

Mauritius Free Route Airspace (FRA)

Risk Assessment

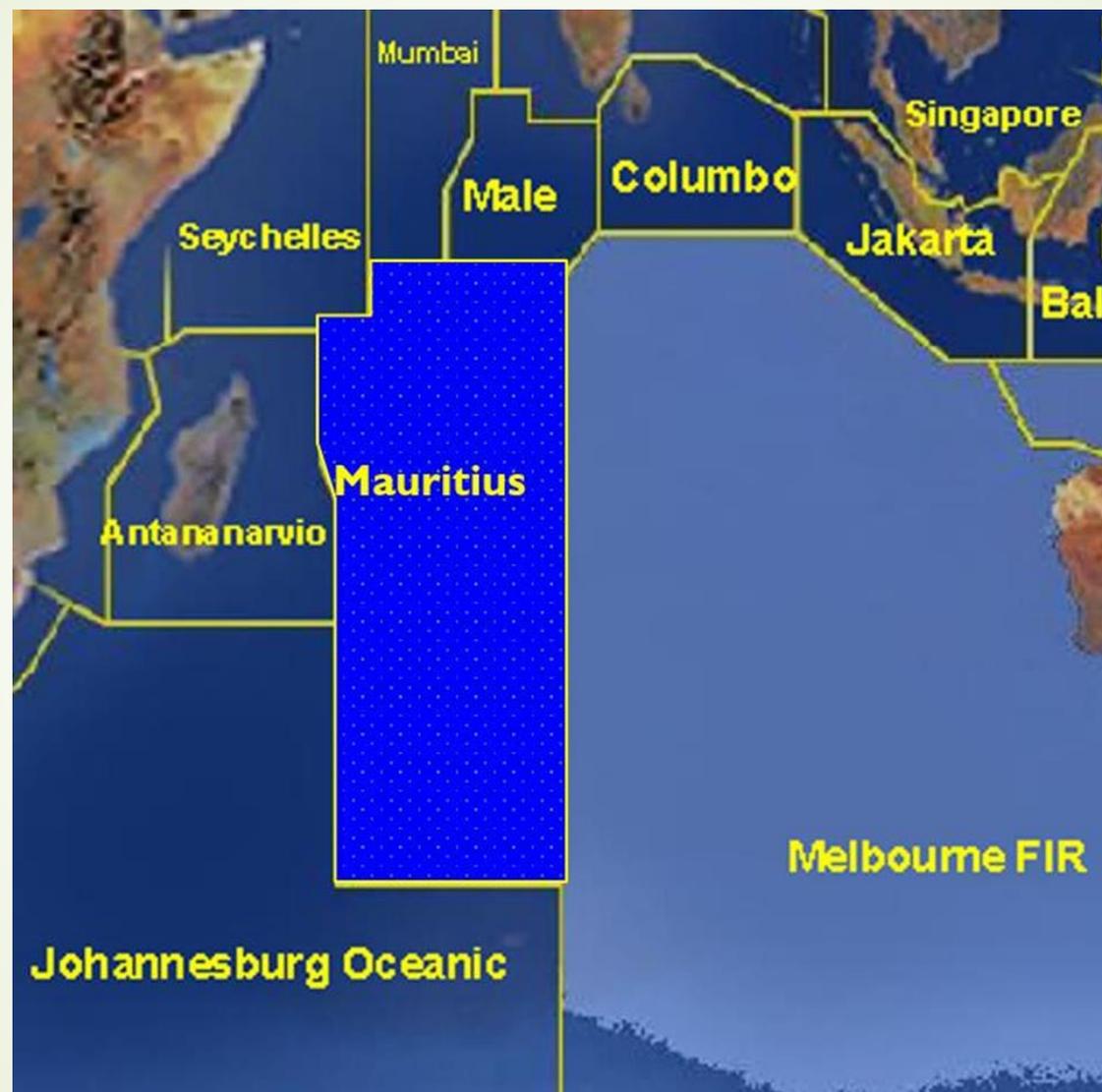
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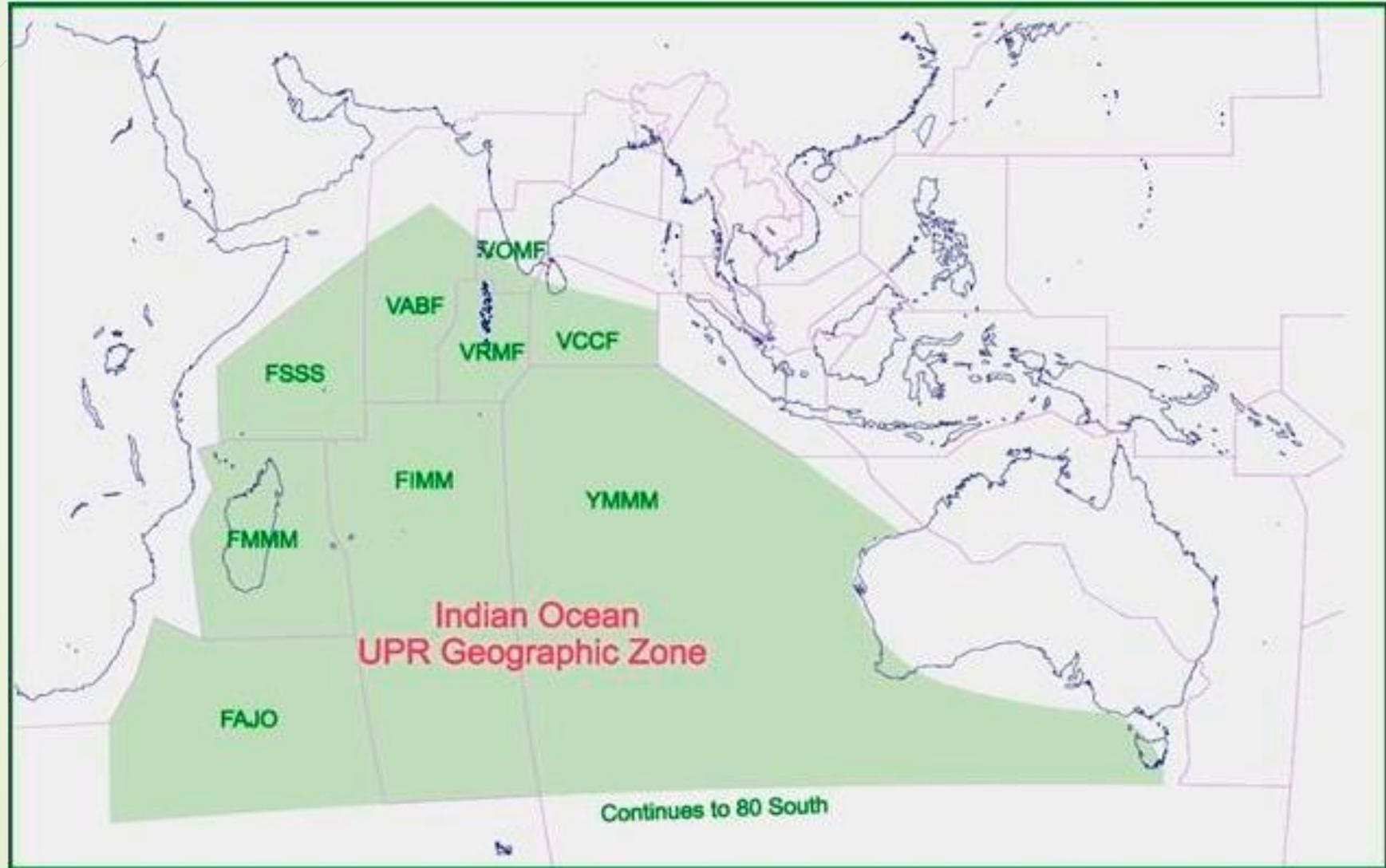
Mauritius FRA



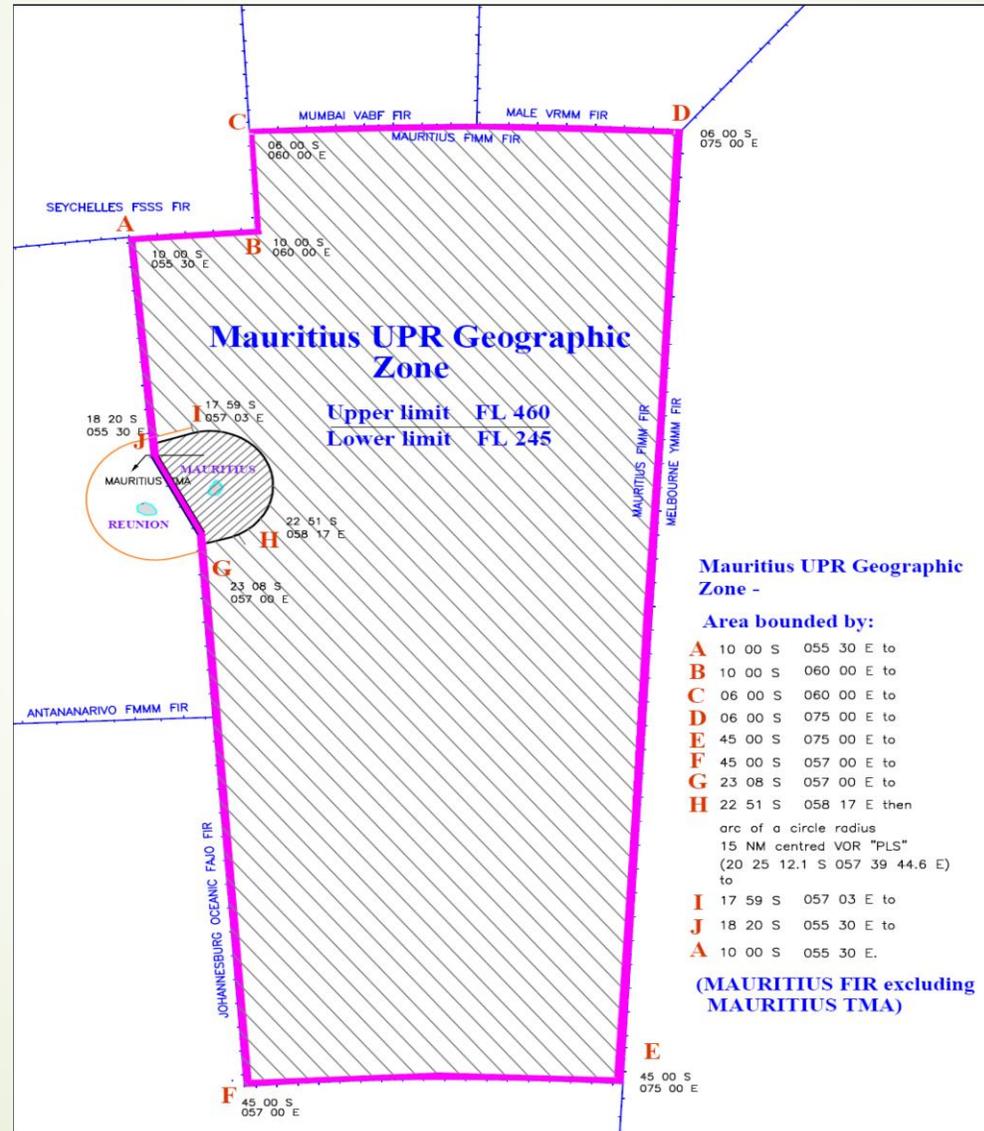
Mauritius Free Route Airspace Implementation

- Following APIRG/22 Conclusion 22/37: Free Route Airspace, that in order to foster the concept of free routing East African States including Seychelles, Mauritius, Kenya, Ethiopia, Tanzania and Uganda were selected as a case study for the implementation of FRA in the AFI Region as part of B1-FRTO ASBU module.
- However, since 2011, following the Indian Ocean Strategic Partnership to Reduce Emissions (INSPIRE) meeting in Dubai, Mauritius implemented the User Preferred Routes (UPR) within the FIMM FIR.
- Other countries involved in INSPIRE are South Africa, Madagascar, Seychelles, India, Maldives, Sri Lanka, Australia.
- The Airspace concerned was between FL245 and 460.
- UPR was implemented within the whole of Mauritius Airspace.

Indian Ocean User Preferred Routes



Mauritius UPR Geographic Zone



FRA Implementation

- In 2015 following an internal survey it was forecasted a rate of 10% increase in Air Traffic and that with the actual Airspace structure Mauritius ATC may reach saturation by 2025.
- As all the ATS Routes start or end at PLS VOR and several routes (P627, L774 and N633) in the oceanic region were not laterally separated with the implementation of RNP10.
- Arrivals and Departures were managed with basic RNAV SIDs and STARs.
- In 2018 Mauritius embarked in a project to upgrade its Airspace completely in order to create a safer, more performant and eco-friendly Airspace and to be in line with ICAO ASBU Plan.
 - RNP 4 unidirectional routes within Mauritius Oceanic Airspace
 - RNP 1 SIDs and STARs within Mauritius TMA and
 - CCOs and CDOs.



Feasibility of FRA

- With the Airspace Upgrade in progress, in August 2020, Management set up a committee regrouping ATM Chief Officers, ATC Supervisors and Air Traffic control Officers under the lead of the Divisional head to the implication of implementing FRA within Mauritius FIR.

Feasibility of FRA

After two meetings the committee concluded that :

1. Having implemented UPR within Mauritius FIR Mauritius since 2011 has the necessary competence to implement FRA within its FIR.
2. 99% of overflight aircraft are equipped with ADS- C and CPDLC.
3. ATC use TOPSKY System since 2003 and are well versed to provide procedural Air Traffic control within the Oceanic region using an ASD.
4. Mauritius has a very good HF communication system
5. Mauritius has already implemented RNP10 in its FIR.
6. No incident reported within enroute traffic for the last 5 years.
7. No failure of GNSS or VSAT encountered during the last 5 years
8. Mauritius has encountered only 4 loss of communication within the last 5 years



Feasibility of FRA

The committee taking into consideration our experience gained through the UPR came up with the following 6 specific components related to the Hazard and their associated consequences related to the implementation of FRA.

1. Surveillance equipment Failure
2. Communication Failure
3. Satellite System Failure GNSS and VSAT
4. Lack of Coordination between ATS Units and Facilities
5. Management of combined FRA and aircraft on conventional ATS routes during peak period.
6. Air Situation Display failure.

Risk Assessment

The committee then decided that due the Airspace Upgrade to implement FRA south of 25° South.

This area is overflowed only by Qantas from Australia to South Africa with a maximum of 4 flights per day 2 westbound and 2 eastbound.

However, with the with COVID 19, this number went down to 1 to 2 traffic per day.

This area was chosen so as to give ATC time to familiarize with FRA.

Mauritius intended to extend FRA to its whole FIR once the Airspace upgrade was implemented and ATC were accustomed to their new environment.

Risk Assessment

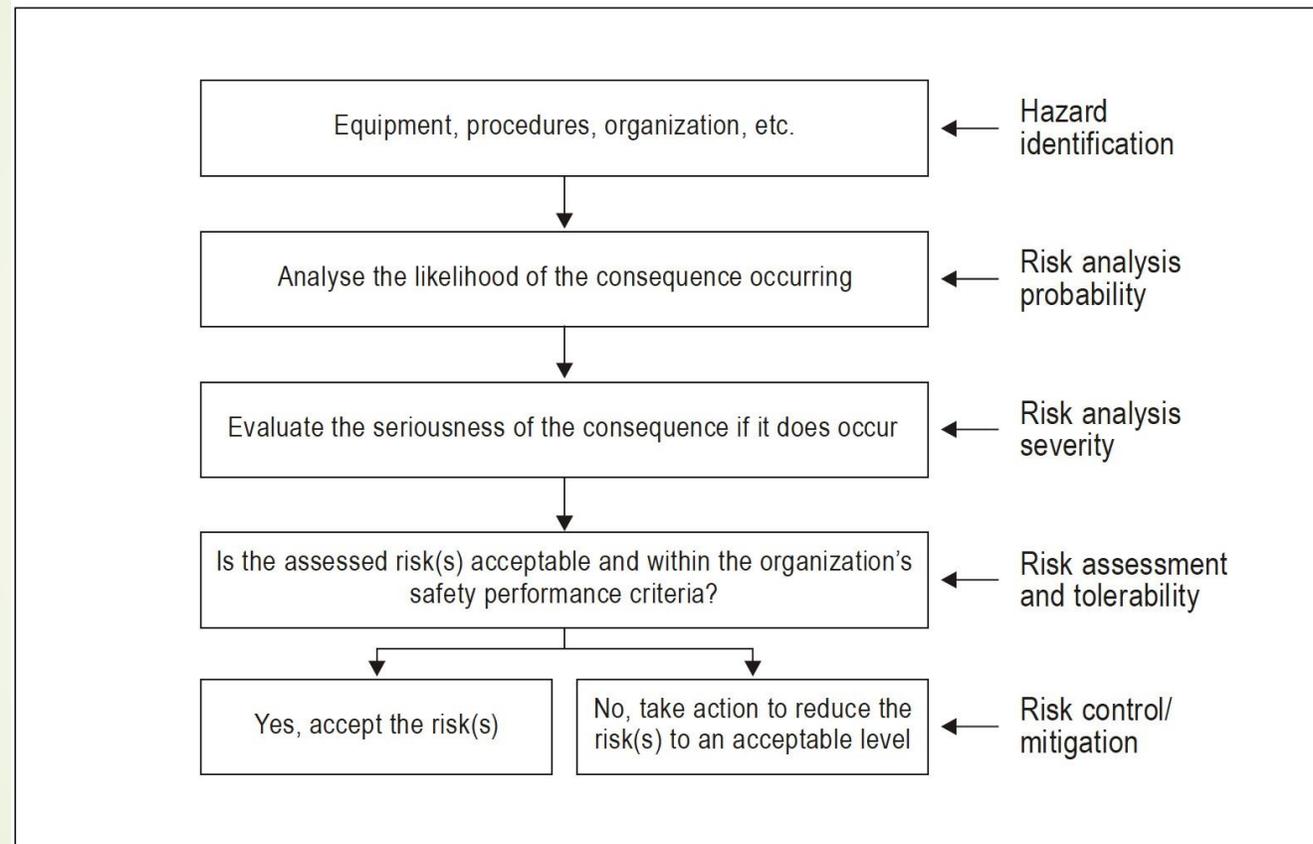


Figure 4: ICAO SMM SAFETY RISK MANAGEMENT PROCESS (fig 5-2)

Risk Assessment

For the Risk assessment The Panel made use of annex 19, Doc9859 Mauritius Safety Management Manual and the FRA CONOPS
Following ICAO Matrices were used

1. ICAO SMM REFERENCE TABLES

<i>Likelihood</i>	<i>Meaning</i>	<i>Value</i>
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Table 1: ICAO SMM SAFETY RISK PROBABILITY TABLE (fig 2-11)

Risk Assessment

<i>Severity</i>	<i>Meaning</i>	<i>Value</i>
Catastrophic	<ul style="list-style-type: none">— Equipment destroyed— Multiple deaths	A
Hazardous	<ul style="list-style-type: none">— A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely— Serious injury— Major equipment damage	B
Major	<ul style="list-style-type: none">— A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency— Serious incident— Injury to persons	C
Minor	<ul style="list-style-type: none">— Nuisance— Operating limitations— Use of emergency procedures— Minor incident	D
Negligible	<ul style="list-style-type: none">— Few consequences	E

Table 2: ICAO SMM SAFETY RISK SEVERITY TABLE (fig 2-12)

Risk Assessment

Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Figure 1: ICAO SMM SAFETY RISK ASSESSMENT MATRIX (fig 2-13)

Risk Assessment

Tolerability description	Assessed risk index	Suggested criteria
Intolerable region	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
Tolerable region	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
Acceptable region	3E, 2D, 2E, 1B, 1C, 1D, 1E	Acceptable

Figure 2: ICAO SMM SAFETY RISK TOLERABILITY MATRIX (fig 2-14)

Risk Assessment

Risk index range	Description	Recommended action
5A, 5B, 5C, 4A, 4B, 3A	High risk	Cease or cut back operation promptly if necessary. Perform priority risk mitigation to ensure that additional or enhanced preventive controls are put in place to bring down the risk index to the moderate or low range.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	Moderate risk	Schedule performance of a safety assessment to bring down the risk index to the low range if viable.
3E, 2D, 2E, 1B, 1C, 1D, 1E	Low risk	Acceptable as is. No further risk mitigation required.

Figure 3: ICAO SMM ALTERNATIVE SAFETY RISK TOLERABILITY MATRIX (fig 2-15)

Risk Assessment

No	Hazard(s)	Specific components of the Hazard	Consequences related to the Hazard	Current defenses controlling the risk	Risk Index RI	Following Actions to mitigate the	Mitigated Risk Index MRI	Responsible for the mitigation
1	Free Route Airspace FRA	Surveillance Equipment Failure	Increase in Fuel Consumption	Two-way communication, (CPDLC and HF)	2D			
			Loss of separation	ASD with PETO (ADS-C traffic refreshed every 15 mins)				
			Increase workload for controller	ATS routes Contingency procedures Trained ATCs SLOP				
			LHD will remain unnoticed	Trained ATCs Pilot reports Two-way communication - (Ground-Air) (Ground-Ground)				
		Communication Failure	Loss of Separation	Trained ATCs, Contingency Procedures	2 D			
			Increase in workload	ADS-C Redundancy in Radio Facilities SLOP				
		Satellite system Failure (GNSS) (VSAT)	Loss of separation	Trained ATCs, Contingency Procedures	2D			
			Increase in workload	Redundancy in Radio Facilities				
			AIDC not available	SLOP				
		Lack of Coordination between ATS Units and Facilities	Loss of Separation	Trained ATCs,	2D			
			Delay in Aircraft movement	Letters of Agreements Ground to ground communication Facilities				
			LHD					
		Management of combined FRA Traffic and aircraft on conventional ATS routes during peak period	Loss of Separation	Trained ATCs, Contingency Procedures	2D			
			Increase in workload	Redundancy in Radio Facilities SLOP				
Air Situation Display Failure	Loss of Data on screen	Trained ATCs, Contingency Procedures	2D					
	Increase in workload	Paper Flight progress strip used for updating traffic						
	Loss of situational Awareness	Preventive Maintenance						
	AIDC not available							
		Delay in Aircraft movement	Trained ATCs, Contingency Procedures	3D	Further Procedural training to controllers to work in downgraded environment Additional staff deploy to unit concerned	2D		



Risk Assessment

The Assessment panel produced a risk assessment document which was submitted to the management in December 2020 with its views and recommendation for the implementation of FRA within Mauritius FIR.

FRA was implemented 12th August 2021 South of 25°S in a first instance.

UP to now ATC has managed 255 overflights without any incident.

I wish also to point out that at the time we were did this assessment there was no available ICAO template to help us in this issue.

This document is not final, and in October last we agreed that we will have new risk assessment done by each State.

This is the goal of this workshop.



Summary

Since the defences in place were and are working and the risk index is at an acceptable level, there was no need to come up with new defences, just to follow up on the existing defences to make sure these are still controlling the risks.

I wish also to point out that at the time we did this assessment there was no available ICAO template as to how to carry out this assessment.

This document is not final, and in October during the Face to Face meeting in Mauritius, we agreed that we will have new risk assessment done by each State.
And

This is the goal of this workshop.



Thank You

