ILCMS – Individual Lamp Control and Monitoring System for AGL

Stop bar enhancement project
Exeter Airport (UK)

CANEW 2018, Lethbridge AB

Canadian Airports Electrical Association
Association Électrique des Aéroports Canadiens

Individual Lamp Control and Monitoring System for AGL Stop Bars enhancement Project and others

- Why is Individual Lamp Control and Monitoring Important
- What are the Standards requiring
- What is the market offering
- Case Study 1: Enhancement of Stop Bars – Exeter Airport UK
- Case Study 2: RETIL in Paris Airport CDG

Why is Individual Lamp Control and Monitoring important ?

- ICAO Annex 14 REQUIRES automatic monitoring and recommends to monitor the light status in less than 2s for stop bars and in less than 5s for any other AGL system different than stop bars.

- ICAO Annex 14 refers to:
  - Point 8.3: Monitoring.
  - Point 10.4: Visual aids.

- Apart from regulation requirements, A-SMGCS needs a reliable individual light control and monitor system for routing functions.

- Each country has it own requirements based in ICAO.

What are the standards requiring?

8.3 Monitoring

Note.— Guidance on this subject is given in the Aerodrome Design Manual *(Doc 9157), Part 5.*

8.3.1 **Recommendation.**— *A system of monitoring should be employed to indicate the operational status of the lighting systems.*

8.3.2 Where lighting systems are used for aircraft control purposes, such systems shall be monitored automatically so as to provide an indication of any fault which may affect the control functions. This information shall be automatically relayed to the air traffic service unit.

8.3.3 **Recommendation.**— *Where a change in the operational status of lights has occurred, an indication should be provided within two seconds for a stop bar at a runway-holding position and within five seconds for all other types of visual aids.*

8.3.4 **Recommendation.**— *For a runway meant for use in runway visual range conditions less than a value of 550 m, the lighting systems detailed in Table 8-1 should be monitored automatically so as to provide an indication when the serviceability level of any element falls below the minimum serviceability level specified in 10.4.7 to 10.4.11, as appropriate. This information should be automatically relayed to the maintenance crew.*

8.3.5 **Recommendation.**— *For a runway meant for use in runway visual range conditions less than a value of 550 m, the lighting systems detailed in Table 8-1 should be monitored automatically to provide an indication when the serviceability level of any element falls below the minimum level specified by the appropriate authority below which operations should not continue. This information should be automatically relayed to the air traffic services unit and displayed in a prominent position.*

Note.— Guidance on air traffic control interface and visual aids monitoring is included in the Aerodrome Design Manual *(Doc 9157), Part 5.*

What are the standards requiring?

10.4.11 The system of preventive maintenance employed for a runway meant for take-off in runway visual range conditions less than a value of 550 m shall have as its objective that, during any period of operations, all runway lights are serviceable and that in any event:

a) at least 95 per cent of the lights are serviceable in the runway centre line lights (where provided) and in the runway edge lights; and

b) at least 75 per cent of the lights are serviceable in the runway end lights.

In order to provide continuity of guidance, an unserviceable light shall not be permitted adjacent to another unserviceable light.

10.4.12 The system of preventive maintenance employed for a runway meant for take-off in runway visual range conditions of a value of 550 m or greater shall have as its objective that, during any period of operations, all runway lights are serviceable and that, in any event, at least 85 per cent of the lights are serviceable in the runway edge lights and runway end lights. In order to provide continuity of guidance, an unserviceable light shall not be permitted adjacent to another unserviceable light.

10.4.13 **Recommendation.**— *During low visibility procedures the appropriate authority should restrict construction or maintenance activities in the proximity of aerodrome electrical systems.*

d) runway end lights.

In order to provide continuity of guidance an unserviceable light shall not be permitted adjacent to another unserviceable light unless the light spacing is significantly less than that specified.

Note.— In barrettes and crossbars, guidance is not lost by having two adjacent unserviceable lights.

— *longitudinally: in the same row of edge lights or barrettes.*

What are the standards requiring?

Without Individual Lamp Monitoring

to meet ICAO for some airports

is simply not possible

What is the market offering?

- Market solutions portfolio could be summarized as follows:

  - Powerline solutions.
    - Several systems available in the market.
    - Difficulties to show successful maintained unshielded cable operation.
    - Most of the systems require a minimum insulation value.

  - Second network solutions.
    - Optical fibre or copper twisted pairs network based.
    - Regenerators/concentrators for communication network required.
    - Power supply network for regenerators may be required.

Target of an ILCMS system

- Powerline solution.
- Minimum impact on existing installations.
- Successful operation with shielded and unshielded cable.
- No minimum value of Insulation required in the primary cable.
- No regenerators required

Key of success

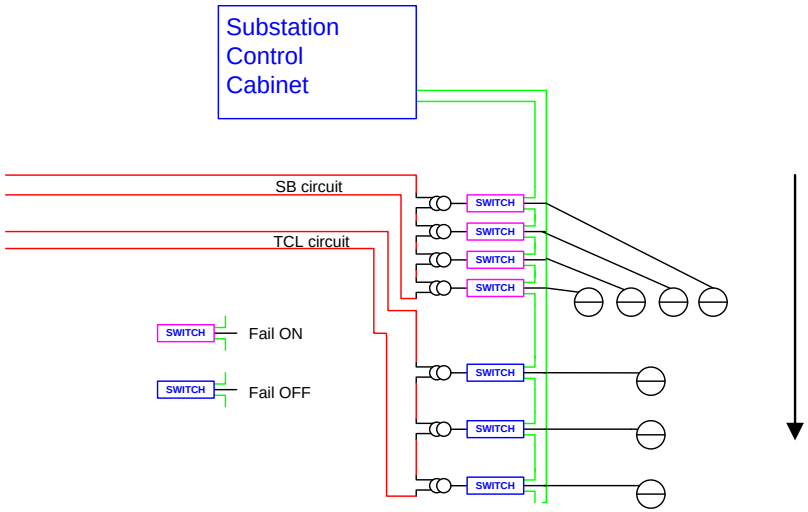
no minimum insulation value required and **unshielded cable compatible**.

CASE STUDY 1: Exeter airport (UK)

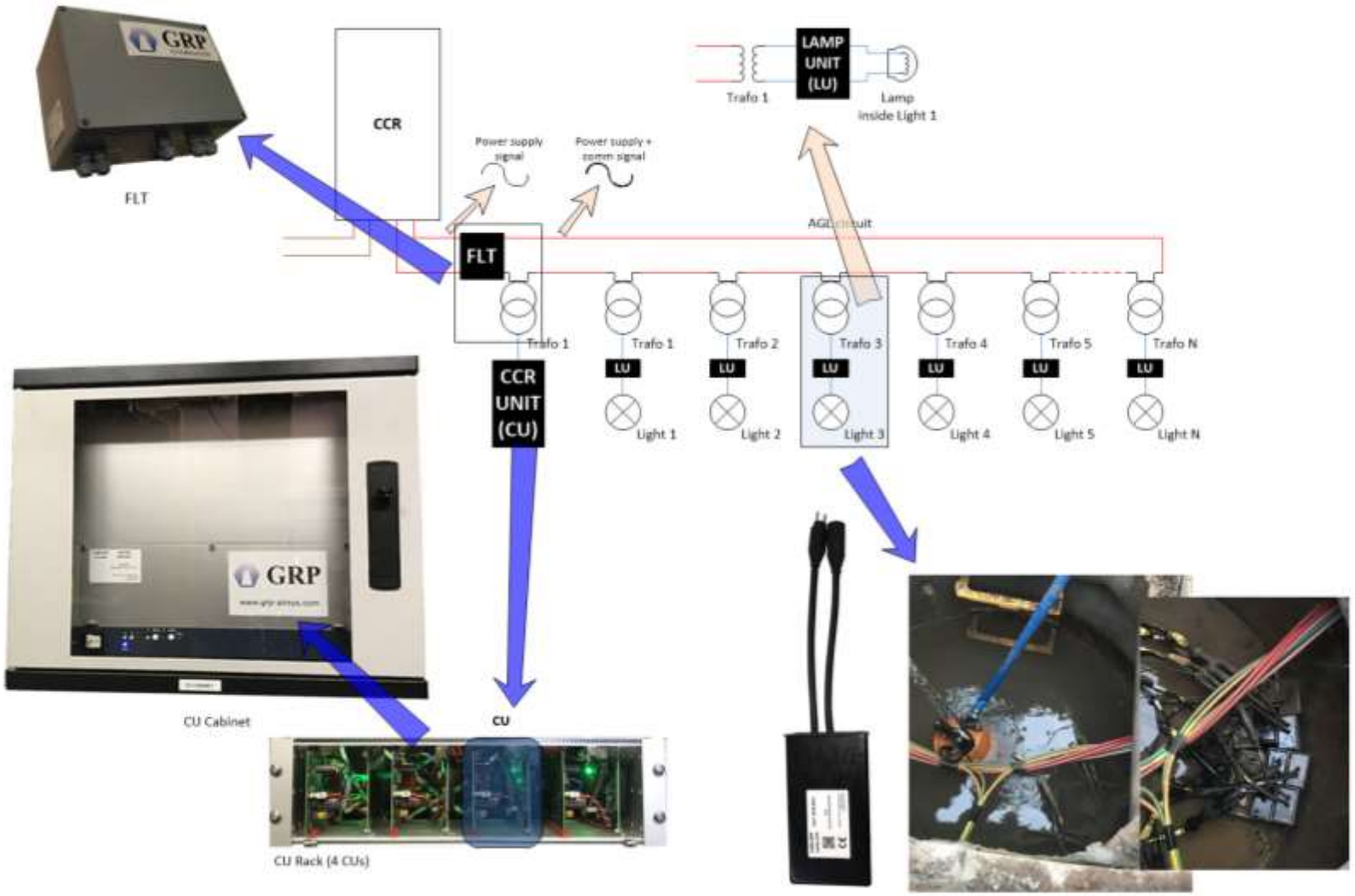
- Runway refurbishment project including new LED lights for runway end, edge, threshold, centreline, stop bar and lead on/off.
- Project included CMS update to include DC switches to control stop bars and lead on/off lights. It was also updated the electrical substation with new CCRs.

CASE STUDY 1: Exeter airport (UK)

- How stop bar and lead on/off is done nowadays usually in the UK ?
  - Most airports in the UK are using individual DC switch units (included in Exeter design)
  - There is only control of lights but not monitoring and no command feedback.
  - Monitoring is done by CCR lamp fail detector (No adjacent monitoring).
  - Need of a control network in the airfield.
  - ICAO Annex 14 is strictly not met → no adjacent light monitoring.



CASE STUDY 1: Exeter Airport - ILCMS architecture



CASE STUDY 1: Exeter airport (UK)

- Exeter Airport authorized to replace DC switches by LUs (Lamp Units).
- LUs are addressable switching units, which communicate with a master unit (CU, CCR unit) by powerline.
- The replacement of LUs became in a complete ALCMS replacement.
- Old PLC based ALCMS was replaced by a new ALCMS based in redundant servers.
- New ALCMS provides true stop bar, lead on and lead off lights feedback. It also provides current and voltage readings in every light.
- Replacement was possible thanks to the proven reliability of technology, that had been subject to test-running for 2 years at Warton Aerodrome, UK (British Aerospace).
- Material involved was:
  - ADB MCR3 CCRs for all circuits.
  - ADB LED lights for new services (stop bar, lead on/off and runway centreline) and existing services (runway threshold, edge and end).
  - CMS and ILCMS-GRP – 300 LUs in 4 circuits

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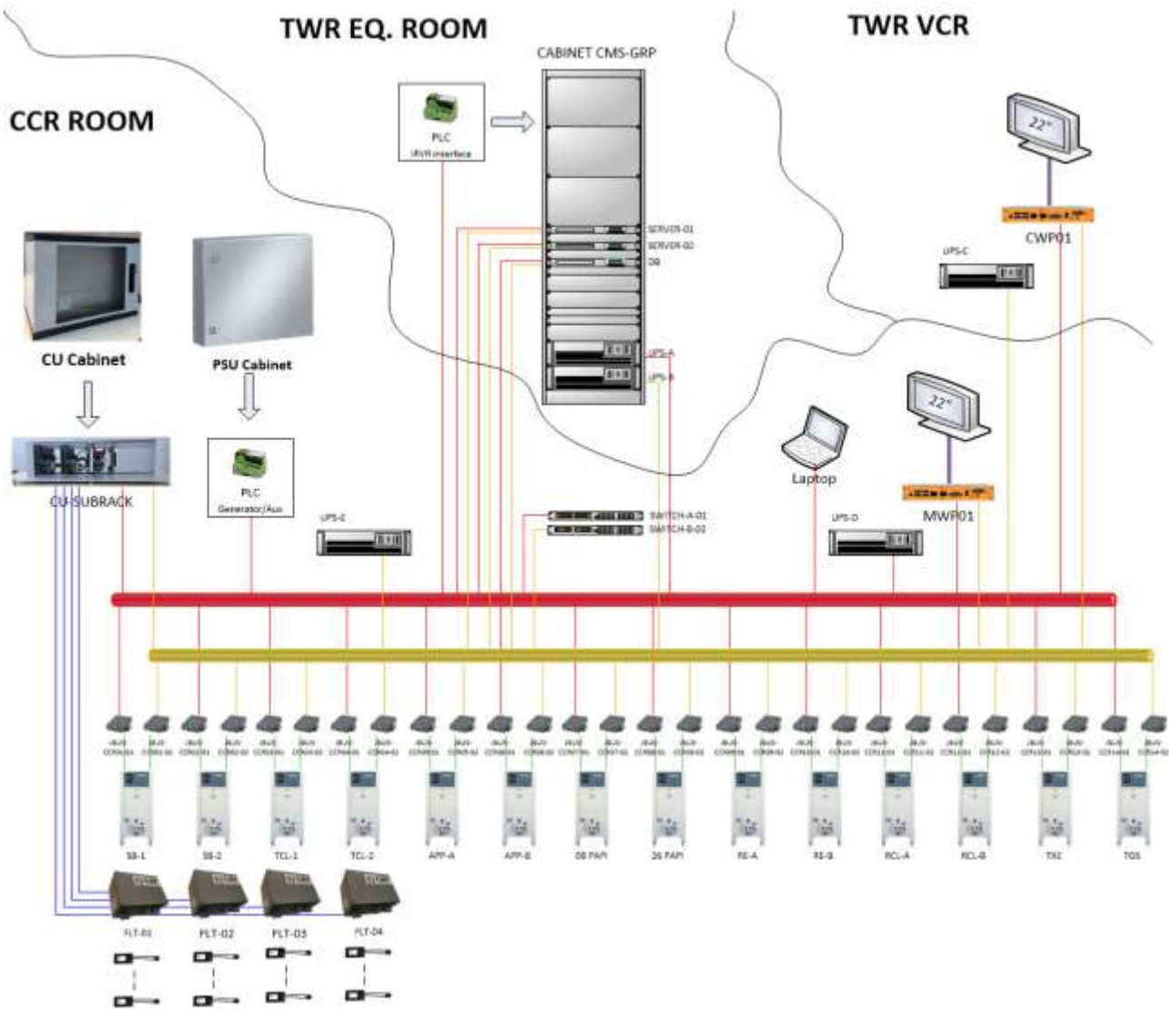


CASE STUDY 1: Exeter airport (UK)

- No special primary cable neither additional communication network required.

standard UK primary unshielded coloured cable used

- Frequency range used does not require regenerators.

CU reach every LUs

- Several frequency channels available and simultaneously running in each device. Crosstalk tolerant design.
- Time lamp command+ confirmation < 200 ms
- 1000 LUs in less than 5s per channel or 400 LUs in less than 2 seconds.
- Every LU measures current, voltage and power in real time and send back to CU under request.
- The lights are monitored even when they are switched off by the LU.
- Every LU is coated with PUR (Polyurethane Resine) to avoid any kind of limitation by installation in any type of pit.

CASE STUDY 1: Exeter airport (UK)

CASE STUDY 2: Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

- Paris CDG Airport
  - 4 Runways.
  - 2nd busiest airport in Europe in passengers and movement.

- RETIL, according to ICAO

R apid **E** xit **T** axiway **I** ndication **L** ights

  - Group of 6 lights in the RWY that indicates the proximity and situation of a rapid Exit.
  - If one of the lights fails, the whole group of 6 has to turn off.

CASE STUDY 2: Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

- Previous Solution to RETIL:
  - Secondary of the 6 lights connected in series.
  - One RETIL system per Regulator (CCR).
  - When one lamp fails, the 6 turn off.
  - Lamp fault detector of the CCR to generate CMS alarm and switch off CCR.

- Problems:
  - Unreliability of the lamp fault detection.
  - If works, no information of which lamp has failed.
  - Every RETIL needs an independent CCR and primary circuit.

CASE STUDY 2: Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

- System proposed:
  - Stand alone application based on ILCMS.
  - Up to 6 RETIL per regulator (CCR). Fully configurable.
  - Integrated into existing CMS or not (Jbus or dry contacts).
  - Provides functioning according to ICAO Annex 14.
  - In case of failure of one lamp, the associated RETIL lights turns off, and gives the information of the lamp failed.
  - The system continues to monitor ALL the lights, even if they are turned off.
  - Provides information of current, voltage and power consumption of every light.

CASE STUDY 2 : Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

ILCM – RETIL Components

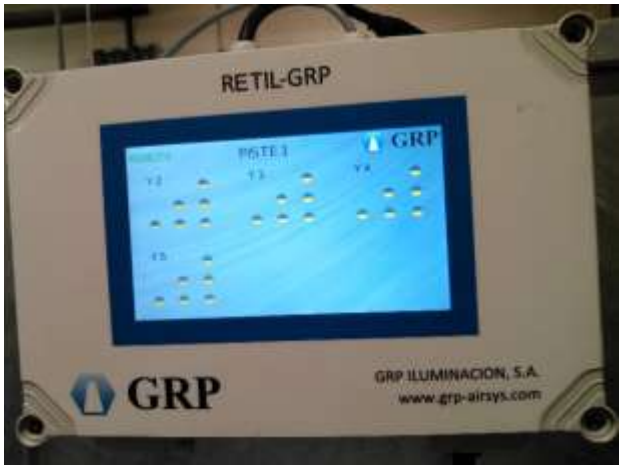
Control Unit
CU

Filter

Lamp Units
LU

CASE STUDY 2: Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

- 4 RETILs (24 lights) of Runway 09R-27L.
- 1 Compact Control Unit CU.
- 24 Lamp Units (LU) on the field.
- 1 Regulator (CCR), 1 circuit.
- Integrated in the ALCMS provides functioning according to ICAO Annex 14.



CASE STUDY 2: Aéroports de Paris
RETIL in Charles de Gaulle Airport (CDG)

GROUPE ADP

Direction de l'Aéroport
Paris-Charles de Gaulle
Aires Aéronautiques

Roissy le 31 AOUT 2018

Objet : Système ILMS mis en place à l'aéroport de Roissy - Charles de Gaulle

Cher Monsieur,

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Délivré pour faire valoir ce que de droit.

Arnaud GUI[illegible]ARD
Pôle Systèmes Navigation Aérienne
Aires Aéronautiques - CDGAA

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Thank you for your attention!!

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