Global Action Plan for the Prevention of Runway Excursions

Part 1 - Recommendations

Logos of Organisations that supported the initiative:

COORDINATING ORGANISATIONS		SIGNATURE
Hassan Shahidi, President and CEO	FLIGHT SAFETY FOUNDATION	
Eamonn Brennan, Director General	EUROCONTROL	

COORDINATING ORGANISATIONS		SIGNATURE
Patrick Ky, Executive Director	EASA	

ACKNOWLEDGEMENTS

STATEMENT OF COMMITMENT

Notwithstanding the specifics to the aviation risks in 2020 brought by the COVID19 situation, the rate and numbers of runway excursions in the world remain steady in the last decade. Data shows the industry has been effective in reducing the commercial flights rate of runway excursion accidents, but the absolute number of accidents and incidents and their severity still indicates a very high risk.

In a study of incident and accident data dedicated to this action plan process, IATA reported that between 2005 and the first half of 2019 23% (283) of accidents in the IATA's global accident database involved a runway excursion. This was the most frequent end state, followed by Gear-up landing/Gear collapse (15%) and Ground Damage (12%).

Managing the runway excursion risk is one of the best examples of how different aviation segments cannot do it alone. Runway excursion risk and resilience management relies on a system of tightly coupled factors for success dependent on a joint and coordinated effort of all the aviation players. The complexity of the runway excursion prevention comes also from the fact that the effect of the risk and resilience factors is highly cumulative – runway condition maintenance and reporting, aircraft performance and operations, collaborative approach path management and adherence to robust policies for safe descent and approach planning, stabilised approach, safe landing and go-around are some examples.

The jointly owned risk requires joint solutions. This is why the industry came together, within a dedicated working group, to discuss and agree on what are the most important actions to address the runway excursion risk. The result is a list of recommendations that represent the industry consensus on what are the best practices and intervention beyond simple regulatory compliance. The recommendations are mainly generic and it will be for the responsible organisations to decide specific details, after taking local conditions and specific context into account.

Addressing both the risk and the resilience factors has been a guiding principle of the working group that reviewed accident and incident data, single scenarios and best practices, and suggestions on risk and resilience management.

The recommendations are the result of the combined and sustained efforts of organisations representing all segments of aviation. The organisations that contributed to this action plan are totally committed to enhancing the safety of runway operations by advocating the implementation of the recommendations that it contains. These organisations include, but are not limited to, Aerodrome Operators, Air Navigation Service Providers, Aircraft Operators, Aircraft Manufacturers, R&D organisations, Regulators, International Organisations and Associations.

INTRODUCTION AND BACKGROUND

This document is Volume I of the Global Enhanced Action Plan for the Prevention of Runway Excursions (GEAPPRE). Volume I contains the agreed recommendations to the following civil aviation organisations: Aerodrome Operators, Air Navigation Service Providers, Aircraft Operators, Aircraft Manufacturers, Regulators, ICAO and addressees of the R&D recommendations (States, international organisations and the Industry).

Volume II of GEAPPRE will provide explanatory and guidance material, and related best practices for the recommendations listed further in this document.

The development of the GEAPPRE recommendations is based on the following principles:

- Provide recommendations that address actions beyond regulatory compliance – the recommendations in this action plan are not exhaustive in managing the runway excursion risk and resilience. It is fundamental that organisations shall be compliant to international, regional and national rules and regulations.

- Recommendations based on consensus – a recommendation is included in the action plan only if there was a consensus for it during the drafting and the subsequent validation process.

- Embrace further data analytics – suggest to actors to make better use of existing data and fuse and analyse larger volumes of heterogeneous data.

- Address both longitudinal and lateral runway excursions.

- Include runway excursion mitigations.

- Promote technology embedded in systemic solutions – promote technological solutions but clearly integrated with the respective training, procedures, standardisation, certification and oversight.

- Provide R & D recommendations for issues with clear potential high-risk mitigation benefits but without maturity for implementation within 10 years horizon.

- Promote a set of selected proven efficient solutions, which are not yet «standard» (still not used by all actors) but that have been proven to be efficient in reducing the risk of runway excursions, based on data analysis and lessons learnt.

- Provide functional recommendations – leave the design of specific implementation solution to the industry.

- The verb "Should" is used to signify that, while a recommendation does not have the force of a mandatory provision, its content has to be appropriately transposed at local level to ensure its implementation.

The organisations, which this action plan is addressed to, should:

- Organise a review of the respective recommendations and assess their relevance against their local conditions and specific context.

- Consult the best practices for implementing the selected recommendations and seek support, if needed, from the GEAPPRE coordinating partners.

- Conduct an appropriate impact assessment (including safety assessment) when deciding on the specific action to implement the recommendations.

- Implement the specific action / change and monitor its effectiveness.

- Share the lessons learnt with the industry.

GLOBAL ENHANCED ACTION PLAN FOR THE PREVENTION OF RUNWAY EXCURSIONS

RECOMMENDATIONS

RECOMMENDATIONS TO AERODROME OPERATORS			
REF	**Recommendation**	**Action**	**Implementation Date**
ADR1	Ensure that runways are constructed, resurfaced and repaired in accordance with the national or regional (e.g. EASA) regulations, so that effective friction levels and drainage are achieved.	Aerodrome Operator.	**Ongoing**
ADR2	An appropriate program should be effectively implemented to ensure the removal of contaminants from the runway surface as rapidly and completely as possible to minimize accumulation and preserve friction characteristics.	Aerodrome Operator.	**End of 2023**
ADR3	If provided, ensure that approach radio navigation aids (e.g. ILS) and visual aids (e.g. AGL, PAPIs and surface markings) are maintained in accordance with ICAO Standards and Recommended Practices'. An appropriate method for the inspection and assessment of markings deterioration should be implemented.	Aerodrome Operator.	**End of 2023**
ADR4	Ensure that the runway holding positions are clearly marked, signed and if required, lit. If intersection take-offs are conducted, install at the relevant runway holding positions signs to indicate the Take-Off Run Available (TORA).	Aerodrome Operator.	**End of 2023**
ADR5	Ensure robust procedures are in place for calculating temporary reduced declared distances e.g. due to work in progress on the runway. When reduced declared distances are in operation, ensure that the temporary markings, lighting and signs accurately portray the reduced distances and that they are well communicated in a timely manner to the state's aeronautical information services for publication and the relevant ATS units.	Aerodrome Operator.	**End of 2023**
ADR6	Ensure that the procedures to assess runway surface conditions according to GRF include reactive as well as proactive surface assessment to make sure hazardous changes are all identified and communicated in a timely manner.	Aerodrome Operator.	**End of 2021**
ADR7	Ensure robust procedures are in place for communicating information regarding changing surface conditions as frequently as practicable to the appropriate services according to the GRF. Roles, responsibilities of stakeholders and coordination procedures should be formalised.	Aerodrome Operator.	**End of 2021**
ADR8	In accordance with ICAO standards (and regional, e.g. EASA regulations), wind sensors and wind direction indicators (wind socks) should be sited to give the best practicable indication of conditions along the runway and touchdown zones.	Aerodrome Operator.	**End of 2025**
ADR9	Consider equipping for digital transmission of ATIS as appropriate to ensure that ATIS information is updated in a timely manner.	Aerodrome Operator.	**End of 2025**

REF	**Recommendation**	**Action**	**Implementation Date**
ADR10	If installed, RWY centreline lights should also be used together with the runway edge lights whenever runway edge lights are switched on and when the runway is in use.	Aerodrome Operator.	**End of 2023**
ADR11	Ensure appropriate coordination with the meteorological service provider, the ANSP and the aircraft operators to regularly assess the relevancy of weather data, in particular at large aerodromes where there could be spatial differences in weather data.	Aerodrome Operator.	**End of 2023**
ADR12	Ensure runway exits are appropriately named according to a logic of succession of numbers and letters avoiding possible ambiguity.	Aerodrome Operator.	**End of 2025**
ADR13	Runway surroundings should be considered when designing or modifying strips or RESA. It is necessary to consider the local constraints against ICAO provisions and regional (e.g. EASA) regulations so as to ensure relevant mitigation.	Aerodrome Operator.	**Ongoing**
ADR14	Information related to air operations hazard or specificities in the airport vicinity should be identified and addressed to pilots in the LRST and published through an appropriate means.	Aerodrome Operator.	**End of 2023**
ADR16	Runway condition codes assessed should be compared against braking action reports by the pilots to ensure the accuracy of the information provided to the pilots.	Aerodrome Operator.	**End of 2023**
ADR17	Consider using Approach Path Management (APM) in coordination with local ATC and aircraft operators. Associated issues should be addressed by the LRST.	Aerodrome Operator.	**End of 2023**

RECOMMENDATIONS TO AIR NAVIGATION SERVICE PROVIDERS			
REF	**Recommendation**	**Action**	**Implementation Date**
ANSP1	ANSPs should ensure the importance of stabilised approach, its elements and compliance with final approach procedures and aircraft energy management are included in initial and refresher training of ATCOs conducted by ANSPs and ATCO Training Organisations, as well as in AFISOs training, as applicable.	Air Navigation Service Provider.	**End of 2023**
ANSP2	With regard to assignment of or change to runway assignment for arriving or departing traffic: ANSP2 a. Whenever the runway change is pre-planned, notify it as early as practicable together with the expected time of the change to flight crews, including by adding relevant information in ATIS, where available. ANSP2 b. As far as practicable, avoid changing the assigned runway to aircraft on approach or taxiing for departure. ANSP2 c. ANSPs should ensure ATCOs are aware that RWY changes create additional workload, increase vulnerability to error and flight crews need time to re-brief and prepare for it. ANSP2 d. ANSPs should ensure that the runway configuration change procedure/process takes account of the above points and of the tailwind information as appropriate. ANSP2.e. When operationally possible, accept the flight crew preference for a runway when requested "due to performance limitations".	Air Navigation Service Provider.	**End of 2023**
ANSP3	ANSPS should: ANSP3 a. Review available data (e.g. occurrence reports, go-around / missed approach data etc.) with the aim of identifying the ANSP-related runway excursion contributing factors and relevant mitigations, for example enhanced airspace design and procedures and ATCO training and procedures. ANSP3 b. Share at network level the identified runway excursion contributing factors and relevant mitigations.	Air Navigation Service Provider.	**End of 2023**
ANSP4	Review processes covering the provision of essential information on aerodrome conditions such as weather, wind and runway surface conditions (e.g. when 'wet' or contaminated) to ensure: ANSP4 a. A consistent, timely and accurate broadcast of aerodrome information. ANSP4 b. The integrity of the essential information supply chain from the originator (e.g. Met Office/Aerodrome Operator) to the user (e.g. flight crews, ATS, Met Office, aerodrome operator and AIS provider). ANSP4 c. Training on the use of ATIS/D-ATIS is provided to relevant operational staff. 3.3.4.d. Compliance with the ICAO Global Runway Format (GRF) for runway surface conditions assessment and reporting, including the training of the relevant ANSP personnel.	Air Navigation Service Provider.	**End of 2021**

REF	**Recommendation**	**Action**	**Implementation Date**
ANSP5	ANSP5 a. ANSPs should ensure that flight crews are informed of the Take off Run Available (TORA) or the Landing Distance Available (LDA) if these differ from the published data using appropriate means. The information should include any alternative runways which may be available. ANSP5 b. ATS providers should collaborate with the aerodrome operators to determine the runway entries from which intersection take-offs may be performed, and develop coordinated procedures for such operations.	Aerodrome Operator.	**End of 2023**
ANSP6	Participate in runway excursion safety information sharing at network level to facilitate, using just culture principles, the free exchange of relevant information on actual and potential safety deficiencies.	Air Navigation Service Provider.	**End of 2023**
ANSP7	If installed, RWY centreline lights should also be used together with the runway edge lights whenever runway edge lights are switched on and when the runway is in use.	Air Navigation Service Provider.	**End of 2023**
ANSP8	Consider equipping for digital transmission of ATIS, as appropriate (e.g. via telephone or other means).	Air Navigation Service Provider.	**End of 2025**

	RECOMMENDATIONS TO AIRCRAFT OPERATORS		
REF	**Recommendation**	**Action**	**Implementation Date**
OPS1	Aircraft operators should participate in safety information sharing networks with all relevant stakeholders. This should facilitate the free exchange of relevant runway safety information including identified risks, safety trends and good practices.	Aircraft Operator.	**Ongoing**
OPS2	Aircraft operators should include and monitor aircraft parameters related to potential runway excursions in their Flight Data Monitoring (FDM) program. Whenever standardised FDM markers are provided by the industry, aircraft operators should use them with priority to ensure effectiveness of risk mitigation and safety assurance associated with runway excursion barriers and to allow comparability on an industry level.	Aircraft Operator.	**End of 2023**
OPS3	Aircraft operators and training providers should include realistic, competency and evidence based scenarios into their training programs requiring threat and error management for runway excursion prevention during both take-off and landing. This should include competency and evidence based recurrent simulator training programs representative in terms of environmental conditions including crosswind, landing on contaminated/slippery runways and poor visibility adapted with simulator representativeness. Representativeness of simulators should be assessed and their limitations communicated (in order to avoid negative training).	Aircraft Operator.	**End of 2023**
OPS4	Aircraft operators should incorporate appropriate technical solutions to reduce runway excursion risks, where available (including ROAAS, and runway veer off awareness and alerting systems, when and if available). If technical solutions are not available, operators should implement appropriate SOPs and TEM strategies which support flight crews to effectively prevent runway excursions	Aircraft Operator.	**End of 2027**
OPS5	If technically feasible, aircraft operators should equip their aircraft fleet with data-link systems (e.g. ACARS) to digitally obtain the latest weather (e.g. D-ATIS or METAR). The use of this technical mean has to be supported by adequate SOP enabling all pilots on the flight deck to familiarise with the latest weather without impeding aircraft and flight path monitoring.	Aircraft Operator.	**End of 2025**
OPS6	Aircraft operators should implement policies for flight crews not to accept ATC procedures and clearances that have the potential to decrease safety margins to an unacceptable level for the flight crew thereby increasing the risk of runway excursions. This includes such procedures and clearances which increase the likelihood of having an unsafe approach path management with consequences for safe landing, e.g. which bear the risk of being un-stabilized at the landing gate or high-energy approaches.	Aircraft Operator.	**End of 2027**

REF	**Recommendation**	**Action**	**Implementation Date**
	These policies should be further supplemented by the implementation of effective SOPs and flight crew training. Flight Crews should be required to report such risks within their operators SMS and the aircraft operator should further report such risks to the ANSPs via established reporting systems. (see OPS1)		
OPS7	Aircraft operators should implement policies for safe descent and approach planning, stabilised approach, safe landing and go-around and should ensure that these are implemented in their training programme. Aircraft Operators should define which elements of these policies have to be included and highlighted in the approach briefings by flight crews.	Aircraft Operator.	**End of 2023**
OPS8	Aircraft operators should implement SOPs or policies for flight crews not to conduct take-off or approach following any runway change until the appropriate set-up, planning, performance calculations (for multi-pilot operations this includes independent calculations and crosschecks by at least two pilots) and re-briefings are completed. When take-off runway change is received whilst taxiing the above should be performed by flight crew without rushing and when the aircraft is stationary. Runway Excursion related TEM should be addressed in the briefing every time a runway change is expected, probable or actually occurs.	Aircraft Operator.	**End of 2023**
OPS9	Aircraft operators should implement SOPs or policies for flight crews to request a more favourable runway for take-off or landing for any reason, which may affect the safety of the flight and to advise the safety reasons to ATC.	Aircraft Operator.	**End of 2023**
OPS10	Aircraft operators should implement SOPs or policies requiring flight crews to confirm, prior to commencing the take-off or landing phase, that the actual conditions (weather and aircraft configuration) are better or at least correspond to the values used for performance calculations. When conditions are predicted to approach operational limitations, flight crews should be required to identify the limiting parameters and incorporate it into their TEM briefing.	Aircraft Operator.	**End of 2023**
OPS11	Aircraft operators should define company cross- and tailwind limits specific for each type of aircraft operated. Moreover, specific guidance on the runway conditions and the gust components should be clarified. Aircraft operators should establish clear policies to allow their flight crew to reduce the established limits whenever deemed necessary for safety reasons in actual flight operation.	Aircraft Operator.	**End of 2023**

REF	Recommendation	Action	Implementation Date
OPS12	Aircraft operators should publish specific guidance and training for their flight crews on crosswind take-off and landing techniques, especially with wet, slippery or contaminated runway conditions. This should include the correct touchdown and stopping techniques, which incorporate all available control and deceleration devices as well as TEM topics and methods for effective monitoring and intervention by the PM. Aircraft manufacturers advice should be incorporated, if available.	Aircraft Operator.	**End of 2023**
OPS1	OPS13 a. Aircraft operators should ensure their SOPs or policies require flight crews to perform independent performance calculations. This should also include to independently cross-check of the load and trim sheet and the actual TORA/TODA from the AIS (e.g. if reduced by NOTAM) with TORA/TODA used to calculate the take-off performance. This independent calculation should also be applied following a runway change. OPS13 b. .Aircraft operators should ensure their SOPs or policies include flight crew gross-error checks and crew cross-checks prior to any data input and prior to executing any data input in the FMS.	Aircraft Operator.	**End of 2023**
OPS14	Aircraft operators should publish SOPs and guidance, which incorporate runway excursion mitigation, associated with rejected take-off decision making and rejected take-off manoeuvres. Appropriate training should be provided.	Aircraft Operator.	**End of 2023**
OPS15	Aircraft operators should develop SOP that include an assessment, possibly prior to top of descent, of landing performance based upon latest and best-available weather information. This calculation should not be performed using dispatch weather information. Flight crews should be informed on the type of landing distance data available (factored or unfactored) and which correlating safety factors are used. When possible, the crew should complete descent, approach, landing planning, set-up and briefings prior to the top-of-descent.	Aircraft Operator.	**End of 2023**
OPS16	Aircraft operators should develop a clear go-around policy, which should be further supplemented by a set of SOPs and guidance materials to put this policy into action. This go-around policy should enable every flight crew member on the flight deck to call for a go-around at any time unless an emergency situation dictates otherwise. In all cases, the SOP should require both pilots to have and retain the required visual reference below DA/MDA with a go around call mandatory if either pilot loses it. A go-around should also be mandatory if the approach becomes un-stabilized below the specified approach/landing gate	Aircraft Operator.	**End of 2023**

REF	Recommendation	Action	Implementation Date
	Recurrent simulator training should be provided on the competencies of safe go-around in various stages during the approach and landing, including shortly prior or during touchdown (e.g. before activation of thrust reversers).'		
OPS17	Aircraft operators should require the flight crew to carefully evaluate operational safety before selecting/accepting an approach and landing runway including the following: weather conditions (in particular cross and tailwind), runway condition (dry, wet or contaminated/slippery), inoperable equipment and aircraft and flight crew performance in order to reduce the runway excursion risks.	Aircraft Operator.	**End of 2023**
OPS18	Aircraft operators should clearly define stabilized approach, landing and go–around polices in their operations manual. These polices have to be aligned with regulations requirements and manufacturers guidance. Supplementing SOP should include the requirement for completion of the landing checklist and flying with the final approach speed latest at the defined approach/landing gate. These SOP should include appropriate means for the Pilot Monitoring (PM) to effectively monitor and if needed, intervene. To properly implement the SOPs and defined policies, aircraft operators have to deliver appropriate training.	Aircraft Operator.	**End of 2023**
OPS19	Aircraft operators should publish SOP and guidance and provide training highlighting the importance of active monitoring and effective intervention by the pilot monitoring (PM) during descent, approach, approach path management and landing. Actions to be taken by the PM and required reactions by the PF should be clearly documented in the official publication (e.g. SOP, Operations Manual, FCOM, etc). These publications should include guidance to achieve effective PM performance independent of rank and experience.	Aircraft Operator.	**End of 2023**
OPS15	Aircraft operators should develop SOP that include an assessment, possibly prior to top of descent, of landing performance based upon latest and best-available weather information. This calculation should not be performed using dispatch weather information. Flight crews should be informed on the type of landing distance data available (factored or unfactored) and which correlating safety factors are used. When possible, the crew should complete descent, approach, landing planning, set-up and briefings prior to the top-of-descent.	Aircraft Operator.	**End of 2023**
OPS16	Aircraft operators should develop a clear go-around policy, which should be further supplemented by a set of SOPs and guidance materials to put this policy into action. This go-around policy should enable every flight crew member on the flight deck to call for a go-around at any time unless an emergency situation dictates otherwise. In all cases, the SOP	Aircraft Operator.	**End of 2023**

REF	Recommendation	Action	Implementation Date
	should require both pilots to have and retain the required visual reference below DA/MDA with a go around call mandatory if either pilot loses it. A go-around should also be mandatory if the approach becomes un-stabilized below the specified approach/landing gate. Recurrent simulator training should be provided on the competencies of safe go-around in various stages during the approach and landing, including shortly prior or during touchdown (e.g. before activation of thrust reversers).'		
OPS17	Aircraft operators should require the flight crew to carefully evaluate operational safety before selecting/accepting an approach and landing runway including the following: weather conditions (in particular cross and tailwind), runway condition (dry, wet or contaminated/slippery), inoperable equipment and aircraft and flight crew performance in order to reduce the runway excursion risks.	Aircraft Operator.	**End of 2023**
OPS18	Aircraft operators should clearly define stabilized approach, landing and go–around polices in their operations manual. These polices have to be aligned with regulations requirements and manufacturers guidance. Supplementing SOP should include the requirement for completion of the landing checklist and flying with the final approach speed latest at the defined approach/landing gate. These SOP should include appropriate means for the Pilot Monitoring (PM) to effectively monitor and if needed, intervene. To properly implement the SOPs and defined policies, aircraft operators have to deliver appropriate training.	Aircraft Operator.	**End of 2023**
OPS19	Aircraft operators should publish SOP and guidance and provide training highlighting the importance of active monitoring and effective intervention by the pilot monitoring (PM) during descent, approach, approach path management and landing. Actions to be taken by the PM and required reactions by the PF should be clearly documented in the official publication (e.g. SOP, Operations Manual, FCOM, etc). These publications should include guidance to achieve effective PM performance independent of rank and experience.	Aircraft Operator.	**End of 2023**
OPS20	Aircraft operators should publish SOP and guidance for their pilots not to conduct auto-land approach manoeuvres at airports when LVP are not in force, unless: - the ILS critical and sensitive areas are protected, - ATC had been informed and reassurance of ILS sensitive area protection had been received Or - specific precautions taken and risk analysis has been performed. More information is available in the guidance material. Or - aircraft is demonstrated robust to non-protection of ILS sensitive area	Aircraft Operator.	**End of 2023**

REF	Recommendation	Action	Implementation Date
OPS21	Aircraft operators should clearly define their policy for a safe landing and publish it in their SOP and Operations Manuals. This policy should clearly define acceptable touchdown limits and prohibit intentional long- and short-landings – e.g. for minimizing runway occupancy or minimizing taxi time to the gate. The supplementing SOPs and guidance should include means, methods and responsibilities on how a crew will identify and act on such limits. Appropriate classroom and simulator training should be provided.	Aircraft Operator.	**End of 2023**
OPS22	Aircraft operators should publish on SOP and guidance clear policy for landing techniques that aligns with ICAO Global Reporting Format and manufacturer guidance for all runway states and environmental conditions he aircraft operators should require their flight crew to always favour a go-around or diversion rather than to attempt a landing when approaching wet, slippery/contaminated runways without appropriate stopping margin and/or in limiting wind situations. Appropriate training should be provided including training for ICAO Global Reporting Format.	Aircraft Operator.	**End of 2021**
OPS23	Aircraft operators should publish SOP for their flight crews when runway conditions are uncertain or actual or anticipated slippery wet, slippery or contaminated, to fully use all deceleration means, including speed brakes, wheel braking and reverse thrust irrespective of noise related restrictions until a safe stop is assured, unless this causes controllability issues.	Aircraft Operator.	**End of 2021**
OPS24	Aircraft operators should publish the SOP and guidance and provide training highlighting the importance of active monitoring, including monitoring of the activation of the stopping devices on landing, and effective intervention during landing associated with Pilot Monitoring duties and performance. Appropriate training should be provided.	Aircraft Operator.	**End of 2023**
OPS25	Aircraft operators should define policies and procedures to address bounced landings. Whenever available, aircraft operators should take into account and include manufacturer's guidance. Moreover, aircraft specific and appropriate training, including simulator training, should be provided for flight crews.	Aircraft Operator.	**End of 2023**
OPS26	Aircraft operators should develop guidance whenever a change of control during landing roll out has to take place and require their flight crews to brief and agree on the planned runway exit taking into account the friction status of runway and runway exit, whenever available. When a change of control is necessary during roll-out, this should be performed below taxi speed and when the aircraft trajectory is stable.	Aircraft Operator.	**End of 2023**

REF	Recommendation	Action	Implementation Date
OPS27	Aircraft operators should implement policy, technical solutions or SOP which confirm aircraft is lining up on the planned runway, its centreline and via the correct intersection.	Aircraft Operator.	**End of 2023**
OPS28	Aircraft operators should publish SOP and guidance for their flight crew not to accept line-up, backtrack or take-off clearances until pre-take-off preparation (incl. cabin secure), procedures and checklists are completed to the appropriate point which permits accomplishing the associated manoeuvre without delay and have reported to ATC "ready for departure" Aircraft operators should publish an explicit SOP for "rolling take-offs".	Aircraft Operator.	**End of 2023**
OPS29	Aircraft operators should foster a culture that stimulates safe behaviour, which encourages risk-averse decision-making by flight crews.	Aircraft Operator.	**Ongoing**
OPS30	Aircraft operators should when determining their TEM strategies and SOPs, identify runways with a remaining safety margin of less than 400m/1200ft after application of all required safety factors as safety critical.	Aircraft Operator.	**End of 2023**
OPS31	Aircraft operators should monitor go-around policy compliance through their FDM programs and establish go-around Safety Performance Indicators (SPIs) for monitoring through their SMS. In addition to monitoring go-arounds, aircraft operators should also monitor discontinued approaches.	Aircraft Operator.	**End of 2023**
OPS32	Aircraft operators should: 1) Define an Unstable Approach followed by landing as a mandatory reporting event by the flight crew and; 2) Minimize the need to report a go-around due to an unstable approach unless there is another significant event in relation to the go-around, e.g. flap overspeed.	Aircraft Operator.	**End of 2023**
OPS33	Aircraft operators, for aircraft equipped with EFBs and when technically feasible, should systematically compare the EFB take-off performance loggings with the relative FDM data to identify the take-off runway excursion risks.	Aircraft Operator.	**End of 2023**
OPS34	Aircraft operators, for aircraft equipped with EFBs and when technically feasible, should display on the EFB the FULL RWY with its planned TO RWY holding position to increase the situational awareness of the crew on the intended T/O position.	Aircraft Operator.	**End of 2023**
OPS35	Aircraft operators should consider observational procedures (e.g. Line Operations Safety Audits) to identify runway excursion safety risks precursors and best practices which cannot be captured by the traditional reporting or FDM.	Aircraft Operator.	**End of 2023**

RECOMMENDATIONS TO AIRCRAFT MANUFACTURER

REF	Recommendation	Action	Implementation Date
MAN1	Aircraft manufacturers should present takeoff and landing performance information for dispatch and time-of-arrival for the full range of reportable runway conditions, using common and shared terminology and to agreed standards, set out in FAA ACs 25-31 and 25-32.	Aircraft Manufacturer.	**End of 2025**
MAN2	Training material promulgated by aircraft manufacturers and aircraft training providers should emphasize the necessity of making best use of deceleration means, including speed brakes, wheel braking and reverse thrust in a timely manner, until a safe stop is assured, and in particular when conditions are uncertain or when runways are wet or contaminated by applying full braking devices, including reverse thrust, until a safe stop is assured.	Aircraft Manufacturer.	**End of 2023**
MAN3	On-board real time performance monitoring and alerting systems that will assist the flight crew with the land/go-around decision and alert when more deceleration force is needed during the landing roll should be made widely available.	Aircraft Manufacturer.	**End of 2027**
MAN4	The aviation industry should develop systems and flight crew manuals to help flight crews calculate landing distances easily and reliably in normal and non-normal conditions. Systems should have a method to apply recommended assumptions. All landing distance computing tools available for the aircraft (FMS, EFB) and on-board real time performance monitoring and alerting systems (e.g. ROAAS, etc.) should be consistent with the overall harmonized set of data used for landing performance assessment. Whenever consistency between on-board alert triggering thresholds and landing distance computation methods available to the crew cannot be entirely achieved, means to determine these thresholds for the planned conditions and guidance to the flight crew on a recommended course of action should be provided.	Aircraft Manufacturer.	**End of 2025**
MAN5	Electronic Flight Bag manufacturers and providers should develop user interfaces for the calculation and data entry of the take-off and landing performance data, designed to minimise the possibility of errors introduced by the pilot. EFB systems should enable the flight crew to perform independent determination of takeoff and landing data and to implement, where possible, an automatic crosscheck of inputs and to ensure correct insertion of the data in the avionics. EFB systems should use terminology and presentation of data consistent with aircraft systems and aircraft documentation to the extent practical. Standard Operating procedures should be developed to support a crosscheck of performance data by both pilots	Aircraft Manufacturer.	**End of 2025**
MAN6	Manufacturers should monitor and analyse (worldwide) runway excursions involving the aeroplanes they support and share the lessons learned – where feasible.	Aircraft Manufacturer.	**Ongoing**

REF	Recommendation	Action	Implementation Date
MAN7	Manufacturers should provide information about effective crosswind landing and take-off techniques including in low visibility when required.	Aircraft Manufacturer.	**End of 2023**
MAN8	Manufacturers should consider a function able to:Use aircraft data to compute braking action (i.e. maximum achievable tire-runway friction when braking is friction limited).Display it to the crew to assist pilot's braking action report to air traffic control (PiRep). Convey it, just after landing, to airport operators and to the aircraft operator(s).	Aircraft Manufacturer.	**End of 2027**
MAN9	Manufacturers should consider to make available flight deck functionality enabling an accuracy of the 3D aircraft trajectory with regards to the runway (including the touch-down point), especially for degraded visibility landings. For example, in order to satisfy this recommendation manufacturers could consider to make available: - Expanded Autoland. Or - Functions that provide additional information to the flight crew to improve positional awareness of the aircraft relative to the landing runway.	Aircraft Manufacturer.	**End of 2027**
MAN10	Aircraft manufacturers and FDA service providers should provide adequate interfaces and consider developing additional services for Flight Data Analysis, to help operators identify precursors to runway excursions. For example, this could include services to identify: - Discrepancies on runway surface conditions (comparing experienced conditions with ATC reported ones) - Reduced aircraft performance margins at landing or take-off, by comparing actual data (such as deceleration and distances) with the expected aircraft performance according to manufacturer models.	Aircraft Manufacturer.	**End of 2023**
MAN11	Manufacturers should consider a real-time take-off performance monitoring function in order to reduce the risk of runway excursion during take-off, including aircraft performance related or wrong position scenarios.	Aircraft Manufacturer.	**End of 2027**
MAN12	Manufacturers should consider to make available systems that provide flight path and energy state awareness in order to aid the flight crew to better anticipate and maintain stability throughout the entire approach.	Aircraft Manufacturer.	**End of 2027**
MAN13	Manufacturers should provide recommendations in their operational documentation for the use of automatic braking when landing on wet or contaminated runways, when appropriate, to minimize delays in brake application.	Aircraft Manufacturer.	**End of 2021**

REF	Recommendation	Action	Implementation Date
MAN14	Manufacturers should consider to make available on-board real time stabilized approach monitoring systems that provide alerts when there is a deviation from stable approach criteria. In those cases where other alerting systems are used in combination (e.g. ROAAS), the alerting systems must be consistent to avoid unnecessary go-arounds.Manufacturers should provide on-board real time stabilized approach monitoring systems that provide alerts when there is a deviation from c stable approach criteria. In those cases where other alerting systems are used in combination (eg ROAAS), the alerting systems must be fully harmonized to prevent conflicting information. The system should not lead to unnecessary go-arounds.	Aircraft Manufacturer.	**End of 2027**
MAN15	Manufacturers should provide on-board real time means to enhance position awareness with respect to runways on final approach and ground operations to addresses risks of aircraft lining up on: - The incorrect runway for landing or departure. - A taxiway for landing or departure. - The incorrect intersection for departure.	Aircraft Manufacturer.	**End of 2027**
MAN16	Whenever new functionality is created that is not supported by existing regulatory guidance, that functionality should be preferably supported by development of a MOPS by a standards organization.	Aircraft Manufacturer.	**Ongoing**

RECOMMENDATIONS TO REGULATORS AND ICAO			
REF	**Recommendation**	**Action**	**Implementation Date**
REG1	Regulators should ensure that: - The national/regional regulations are in line with the relevant ICAO standards and recommended practices; and - All infrastructure, practices and procedures relating to runway operations are designed and remain in compliance with such national/regional regulations.	Regulators.	**Ongoing**
REG2	Regulators should enhance the focus on the prevention of runway excursions in their oversight activities by taking into account best practices (e.g. EAPPRE), in addition to their national/regional regulatory requirements.	Regulators.	**Ongoing**
REG3	Ensure that the risk of runway excursion is included as part of runway safety in the State Safety Plan and provide safety performance indicators to monitor/demonstrate the effectiveness of any State or industry initiatives.	Regulators.	**Ongoing**
REG4	As part of their oversight activities, Regulators should ensure close cooperation between ground handling service providers, aircraft operators, aerodrome operators and air navigation service providers, with regard to the prevention of runway excursions. This cooperation will be a part of an effective implementation of SMS of the relevant organisations, verified by the respective regulator through regular assessments and safety performance indicator monitoring.	Regulators.	**Ongoing**
REG5	Ensure that any noise mitigation rules required to be implemented by aerodromes should be subject to regular and coordinated hazard identification and risk assessment, to ensure they do not increase the likelihood of runway excursions, in particular in relation to operations on contaminated runways.	Regulators.	**Ongoing**
REG6	Ensure a continued focus on training for pilots, air traffic controllers, AFISOs, and aerodrome personnel, which includes runway excursion prevention. Ensure the continuous review and improvement of the respective training programmes by the regulator and Training Organisations, through the use of performance indicators.	Regulators.	**End of 2022**
REG7	Assess the performance of aircraft operators' processes for: - Safety data collection (e.g. flight data monitoring and reporting). - Identification and analysis of precursors and causal factors. Ensure that aircraft operators are participating in safety data sharing programs, e.g. Data4Safety.	Regulators.	**End of 2022**
REG8	As part of safety promotion, ensure EAPPRE V2 is shared with relevant stakeholders to ensure that the causal and contributory factors of runway excursion continue to be understood, enabling organisations to further enhance effective runway excursion prevention measures.	Regulators.	**Ongoing**

REF	**Recommendation**	**Action**	**Implementation Date**
REG9	States should assess the performance and success of safety information sharing networks among all users of the aviation system including the extent of free exchange of information on actual and potential safety deficiencies.	Regulators.	**Ongoing**
REG10	States should establish a national runway safety forum/network which includes representatives from aircraft operators, ANSPs, aerodromes and regulators where best practices and learning can be shared. The National forum/network should include key representatives from Local Runway Safety Teams. National best practices should be shared regional/globally through regional/global knowledge platforms.	Regulators.	**End of 2022**
REG11	States should measure the effectiveness of the EAPPRE recommendations, for example by collaboratively developing harmonised performance indicators or success factors.	Regulators.	**End of 2022**
REG12	REG12 a. Regulators and ICAO should consider and adopt regulatory measures for preventing visual confusion during line-up between runway edge and centreline lights leading to misalignment with the runway centreline. This should also take into account the effects of low visibility and runway contamination and the effect of using various light colours and patterns to differentiate the runway centreline and edge lighting systems. REG12 b. Regulators and ICAO should consider the guidance needs of the individual aircraft, and adopt provisions that disassociate the installation of taxiway centreline lights from the aerodrome traffic density.	ICAO and Regulators.	**End of 2025**
REG13	Except where runway TDZ lights are provided, regulators and ICAO should upgrade to a standard the use of simple TDZ lighting as an aid to enhance landing (touch down point) accuracy.	ICAO and Regulators.	**End of 2025**
REG14	ICAO should investigate improvements in marking and lighting systems that may enhance the simple TDZ lighting system.	ICAO.	**End of 2025**
REG15	ICAO should consider to upgrade to a standard the introduction of runway centreline lights for: - CAT I runways; - Runways used for take-off with RVR of the order of 400m or higher when the runway is used by high-speed aircraft, particularly where the width between the runway lights is greater than 50 m.	ICAO.	**End of 2025**
REG16	Recommendation still in discussion: Support the development of approved signal in space SBAS models to allow certification of Autoland on LPV 200 procedures as part of a wider initiative to promote and encourage the use of all types of GNSS approaches to a wider set of aerodromes that currently have no IFP.	Regulators.	

REF	Recommendation	Action	Implementation Date
REG17	Regulators and ICAO should launch initiatives or working groups having the objective to define a rulemaking baseline for video based navigation to supplement (and/or replace) traditional navigation means in the visual segment. Such capacity would allow enhancing availability of advance functions such as autoland and veer-off prevention warnings.	ICAO and Regulators	**End of 2025**

RECOMMENDATIONS FOR R&D

REF	Recommendation	Action	Implementation Date
R&D1	Investigate a awareness and alerting system when an aircraft experiences abnormal/significant lateral deviation during final stages of the landing.	States, international organisations and the Industry.	**End of 2030**
R&D2	Conduct research on transport-category aircraft, to extend autoland capacity to any runway states.	States, international organisations and the Industry.	**End of 2030**
R&D3	Improve methods for assessing runway micro texture. Make pilots and aerodrome operators aware of the impact of a poor micro texture and of the shortfalls of current industry practice.	States, international organisations and the Industry.	**End of 2030**
R&D4	Develop models for assessing runway wetness, particularly the depth.	States, international organisations and the Industry.	**End of 2030**
R&D5	Explore the accuracy of and develop new automatic runway condition monitoring systems.	States, international organisations and the Industry.	**End of 2030**
R&D6	Research ways to improve graded area of wet runway strips to mitigate the damage to aircraft when veering off a runway.	States, international organisations and the Industry.	**End of 2030**
R&D7	Research and develop functions that provide additional flight path and energy information (e.g. such as FPV symbology) in order to help the flight crew to better anticipate and maintain stability at the gate and below	States, international organisations and the Industry.	**End of 2030**
R&D8	R&D efforts should be conducted to develop on-board real time stabilised approach monitoring (upstream of ROAAS function at higher altitudes eg FL 200). Such systems should ensure that they are harmonized with other systems such as ROAAS and RAAS.	States, international organisations and the Industry.	**End of 2030**

Logos of Organisations that supported the initiative: