Runway Centerline Lights and Displaced Thresholds

Presented by David B. Williams,
PE, RCDD, LEED AP, AAAE ACE Airfield Lighting

Illuminating Engineering Society Aviation Lighting Committee
2022 Technology Meeting

Rethinking Infrastructure®

Presenter

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  - PE, Professional Engineer in 31 States and counting
  - ACE, AAAE Airport Certified Employee (ACE) in Airfield Lighting
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  - LEED AP, USGBC LEED Accredited Professional
  - 18 years of experience in electrical engineering with a design focus in airfield lighting, lighting, lighting controls, power distribution, and telecommunication systems
  - Airfield Electrical Engineering Practice Lead for Arora Engineers
  - Bachelor of Science in Electrical Engineering from North Carolina State University in 2004

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Disclaimers

1. This presentation is not intended to be a guide for designing Airfield Lighting.

2. Engage a Licensed Electrical Engineer experienced with Airfield Electrical Designs and Products.

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WHAT Are Runway Centerline Lights?

L-850A

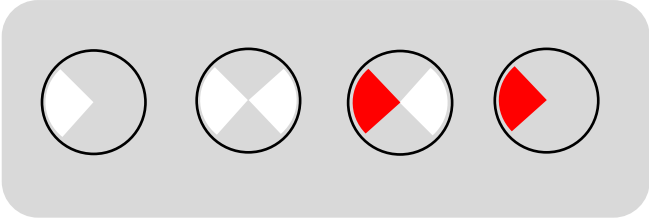
AC 150/5340-30

AC 150/5345-46

AC 150/5370-10 SPEC L-125

(1) L-830 Iso Xfmr / Fixture

(1) L-830 Iso Xfmr / Side



WHEN Are Centerline Lights Required?

AC 150/5340-30J 3.2

3.2. **Selection Criteria.**

Runway centerline lights and touchdown zone lights are required for CAT II and CAT III runways, and for CAT I runways used for landing operations below 2,400 ft (750 m) RVR.

3.2.1 Runway centerline lights are required on runways used for takeoff operations below 1,600 ft (480 m) RVR unless specifically approved by the FAA in an airline operator's specification for that runway.

3.2.2 See guidance in FAA Order 8900.1, *Flight Standards Information Management Systems (FSIMS*), Volume 4, Chapter 2, Section 9, "Lower than Standard Takeoff Minima".

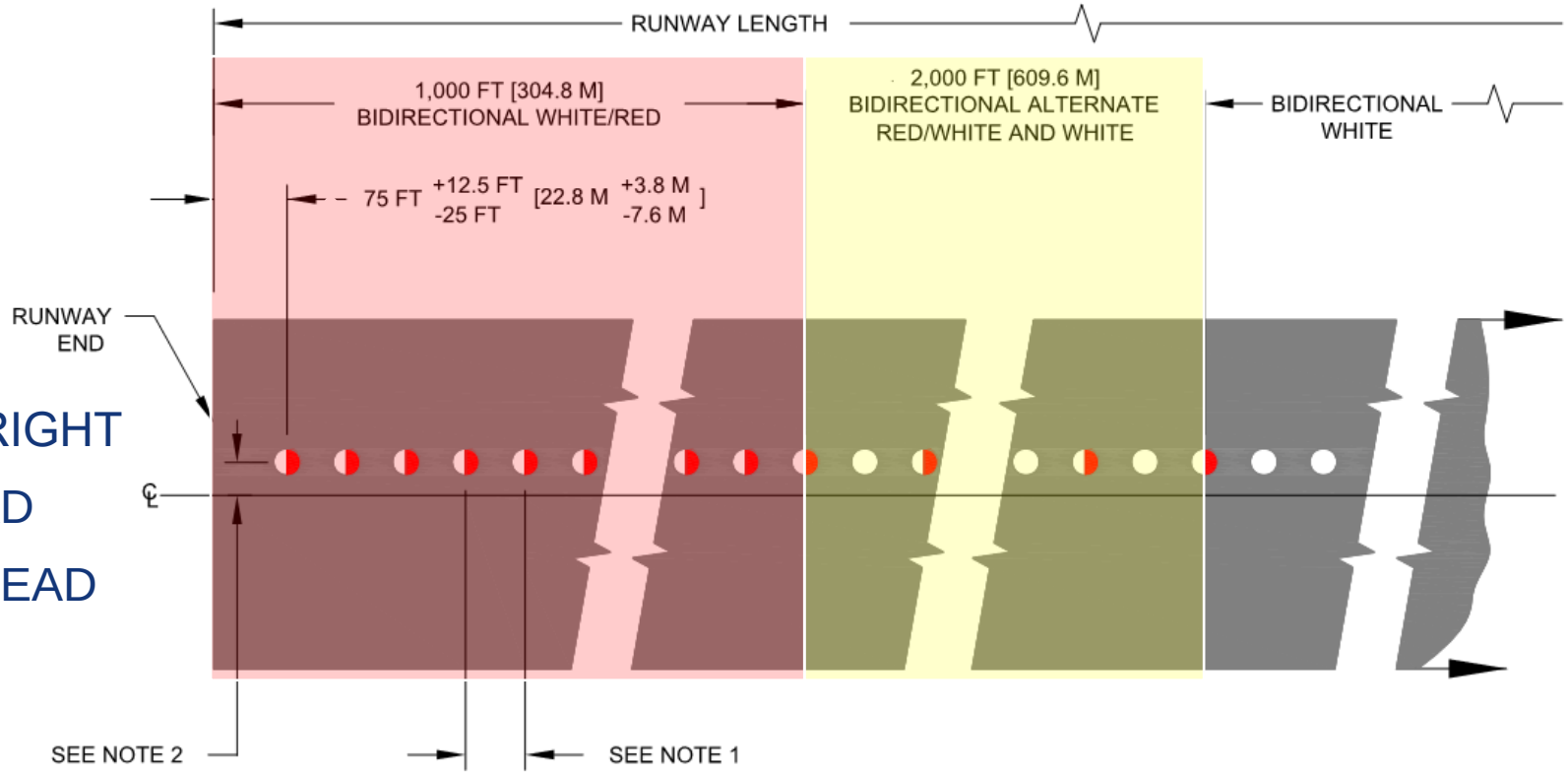
3.2.3 Although not operationally required, runway centerline lights are recommended for CAT I runways greater than 170 ft (50 m) in width or when used by aircraft with approach speeds over 140 knots Aircraft Approach Category (AAC).

HOW Are RW Centerline Lights Arranged?

AC 150/5340-30

NOTE:

1. REFER TO PARAGRAPH 3.3.1.1 FOR RUNWAY CENTERLINE LIGHT FIXTURES PLACEMENT AND TOLERANCES.
2. SPACE THE RCLs EQUALLY AT 50 FT [15.2 M] FOR THE FAA TYPE L-850A LIGHTS. THE LONGITUDINAL TOLERANCE IS ±2 FT [0.6 M].



WHITE TO WHITE – YOU'RE ALRIGHT

WHITE TO RED – LOOK AHEAD

RED TO RED – TIME TO DREAD

What About Displaced Thresholds?

AC 150/5340-30J 3.3.1.3

3.3. **Configuration.**

3.3.1 Runway Centerline Lighting.

3.3.1.1 **Location.**

The runway centerline lights are located along the runway centerline at 50 ft (15 m) equally spaced longitudinal intervals.

3.3.1.1.1 The longitudinal tolerance for runway centerline lights is ±2 ft (0.6 meter).

3.3.1.1.2 See Figure A-34 for a graphic of the runway centerline lighting layout. The line of runway centerline lights may be uniformly offset laterally to the same side of the physical runway centerline by a maximum of 2.5 ft (0.8 m) (tolerance ±1 inch (25.4 mm)), as measured from the physical runway centerline to the fixture centerline.

3.3.1.1.3 For any new runway, the light base installation must be no closer than 2 ft (0.6 m) (measured to the edge of the fixture base) to any pavement joints. Runway extensions of existing runways must use the convention already established for that runway.

3.3.1.1.4 See paragraph 4.3 and Figure A-46 for additional information about the taxiway centerline lighting location requirements related to runway centerline lights for major taxiway turnoffs. See AC 150/5340-1, *Standards for Airport Markings*, for additional information about runway centerline marking widths and locations.

3.3.1.2 **Color Coding.**

The last 3,000 ft (900 m) portion of the runway centerline lighting system is color coded to warn pilots of the impending runway end. Alternating red and white lights are installed, starting with red, as seen from 3,000 ft (900 m) to 1,000 ft (300 m) from the runway end, and red lights are installed in the last 1,000 ft (300 m) portion.

3.3.1.3 **Displaced Threshold.**

On runways with centerline lights, the centerline lights are extended into the displaced threshold area.

3.3.1.3.1 If the displaced area is equal to or less than 700 feet (110 m) in length, the centerline lights are blanked out in the approach direction.

3.3.1.3.2 For displaced threshold areas over 700 ft (110 m) in length, the centerline lights in the displaced area are circuited separately from the centerline lights in the non-displaced runway area to permit turning "off" the centerline lights in the displaced area during landing operations.

3.3.1.3.3 If the displaced threshold area also contains a medium intensity approach light system, the control of the approach lights and displaced threshold area centerline lights is interlocked to ensure that when the approach lights are "on", the displaced area centerline lights are "off", and vice versa.

3.3.1.3.4 If the displaced threshold area contains a high intensity approach lighting system, separate circuiting of the centerline lights in the displaced area is not required since the high intensity approach lights will "wash out" the centerline lights.

What About Displaced Thresholds?

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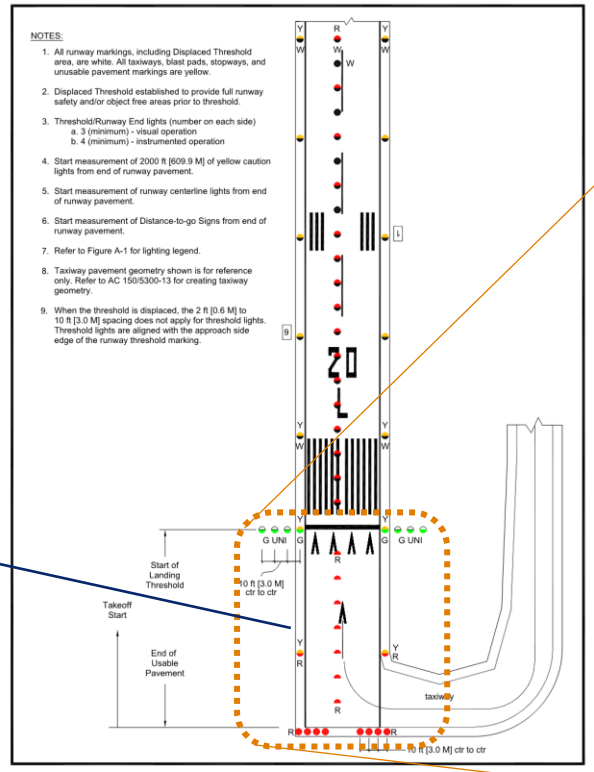
CASE 1 (≤700ft)

3.3.1.3.1 If the displaced area is equal to or less than 700 feet (110 m) in length, the centerline lights are **blanked out** in the approach direction.

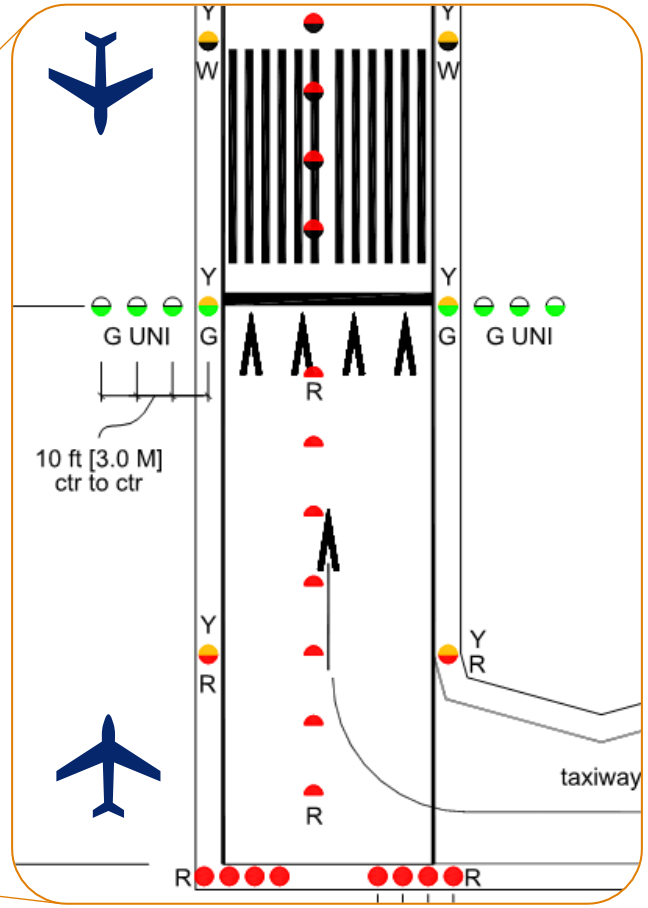
2/12/2018

AC 150/5340-30J
Appendix A

Figure A-8. Lighting for Runway with Displaced Threshold/Usable Pavement



≤700ft



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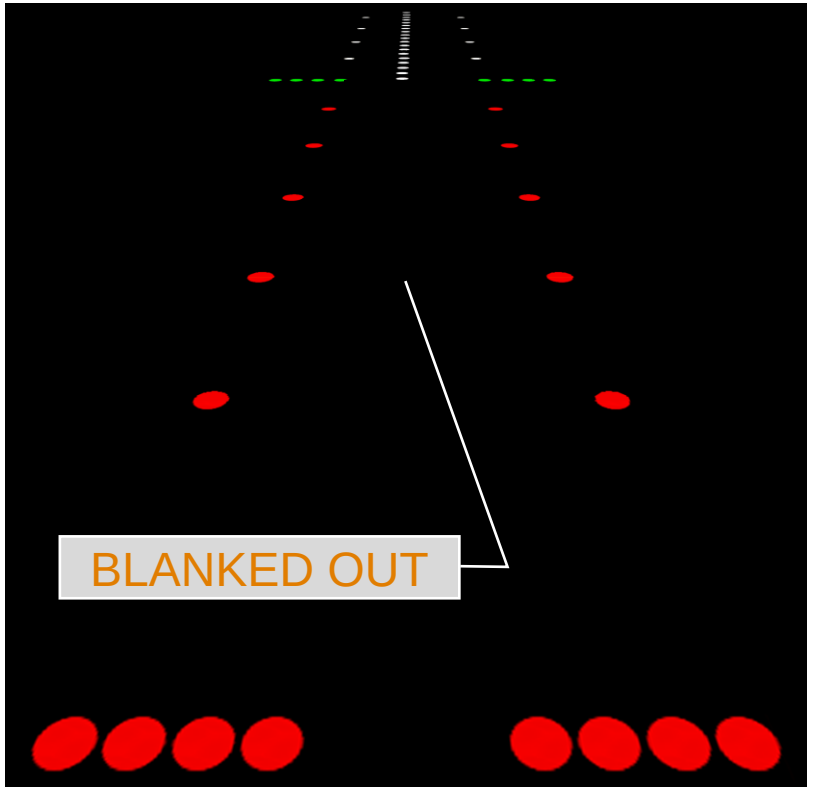
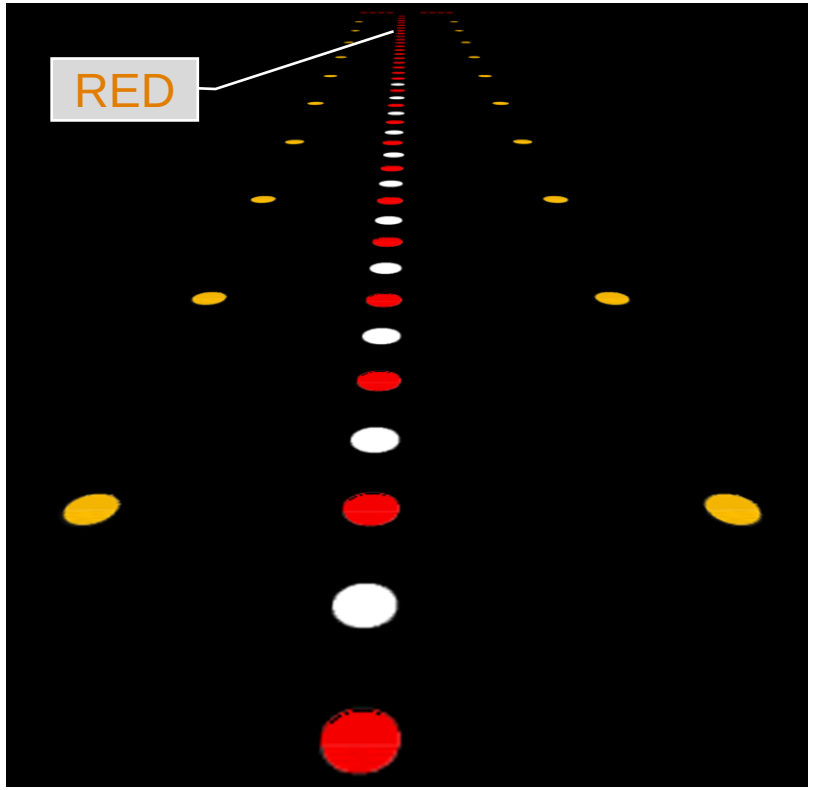


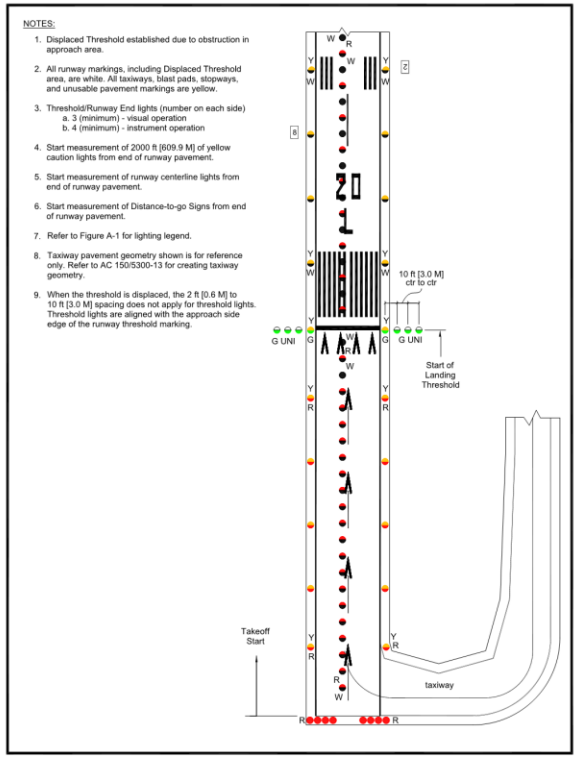


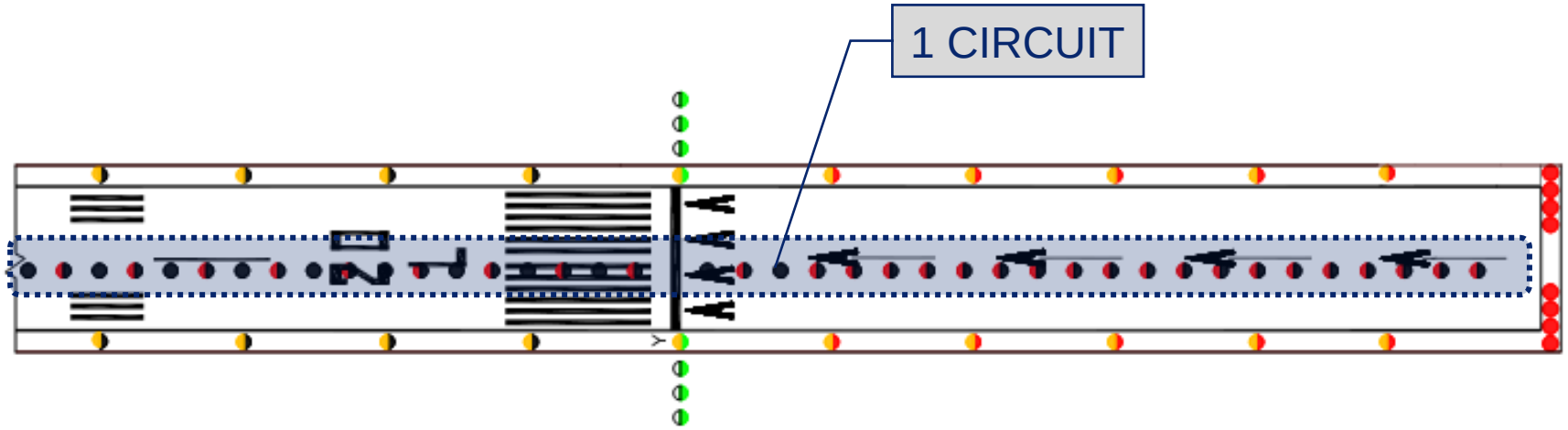
CASE 4 (>700ft w/ High Intensity ALS)

3.3.1.3.4 If the displaced threshold area contains a high intensity approach lighting system, **separate circuiting** of the centerline lights in the displaced area **is not required** since the high intensity approach lights will “wash out” the centerline lights.

2/12/2018 AC 150/5340-30J Appendix A

Figure A-7. Lighting for Runway with Displaced Threshold





High Intensity Approach Lighting Systems:
ALSF-2, ALSF-1, SSALS, SSALF, SSALR

CASE 4 (>700ft w/ High Intensity ALS)

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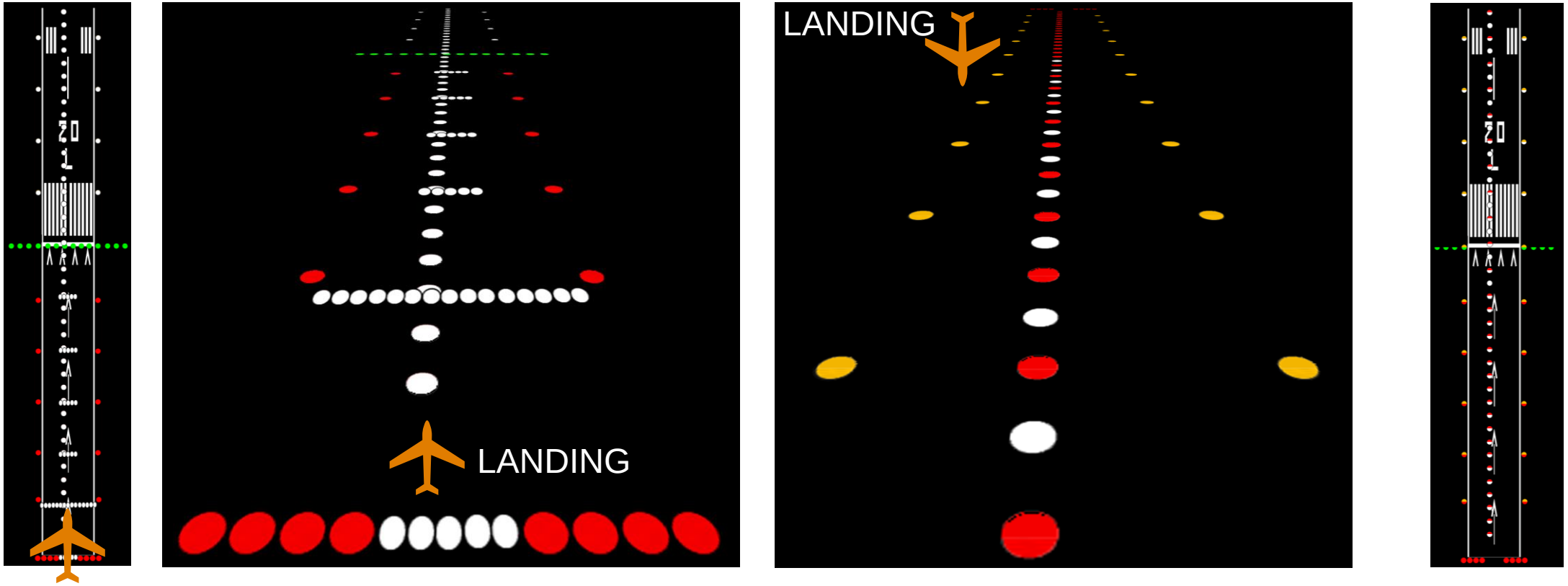

CASE 2 (>700ft w/o ALS)

3.3.1.3.2 For displaced threshold areas over 700 ft (110 m) in length, the centerline lights in the displaced area are **circuited separately** from the centerline lights in the non-displaced runway area to permit turning “off” the centerline lights in the displaced area during landing operations.

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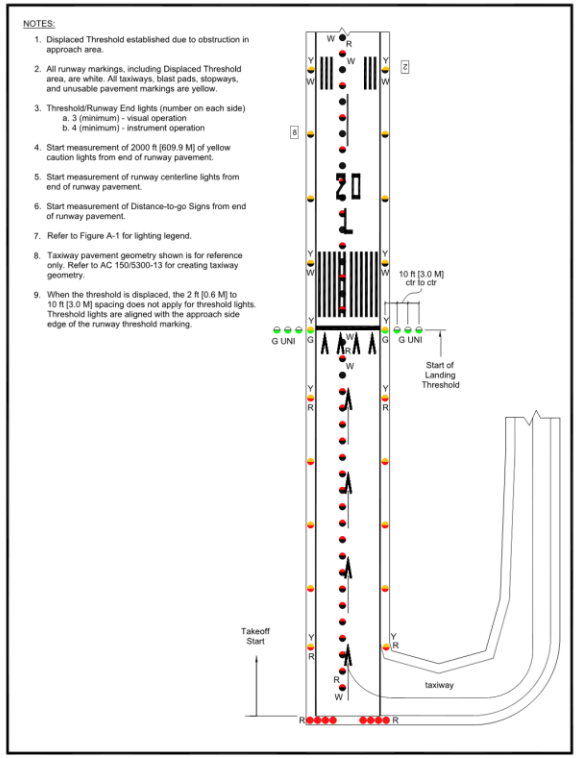

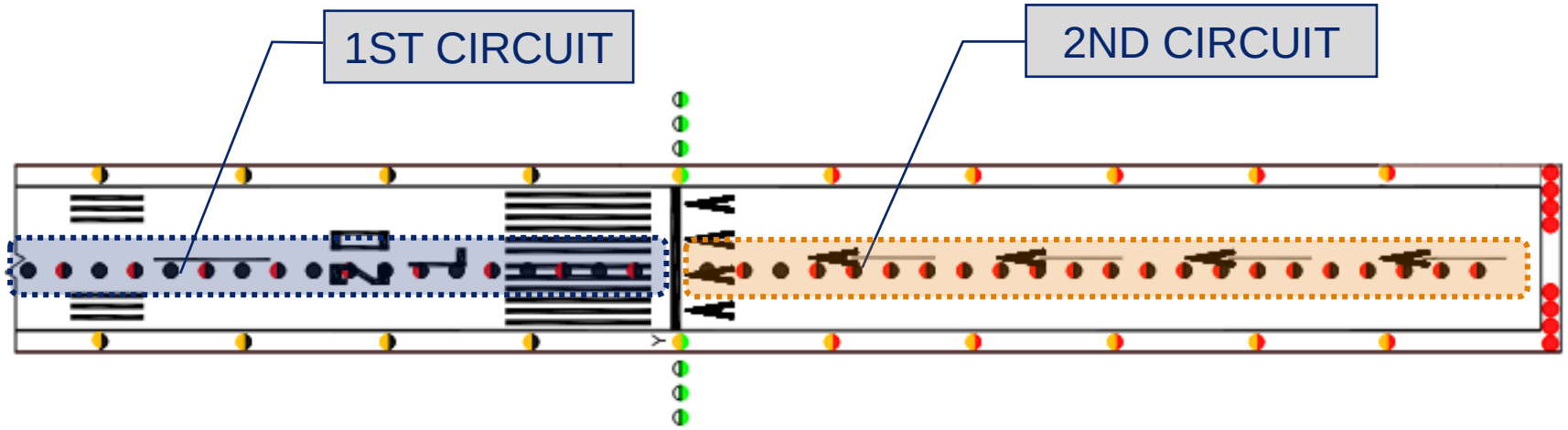

Landing Operations, Displaced CL lights = “OFF”
Takeoff Operations , Displaced CL lights = “ON”

CASE 2 (>700ft w/o ALS)

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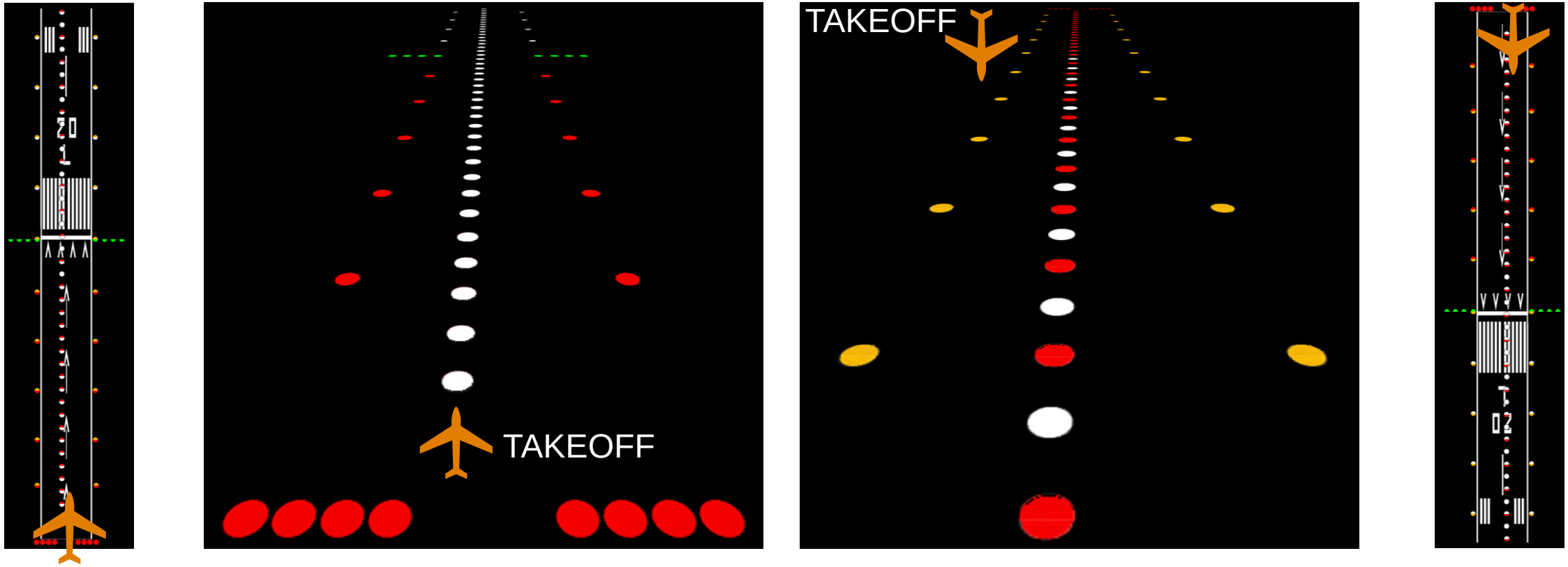

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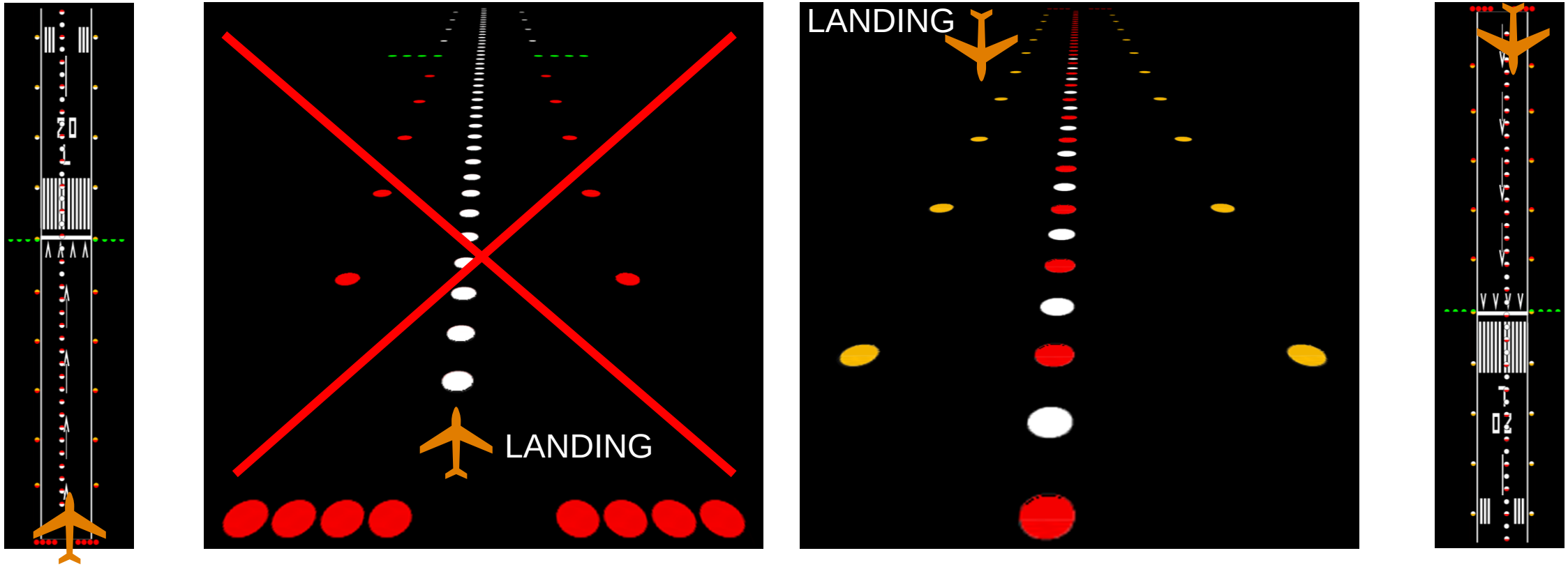

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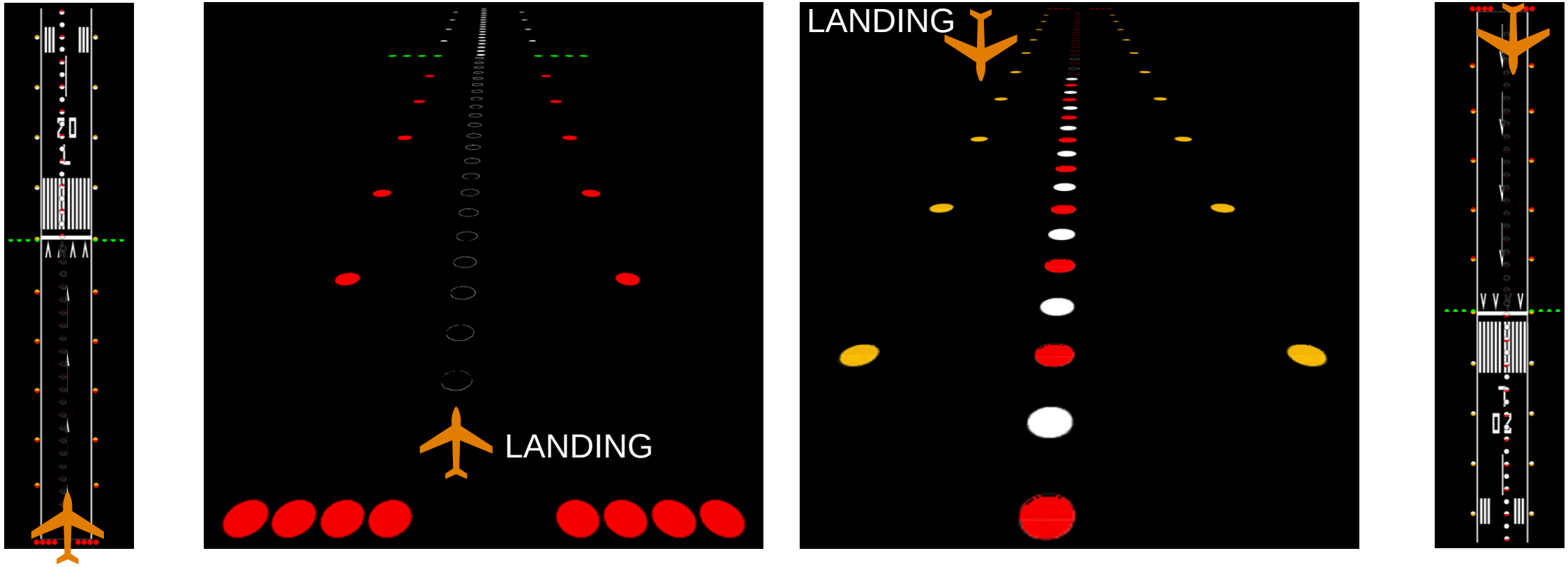
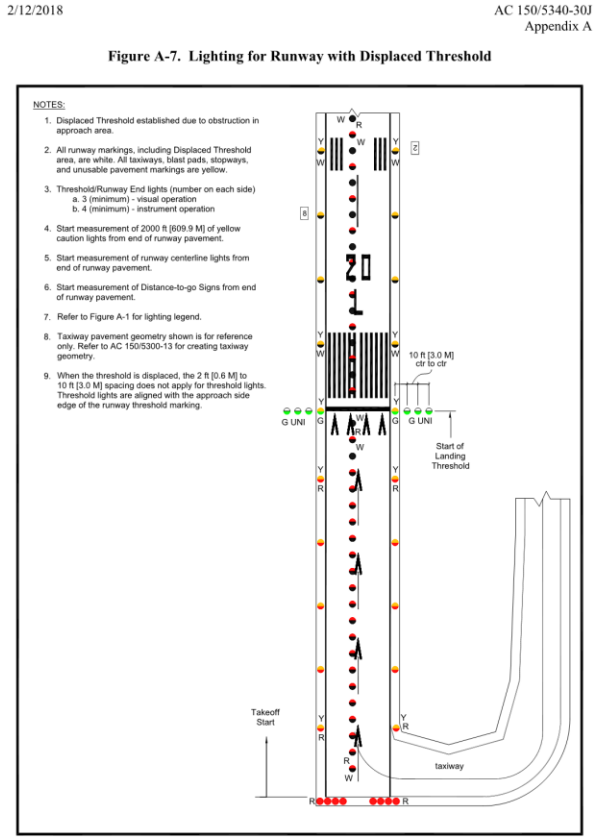
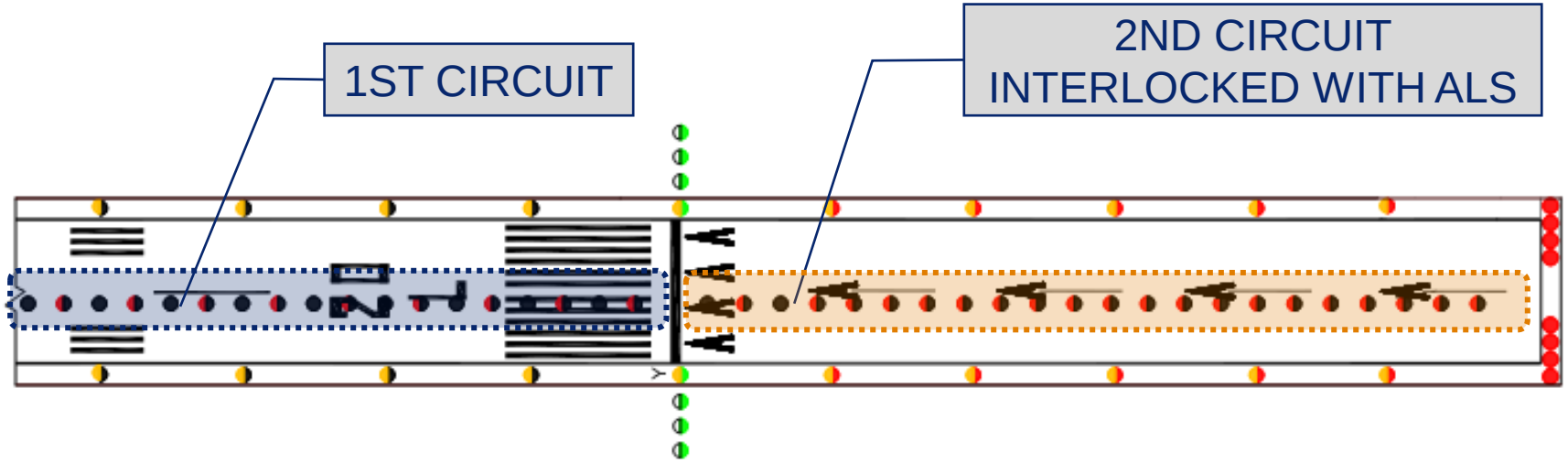


CASE 3 (>700ft w/ Medium Intensity ALS)

3.3.1.3.3 If the displaced threshold area also contains a medium intensity approach light system, the control of the approach lights and displaced threshold area CL lights is **interlocked** to ensure that when the approach lights are “on”, the displaced area CL lights are “off”, and vice versa.





Landing Operations
- Approach = “ON”
- Displaced CL lights = “OFF”

Takeoff Operations
- Approach = “OFF”
- Displaced CL lights = “ON”

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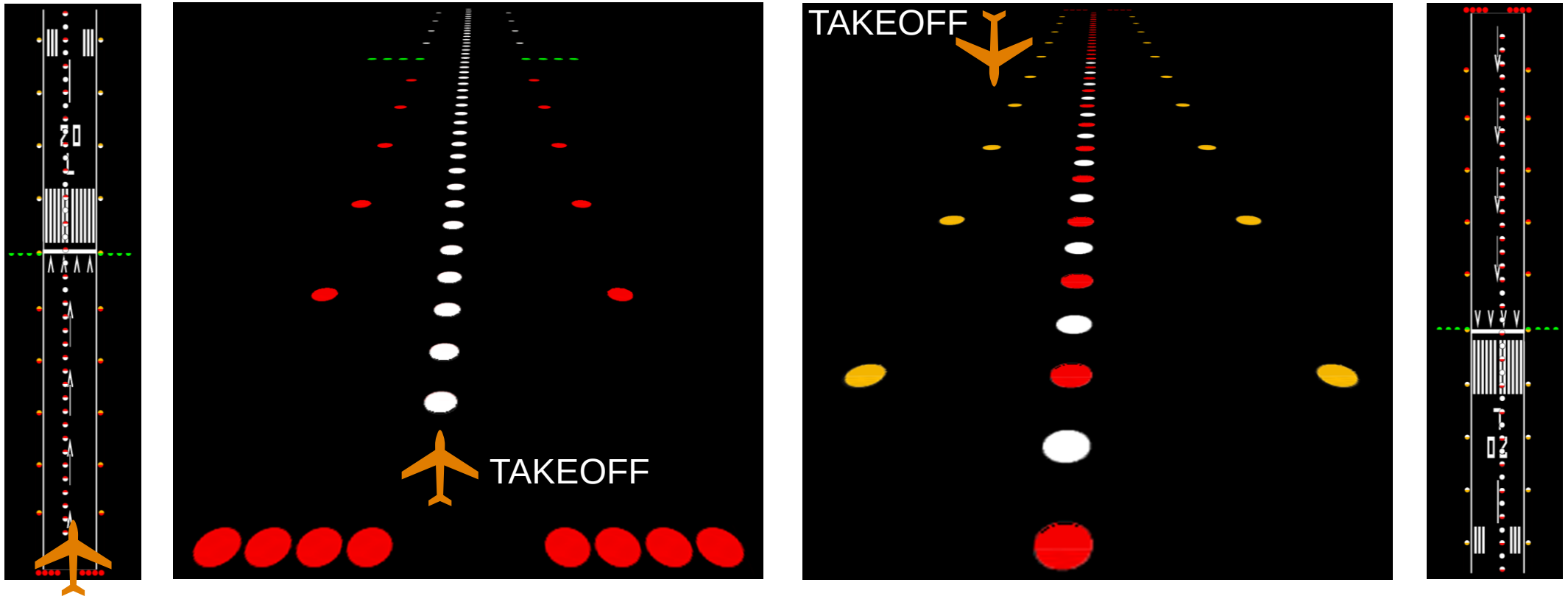

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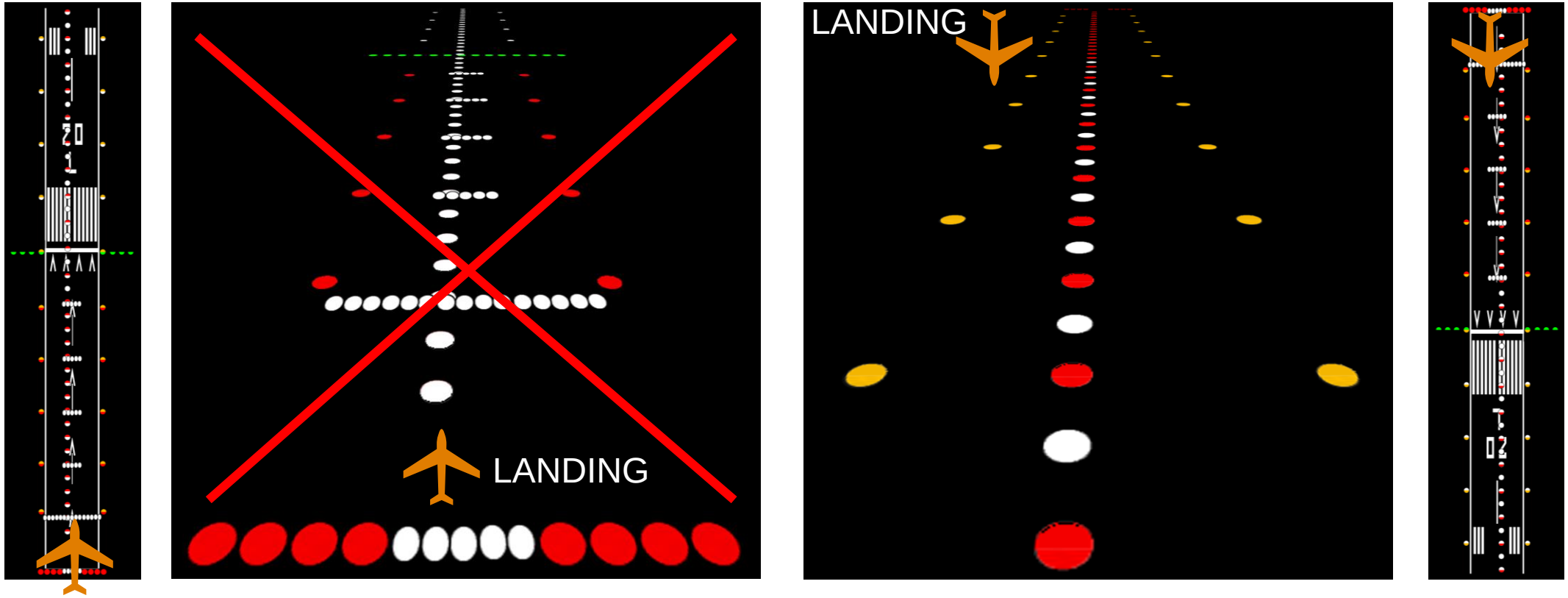

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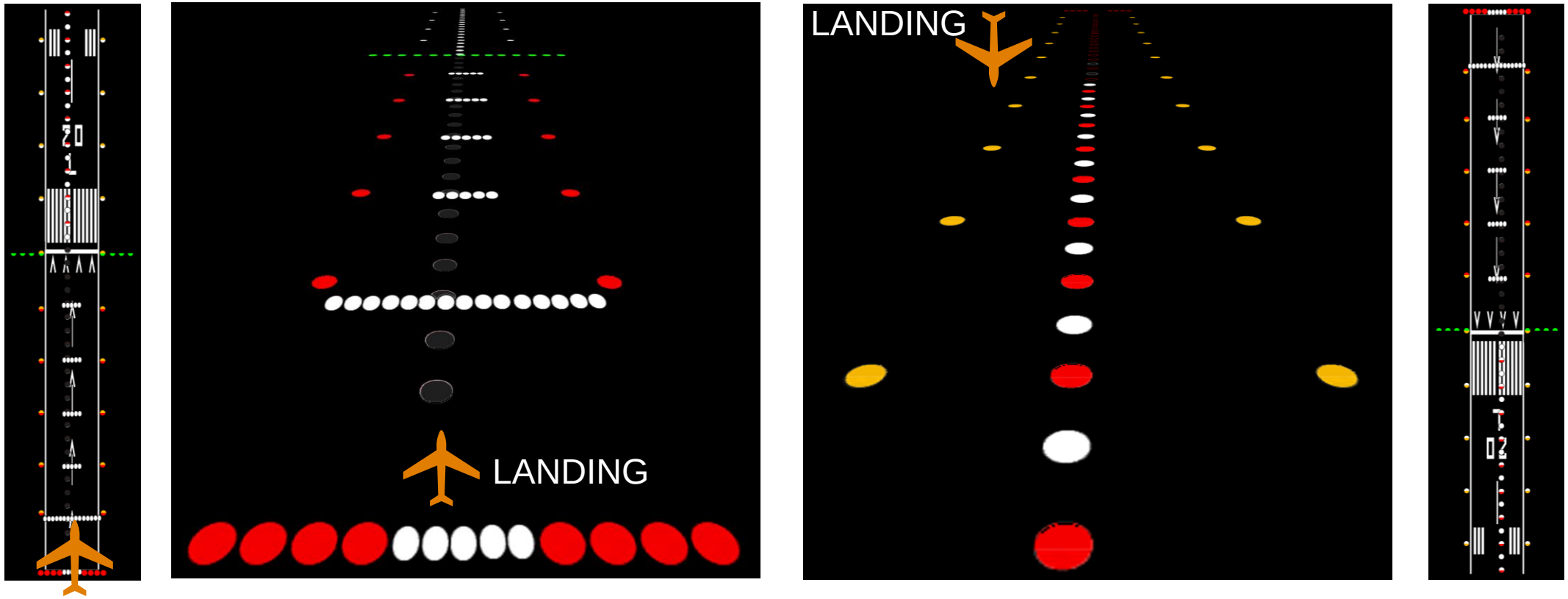


ICAO Annex 14 – 9th Edition (2022)

5.3.12.6 Recommendation.— Centre line guidance for take-off from the beginning of a runway to a displaced threshold should be provided by:

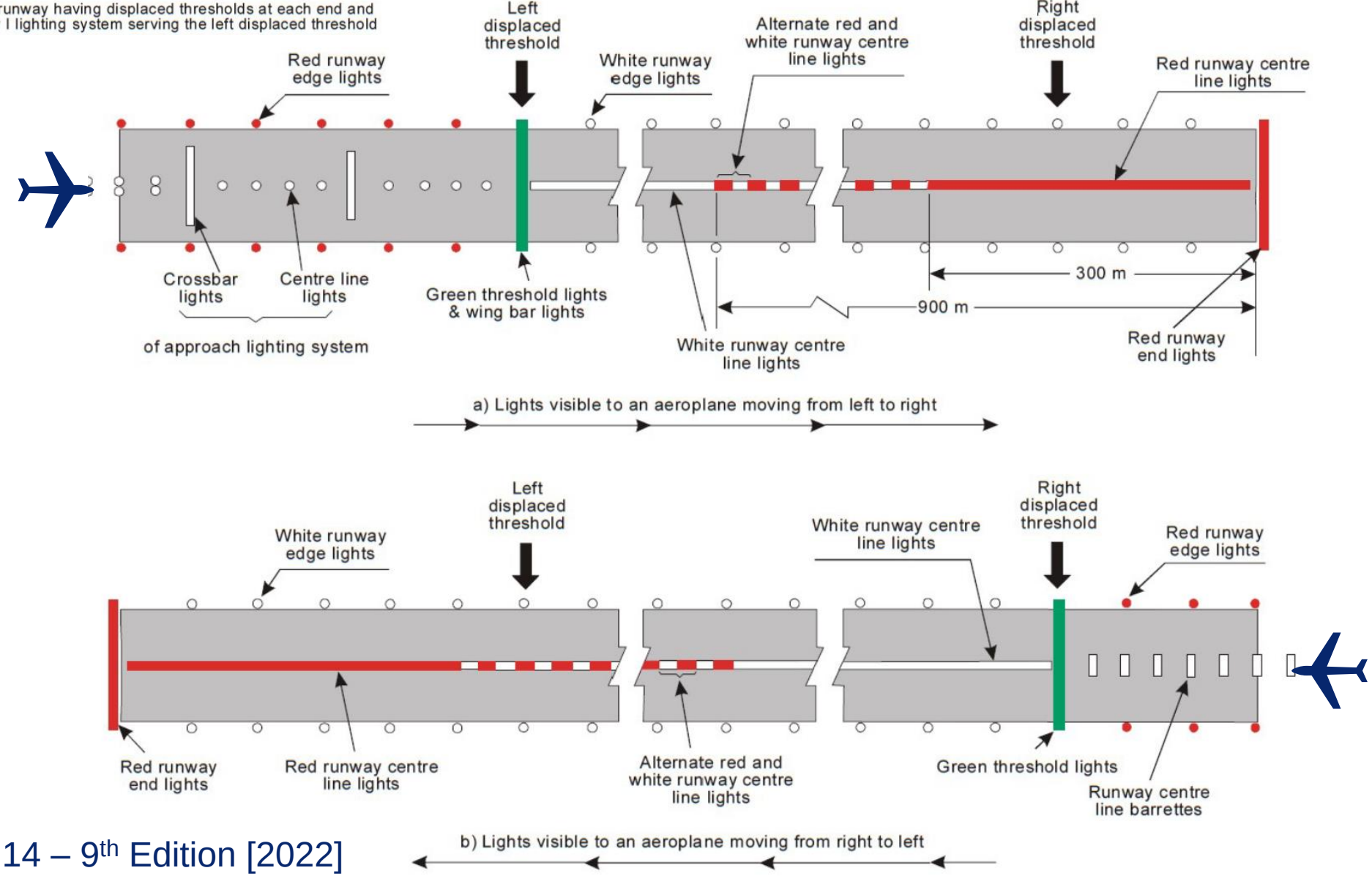
a) an approach lighting system if its characteristics and intensity settings afford the guidance required during take-off and it does not dazzle the pilot of an aircraft taking off; or

b) runway centre line lights; or

c) barrettes of at least 3 m in length and spaced at uniform intervals of 30m, as shown in Figure 5-23, designed that their photometric characteristics and intensity setting afford the guidance required during take-off without dazzling the pilot of an aircraft taking off.

Where necessary, provision should be made to extinguish those centre line lights specified in b) or reset the intensity approach lighting system or barrettes when the runway is being used for landing. **In no case should only the single source runway centre line lights show from the beginning of the runway to a displaced threshold when the runway is being used landing.**

Example shows lighting on a runway having displaced thresholds at each end and a precision approach category I lighting system serving the left displaced threshold



ICAO Annex 14 – 9th Edition [2022]

Figure 5-23 Example of approach and runway lighting for runways with displaced thresholds.

Additional Complications?

Air Carrier OpSpec?

Modification to Standard (MOS) Order 5300-1

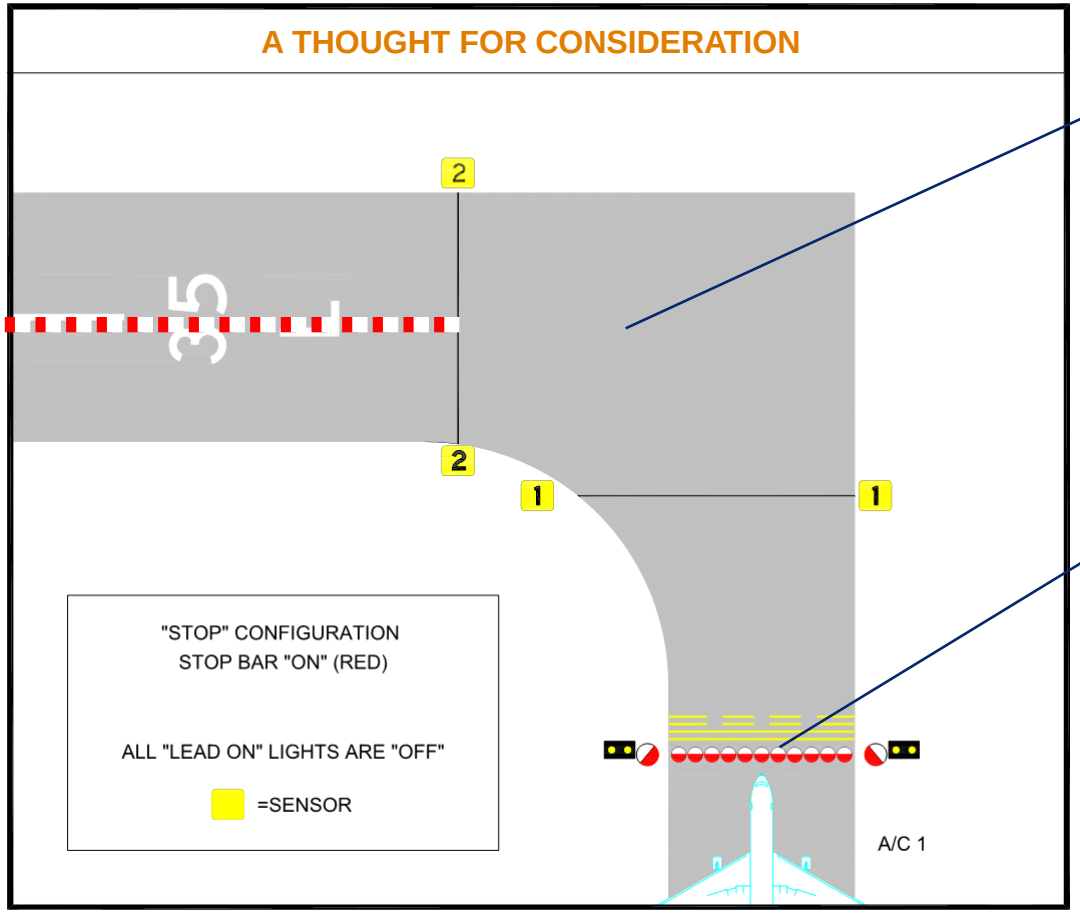
Safety Review Management (SRM) Order 8040-4

Closed / Unattended ATCT? L-854 Radio Control?

How To Control?

- Separate CCRs or Circuit Selector Switch for 2 Circuits
- Individual Light Monitoring and Control (Cost Effective?)
- Centerline Lights with 2 secondary connectors for independent lamp operation.
- Inputs to toggle between Landing & Takeoff Ops:
  - Manual Control – Additional Workload for ATCT Staff
  - L-854 Radio Control – FAA & Safety Risk Management (SRM)

✈ How To Control? CAN IT BE AUTOMATIC?

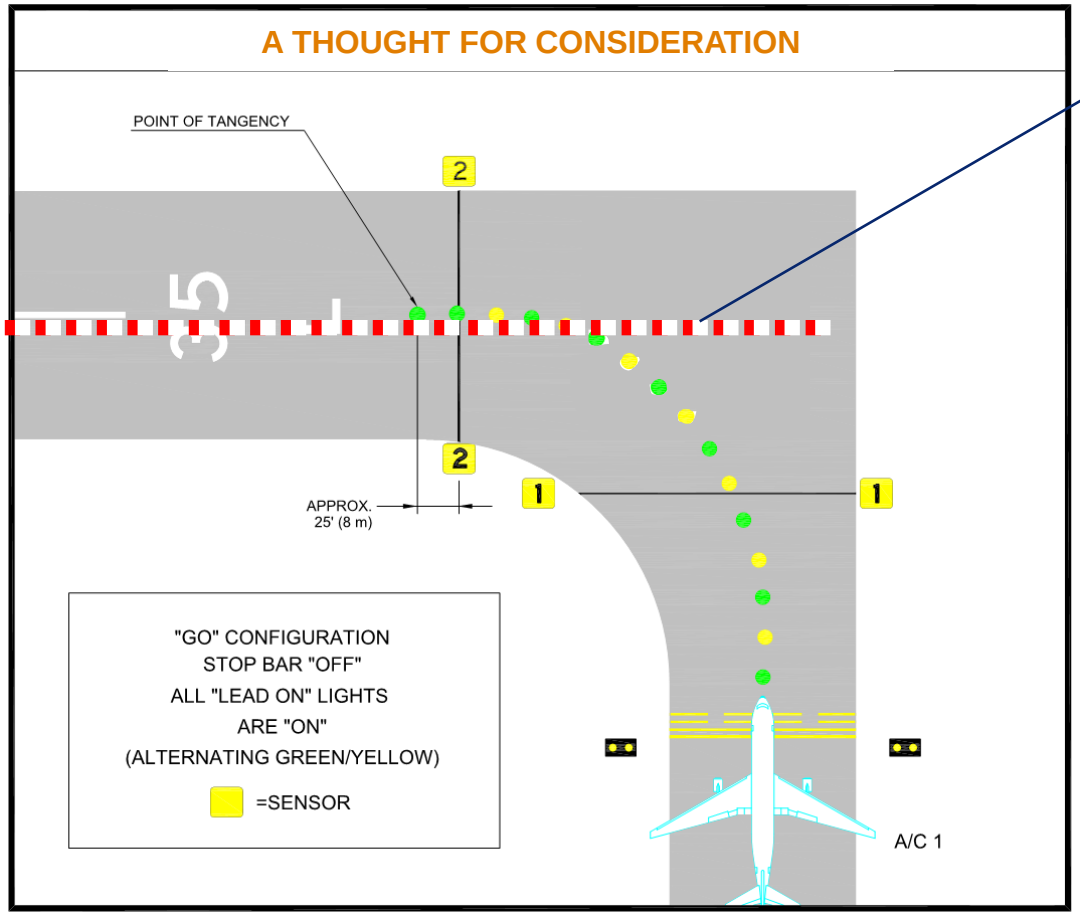


DISPLACED CENTERLINE LIGHTS **OFF BY DEFAULT** FOR LANDINGS

MANUAL TRIGGER FROM ATCT TO START ENTRY AND TAKEOFF SEQUENCE

CONSULT FAA
NOT CURRENTLY RECOGNIZED AS A STANDARD

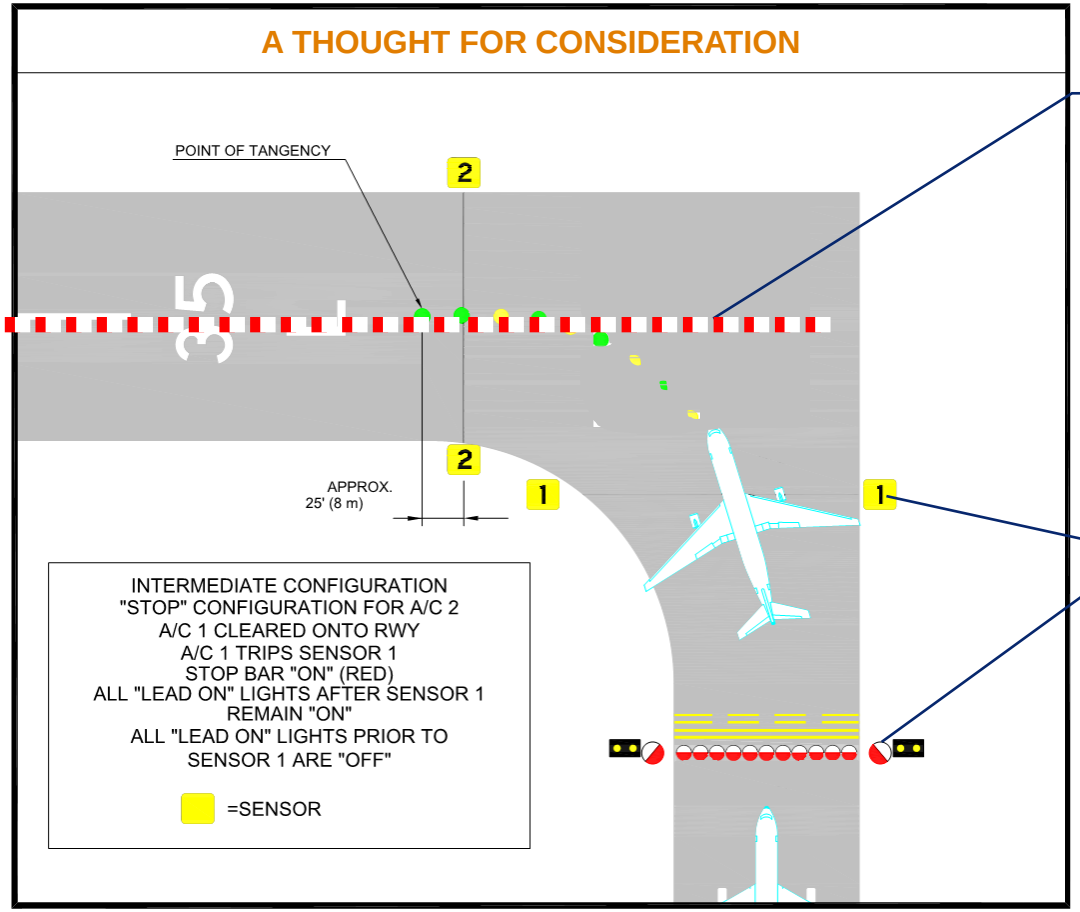
How To Control? CAN IT BE AUTOMATIC?



TURN ON DISPLACED CENTERLINE LIGHTS AS AIRCRAFT ENTERS RUNWAY AREA

CONSULT FAA
NOT CURRENTLY RECOGNIZED AS A STANDARD

How To Control? CAN IT BE AUTOMATIC?



TURN ON DISPLACED CENTERLINE LIGHTS AS AIRCRAFT ENTERS RUNWAY

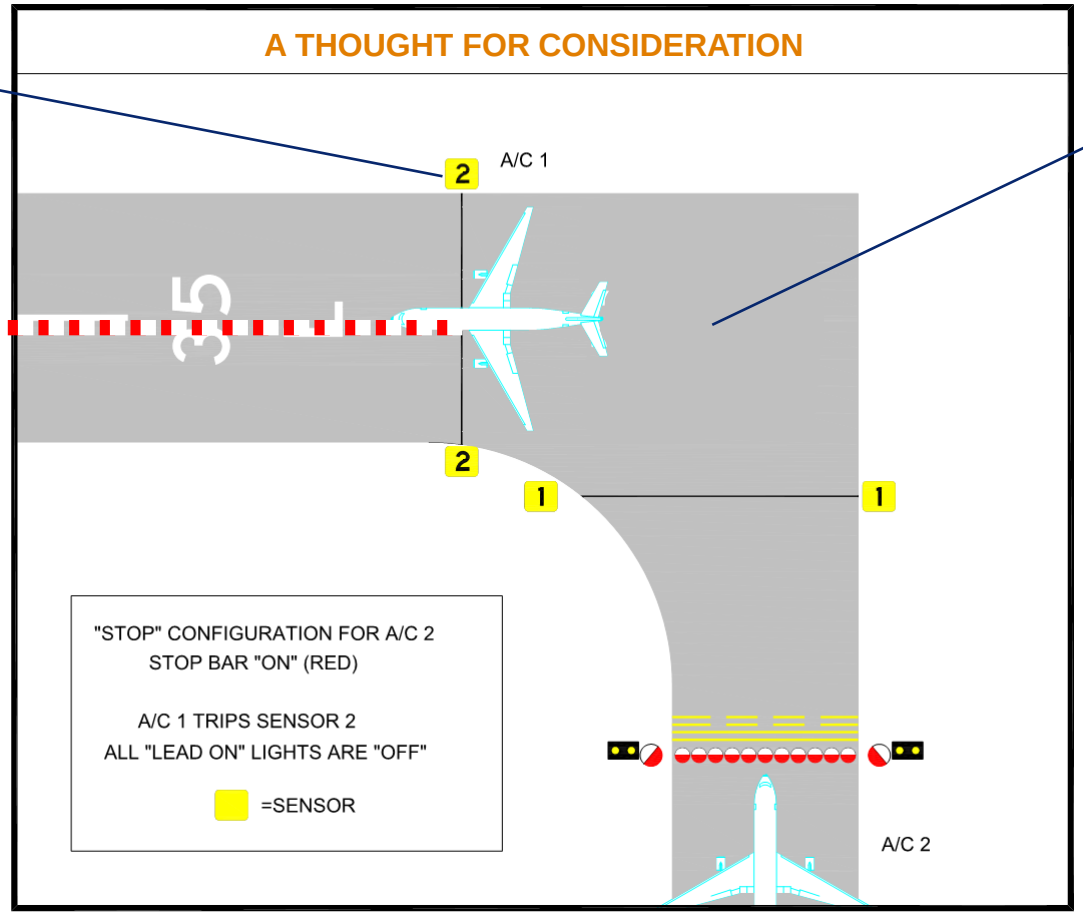
AUTOMATIC TRIGGER FROM SENSOR TO CLOSE ENTRANCE BEHIND
(COULD THIS ALSO BE AN AUTOMATIC TRIGGER FOR DISPLACED CENTERLINE LIGHTS?)

CONSULT FAA
NOT CURRENTLY RECOGNIZED AS A STANDARD

How To Control? CAN IT BE AUTOMATIC?

AUTOMATIC TRIGGER FROM SENSOR

TURN OFF DISPLACED CENTERLINE LIGHTS WHEN PLANE CROSSES DISPLACED THRESHOLD



CONSULT FAA
NOT CURRENTLY RECOGNIZED AS A STANDARD

WHERE?

CASE 1 (≤700ft): 40 Airports / 58 Approaches

BUF 05, ACK 06, MHT 06, ELM 06, BQN 08, BWI 10, NGU 10, TXKF 12, ACV 14, MHT 17, MSN 18, CRW 23, ELM 24, ABE 24, MIA 27, DLH 27, BWI 28, CN66 29, EWR 29, OAK 30, ACV 32, SHV 32, PIT 32, ANC 33, SLC 35, SFO 01L, MKE 01L, SFO 01R, LIT 04L, JFK 04L, MDW 04R, DTW 04R, LAX 06R, DAB 07L, PIT 10C, IAG 10L, STL 12R, MDW 13C, DFW 13L, DAL 13L, DAL 13R, BWI 15R, SDF 17L, MDW 22L, TYS 23L, SUS 26L, MLB 27L, ATL 27R, PIT 28C, SFO 28L, SFO 28R, PDX 28R, FAT 29R, STL 30L, MSP 30R, MDW 31C, BWI 33L, SDF 35R

CASE 2 (>700ft w/o ALS): 12 Airports / 15 Approaches

ALB 28, BOS 22R, JFK 22R, JFK 31L, LGB 12, MDT 31, NKT 14R, PBI 28R, PIE 36, SGJ 13, SJC 12L, SJC 30R, SWF 27, TEB 01, TEB 19

CASE 3 (>700ft w Medium Intensity ALS): 25 Airports / 34 Approaches

ABQ 08, BFL 30R, BHM 24, BOS 15R, BOS 22L, CLE 06R, EWR 04L, EWR 22R, FAI 20R, GYY 30, HOU 13R, JFK 13R, JFK 31R, LAX 07L, LAX 24L, LAX 25R, LGB 30, LIT 04R, MIA 09, MIA 30, MKE 19R, ONT 08L, ORF 05, PBI 10L, PDX 10L, PHL 27L, RNO 16R, RNO 34L, SAN 09, SAN 27, SDF 17R, SGJ 31, SJC 12R, SJC 30L

CASE 4 (>700ft w High Intensity ALS): 12 Airports / 13 Approaches

BOS 04R, BUF 23, EWR 04R, EWR 22L, FAI 02L, JFK 13L, MDT 13, MHT 35, MSN 36, NGU 28, NIP 10, SDF 35L, SWF 09

REQUIRES SEPARATE CONTROLS OF DISPLACED THRESHOLD CENTERLINE LIGHTS

CASE 2+3 (>700ft): 31 Airports / 49 Approaches

WHERE?

CASE 2 (>700ft w/o ALS): 12 Airports / 15 Approaches

ALB 28, BOS 22R, JFK 22R, JFK 31L, **LGB 12,** MDT 31, NKT 14R, PBI 28R, **PIE 36, SGJ 13,** SJC 12L, SJC 30R, SWF 27, TEB 01, TEB 19

CASE 3 (>700ft w Medium Intensity ALS): 25 Airports / 34 Approaches

ABQ 08, **BFL 30R,** BHM 24, BOS 15R, BOS 22L, CLE 06R, EWR 04L, EWR 22R, FAI 20R, **GYY 30,** HOU 13R, JFK 13R, JFK 31R, LAX 07L, LAX 24L, LAX 25R, **LGB 30,** LIT 04R, MIA 09, MIA 30, MKE 19R, ONT 08L, ORF 05, PBI 10L, PDX 10L, PHL 27L, RNO 16R, RNO 34L, SAN 09, SAN 27, SDF 17R, **SGJ 31,** SJC 12R, SJC 30L

CASE 2+3 (>700ft): 31 Airports / 49 Approaches

Airports BFL, GYY, LGB, PIE, SGJ have remarks on their FAA Chart Supplements regarding controlling their lights with CTAF when the ATCT is closed even though the FAA Chart Supplement may denote the Airport is Attended Continuously.

What Next? ACTION ITEM

FAA Advisory Circular Feedback Form

Mail to:

ATTN: AAS-100
800 Independence Avenue SW
Washington, DC 20591

or

Fax to:

(202) 267-5383

Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) mailing this form to Manager, Airport Engineering Division, Federal Aviation Administration ATTN: AAS-100, 800 Independence Avenue SW, Washington DC 20591 or (2) faxing it to the attention of the Office of Airport Safety and Standards at (202) 267-5383.

Subject: AC 150/5340-30J Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____
_____
_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____
_____
_____

☐ Other comments:

_____
_____
_____

☐ I would like to discuss the above. Please contact me at (phone number, email address).

_____
_____
_____

Submitted by: _____ Date: _____

THANK YOU TO IES ALC!

QUESTIONS?

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