TWY Col V2.0 Review 1.0 Taxiway Collision Risk Model March 2021

Short name	Risk Model	Type of accident	Operational Environment / ATService provided	Systems /elements considered
TWY Col	Taxiway Collision	Collision between: - two aircraft, OR - an aircraft and a ground vehicle	the runway area. Apron area is excluded as well. - Service provided by ANSP: Ground Control service (preventing collision between aircraft and aircraft and vehicles) - Two type of vehicles are considered: * Vehicles allowed to use the manoeuvring area withing a specific clearance from the ground controller, they follow procedures (called Un-controlled vehicles) * Vehicles needing clearances/instructions from the Ground Controller to use and navigate in the manoeuvring area (called Controller vehicles)	In the aircraft: - Flight Crew - Navigation, Surveillance and Communication systems on board - Airport related procedures On the service provided side to provide Ground Control: - Ground Controller - Surveillance (A-SMGCS) and Communication systems, Flight Planning system Operational procedures to ensure traffic management in a safe way In the Vehicles: - Drivers - Navigation, surveillance and communciation systems on board - Airport related procedures On the taxiways/airport: - Surface Marking and lights with respect to taxiway location, identification and access

Lauses of barrier failure

ATM Barriers

Barriers in ATM model

Accidents & Base Event Failures

Contribution ID

Circumstantial

Event ID

Event Contribution ID | Stepped OR gate | Stepped OR gate | Stepped OR gate | Only on remaining case | Precursor Probability | Stepped OR gate | Only on remaining case | Barrier & AND gate | Barrier Failure Rate% | Contribution | KEY

> **Taxiway Collision Risk Model** March 2021

TF3
Taxiway Collision TWY Col V2.0 Review 1.0 TWY Col V2.0 Review 1.0 **Taxiway Collision Risk Model** Taxiway Collision Risk Model TC3
Avoidance
Essential March 2021 March 2021 TF3a
TC barrier failure Pilot / driver actions TP1
Imminent Taxiway Collision **B2**ATC Taxiway Collision Prevention TB2.1
ATC does not detect conflict in time TB2.4
Pilot/Driver of controlled vehicle does not properly execute the ATC instruction TB2.2
ATC does not act in time to resolve conflict or inappropriate action is take TB2.3.3 Vehicle is not controlled by TWR TB2.3.1 Loss of Communications There is no specific ASMGCS service that provides alerts for conflicts in the TWYs. That's why the previous TB2.1.3 has been removed TB1.2.2.2.3.1
Failure or inefficiency of the system

TB1.2.2.2.3.2
Pilot/driver does not detect the ac/vehicle by onboard systems TB2.1.1.1 Conflict effectively invisible TB2.1.1.1.2 Darkness hides conflict TB2.3.2.2.1 Inappropriate Readback Hearback TB2.3.2.1.1 Unclear clearance (inappropriate phraseology) TB2.3.2.1.2 Pilot/Driver misunderstanding TB2.1.2.1.2
Inadequate Flight Plan
(FPL) data

OR Including str B3 Taxiway Conflict Management TB2.1.1.1.1.3 Glare prevents detection TB2.1.1.1.1 Low Visibility Operations **TB2.1.1.1.1.2**Restricted view of the conflict visibility TB2.1.4.1.1.1 Pilot/Driver does not detect aircraft/vehicle visually TB3.4
Pilot/Driver of controlled vehicle
does not properly execute the
ATC instruction TB3.3 Inadequate communication with pilot/driver TB2.1.4.1.1.2.1
Pilot/Driver does not monitor RT

TB2.1.4.1.1.2.2
Inability to interpret RT

TB2.1.4.1.1.3.1
Failure or inefficiency of the system

TB2.1.4.1.1.3.2
Pilot/Driver does not detect the ac/vehicle by onboard systems TB3.1.2
Ineffective ATC Avoidance usi traffic data TB3.1.4
Others do not inform ATC of evolving conflict TB3.3.1 Loss of Communications TB3.3.3 hicle is not controlle by TWR TB3.1.1.2 ATCo Does not see visible conflict in time TB3.1.2.1.1 Inadequate Surveillance data TB3.3.2.1.2
Pilot/Driver
misunderstanding
TB3.3.2.2.1
Inappropriate
Readback
Rearback TB3.1.4.1.2
Pilot/Driver does not warn controller in time TB3.1.1.1.1.1
Low Visibility
Operations

TB3.1.1.1.1.2
Restricted view of the conflict visibility TB3.1.1.1.3 Glare prevents detection TB3.1.2.1.1.1
Inappropriate or missing
Surveillance data

TB3.1.2.1.1.2
Inappropriate or missing FPL data

TB3.1.2.1.2.1
Inappropriate or missing FPL data TWY Col V2.0 Review 1.0 TB3.1.4.1.1.2.1
Pilot/Driver does not monitor RT

TB3.1.4.1.1.2.2 Inability to interpret RT

TB3.1.4.1.1.3.1 Failure or inefficiency of the system

TB3.1.4.1.1.3.2 Pilot/Driver does not detect the ac/vehicle by onboard systems Taxiway Collision Risk Model March 2021 TP3.1.3
Adjacent Ground
Controller creates new
conflict during taxiing TP3.1.1
Runway Controller creates new conflict during taxiing Apron Controller creates new conflict during taxiing TB4
Ineffective Taxiway
Instruction **B4**Tactical Taxiway Routing Instruction **B8**Taxiway Monitoring Taxiway Monitoring TB4.3
Pilot/Driver of controlled vehicle
does not properly execute the
ATC instruction Imminent Inappropriate
AC/ Vehicle Movement
on TWY TBY
Inappropriate clearance (for taxiing to a different Area of Responsibility) is provided by ATC and executed by AC/Controlled Vehicle TB4.1.3 GC creates conflict with vehicle Clearance/Operations: Y=5: RWY exit Y=6: Apron exit Y=7: Adjacent Manoeuvring Area exit TB4.1.3.1
GC has
Inadequate
information
TB4.1.3.2
Inappropriate GC
decision TB4.1.2.1
GC has
Inad equate
information
TB4.1.2.2
Inappropriate GC
decision TBY.2
Pilot/Driver does not detect and inform ATCo that clearance may lead to a entering another area of responsibility TBY.1
ATC Issues an inappropriate clearance (to a TWY out of the AoR) Pilot/Driver ignores surface markings or indications TB4.1.2.1.3 Inadequate surface Radar Inadequate Area layout Inadequate Surface Radar Inadequate Surface Radar Inadequate Surface Radar Inadequate Manoeuvring Area layout Inadequate Surface Radar I TB4.1.1.1 Poor RT TB4.1.1.2 Limited visual resources Tight Progress strips ineffective for conflict prediction Data TB4.1.2.1.1 Limited visual resources Tilght Progress strips ineffective for conflict prediction TBY.1.1 Limited visibility on the relevant area Influencing factors related to visibility on the relevant area:

- Low Visibility operations

- Restricted view from tower to see AC/Vehicle

- Glare prevents visibility TBY.1.4 Inadequate Coordination results in instigating a taxiway incursion TBY.1.3 ATCo inappropriately assesses the situation TBY.2.1
Pilot/Driver does not detect the inappropriate clearance TBY.2.2 Pilot/Driver does not act (warn ATCo or stop) in time TB8
Ineffective ATC Taxiway
Monitoring TP8.2 er of non-controlled ve Uses TWY inappropriately TP8.1 Unauthorised AC/ Controlled Vehicle movement on Taxiway TBY.2.1.1
Pilot/Driver does
not detect
inappropriate
clearance visually TBY.1.2.3
Pilot/Driver
provides inadequate
Position/Intent
Reporting
Position/Intent
Reporting
Position/Intent
Reporting
Position/Intent
Reporting
Position/Intent
Reporting
Position/Intent
Reporting
Reporting
Position/Intent
Reporting
R TBY.1.2.2 Airport Layout Information Inadequate Poor visibility from tower

TBY.1.1.2

Darkness hides conflict TBY.2.1.2.1
Pilot/Driver does not monitor RT

TBY.2.1.2.2
Inability to interpret RT TBY.1.2.2.1
No Airport
Configuration
Information

TBY.1.2.2.2
Incorrect
Airport
Configuration
info.

TBY.1.2.2.3
Ignored
Airport
Configuration
info. TB8.4
Pilot/Driver of controlled vehicle does not properly execute the ATC instruction TBY.1.1.1
Low Visibility
Operations

TBY.1.1.1.2
Restricted view of the conflict visibility

Indicate motivated

TBY.1.1.1.3
Glare prevents detection

TBY.1.2.1.1
Inadequate Surveillance data TBY.1.2.1.2 Inadequate Flight plan (FPL) data TB8.2
ATCo does not act in time to resolve Unauthorised movement or inappropriate action is taken TB8.1 ATC does not detect TP8.1.1
Pilot/Driver of controlled vehicle Uses TWY
Without Permission (including wrong Taxiway) Includes restricted view from tower hides conflict TBY.1.2.1.1.1 Inappropriate or missing Surveillance data

TBY.1.2.1.1.2 Inadequate use of surveillance data

TBY.1.2.1.1.2 Inappropriate or missing FPL data

TBY.1.2.1.2.2 Inadequate use of FPL data TB8.1.1
Ineffective Visual ATC
Taxiway Monitoring TB8.3.3 Vehicle is not controlled by TWR TB8.3.1 Loss of Communications TB8.3.2 Incorrect communication Active
Guidance

w the ns is but the ris the ars TP8.1.2.1
Pilot/Driver Does not respect surface Markings/aids TP8.1.1.1 Pilot/Driver Wrong information on the charts (AIP) TP8.1.1.2
Pilot/Driver Does
not follow intended
taxi route TP8.1.1.3
Pilot/Driver does not follow
nway exit procedures/instructions thus
enters Taxiway without permission TB8.1.1.1
Unauthorised movement effectively invisible

OR

TB8.1.1.2
ATCo does not see visible unauthorised movement in time TB8.1.2.1
Inappropriate traffic data

OR

TB8.1.2.2

ATCo does not detect imminent infringement in time based on traffic data TB8.1.3.3
Controller does not respond to CMAC

TB8.1.4.1
Pilot/Driver does not inform ATCo of unauthorised movement TB8.3.2.1 Unclear clearance / misunderstood TB8.1.4.2 Other ATC actors (supervisor, assistant) does not inform ATCo of unauthorised movement TB8.1.3.2 MAC failure to give alert in time TP8.1.2.2.1
Failure of active surface guidance

TP8.1.2.2.2
Pilot/Driver ignores active surface guidance TP8.1.1.3.1
Inappropriate communication

AND

TP8.1.1.3.2
Pilot/Driver non-compliance with instructions

TP8.1.1.3.3
Pilot/Driver is lost

TP8.1.1.3.4
Inadequate Procedures

TP8.1.1.3.5
Pilot/Driver application of procedures TP8.1.2.1.1
Pilot does not see surface markings/ lights/aids

TP8.1.2.1.2
Inadequate surface markings

OR

OR

OR TP8.1.1.2.1 Inappropriate communication AND

TP8.1.1.2.2 Pilot/Driver non-compliance with instructions

TP8.1.1.2.3 Pilot/Driver is lost

TP8.1.1.2.4 Inadequate Procedures

TP8.1.1.2.4 Inadequate Procedures

TP8.1.1.2.5 Pilot/Driver is non-compliance with instructions TB8.1.1.1
Poor visibility
from tower

OR TB8.1.4.1.1
Pilot/Driver does not detect the evolving Imminent Incursion TB8.3.2.1.1
Unclear clearance (inappropriate phraseology)

TB8.3.2.1.2
Pilot/Driver misunderstanding
TB8.3.2.2.1
Inappropriate Readback
Readback
TB8.3.2.2.2
Inappropriate Readback TB8.1.1.1.2
Darkness hides unauthorised movement TB8.1.3.1.2 CMAC not In operational use TP8.1.1.2.1.1 Unclear clearance / misunderstood TP8.1.2.1.3.1
Pilot/Driver confused

TP8.1.2.1.3.2
Pilot/Driver non-compliance TP8.1.1.2.1.2 Inappropriate TP8.1.1.3.1.2 Inappropriate Readback/ Hearback TB8.1.1.1.1.2
Restricted view of the incursion visibility

Includes restricted view from tower hides incursion TB8.1.4.1.1.3
No detection by Onboard systems (e.g.Situational display, ...) TB8.1.2.1.1.1 Inappropriate or missing Surveillance data

TB8.1.2.1.1.2 Inadequate use of surveillance data

TB8.1.2.1.2.1 Inappropriate or missing FPL data

TB8.1.2.1.2.2 Inadequate use of FPL data TB8.1.4.1.1.1 Pilot/driver does not detect aircraft/ vehicle visually TB8.1.1.1.1.1 Low Visibility Operations TP8.1.1.2.1.1.2
Unclear clearance (inappropriate phraseology)
TP8.1.1.2.1.1.3
Pilot/Driver misunderstanding
TP8.1.1.2.1.2.1
Inappropriate Readback
Hearback TP8.1.1.2.1.1.1
Pilot/Driver takes clearance intended for other aircraft TWY Col V2.0 Review 1.0 TP8.1.1.3.1.1.1
Pilot/Driver takes clearance (inappropriate phraseology)
TP8.1.1.3.1.1.3
TP8.1.1.3.1.1.3
TP8.1.1.3.1.1.3
Pilot/Driver misunderstanding
TP8.1.1.3.1.2.1
Inappropriate Readback
Hearback

TB8.1.4.1.1.2.1
Pilot/Driver does not monitor RT

TB8.1.4.1.1.2.2
Inability to interpret RT

TB8.1.4.1.1.3.1
Failure or inefficiency of the system

TB8.1.4.1.1.3.2
Pilot/driver does not detect the ac/vehicle by onboard systems

