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REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
No. : AC/AGA/014R00
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AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT:

Global Reporting Format for Runway Surface Condition

EFFECTIVE DATE:

04 November 2021

CANCELLATION:

Nil.

GENERAL:

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (AC).

1 Introduction

1.1 The International Civil Aviation Organization (ICAO) new methodology for assessing and reporting runway surface conditions, commonly known as the Global Reporting Format (GRF), will be globally applicable on 4 November 2021. It enables the harmonized assessment and reporting of runway surface conditions and a correspondingly improved flight crew assessment of take-off and landing performance.

1.2 This AC is to provide general information and instruction on the forthcoming implementation of GRF in Macao.

2 Applicability

The requirements contained in this AC are applicable to aerodromes within Macao.

3 Global Reporting Format

3.1 GRF is based on the characterization of the runway surface. The philosophy is that the aerodrome operator assesses the runway surface conditions whenever water, snow, slush, ice or frost are present on an operational runway; nonetheless, in the absence of severe weather associated with low temperatures, this AC is applicable to the aerodromes that are affected with only water as the contaminant.

3.2 The GRF consists of five fundamental elements:

- runway surface conditions;
- runway surface condition descriptors;
- runway condition assessment matrix (RCAM);
- runway condition report (RCR); and
- runway condition code (RWYCC).

3.2.1. There are four defined runway surface conditions:

(a) dry runway: a runway is considered dry if its surface is free of visible moisture and not contaminated within the area intended to be used;

(b) wet runway: the runway surface is covered by any visible dampness or water up to and including 3 mm deep within the intended area of use;

(c) slippery wet runway: a wet runway where the surface friction characteristics of a significant portion of the runway have been determined to be degraded; and

(d) contaminated runway: a runway is contaminated when a significant portion of the runway surface area (whether in isolated areas or not) within the length and width being used is covered by one or more of the substances listed in the runway surface condition descriptors.

3.2.2. There are eight contaminated runway surface condition descriptors:

(a) compacted snow;

(b) dry snow;

(c) frost;

(d) ice;

(e) slush;

(f) standing water, i.e. water of depth greater than 3 mm;

(g) wet ice; and

(h) wet snow.

3.3 Runway condition assessment matrix (RCAM) is a matrix allowing the assessment of the runway condition code, using associated procedures, from a set of observed runway surface condition(s) and pilot report of braking action. The details are shown in Table 1.

3.4 Runway condition report (RCR) is a comprehensive standardized report relating to runway surface conditions and its effect on the aeroplane landing and take-off performance. The information to be reported shall be included in an information string in the following order using only AIS-compatible characters:

3.4.1 aeroplane performance calculation section:

(a) aerodrome location indicator;

(b) date and time of assessment;

(c) lower runway designation number;

(d) RWYCC for each runway third;

(e) per cent coverage contaminant for each runway third;

(f) depth of loose contaminant for each runway third;

(g) condition description for each runway third; and

(h) width of runway to which the RWYCCs apply if less than published width.

3.4.2 situational awareness section:

(a) reduced runway length;

(b) loose sand on the runway;

(c) chemical treatment on the runway;

(d) taxiway conditions;

(e) apron conditions;

(f) approved, and published use of, measured friction coefficient; and

(g) plain language remarks.

Table 1 Runway condition assessment matrix (RCAM)

Runway condition assessment matrix (RCAM)			
Assessment criteria		**Downgrade assessment criteria**	
Runway condition code	**Runway surface description**	**Aeroplane deceleration or directional control observation**	**Pilot report of runway braking action**
6	• DRY	---	---
5	• FROST • WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth) ***Up to and including 3 mm depth:*** • SLUSH • DRY SNOW • WET SNOW	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
4	***−15ºC and Lower outside air temperature*:** • COMPACTED SNOW	Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
3	• WET ("slippery wet" runway) • DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW ***More than 3 mm depth:*** • DRY SNOW • WET SNOW ***Higher than −15ºC outside air temperature*[1]:** • COMPACTED SNOW	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	***More than 3 mm depth of water or slush:*** • STANDING WATER • SLUSH	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
1	• ICE [2]	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR
0	• WET ICE [2] • WATER ON TOP OF COMPACTED SNOW [2] • DRY SNOW or WET SNOW ON TOP OF ICE [2]	Braking deceleration is minimal to non- existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR

[1] Runway surface temperature should preferably be used where available.

[2] The aerodrome operator may assign a higher runway condition code (but no higher than code 3) for each third of the runway, provided the procedure in 3.8.4 is followed.

3.5 Runway condition code (RWYCC) is a number describing the runway surface condition to be used in the runway condition report. The RWYCC shall be reported and determined through the assessment of the following criteria:

- the percentage of coverage of contamination for each third of the runway;
- the type of contaminant which is selected from the RCAM;
- the depth of contamination; and
- surface air temperature (when applicable).

3.6 Runway surface condition is a description of the condition(s) of the runway surface used in the runway condition report which establishes the basis for the determination of the runway condition code for aeroplane performance purposes.

3.6.1 Reporting, in compliance with the runway condition report, shall commence when a significant change in runway surface condition occurs due to water.

3.6.2 Reporting of the runway surface condition should continue to reflect significant changes until the runway is no longer contaminated. When this situation occurs, the aerodrome operator will issue a runway condition report that states the runway is wet or dry as appropriate.

3.6.3 A change in the runway surface condition used in the runway condition report is considered significant whenever there is:

- any change in the RWYCC;
- any change in contaminant type;
- any change in reportable contaminant coverage according to Table 2;
- any change in contaminant depth according to Table 3; and
- any other information, for example a pilot report of runway braking action, which according to assessment techniques used, are known to be significant.

Table 2 Percentage of coverage for contaminants

Assessed per cent	*Reported per cent*
≤ 9	*NR*
10 – 25	25
26 – 50	50
51 – 75	75
76 – 100	100

Note – When the conditions are not reported, insert "NR" for the appropriate runway third(s).

Table 3 Depth assessment for contaminants

Contaminant	*Valid values to be reported*	*Significant change*
STANDING WATER	04, then assessed value	3 mm up to and including 15 mm

Note – For STANDING WATER, 04 (4 mm) is the minimum depth value at and above which the depth is reported. (From 3 mm and below, the runway third is considered WET).

3.7 Runway Condition Report (RCR)

3.7.1 Aeroplane performance calculation section

The aeroplane performance calculation section is a string of grouped information separated by a space " " and ends with a return and two line feed "≪≡" . This is to distinguish the aeroplane performance calculation section from the following situational awareness section or the following aeroplane performance calculation section of another runway.

(a) **Aerodrome location indicator:** a four-letter ICAO location indicator assigned to the aerodrome.

This information is mandatory.

Format: nnnn

Example: VMMC

(b) **Date and time of assessment:** date and time (UTC) when the assessment was performed by the trained personnel.

This information is mandatory.

Format: MMDDhhmm

Example: 09111357

(c) **Lower runway designation number:** a two- or three-character number identifying the runway for which the assessment is carried out and reported.

This information is mandatory.

Format: nn[L] or nn[C] or nn[R]

Example: 09L

(d) **Runway condition code for each runway third:** a one-digit number identifying the RWYCC assessed for each runway third. The codes are reported in a three-character group separated by a "/" for each third. The direction for listing the runway thirds shall be in the direction as seen from the lower designation number.

This information is mandatory.

When transmitting information on runway surface conditions by ATS to flight crews, the sections are, however, referred to as the first, second or third part of the runway. The first part always means the first third of the runway as seen in the direction of landing or take-off as illustrated in Figure 1 and 2 and detailed in ICAO PANS-ATM (Doc 4444).

Format: n/n/n

Example: 5/5/2

Note 1 – A change in RWYCC from, say, 5/5/2 to 5/5/3 is considered significant. (See further examples below).

Note 2 – A change in RWYCC requires a complete assessment taking into account all information available.

Note 3 – Procedures for assigning a RWYCC are available in 3.8.1 to 3.8.5.

(e) **Per cent coverage contaminant for each runway third:** a number identifying the percentage coverage. The percentages are to be reported in an up-to-nine character group separated by a "/" for each runway third. The assessment is based upon an even distribution within the runway thirds using the guidance in Table 2.

This information is conditional. It is not reported for one runway third if it is dry or covered with less than 10 per cent.

Format: [n]nn/[n]nn/[n]nn

Example: 25/50/100

NR/50/100 if contaminant coverage is less than 10% in the first third

25/NR/100 if contaminant coverage is less than 10% in the middle third

25/50/NR if contaminant coverage is less than 10% in the last third

With uneven distribution of the contaminants, additional information is to be given in the plain language remark part of the situational awareness section of the runway condition report. Where possible, a standardized text should be used.

Note. — When no information is to be reported, insert "NR" at its relevant position in the message to indicate to the user that no information exists (/NR/).

(f) **Depth of loose contaminant:** a two- or three-digit number representing the assessed depth (mm) of the contaminant for each runway third. The depth is reported in a six- to nine-character group separated by a "/" for each runway third as defined in Table 3. The assessment is based upon an even distribution within the runway thirds as assessed by trained personnel. If measurements are included as part of the assessment process, the reported values are still reported as assessed depths, as the trained personnel have placed their judgment upon the measured depths to be representative for the runway third.

Format: [n]nn/[n]nn/[n]nn

Examples: 04/06/12 [STANDING WATER]

This information is conditional. It is reported for STANDING WATER.

(g) **Condition description for each runway third:** to be reported in capital letters using terms specified in 2.9.5 of AACM Aeronautical Circular AC/AGA/010. The condition type is reported by any of the following condition type descriptions for each runway third and separated by an oblique stroke "/".

This information is mandatory.

DRY

STANDING WATER

WET

Format: nnnn/nnnn/nnnn

Example: WET/STANDING WATER/STANDING WATER

(h) **Width of runway to which the RWYCCs apply if less than published width** is the two-digit number representing the width of cleared runway in meters.

This information is optional.

Format: nn

Example: 30

If the cleared runway width is not symmetrical along the center line, additional information is to be given in the plain language remark part of the situational awareness section of the runway condition report.

3.7.2 Situational awareness section

All individual messages in the situational awareness section end with a full stop sign. This is to distinguish the message from subsequent message(s).

(a) **Reduced runway length:** This information is conditional when a NOTAM has been published with a new set of declared distances affecting the landing distance available (LDA).

Format: Standardized fixed text

RWY nn [L] or nn [C] or nn [R] LDA REDUCED TO [n]nnn

Example: RWY 22L LDA REDUCED TO 1450.

(b) **Loose sand on the runway**

This information is optional.

Format: RWY nn[L] or nn[C] or nn[R] LOOSE SAND

Example: RWY 02R LOOSE SAND.

(c) **Chemical treatment on the runway**

This information is mandatory.

Format: RWY nn[L] or nn[C] or nn[R] CHEMICALLY TREATED

Example: RWY 06 CHEMICALLY TREATED.

(d) **Taxiway conditions**

This information is optional.

Format: TWY [nn]n POOR

Example: TWY B POOR.

(e) **Apron conditions**

This information is optional.

Format: APRON [nnnn] POOR

Example: APRON NORTH POOR.

(f) **approved and published use of measured friction coefficient**

This information is optional.

Format: [State set format and associated procedures]

Example: [Function of State set format and associated procedures].

(g) **Plain language remarks using only allowable characters in capital letters**

Where possible, standardized text should be developed.

This information is optional.

Format: Combination of allowable characters where use of full stop « . » marks the end of the message.

Allowable characters:

A B C D E F G H I J K LM N O P Q R S T U V W X Y Z

0 1 2 3 4 5 6 7 8 9

/ [oblique stroke] "." [period]" " [space]

3.7.3 Complete information sting

An example of a complete information string prepared for dissemination is as follows:

Runway assessment performed at 9am on 12 July 2020 at Macau International Airport. A thunderstorm has passed and significant rain has fallen on the airport and surrounding region. The first third of the runway has 33% coverage of water up to 3mm. The middle third of the runway has 20% coverage of water up to 3mm. The last third of the runway has 50% coverage of water up to 3mm.

[RCR]

VMMC 07120100 16 5/6/5 50/25/50 NR/NR/NR WET/WET/WET

3.8 Runway condition code (RWYCC)

3.8.1 The assessed RWYCC to be reported for each third of the runway is determined using the assessment criteria in Table 1.

3.8.2 The variables, in Table 1, that may affect the runway condition code are:

- type of contaminant;
- depth of contaminant; and
- outside air temperature. Where available the runway surface temperature should preferably be used.

3.8.3 An assigned RWYCC 5, 4, 3 or 2 shall not be upgraded.

3.8.4 If 25 per cent or less area of a runway third is wet or covered by contaminant, a RWYCC 6 shall be reported.

3.8.5 If the distribution of the contaminant is not uniform, the location of the area that is wet or covered by the contaminant is described in the plain language remarks part of the situational awareness section of the runway condition report.

3.8.6 A description of the runway surface condition is provided using the contamination terms described in capital letters the assessment criteria in Table 1.

3.8.7 If multiple contaminants are present where the total coverage is more than 25 per cent but no single contaminant covers more than 25 per cent of any runway third, the RWYCC is based upon the judgment by trained personnel, considering what contaminant will most likely be encountered by the aeroplane and its likely effect on the aeroplane's performance.

3.8.8 If sand or other runway treatments are used to support upgrading, the runway surface is assessed frequently to ensure the continued effectiveness of the treatment.

3.8.9 The RWYCC determined from Table 1 should be appropriately downgraded considering all available means of assessing runway slipperiness, including the criteria in the same table.

3.8.10 Where available, the pilot reports of runway braking action should be taken into consideration as part of the ongoing monitoring process, using the following principle:

- a pilot report of runway braking action is taken into consideration for downgrading purposes; and
- a pilot report of runway braking action can be used for upgrading purposes only if it is used in combination with other information qualifying for upgrading.

3.8.11 Two consecutive pilot reports of runway braking action of POOR shall trigger an assessment if an RWYCC of 2 or better has been reported.

3.8.12 When one pilot has reported a runway braking action of LESS THAN POOR, the information shall be disseminated, a new assessment shall be made and the suspension of operations on that runway shall be considered.

Note — If considered appropriate, maintenance activities may be performed simultaneously or before a new assessment is made.

3.8.13 Table 1 shows the correlation of pilot reports of runway braking action with RWYCCs.

3.8.14 The RCAM is a tool to be used when assessing runway surface conditions. It is not a standalone document and shall be used in compliance with the associated procedures of which there are two main parts:

- assessment criteria; and
- downgrade assessment criteria.

4 Training

The training syllabus may include initial and periodic recurrent training in the following areas:

(a) aerodrome familiarization, including aerodrome markings, signs and lighting;

(b) aerodrome procedures as described in the aerodrome manual;

(c) aerodrome emergency plan;

(d) Notice to Airmen (NOTAM) initiation procedures;

(e) completion of/initiation procedures for RCR;

(f) aerodrome driving rules;

(g) air traffic control procedures on the movement area;

(h) radiotelephone operating procedures;

(i) phraseology used in aerodrome control, including the ICAO spelling alphabet;

(j) aerodrome inspection procedures and techniques;

(k) type of runway contaminants and reporting;

(l) assessment and reporting of runway surface friction characteristics;

(m) use of runway friction measurement device;

(n) calibration and maintenance of runway friction measurement device;

(o) awareness of uncertainties related to l) and m);

(p) low visibility procedures;

(q) basics of the global reporting format (GRF);

(r) runway condition assessment matrix (RCAM)components;

(s) determination along with downgrade and upgrade of RWYCC;

(t) measurement technique and assessment.

5 Reference Documents

For more details, it is referred to ICAO Annex 14 – Volume I: Aerodrome Design and Operations, ICAO Circular 355: Assessment, Measurement and Reporting of Runway Surface Conditions, ICAO Doc 9981: Procedures for Air Navigation Services – Aerodromes and the related ICAO Annexes.

Figure 1 - Reporting of runway condition code from ATS to flight crew for runway thirds

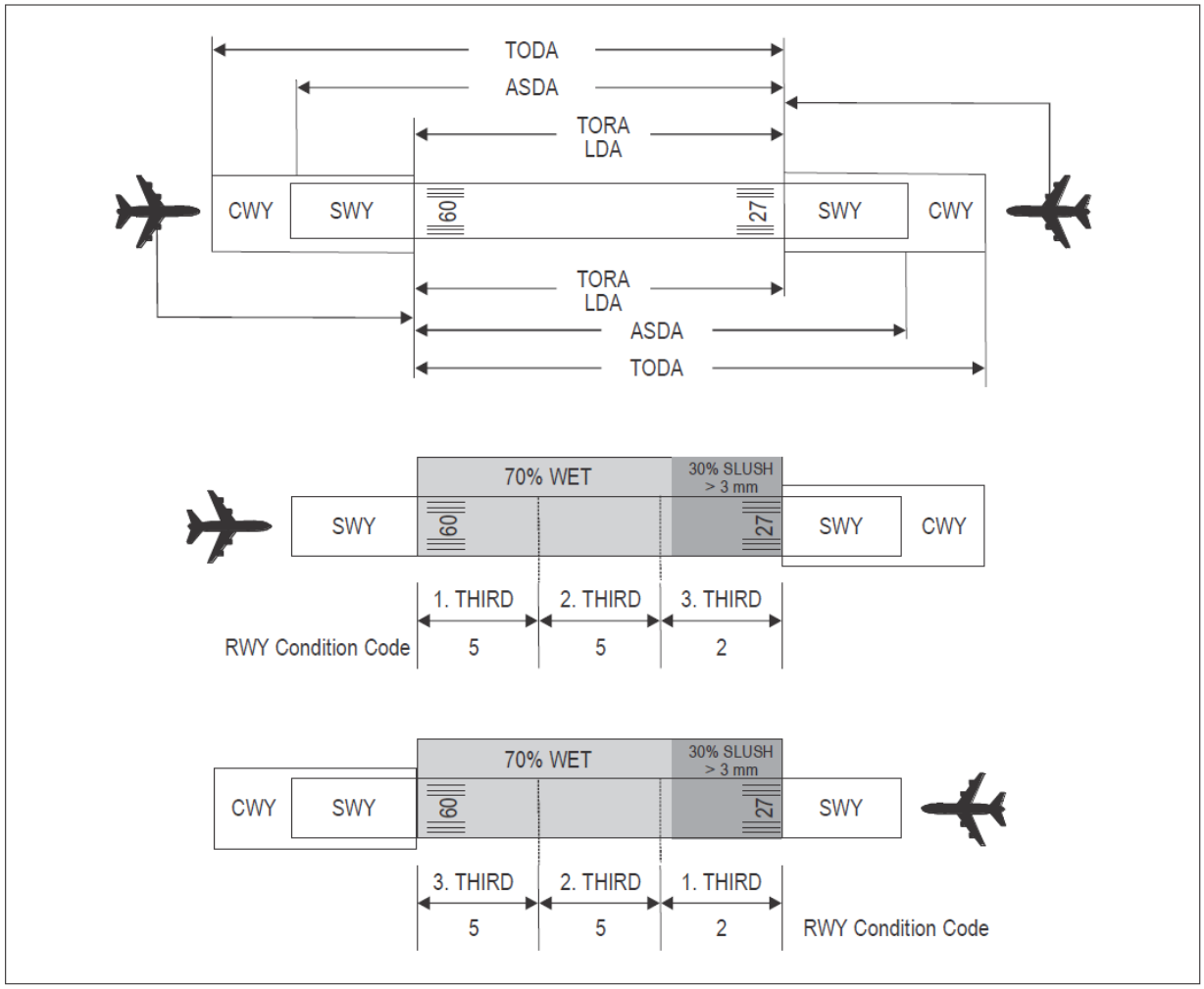
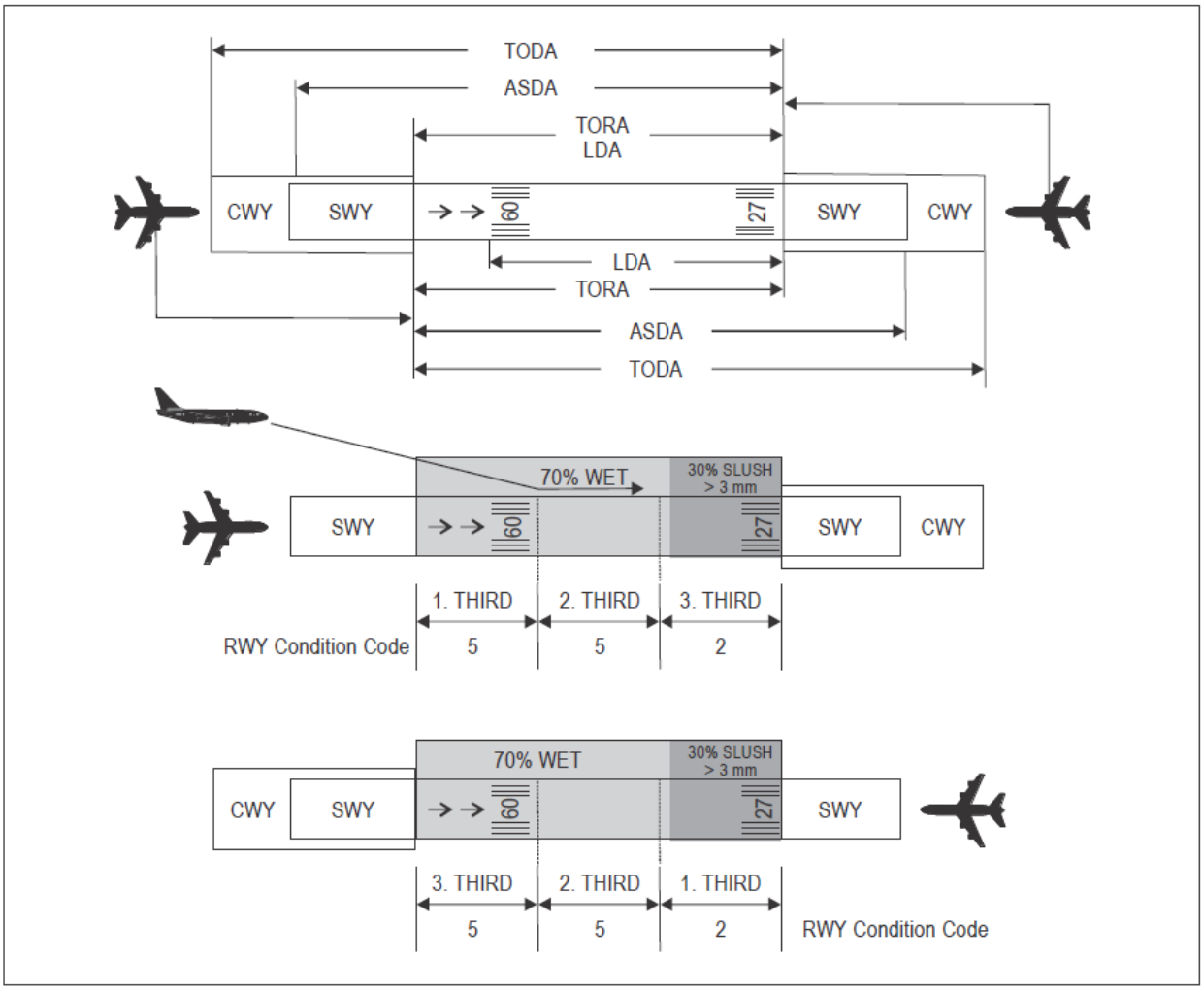


Figure 2 - Reporting of runway condition code from ATS to flight crew for runway thirds



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