small bush and shrubs on runway edge causing minor sand deposits due to “ wind shadow”. These shrubs are to be removed.

LA 10: Sand deposit in “wind shade” of hanger on back taxiway.

LA 5: Localised construction joint at main runway 04 end in need of repair via crack filling.

LA 7: Joint opening up due to movement of slab on passenger apron.

Airport	Condition rating
Lüderitz	Sound

Moth Balling Options
None possible or needed. Optimum for 3C class

Proposed maintenance actions
Minor patch and crack repairs. Plus routine maintenance needed

Katima Mulilo

KMA : Potholes in front of passenger terminal

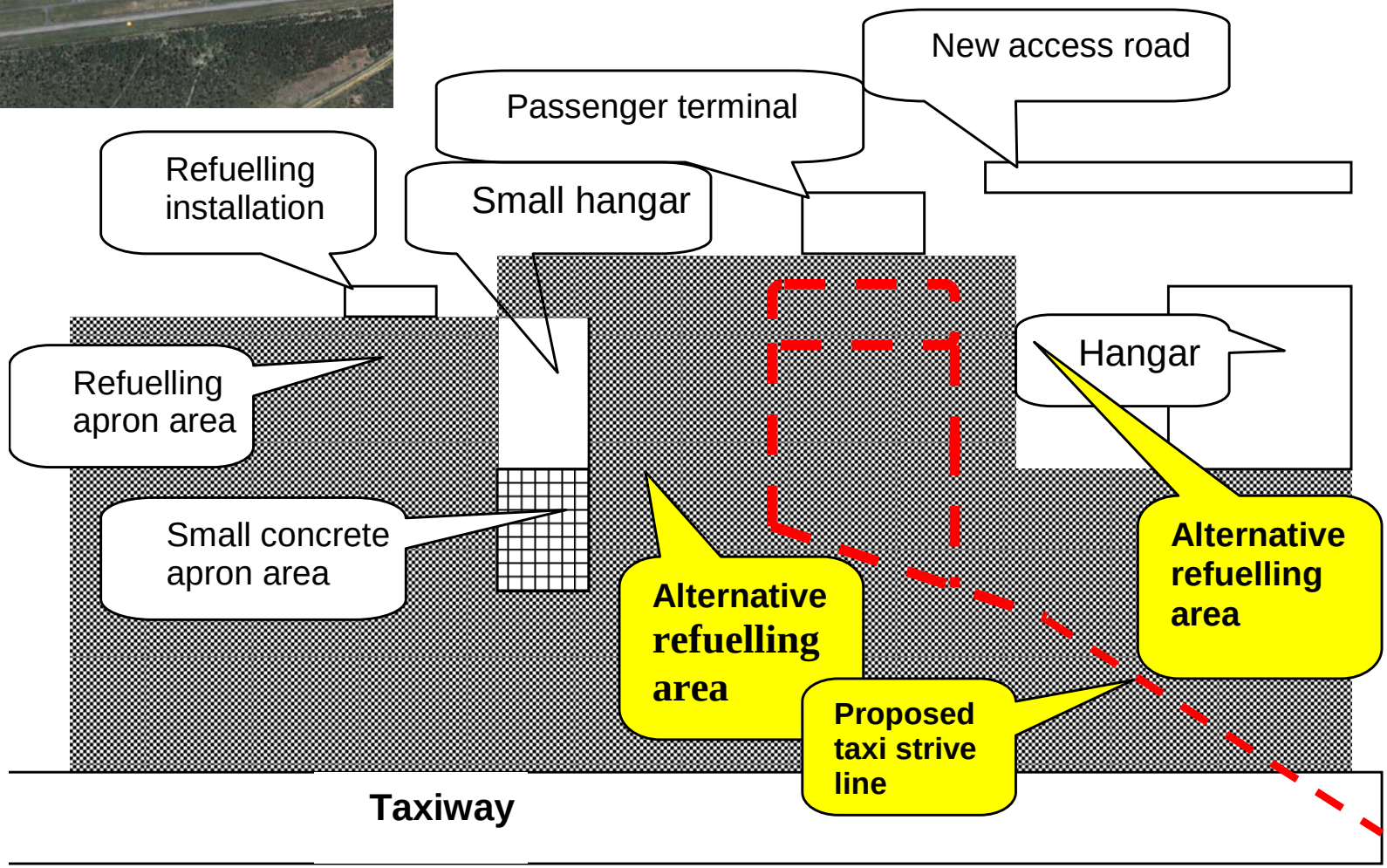
KMA 3: Cracked and potholed area at refuelling apron next to small concrete apron area in foreground.

KMA 8: Shoulder at the 27 end showing ant activity, vegetation intrusion, longitudinal cracking on the shoulder and extreme map cracking on the paved area. Faint and fading line marking are also shown.

KMA 11: extent of ant activity on paved shoulder area.

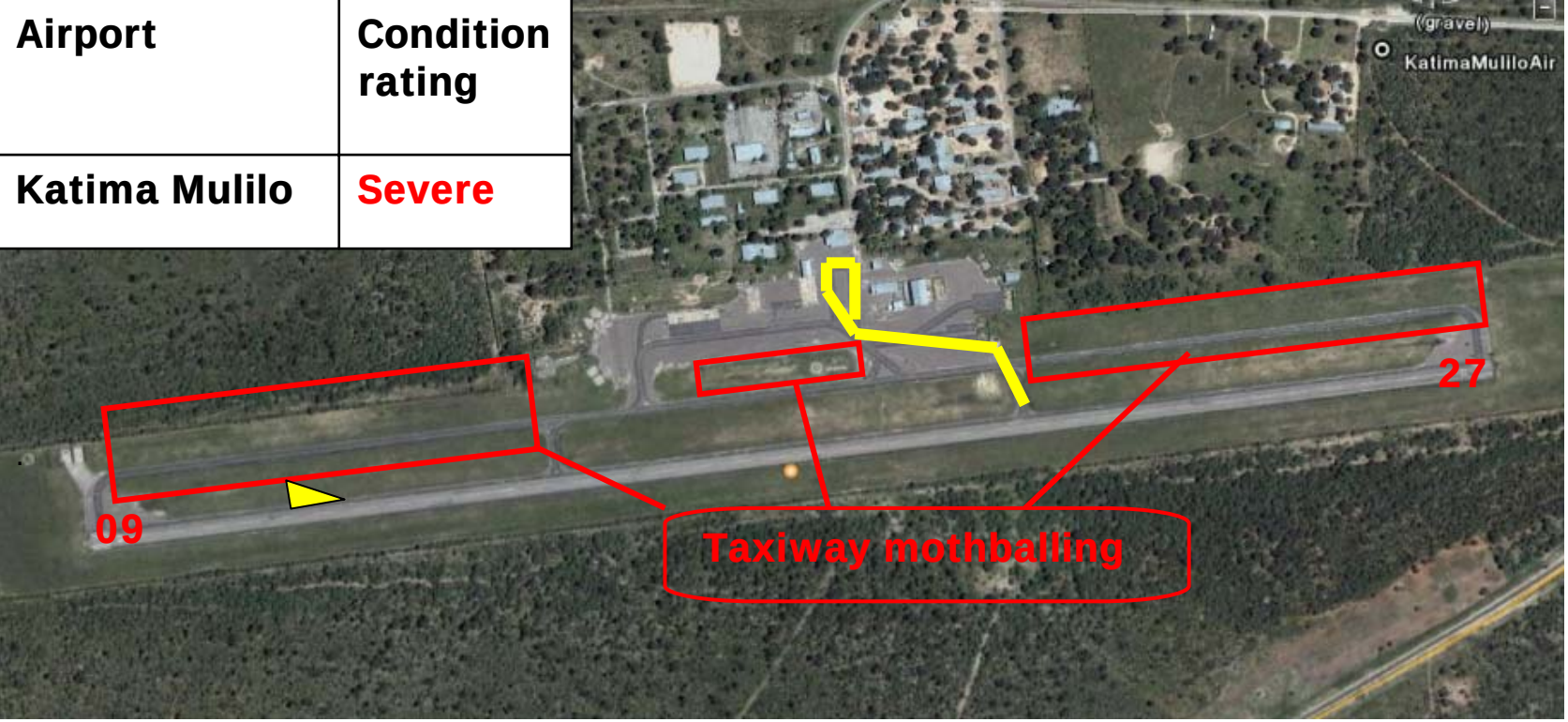
KMA 14: Large anthill on 27 end with ant activity on left.

KMA 15: Current taxiway link with previous rejuvenation showing extensive potholing, cracking and aging. Suggested shorter taxi strive line (red dotted left) to cut out areas in need of rehabilitation as it will traverse over relatively sound areas.



Apron and taxiway area sketch of Katima Mulilo airport

Airport	Condition rating
Katima Mulilo	Severe



Moth Balling Options

- Close taxiways, reduce apron area.
- Close portion of 09 runway with a turning circle at approximately 2000m.
- Displace threshold accordingly.
- Change position of refuelling apron or repair.

Proposed maintenance actions

- Crack seal runway and limited resultant shortened taxiway lane and apron followed with rejuvenator spray.
- Back track on runway.
- Follow up with new bitumen rubber seal within 5 years.

Rundu Airport

RA 1: Apron area in front of terminal building and hangar. Evidence of ponding seen in the foreground. Area under tree to the right was flooded during the subsequent rain storm.

RA 3: Intrusion and break up of shoulder asphalt area due to vegetation and high grass on shoulder blocking side drainage.

RA 12: Potholes and loose gravel extent plus extreme cracking on refuelling apron area directly after rain storm.

RA 4: Badly distressed area in front of refuelling area. Area has loose stones and potholes everywhere and is a FOD hazard. Mobile fuel pump in right hand side.

RA 6: Set-out of closure marking on secondary runway end. Discarded paved parking area is seen on the left hand side.

Figure RA 7: Sheet flow over main runway at RET and secondary runway intersection.

RA 10: RET on 26 end showing some ponding and longitudinal cracks in the foreground on the main runway

RA 8: Extent of step at 26 end due to erosion as well as vegetation

RA 9: Height of uncut grass on the shoulder edge.

Intersection with 2nd runway

Taxiway

RET used to taxi

Refuelling apron

Proposed refuelling apron

Taxi strive line

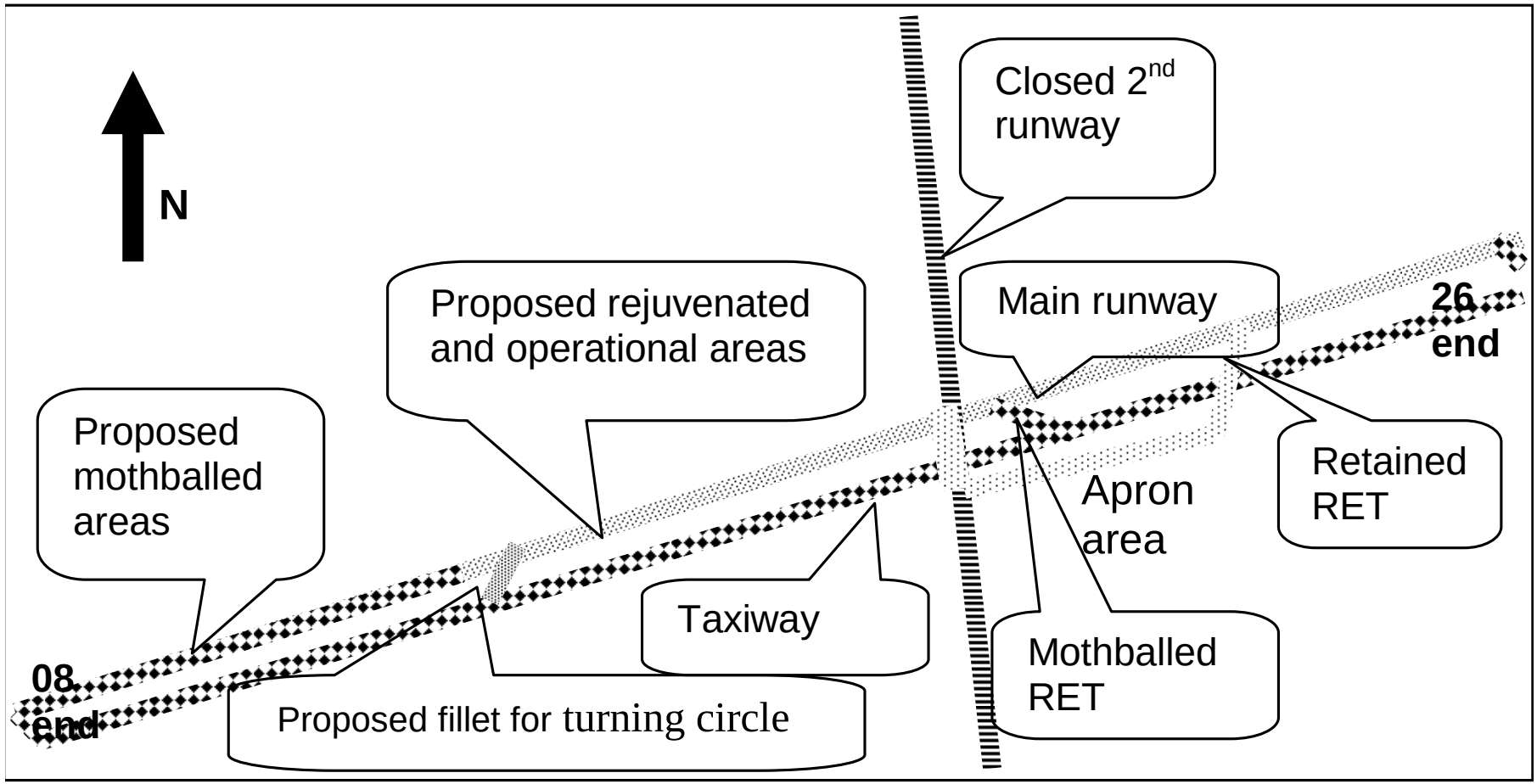
Current refuelling Instal-lation

Freight Hanger

Proposed alternative fuel installation

Passenger Terminal

Layout sketch of Rundu airport apron and taxiway facilities



Rundu airport layout sketch plan

Airport	Condition rating
Rundu	Warning to severe

Moth Balling Options

- **Close 2nd runway.**
- **Mothball most of taxiway.**
- **Use RET on 08 end as runway displaced end for runway length result of 2220m.**
- **Do fillet infill to provide turning circle.**
- **Change position of refuelling apron or repair.**

Proposed maintenance actions

- Crack seal runway and limited resultant shortened taxiway lane and apron followed with rejuvenator spray.
- Back track on runway.
- Follow up with new bitumen rubber seal on runway within 5 years.

Ondangwa Airport

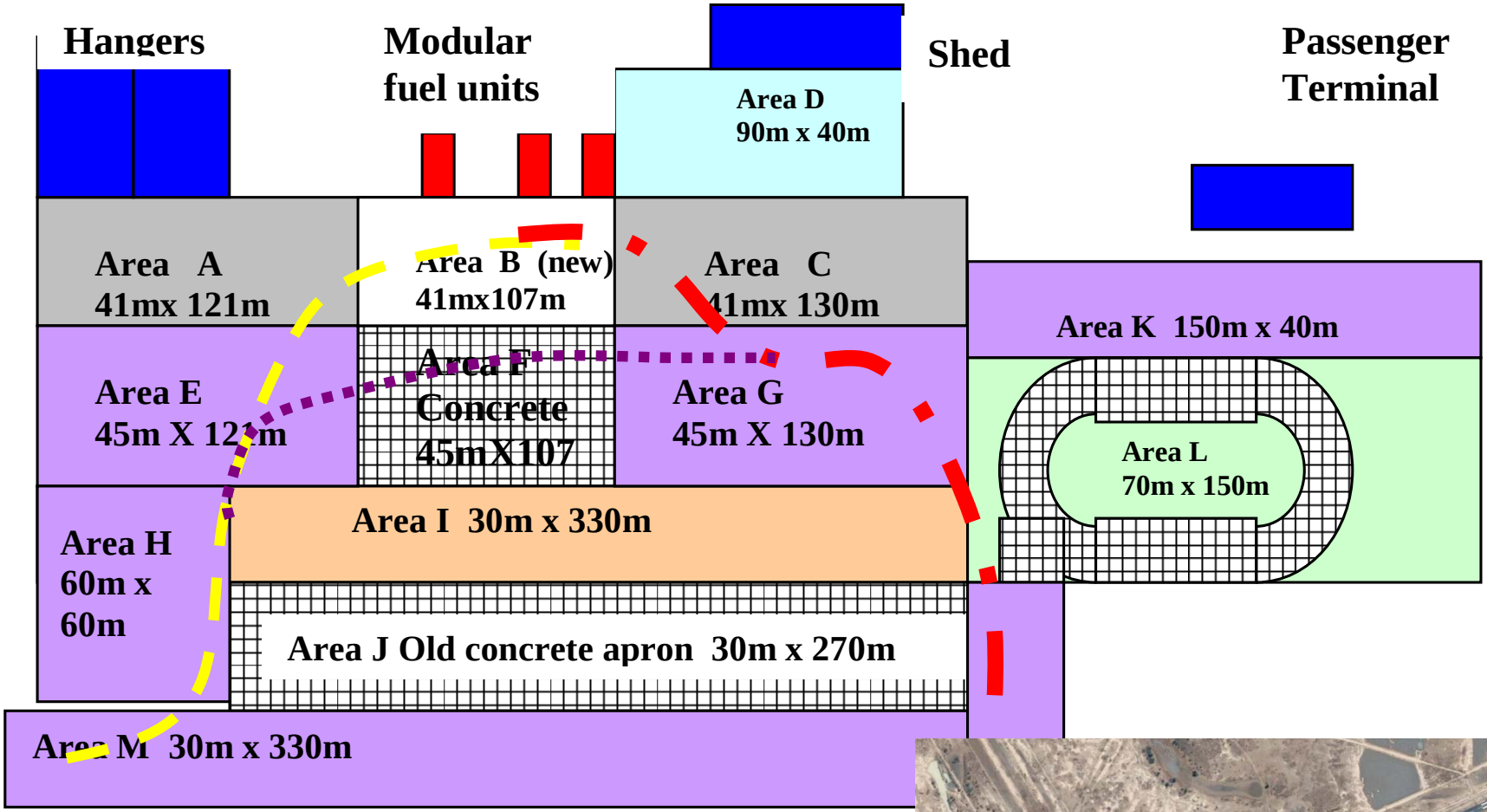
OA 2: Extent of ponding in front of modular refuelling units on area B. Extent of aging , ravelling and cracking in the foreground.

OA 3: Aircraft parked in front of modular refuelling units in water pond. Passengers disembarking and walking towards passenger terminal directly ahead. Shallow trench dug in left corner managed to drain the ponding.

OA 12: DCP sounding to be done in bird baths one day after the rain at intersection with secondary runway. In back ground set-out of closure cross on secondary runway in progress. Observe extent of crack sealing.

OA 14: Loose geo-fabric at 2007 crack sealing on shoulder. Extent of previous crack sealing and aged surface can also be seen.

OA 22: Badly potholed and ravelling area A linking newly constructed refuel apron with area in front of large hangers. V type drain functioning in foreground.



Ondangwa apron area layout sketch

Closed and discarded 2nd runway

Maintained areas

26 End

Mothballed areas

Discarded parking area

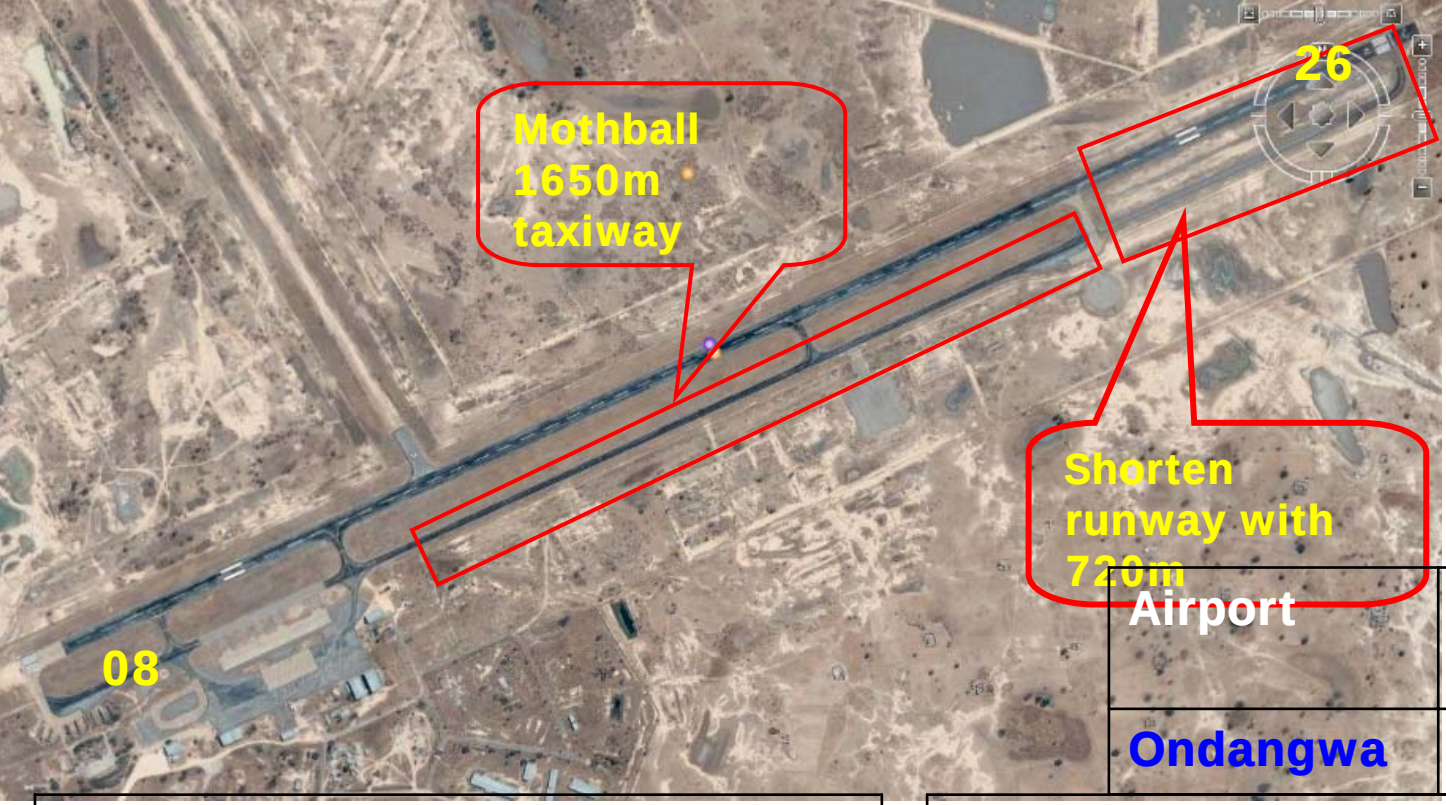
Area where large bird baths occur

08 End

Apron areas

N

Sketch plan layout of Ondangwa airport



Airport	Condition rating
Ondangwa	Severe

Moth Balling Options

- Close 2nd runway.
- Mothball most of taxiway.
- Use last taxiway link on 26 end as runway displaced threshold position for runway length result of 2270m.
- Change position of modular refuelling apron .

Proposed maintenance actions

- Limited crack seal runway, taxiway lane and apron
- Urgently follow up with new bitumen rubber seal on runway.
- Rejuvenator spray on reduced taxiway lanes and apron areas.

Keetmanshoop

Airport

3: Longitudinal cracking and localised repair on shoulder.

KA 6: Longitudinal cracking with vegetation in old construction joint on shoulder of main runway.

KA 11: Localised pothole on secondary taxiway.

KA 12: Evidence of shoving of concrete slabs on passenger apron. Vegetation growth in cracks.

Airport	Condition rating
Keetmanshoop	Sound to warning

Moth Balling Options
Reduce runway width from 45m to 30m with paved shoulders. Mothball large holding areas at thresholds on taxiway.

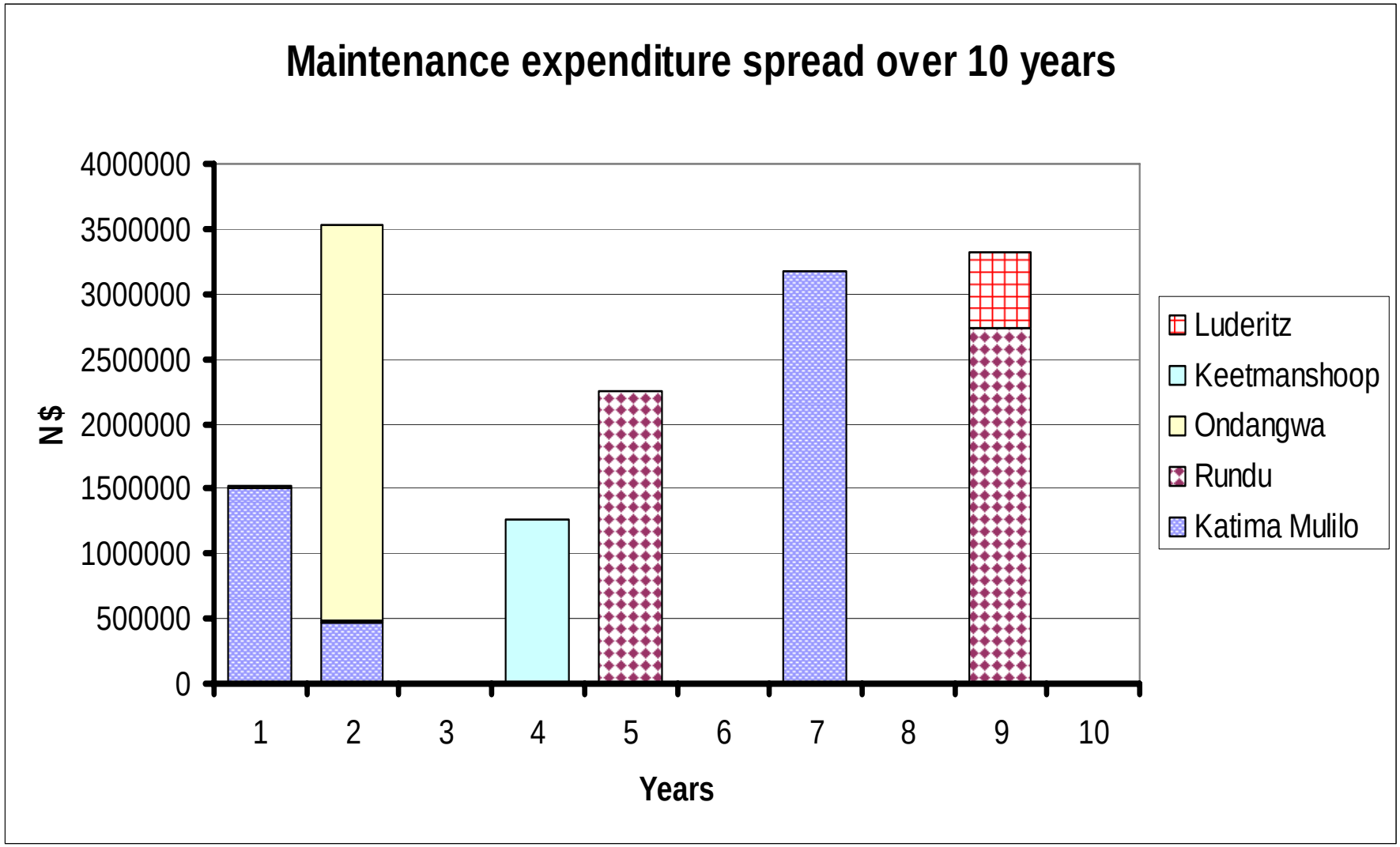
Proposed maintenance actions
Crack filling of longitudinal cracks, minor patching and rejuvenation in medium term.

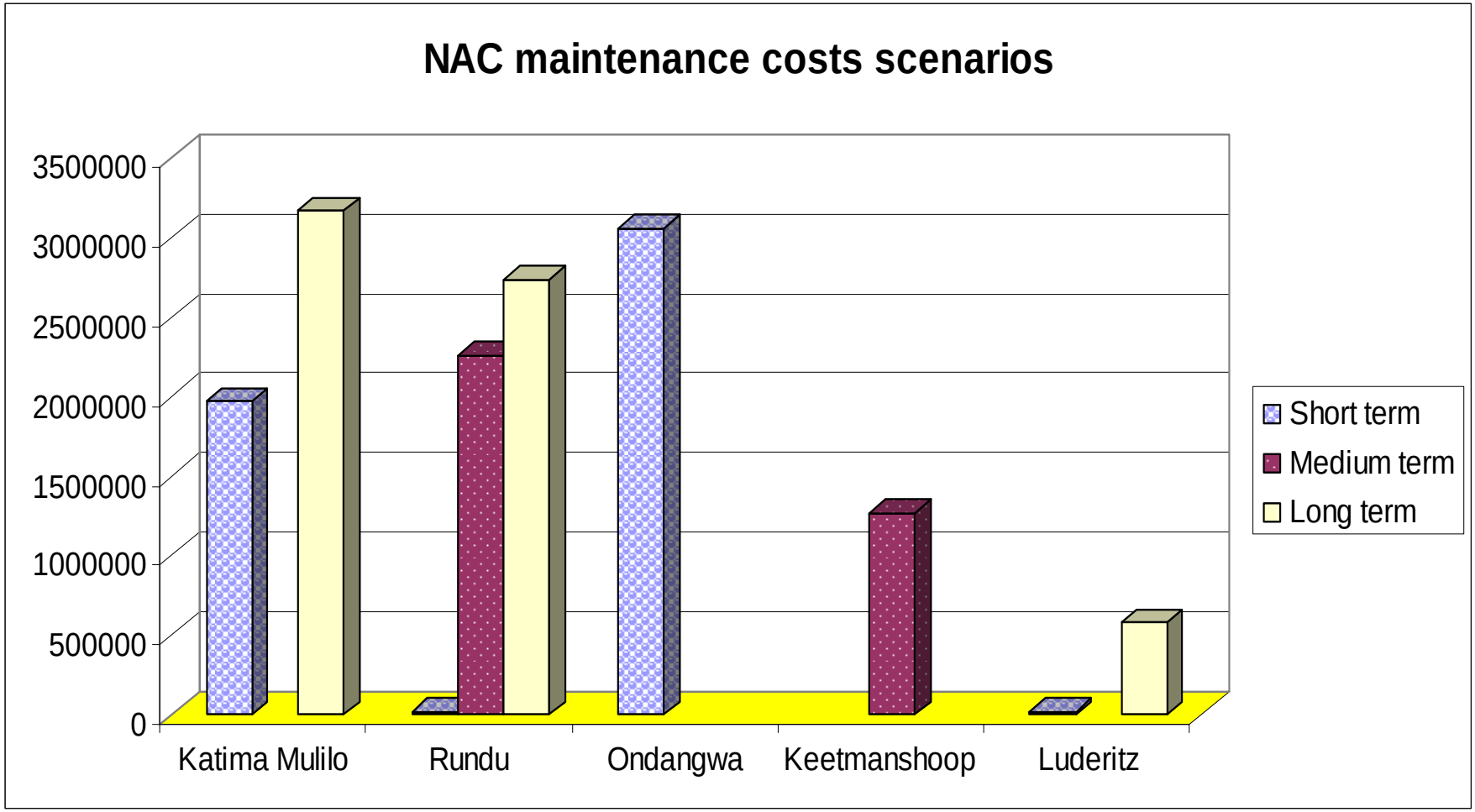
Summary condition rating

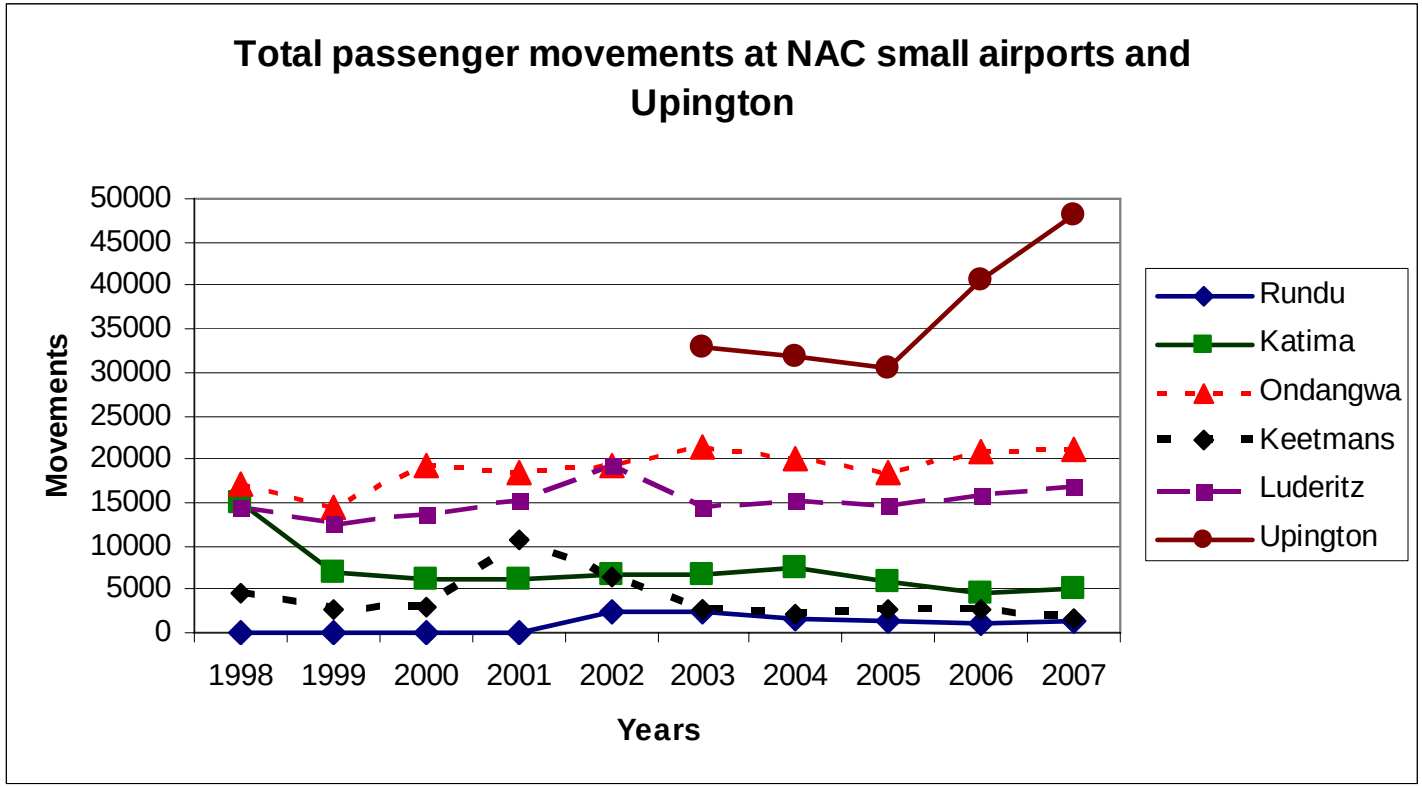
Airport	Condition rating
Lüderitz	Sound
Keetmanshoop	Sound to warning
Katima Mulilo	Severe
Rundu	Warning to severe
Ondangwa	Severe

Summary budget requirement for five airports

Term	Amount (N$)
Short (1 to 2 years)	5 054 408
Medium (2 to 5 years)	3 526 950
Long (5 to 10 years)	10 346 100
Total over ten years	18 927 458


Maintenance expenditure spread over 10 years
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
N$
1
2
3
4
5
6
7
8
9
10
Years
Luderitz
Keetmanshoop
Ondangwa
Rundu
Katima Mulilo


NAC maintenance costs scenarios
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
Katima Mulilo
Rundu
Ondangwa
Keetmanshoop
Luderitz
Short term
Medium term
Long term



- Regional economic and strategic value prevent discarding or closure.

- These airports are “loss leaders” Not commercially viable

- These “loss leader” airports will be in need of subsidy from the other larger NAC profitable airports.

- Grant from Government?