

MBA in Aviation Management

Part 3: Airport Operations

Frankfurt, 2023, January

Knut R. WALTHER

Airport Operations

Initiative

Legal Framework

Areas of competency

Nomenclature

Surface Movement Guidance and Control

Outlook

Safety is paramount !



Airport Operations

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Surface Movement Guidance and Control

Outlook

Legal Framework

ICAO Annex 10 Aeronautical Telecommunication

ICAO-Annex 11: Air Traffic Services

ICAO-Annex 14: Airports

Doc 4444 Rules of the Air and Air Traffic Management: PANS-ATM

Doc 7910 Location Indicator

Doc 7920 Aerodrome Manual,
Part 3, "Obstruction Restriction, Removal and Marking"

Doc 8168 PANS-OPS

Doc 8400 ABC - ICAO - Abbreviations and Codes

Doc 8585 Designators for Aircraft operation Agencies, Aeronautical
Authorities and Services

Legal Framework

Doc 8643	Aircraft Type Designators
Doc 9150	Stolport Manual
Doc 9157	Aerodrome Design Manual
Doc 9184	Airport Planning Manual
Doc 9261	Heliport Manual
Doc 9332	Bird Strike Manual
Doc 9365	Manual of All Weather Operations
Doc 9476	Surface Movements Guidance and Control Systems (SMGCS)
Doc 9830	Advanced Surface Movements Guidance and Control Systems (A-SMGCS)

Legal Framework

Doc 9774 Manual on Certification of Aerodromes

Doc 9859 Manual on Safety Management for Aerodrome Operators

Doc 9137 Airport Services Manual Part 1 – Rescue and Fire Fighting

Doc 9137 Airport Services Manual Part 2 – Pavement Surface Conditions

Doc 9137 Airport Services Manual Part 5 – Removal of Disabled Aircraft

Doc 9137 Airport Services Manual Part 6 – Control of Obstacles

Doc 9137 Airport Services Manual Part 7 – Airport Emergency Planning

Doc 9137 Airport Services Manual Part 8 – Airport Operational Services

Legal Framework

ACI Aerodrome Bird Hazard and Wildlife Prevention Handbook

ACI Airside Safety Handbook

ACI Apron Signs and Markings Handbook

ACI Policy Handbook

Eurocontrol: European Action Plan for the Prevention of Runway Incursions

FAA: Advisory Circular pertaining to Operational Safety on Airports during Construction

IATA: Airport Handling Manual

ICAO: Safety Oversight Audit Manual (Doc 9735)

NSC: Aviation Ground Operation Safety Handbook (6th Edition)

UK CAA – Licensing of Aerodromes (CAP 168)

UK CAA – Visual Aids Handbook (CAP 637)

UK CAA – Airside Safety Management (CAP 642)

Legal Framework

National Law

Regional Law

Legal Framework

an example

- German aviation act:

- §2 LuftVO

(2) Luftfahrzeuge sind während des Flugs und am Boden von dem verantwortlichen Luftfahrzeugführer zu führen.

During flight and on the ground aircraft have to be directed by a responsible pilot

- §3 LuftVO

(1) Der Luftfahrzeugführer hat das Entscheidungsrecht über die Führung des Luftfahrzeugs.

Er hat die während des Flugs, bei Start und Landung und beim Rollen aus Gründen der Sicherheit notwendigen Maßnahmen zu treffen.

The pilot has the decision right about the guidance of the aircraft.
He has to take all measures to guide the aircraft safely

Legal Framework

an example

- German aviation act:
- §45 LuftVZO -> outdated

New: REGULATION (EU) 2018/1139 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2018

<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139&from=EN>

The Airport Operator is responsible for the safe operation of the airport

The Airport Operator is obliged to nominate an accountable person in charge for the safe operation of the airport

- The Aeronautical Information Publication (AIP)
- Airport User Regulations

Legal Framework

Regulation EU 2018/1139

It is the target of the EU to introduce a harmonized and high level of safety (Aviation Safety) and to realize it for civil aviation.

REGULATION EU **2018/1139** on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency (EASA) formulates the basis to reach this goal.

To reach this target a COMMISSION REGULATION (EU) No 139/2014 was formulated.

This Regulation lays down detailed rules in the annexes I to IV.

Annex III lays down the organizational requirements for airport operators.

In Part D – Management – under the headline “Personnel requirements” the requirements of the “nominated persons” are listed (ADR.OR.D.005 und ADR.OR.D.015).

Legal Framework

Regulation EU 139/2014

ADR.OR.D.015 personnel requirements

- (a) The aerodrome operator shall appoint an accountable manager, who has the authority for ensuring that all activities can be financed and carried out in accordance with the applicable requirements. The accountable manager shall be responsible for establishing and maintaining an effective management system.
- (b) The aerodrome operator shall nominate persons responsible for the management and supervision of the following areas:
 - (1) operational services of the aerodrome; and
 - (2) maintenance of the aerodrome.

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.015 personnel requirements

- (c) The aerodrome operator shall nominate a person or group of persons responsible for the development, maintenance and day-to-day management of the safety management system.

Those persons shall act independently of other managers within the organisation, shall have direct access to the accountable manager and to appropriate management for safety matters and shall be responsible to the accountable manager.

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.015 personnel requirements

- (d) The aerodrome operator shall have sufficient and qualified personnel for the planned tasks and activities to be performed in accordance with the applicable requirements.
- (e) The aerodrome operator shall assign a sufficient number of personnel supervisors to defined duties and responsibilities, taking into account the structure of the organisation and the number of personnel employed.
- (f) The aerodrome operator shall ensure that personnel involved in the operation, maintenance and management of the aerodrome are adequately trained in accordance with the training programme.

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.005 Managementsystem

- (a) The aerodrome operator shall implement and maintain a management system integrating a safety management system.
- (b) The management system shall include:
 - (1) clearly defined lines of responsibility and accountability throughout the aerodrome operator, including a direct accountability for safety on the part of senior management;
 - (2) a description of the overall philosophies and principles of the aerodrome operator with regard to safety, referred to as the safety policy, signed by the accountable manager;
 - (3) a formal process that ensures that hazards in operations are identified;
 - (4) a formal process that ensures analysis, assessment and mitigation of the safety risks in aerodrome operations;

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.005 Managementsystem

- (5) the means to verify the safety performance of the aerodrome operator's organisation in reference to the safety performance indicators and safety performance targets of the safety management system, and to validate the effectiveness of safety risk controls;
- (6) a formal process to:
 - (i) identify changes within the aerodrome operator's organisation, management system, the aerodrome or its operation which may affect established processes, procedures and services;
 - (ii) describe the arrangements to ensure safety performance before implementing changes; and
 - (iii) eliminate or modify safety risk controls that are no longer needed or effective due to changes in the operational environment;

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.005 Managementsystem

- (7) a formal processes to review the management system referred to in paragraph (a), identify the causes of substandard performance of the safety management system, determine the implications of such substandard performance in operations, and eliminate or mitigate such causes;
- (8) a safety training programme that ensures that personnel involved in the operation, rescue and firefighting, maintenance and management of the aerodrome are trained and competent to perform the safety management system duties;
- (9) formal means for safety communication that ensures that personnel are fully aware of the safety management system, conveys safety critical information, and explains why particular safety actions are taken and why safety procedures are introduced or changed;

Legal Framework

Regulation EU Regulation EU 139/2014

ADR.OR.D.005 Managementsystem

- (10) coordination of the safety management system with the aerodrome emergency response plan; and coordination of the aerodrome emergency response plan with the emergency response plans of those organisations it must interface with during the provision of aerodrome services; and
- (11) a formal process to monitor compliance of the organisation with the relevant requirements.
- (c) The aerodrome operator shall document all management system key processes.
- (d) The management system shall be proportionate to the size of the organisation and its activities, taking into account the hazards and associated risks inherent in these activities.
- (e) In the case that the aerodrome operator holds also a certificate to provide air navigation services, it shall ensure that the management system covers all activities in the scope of its certificates.

Legal Framework

Regulation EU Regulation EU 139/2014

The Fraport AG solution

To fulfill the requirements the airport operator, represented through the board of directors, nominates the following functions:

- EASA **Accountable** Manager
- EASA **Operations** Manager / *Verkehrsleiter*
- EASA **Maintenance** Manager
- EASA **Safety** Manager
- EASA **Compliance** Manager

Legal Framework

Airport User Regulations /
Flughafenbenutzungsordnung (FBO)

Valid for **ALL** users at the airport !!

Published document



Airport Operations

Initiative

Legal Framework

Areas of competency

Nomenclature

Surface Movement Guidance and Control

Outlook

Areas of Competency

- German aviation act:

- § 26 LuftVO

„(2) Mit der Flugverkehrskontrollfreigabe erhält der Luftfahrzeugführer die Erlaubnis, seinen Flug unter bestimmten Bedingungen durchzuführen...“

„(4) Von der zuletzt erteilten und bestätigten Flugverkehrskontrollfreigabe darf der Luftfahrzeugführer nicht abweichen, bevor ihm nicht eine neue Flugverkehrskontrollfreigabe erteilt worden ist. Dies gilt nicht in Notlagen, die eine sofortige eigene Entscheidung erfordern....“

With the Air Traffic Control Clearance the pilot is entitled to execute the flight under specified conditions.

He is not allowed to deviate from the clearance – only in cases of emergency if an immediate decision is necessary.

Areas of Competency

Competencies

- ICAO Annex 11 Chapter 3.2
- „The task of providing specified services on the apron e.g. apron management service, may be assigned to an aerodrome control tower or to a separate unit.“

Clearance

- ICAO Annex 11 Chapter 3.7
- „Air Traffic Control Clearances shall be solely on the requirements for providing air traffic control service.“

Areas of Competency

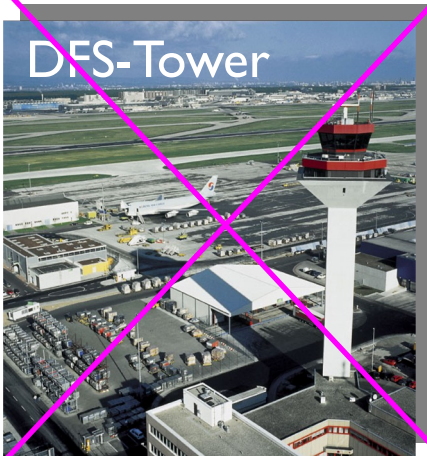
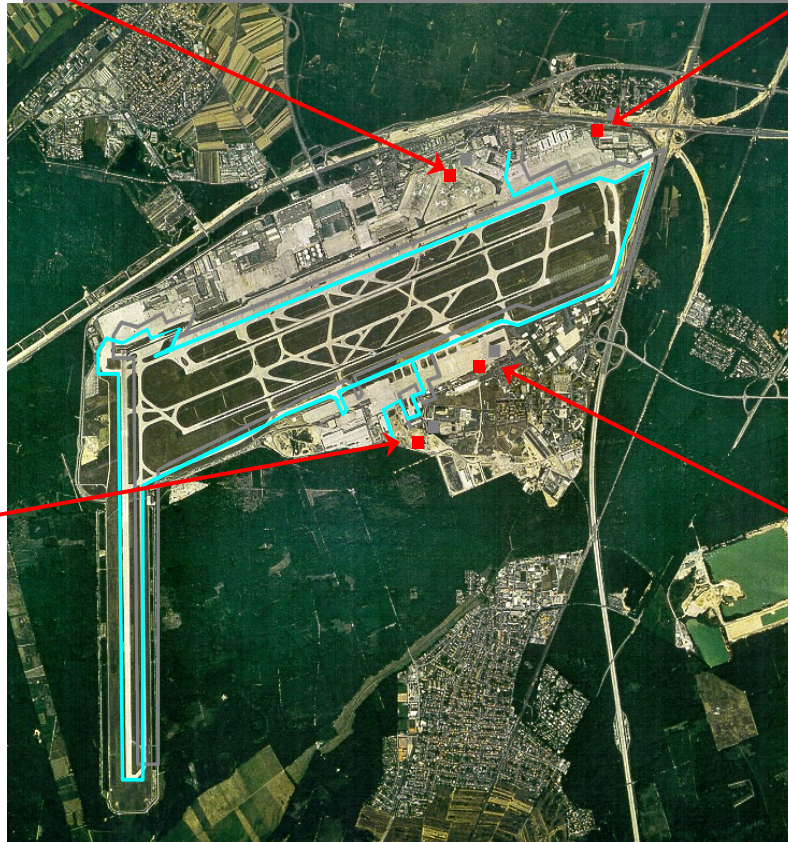
- Recommendation:
to segregate the functional areas of Apron Control and manoeuvring area Control for the safe operation within the movement area.
[only for the design of surface movement guidance]
- It is no prejudice for the organisational structure of the responsibilities within the movement area.
- Due to the complexity of operations and surface movement guidance within the apron.
- The recommendations of the ICAO docs „ICAO Manual for SMGCS“ (ICAO Dokument 9476) and Advanced Surface Movements Guidance and Control Systems (A-SMGCS, ICAO Doc 9830) shall be considered.

Areas of Competency

- The borderlines of the designated areas must not be identical with the so called „Transfer-of-Control-Point“.
This point describes the location where an aircraft is handed over between two control units (e.g. by switching the radio frequency).
- Important: If aircraft are handed over already and still remain in the area of competency of the transferring unit, it **MUST** be free of conflict!

Areas of Competency

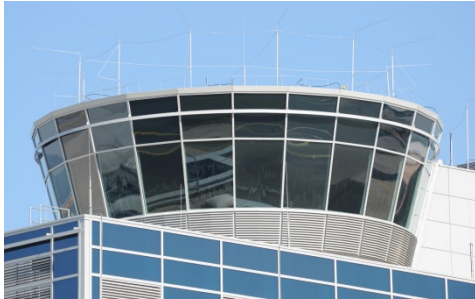
Control Centers at Frankfurt Airport



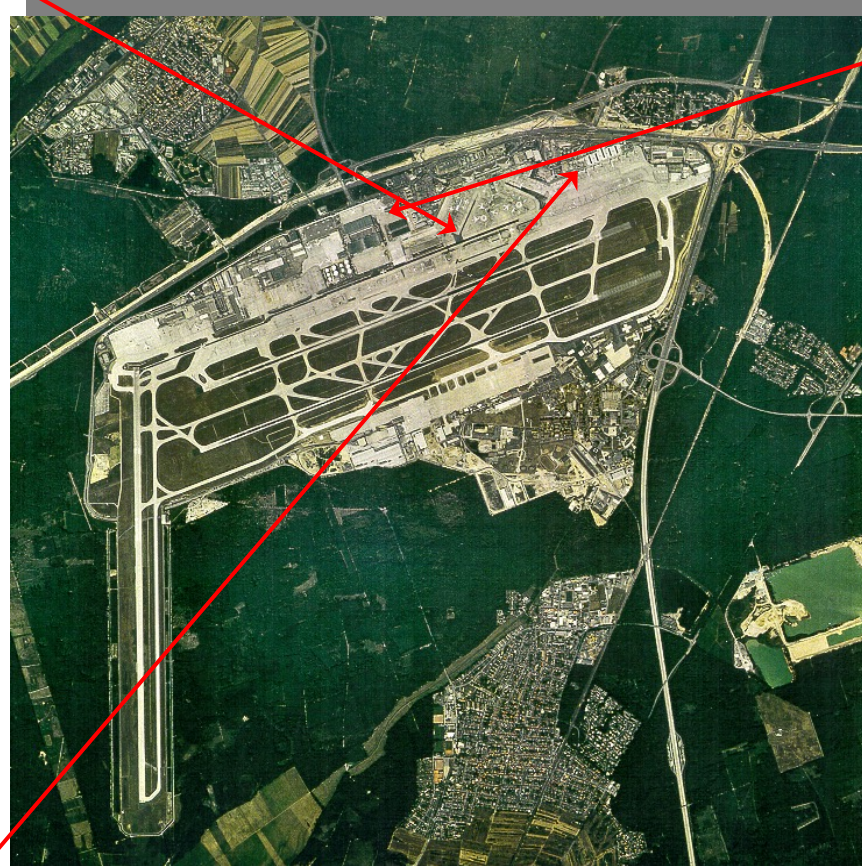
Areas of Competency

Control Centers at Frankfurt Airport

Fraport
Apron Control A



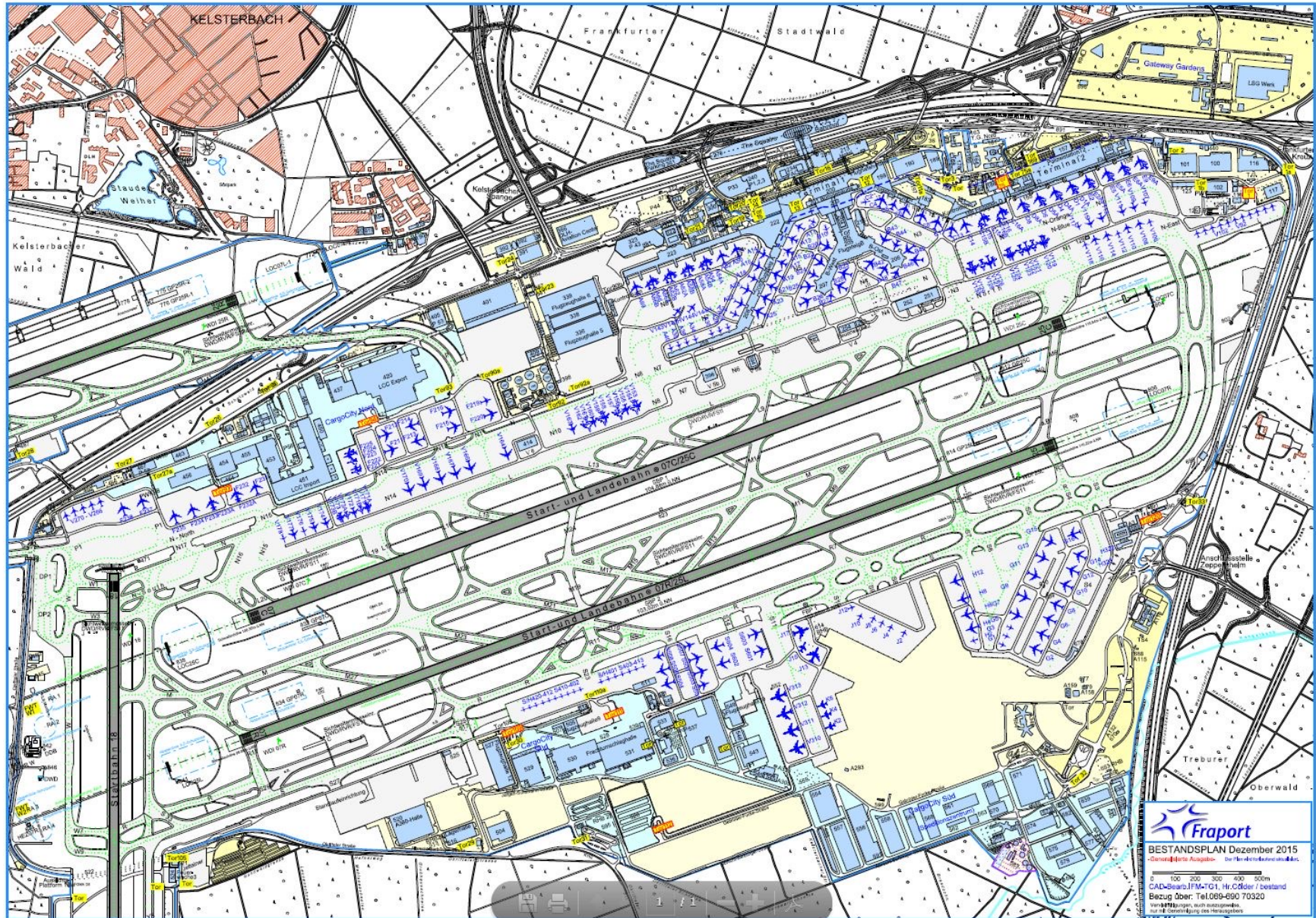
Fraport
Apron Control C



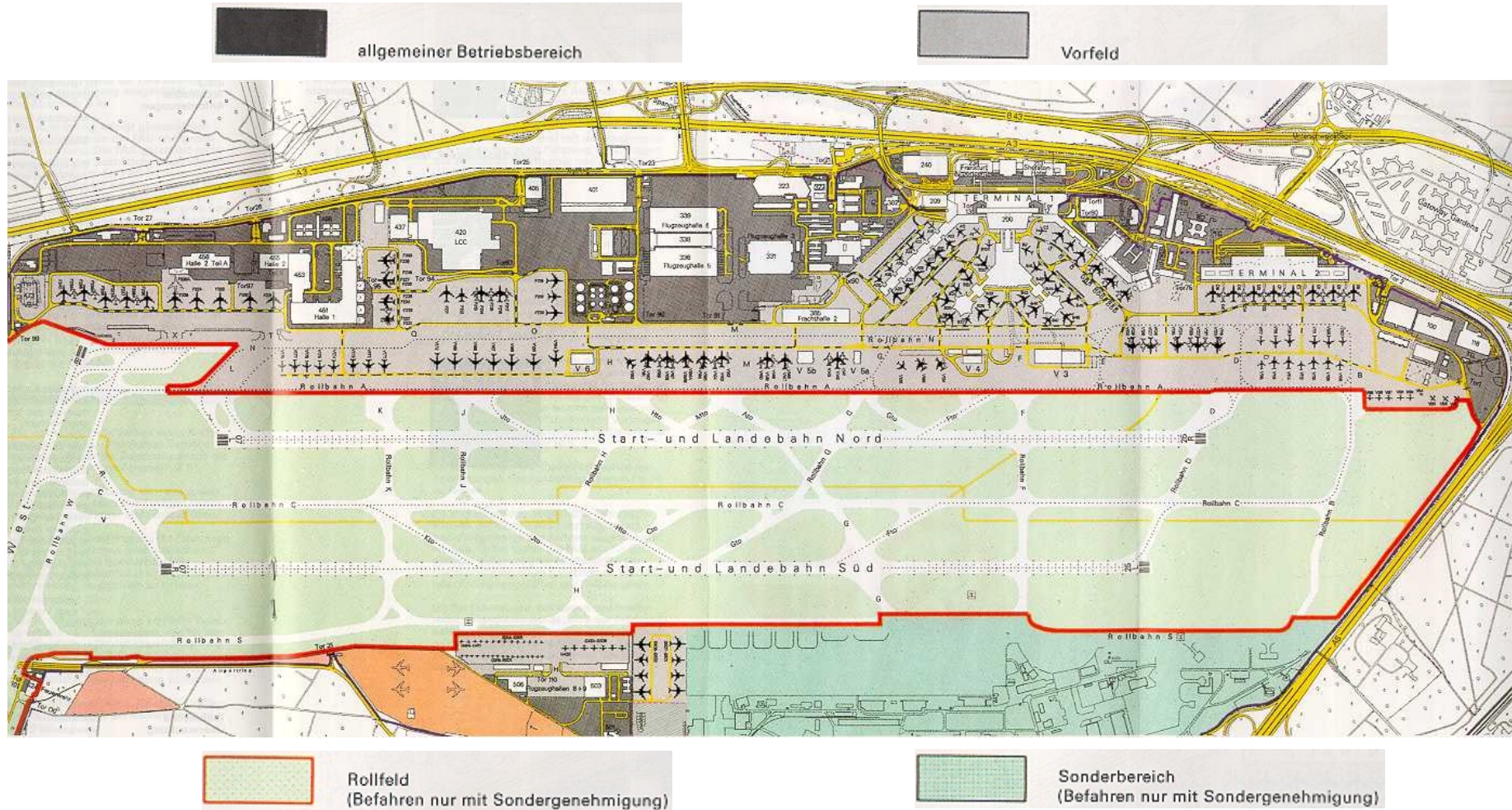
DFS-Tower



Airport Layout – Dez 2015

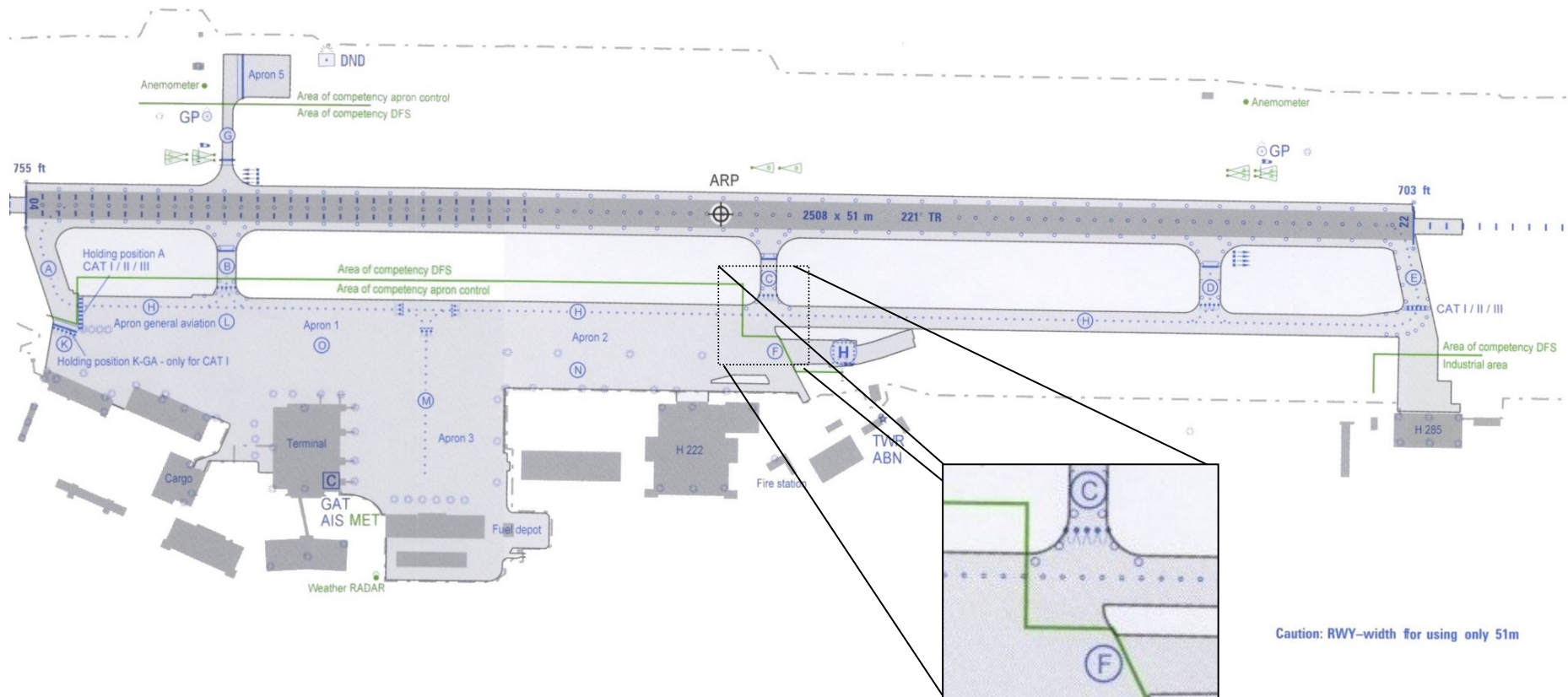


Areas of Competency



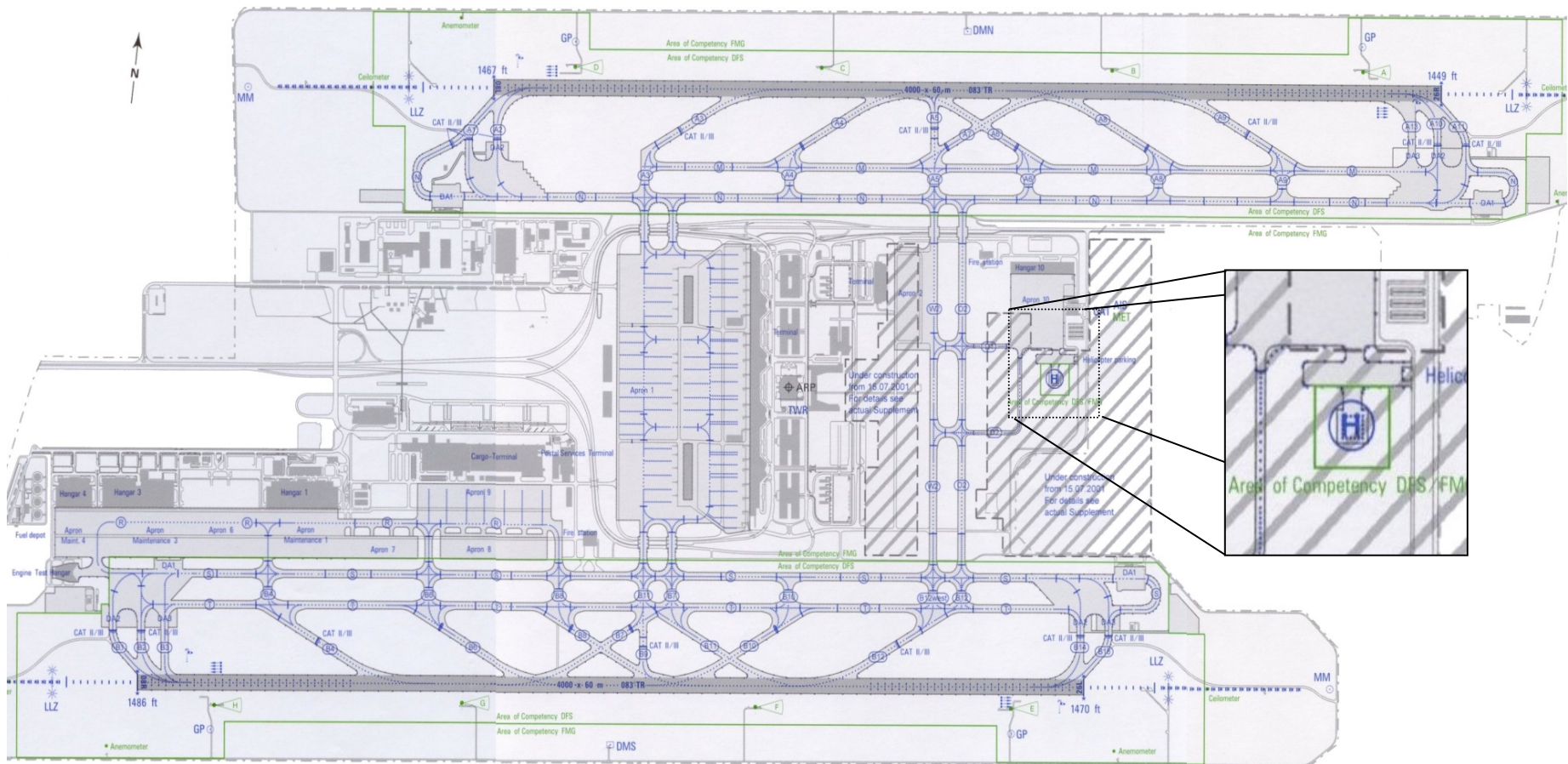
Areas of Competency

AIP: Airport Hahn (HHN)



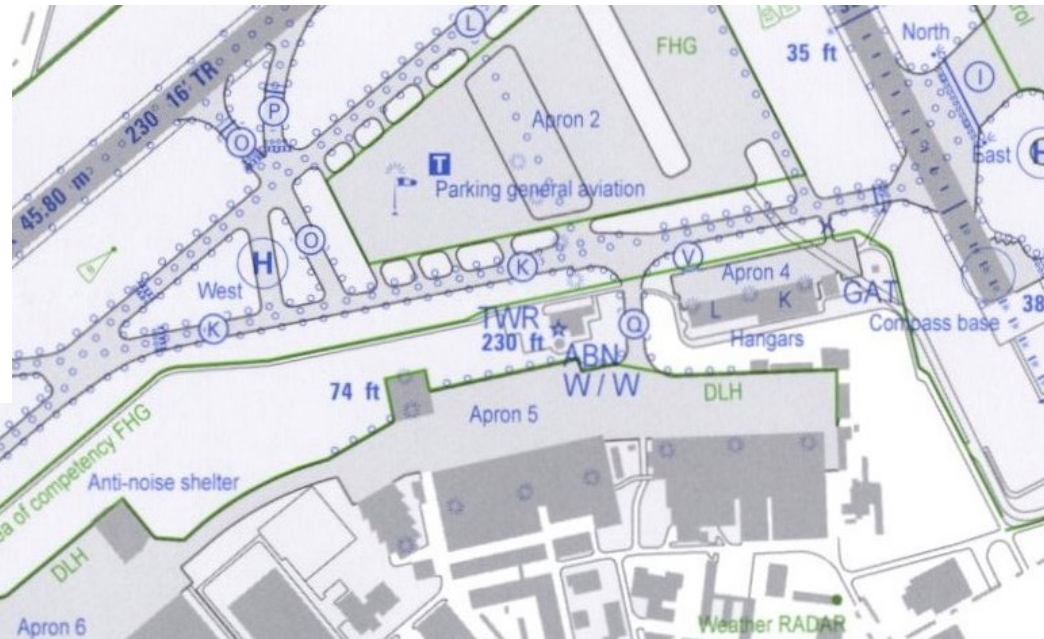
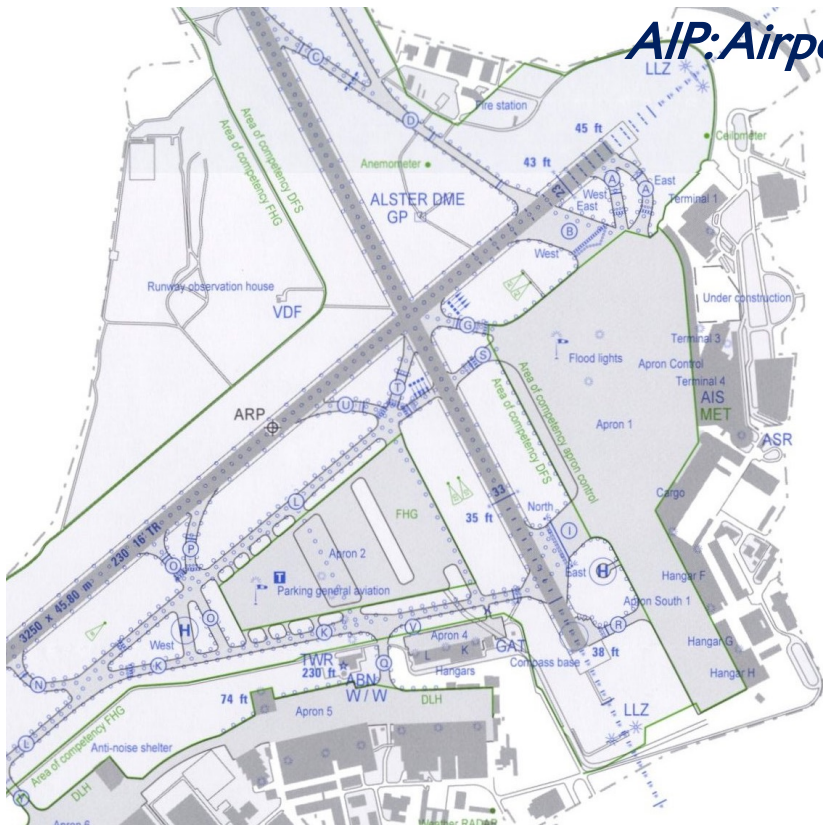
Areas of Competency

AIP: Airport Munich (MUC)



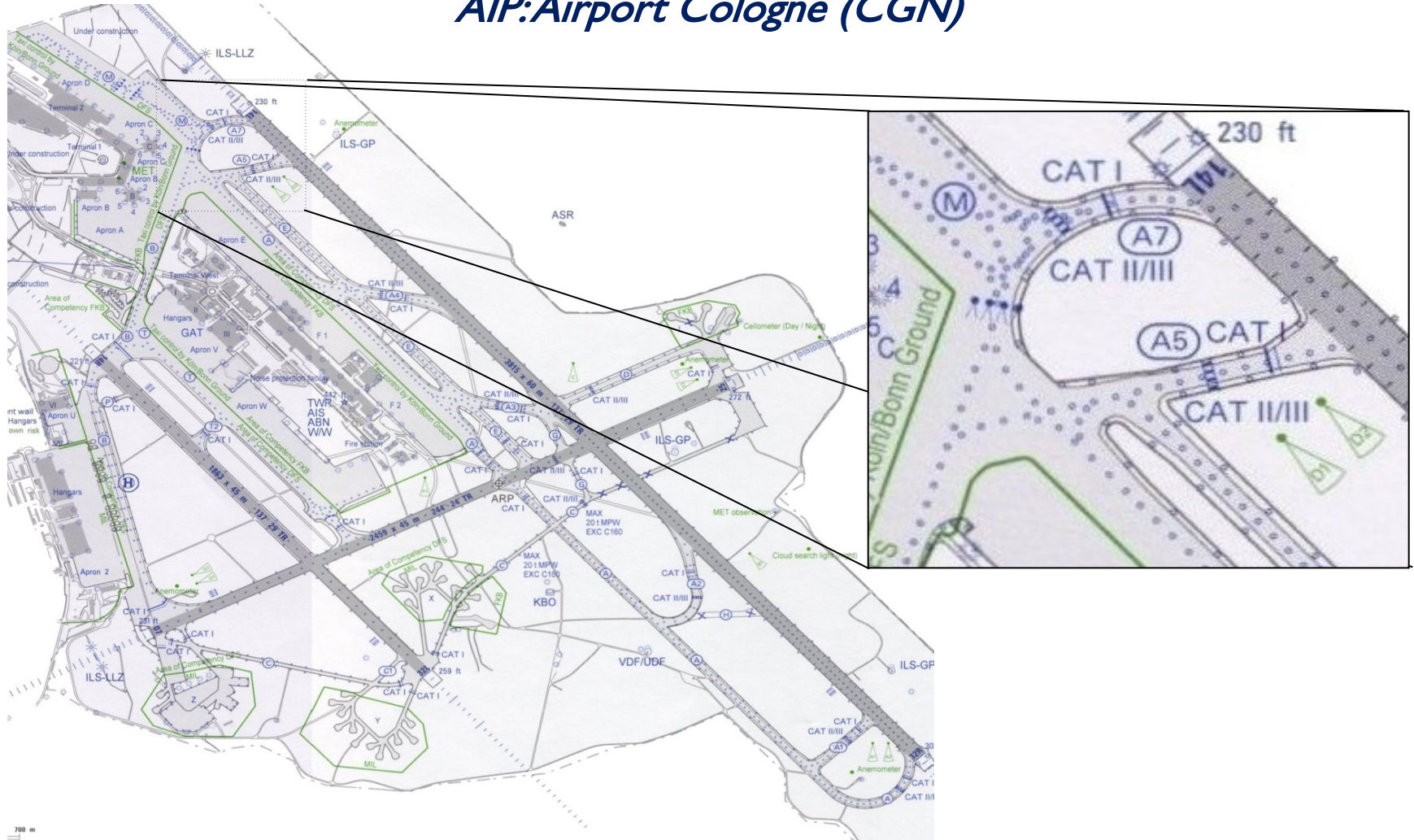
Areas of Competency

AIP: Airport Hamburg (HAM)



Areas of Competency

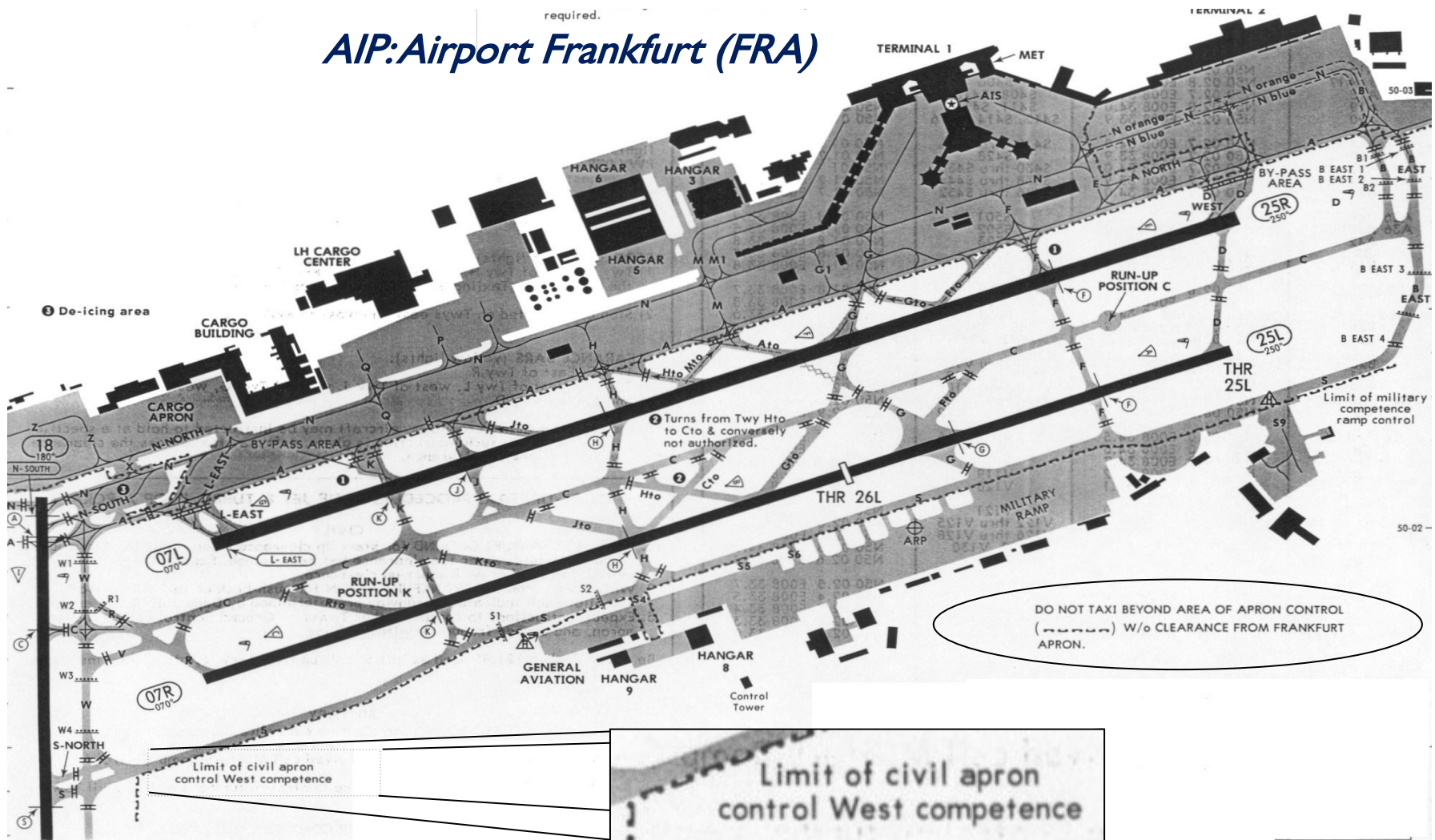
AIP: Airport Cologne (CGN)



Areas of Competency

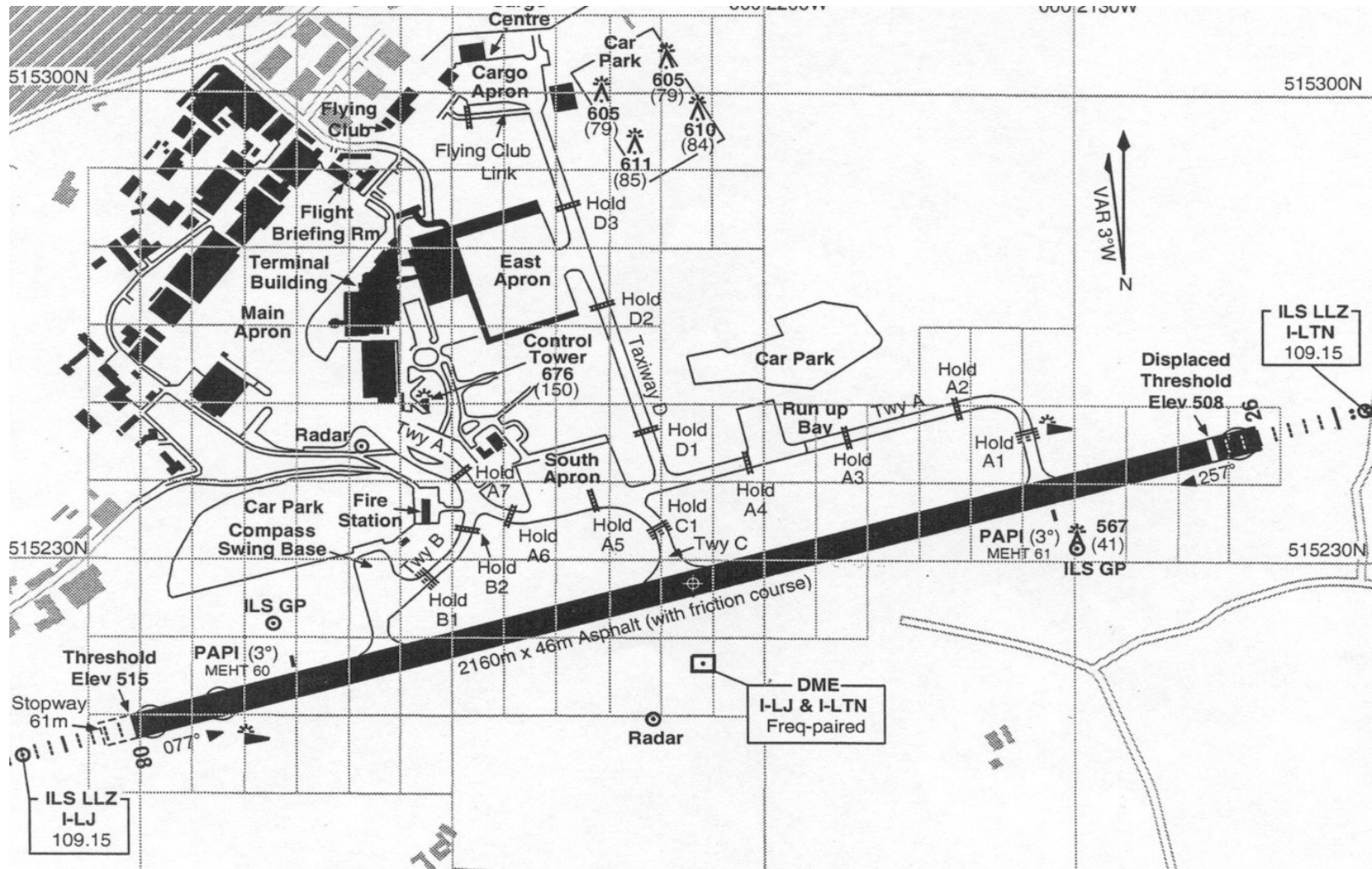
AIP: Airport Frankfurt (FRA)

required.



Areas of Competency

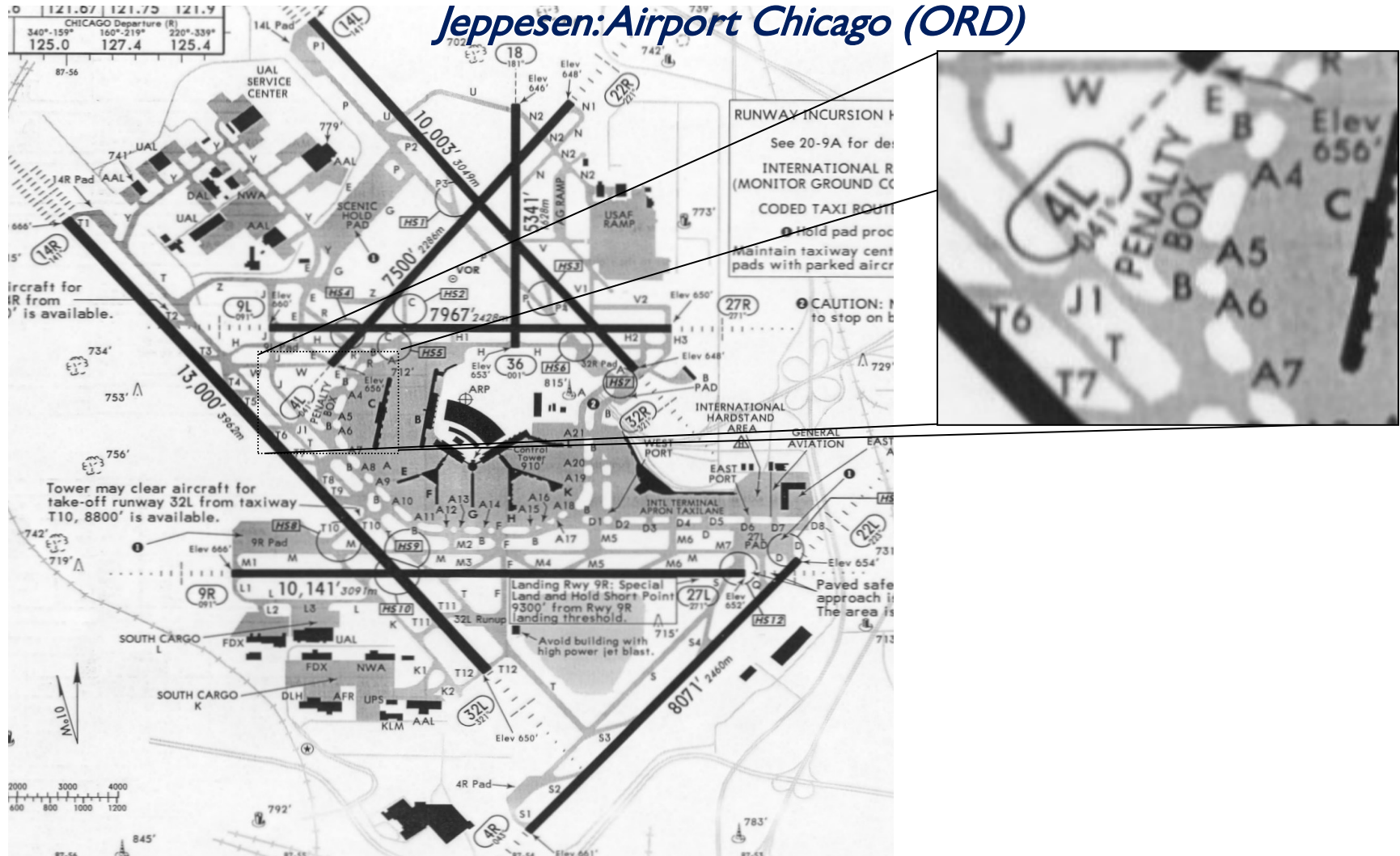
Jeppesen: Airport Luton (LTN)





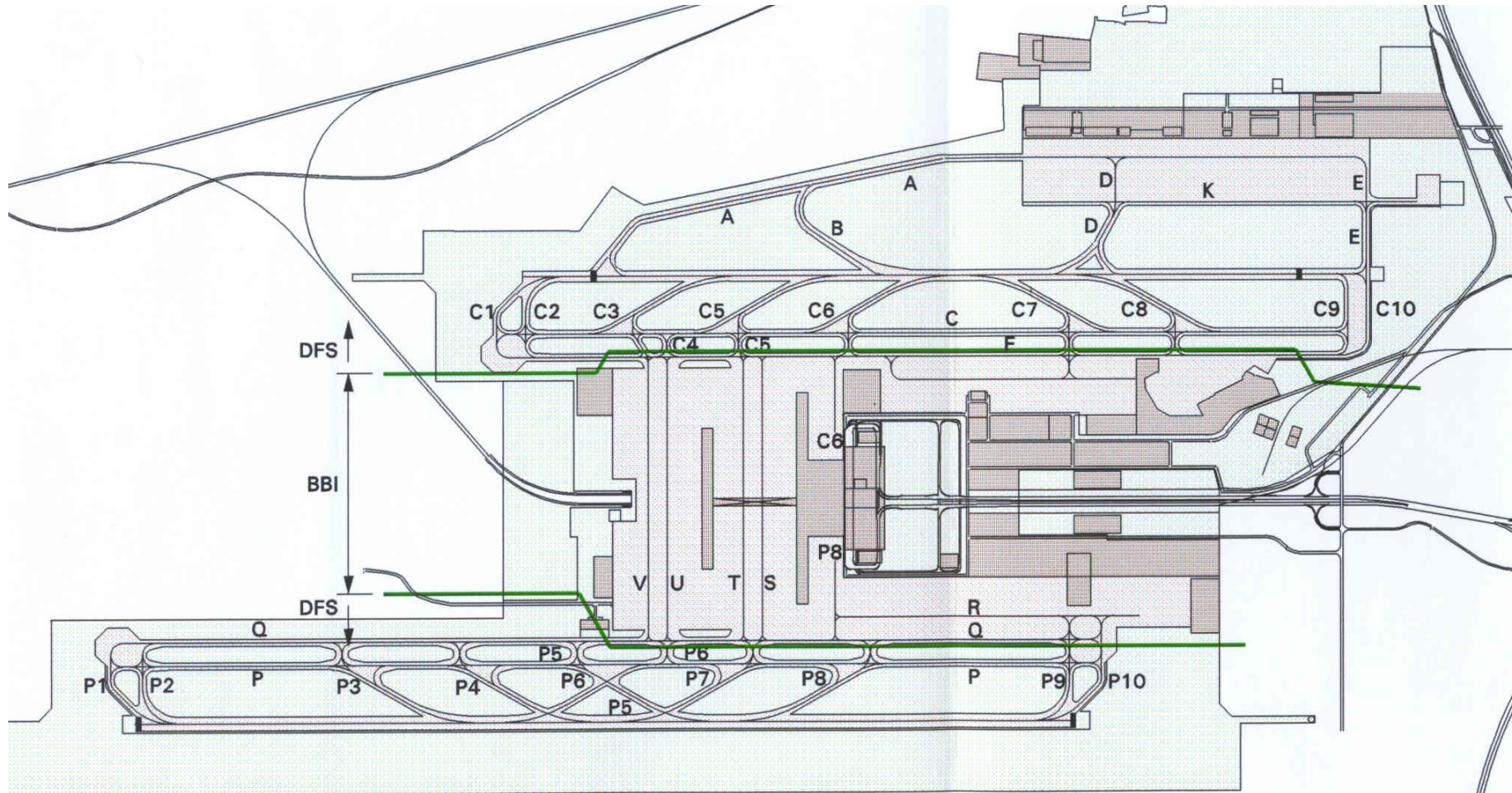
Areas of Competency

Jeppesen: Airport Chicago (ORD)



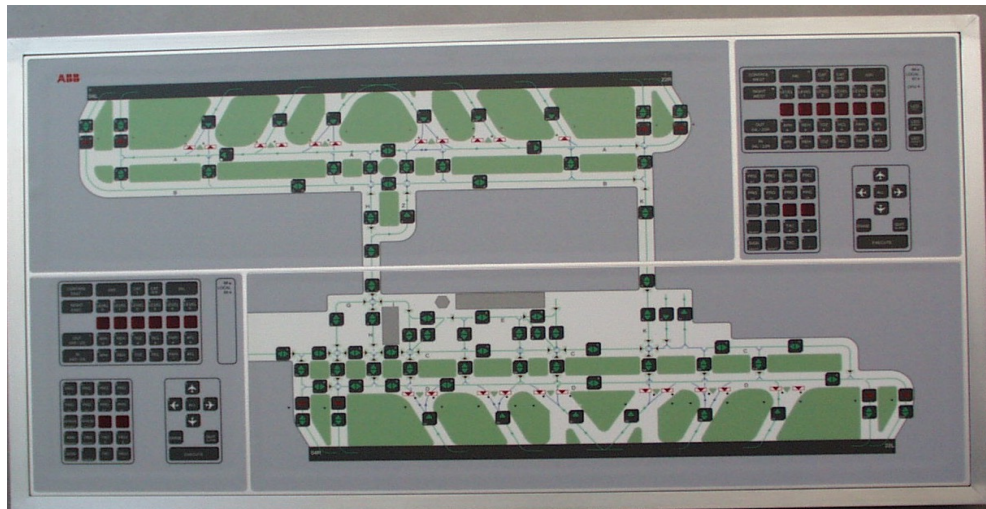
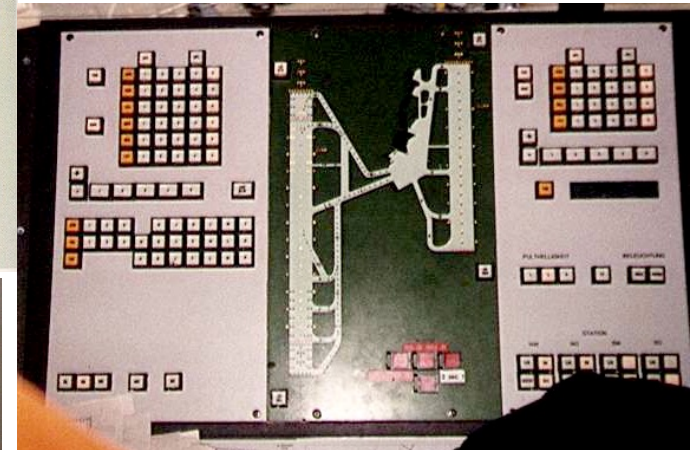
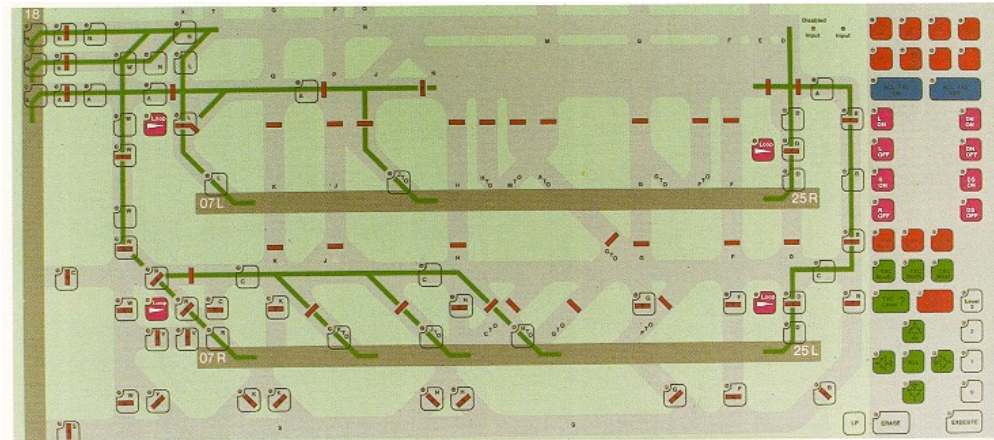
Areas of Competency

Masterplan: Airport Berlin (BER)



Areas of Competency

Old Airfield Lighting Panels: Frankfurt, Athen, Hannover



Areas of Competency

Airport Operations – Special Operations – Aircraft Towing

- Maintenance towing
- Towing between positions



Areas of Competency

Airport Operations – All Weather Operations – Low visibility Operations



Frankfurt

CAT III Sign
(Apron Service Roads)
and Obstruction Lighting

Areas of Competency

Airport Operations – All Weather Operations – Weather Observation

Frankfurt

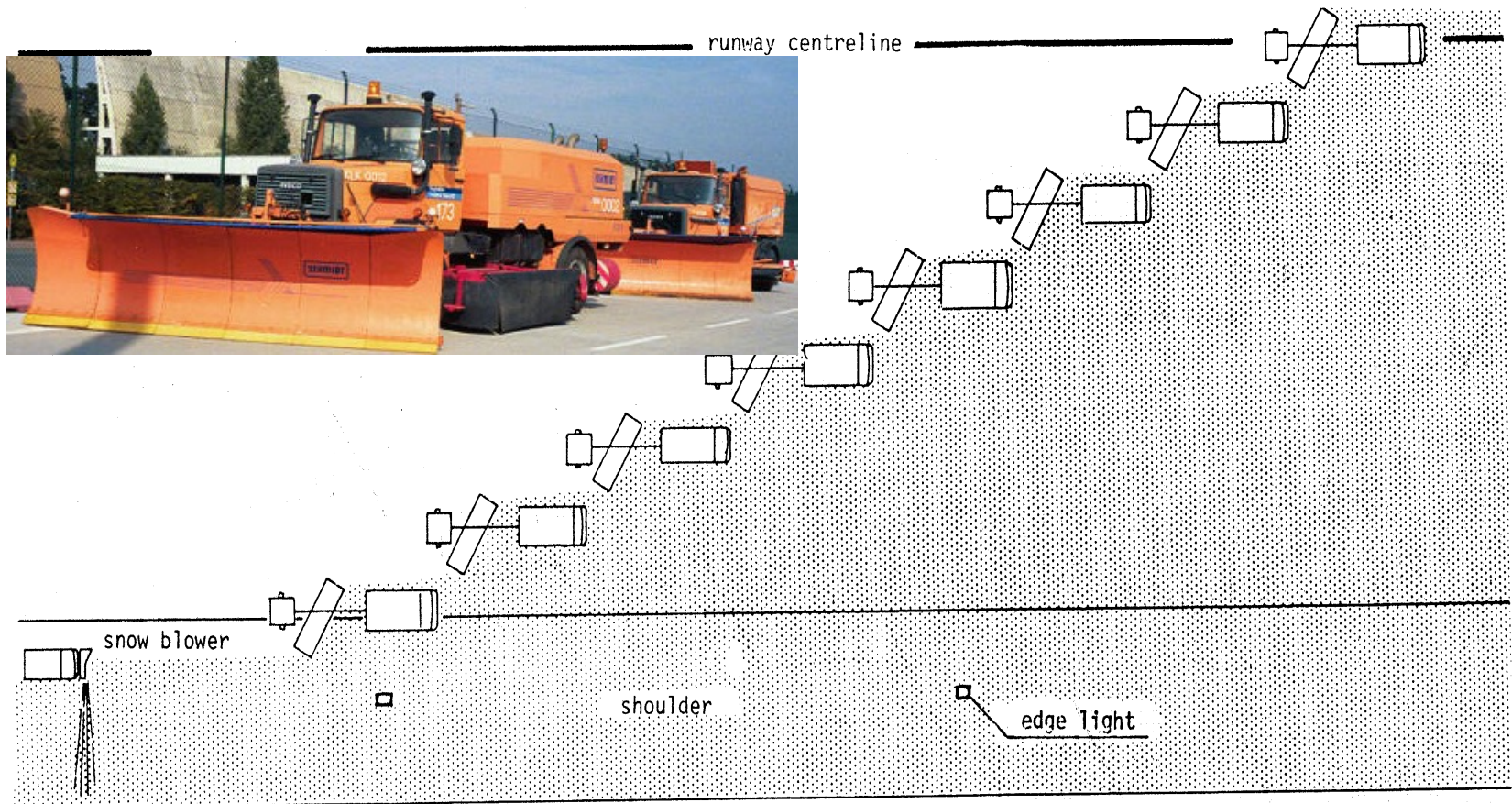
Windsack

Transmissometer



Areas of Competency

Airport Operations – All Weather Operations – Winter Operations – Runway deicing



Areas of Competency

*Airport Operations –
All Weather Operations – Winter Operations – Friction Testing*



Areas of Competency

*Airport Operations –
All Weather Operations – Winter Operations – Aircraft deicing*



Airport Operations

Initiative

Legal Framework

Areas of competency

Nomenclature

Surface Movement Guidance and Control

Outlook

Taxiway System Nomenclature

- Marking and Signage Handbook (IATA / ACI)
- Layout and Operations

Taxiway System Nomenclature

- A complex airport infrastructure with multiple runways and taxiways as well as aprons with different usage concepts lead to multiple taxi-routings which influence each other.
- Due to this circumstances the nomenclature of taxiway shall be clear and not misleading. It is helpful for pilots if they can derive their relative positions out of the nomenclature (relative to the runways)
- Ref. ICAO Annex 14, section 5.4.3.32.
- The letters I, O, and X shall not be used.

Taxiway System Nomenclature

- Double letters (e.g in Berlin-Tegel: TE, TW, etc.) are misleading.

Clearance: (Example)

- „Taxi to A42 via A, M and M1“
- „Taxi to Runway 25 via M2, M and A“
- „Taxi to Runway 25 intersection S, via G, A, B-East and S“

Taxiway System Nomenclature

Shall - standard

Safe and orderly guidance of aircraft on the ground

Latin letters

Arabic numbers

Should recommendation

Do not use the index „2“ if you use alphanumeric codes

No double letters (e.g. AA, AB)

Do not use: I, O, X

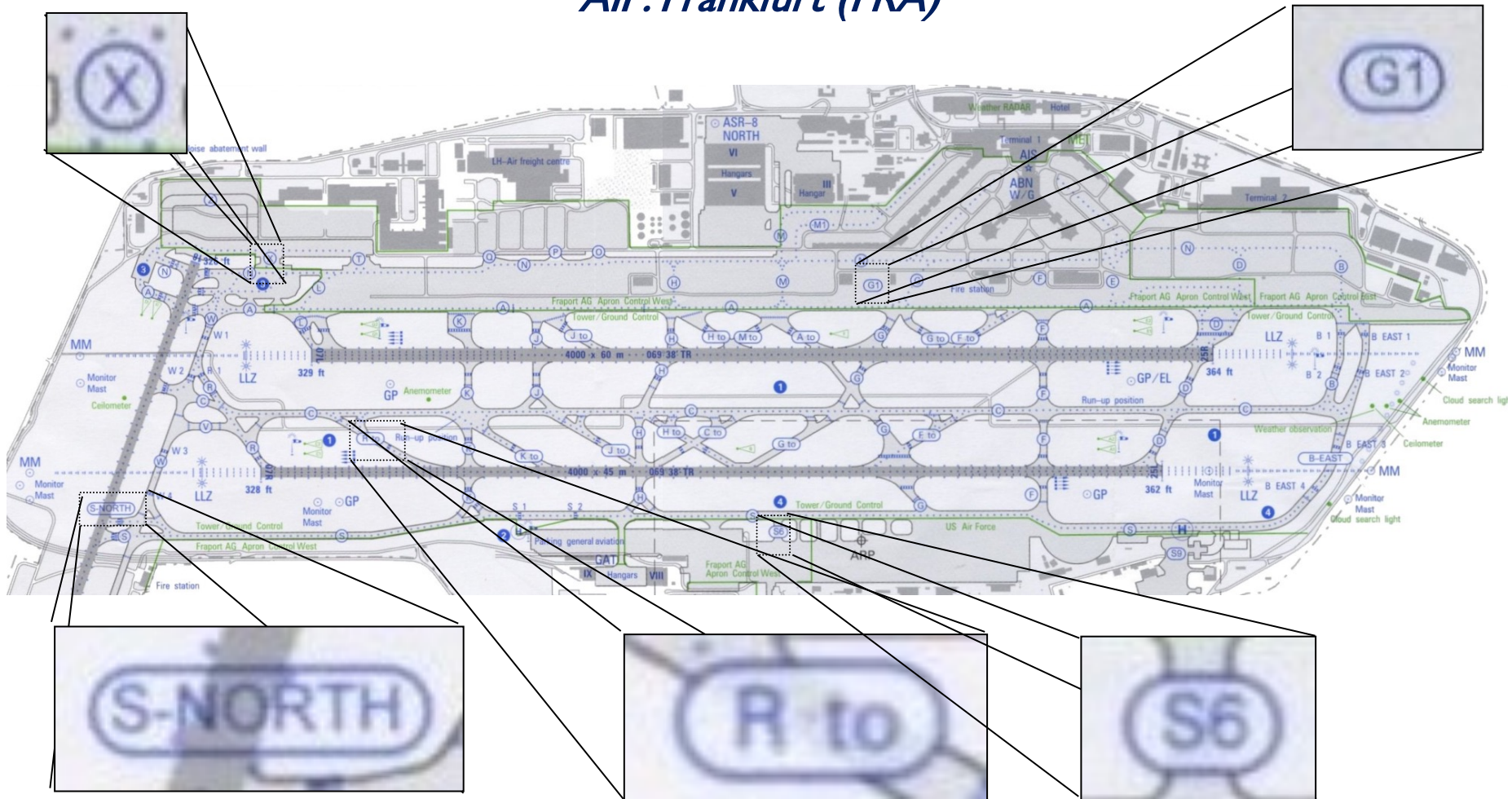
No standard systematic recommended

Taxiway System Nomenclature

- ☺ Clear and consistent ➔ safety is assured
- ☺ Room for expansion
- ☺ Rapid orientation for pilots and controllers
- ☹ High cost if you consider the number of signs
- ☹ Operational restrictions must be avoided during exchange of signs

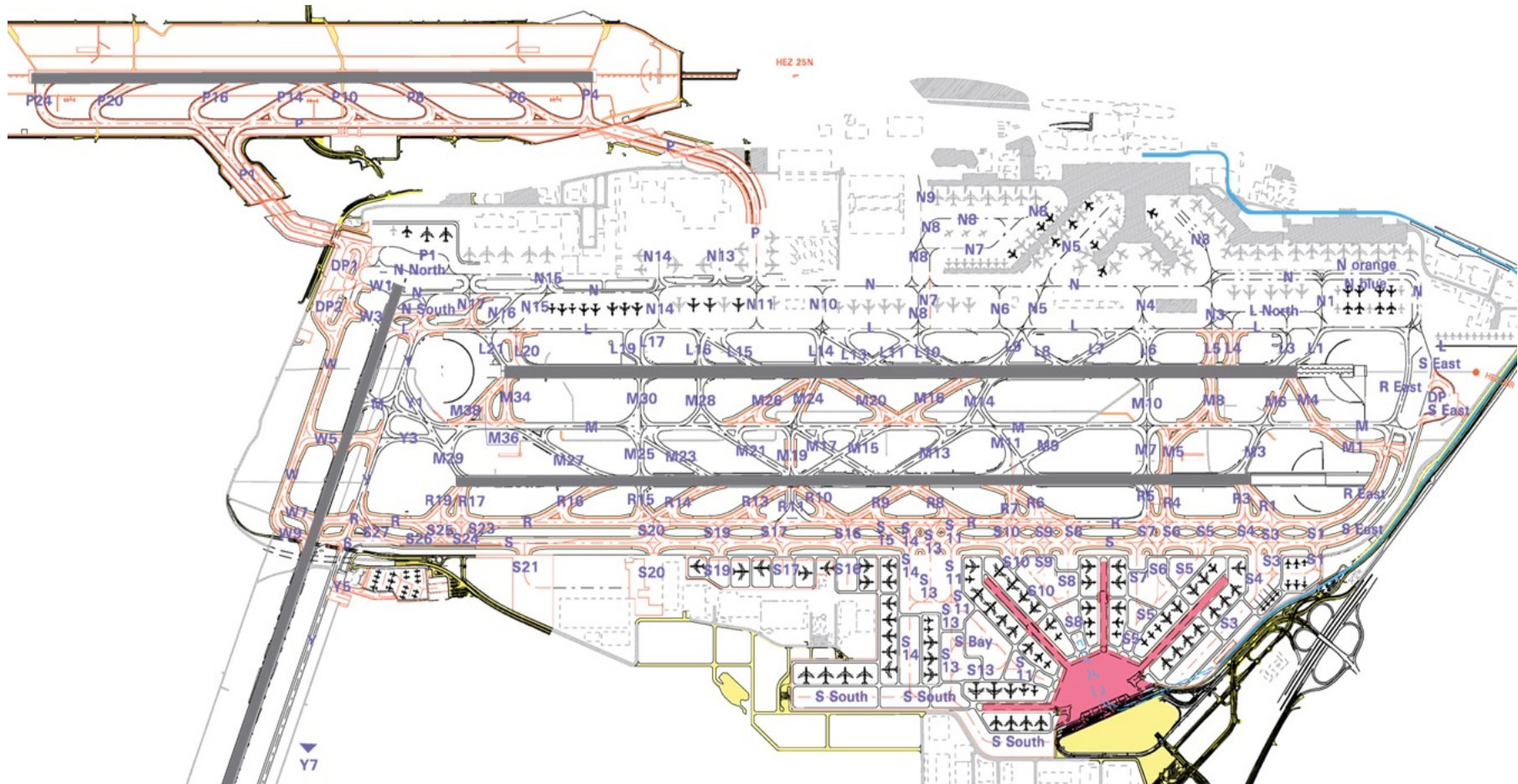
Taxiway System Nomenclature

AIP: Frankfurt (FRA)



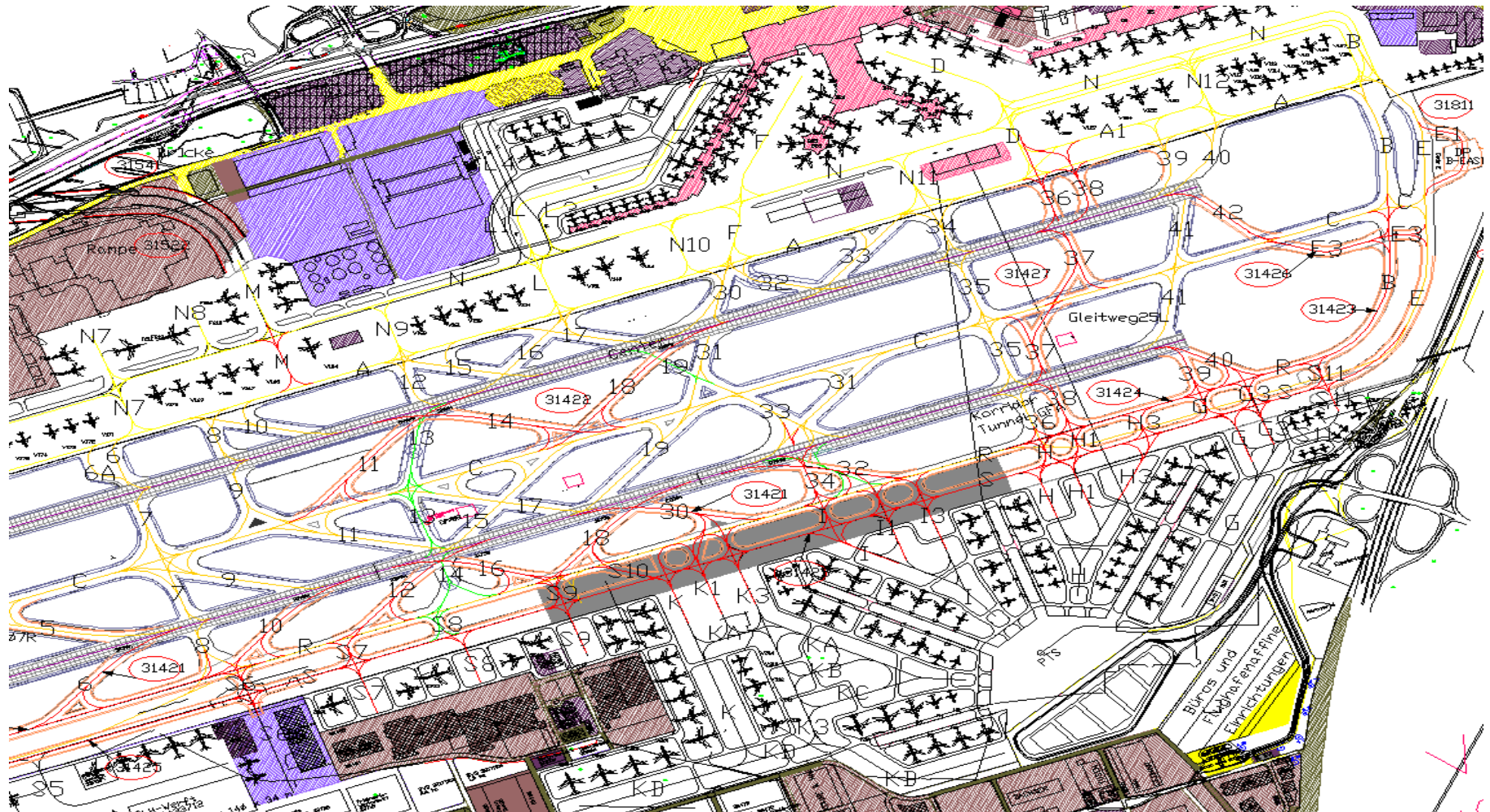
Taxiway System Nomenclature

Concept: Frankfurt (FRA)



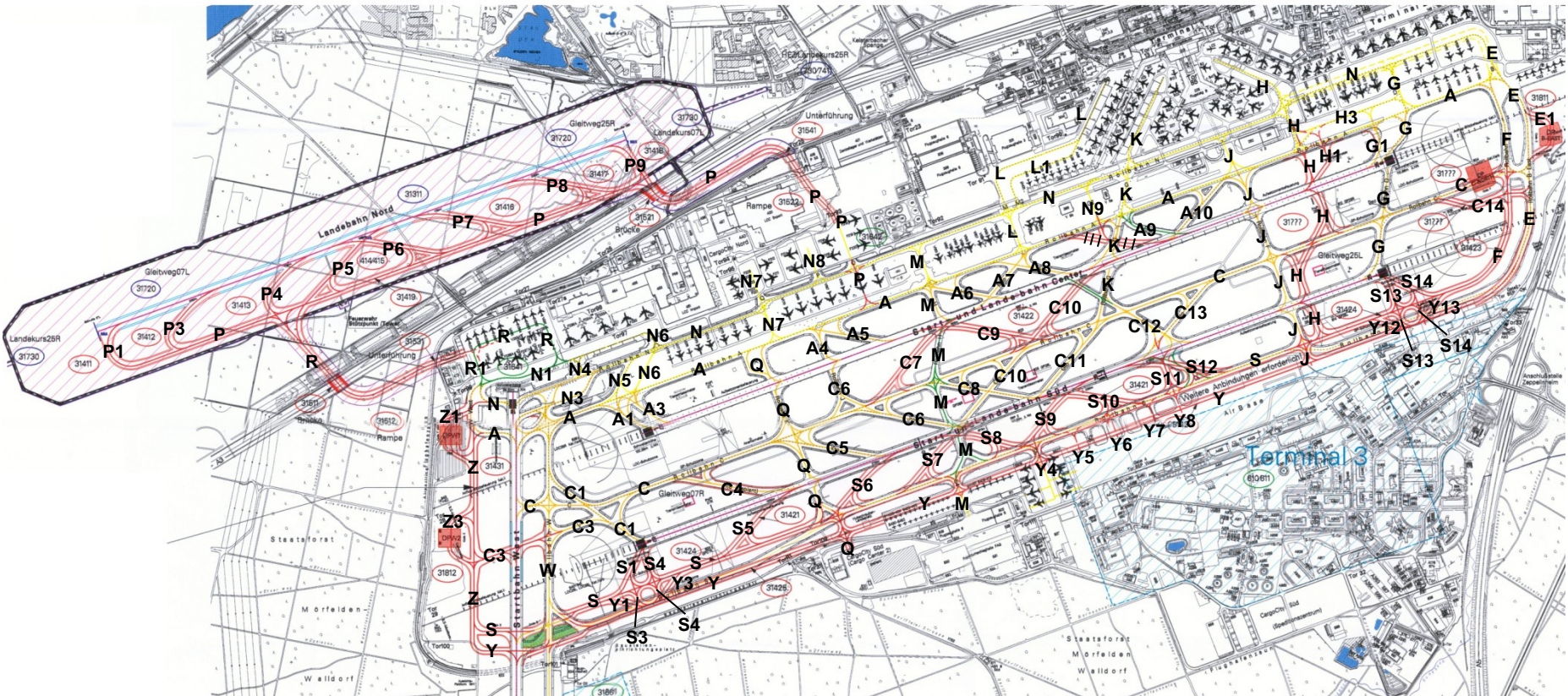
Taxiway System Nomenclature

Concept: Frankfurt (FRA)



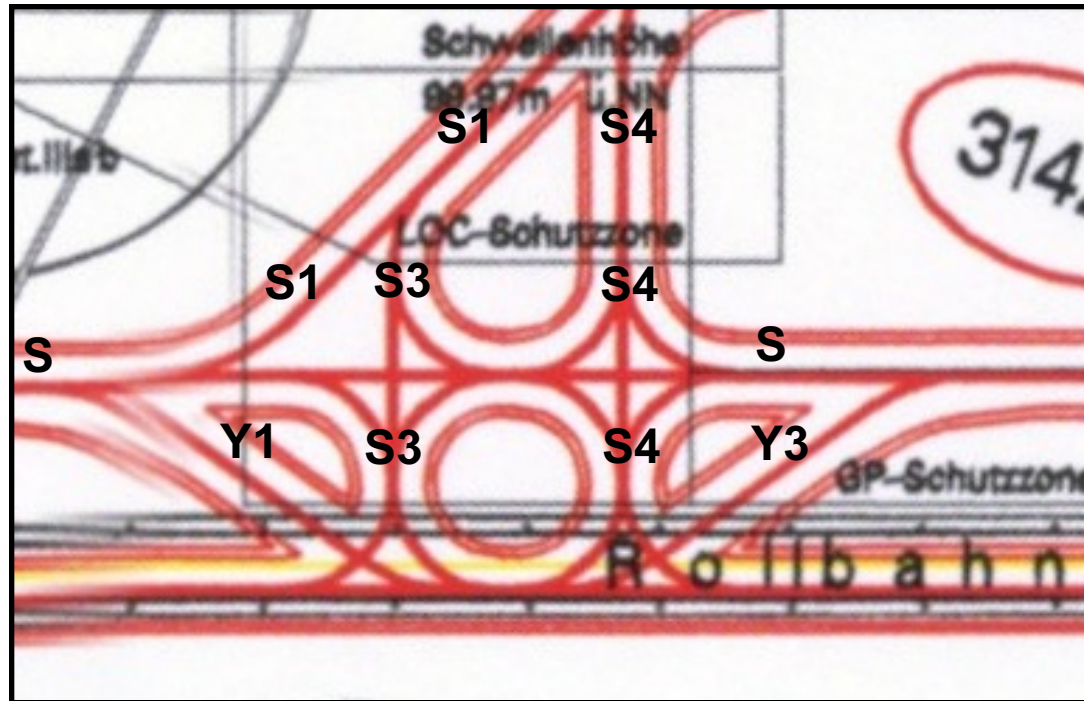
Taxiway System Nomenclature

Concept: Frankfurt (FRA)



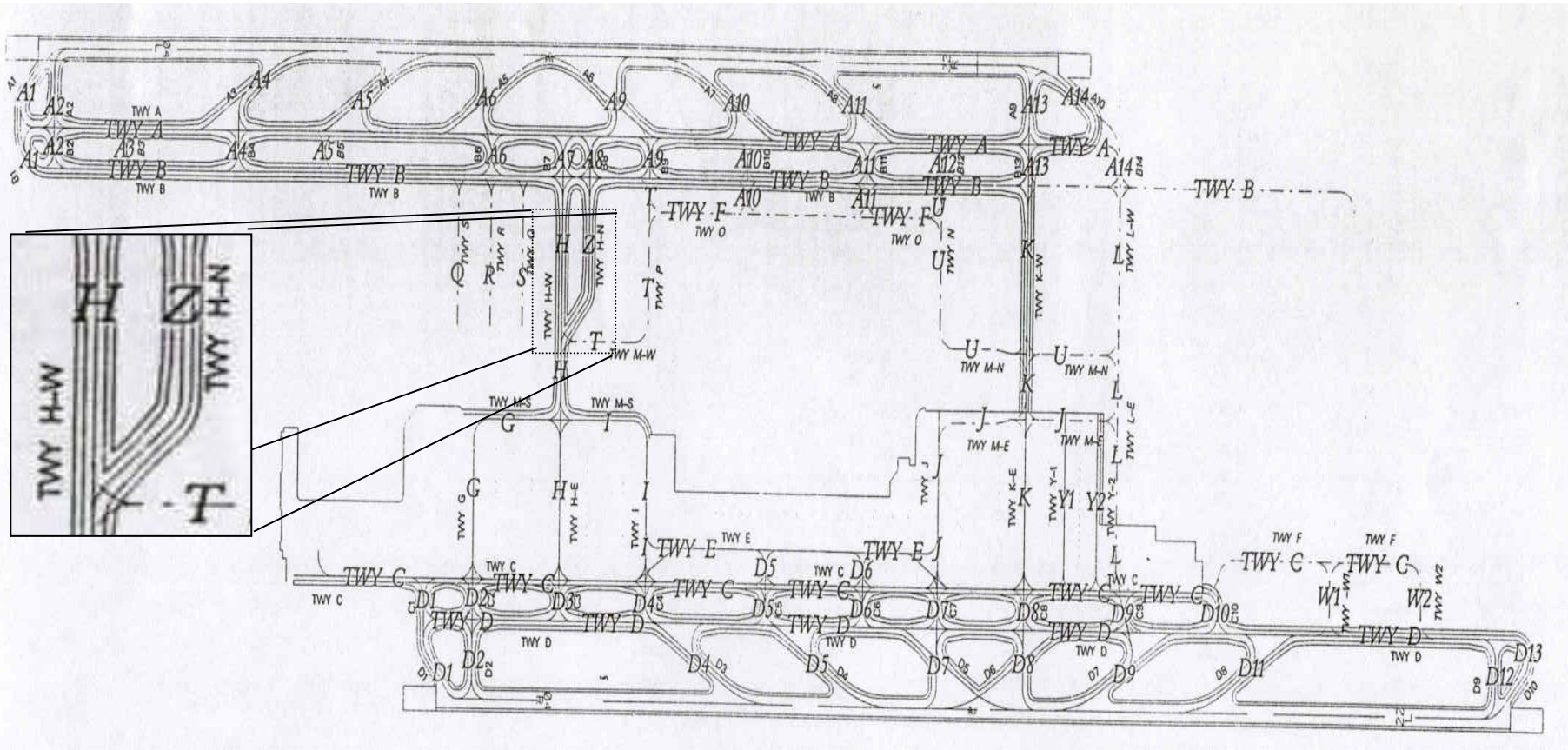
Taxiway System Nomenclature

Concept: Frankfurt (FRA)



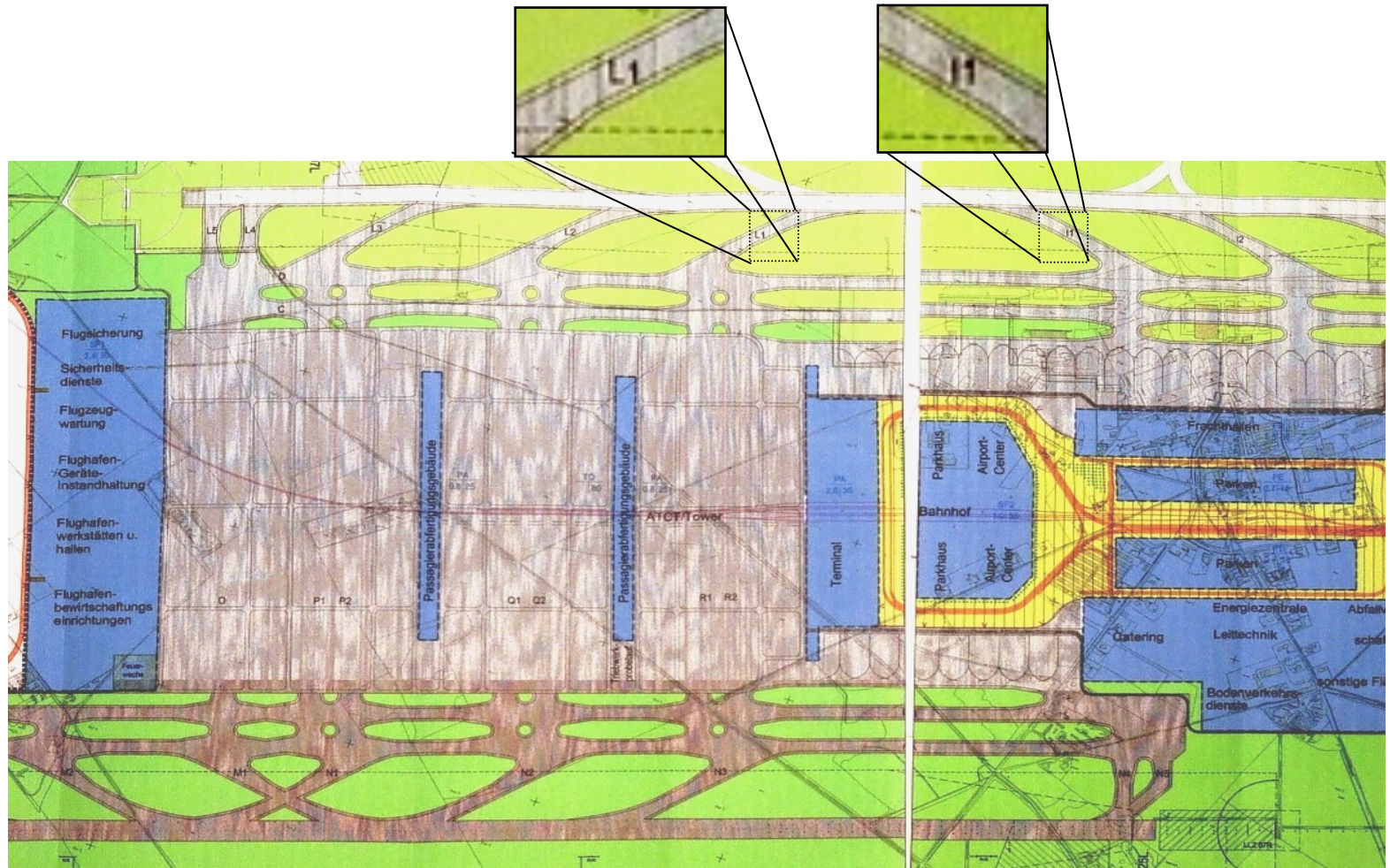
Taxiway System Nomenclature

Masterplan: Athens (ATH)



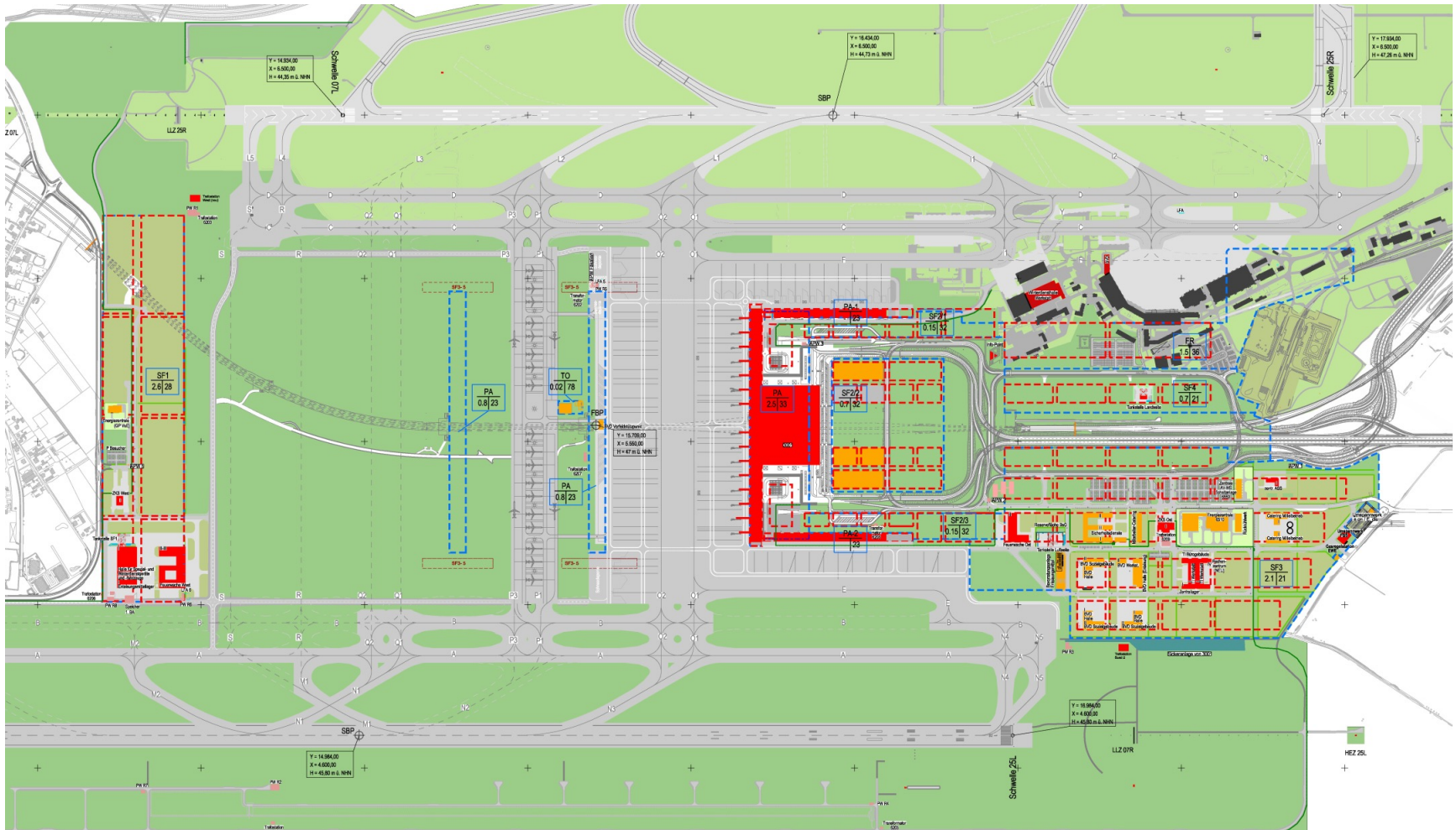
Taxiway System Nomenclature

Concept: Berlin (BBI)



Taxiway System Nomenclature

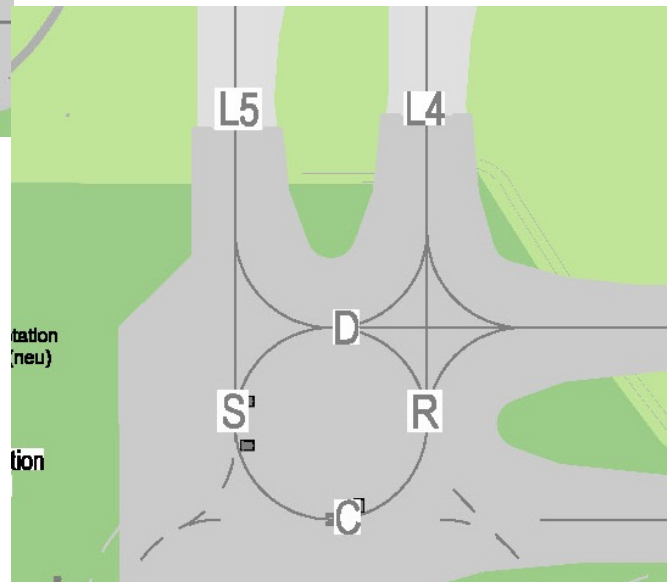
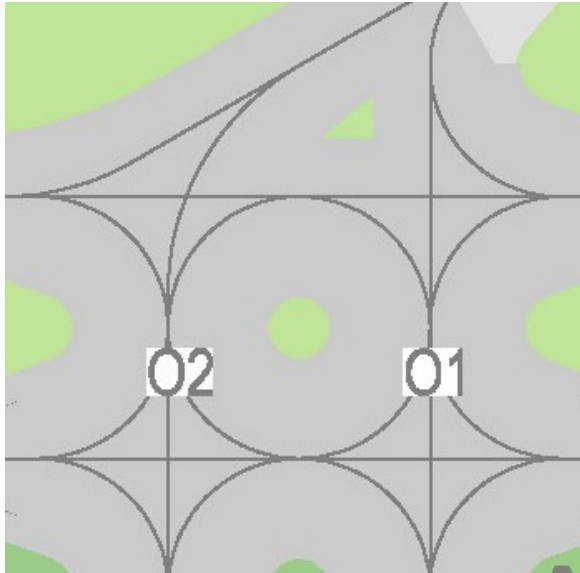
Masterplan: Berlin (BER)



Taxiway System Nomenclature

Masterplan: Berlin (BER)

Detail



Taxiway System Nomenclature

Signage: London Heathrow (LHR)



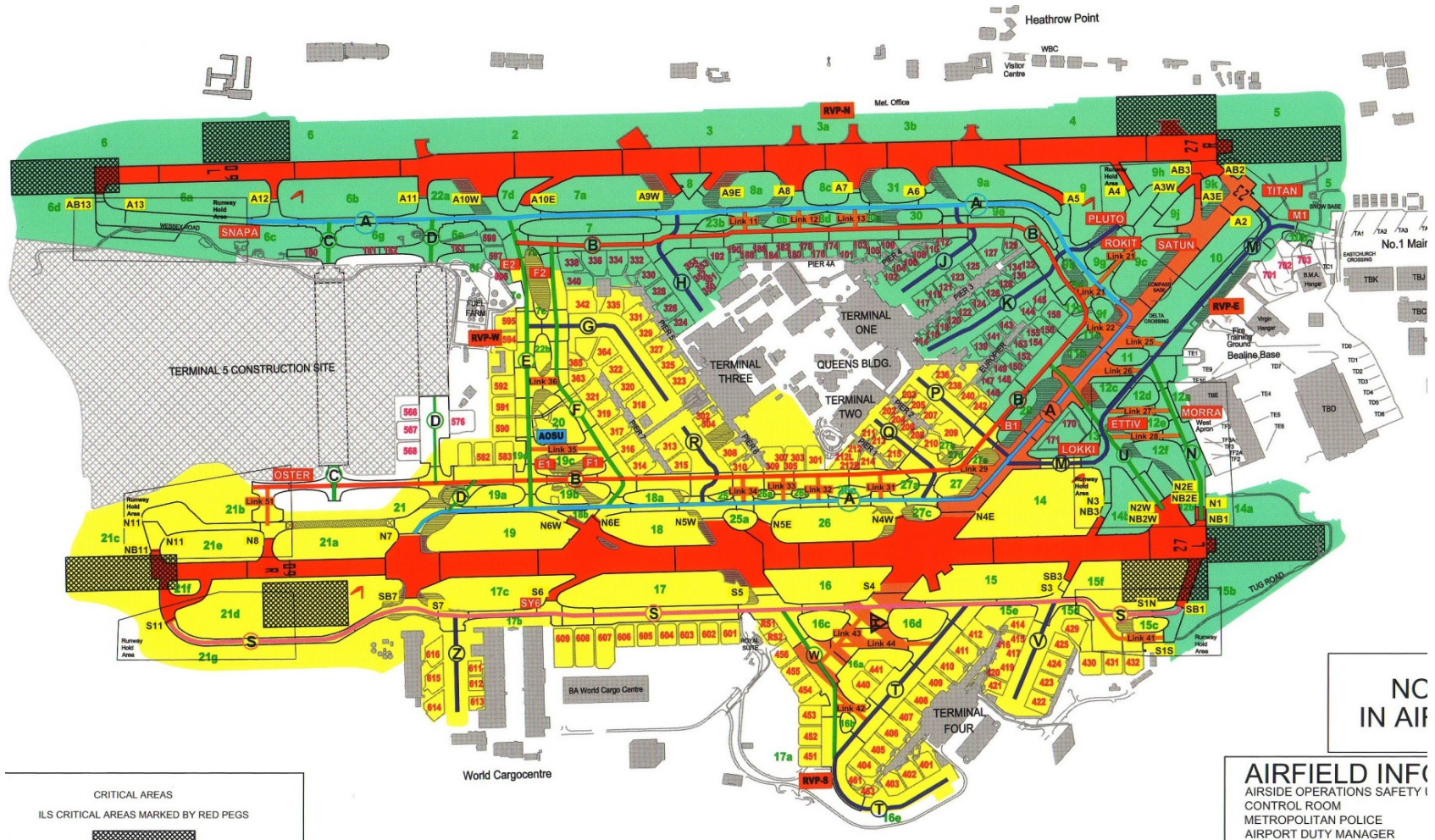
Taxiway System Nomenclature

Signage: London Heathrow (LHR)



Taxiway System Nomenclature

Concept: London Heathrow (LHR)



Airport Operations

Initiative

Legal Framework

Areas of competency

Nomenclature

Surface Movement Guidance and Control

Outlook

Surface Movement Guidance and Control

- According to ICAO Annex 14 „Aerodromes“,
- For the execution of a safe, orderly and expeditious flow of surface traffic a clear structure of taxiway relations with clear relations is necessary.
- The concept takes into consideration all potential taxi relations for various models of runway usage (arrivals/departures)
- All types of traffic (IFR/VFR)
- All types of weather conditions
- The concept is part of the operations handbook.

Surface Movement Guidance and Control

Basic Aspects:

- Safety (Avoiding conflicts)
- Order (no or not many changes of direction)
- Speediness (short time - short distance)

Surface Movement Guidance and Control

Criteria to be considered:

- Avoiding opposite movements (Safety)
- Avoiding of unnecessary crossings (Safety)
- Avoiding of through traffic behind Push-Back Positions (Order)
- All parking positions concerned (Order)
- short distances (Speediness).

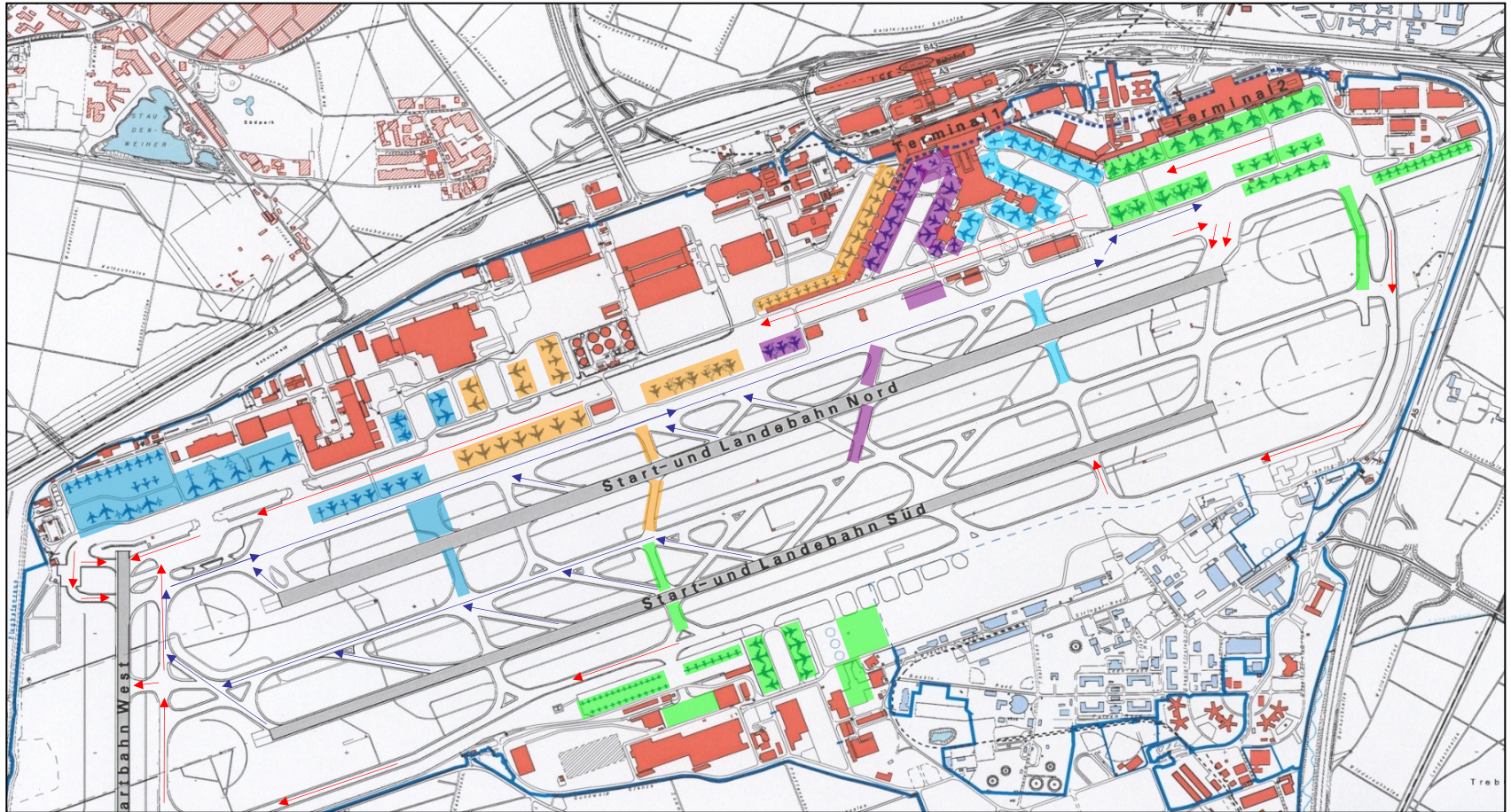
Surface Movement Guidance and Control

Routes RWY 07 (Frankfurt)



Surface Movement Guidance and Control

Routes RWY 25 (Frankfurt)



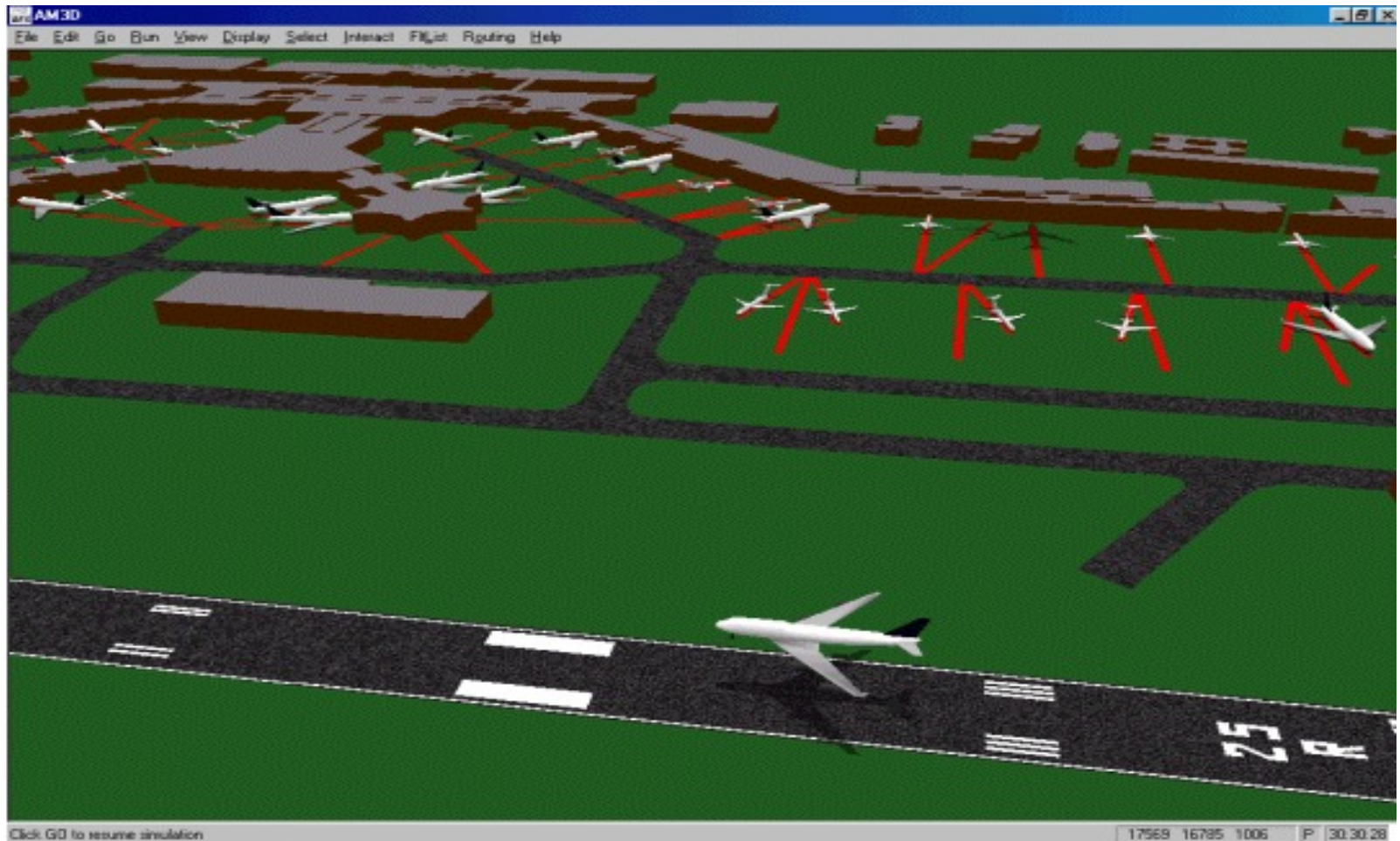
Surface Movement Guidance and Control

Airport Machine



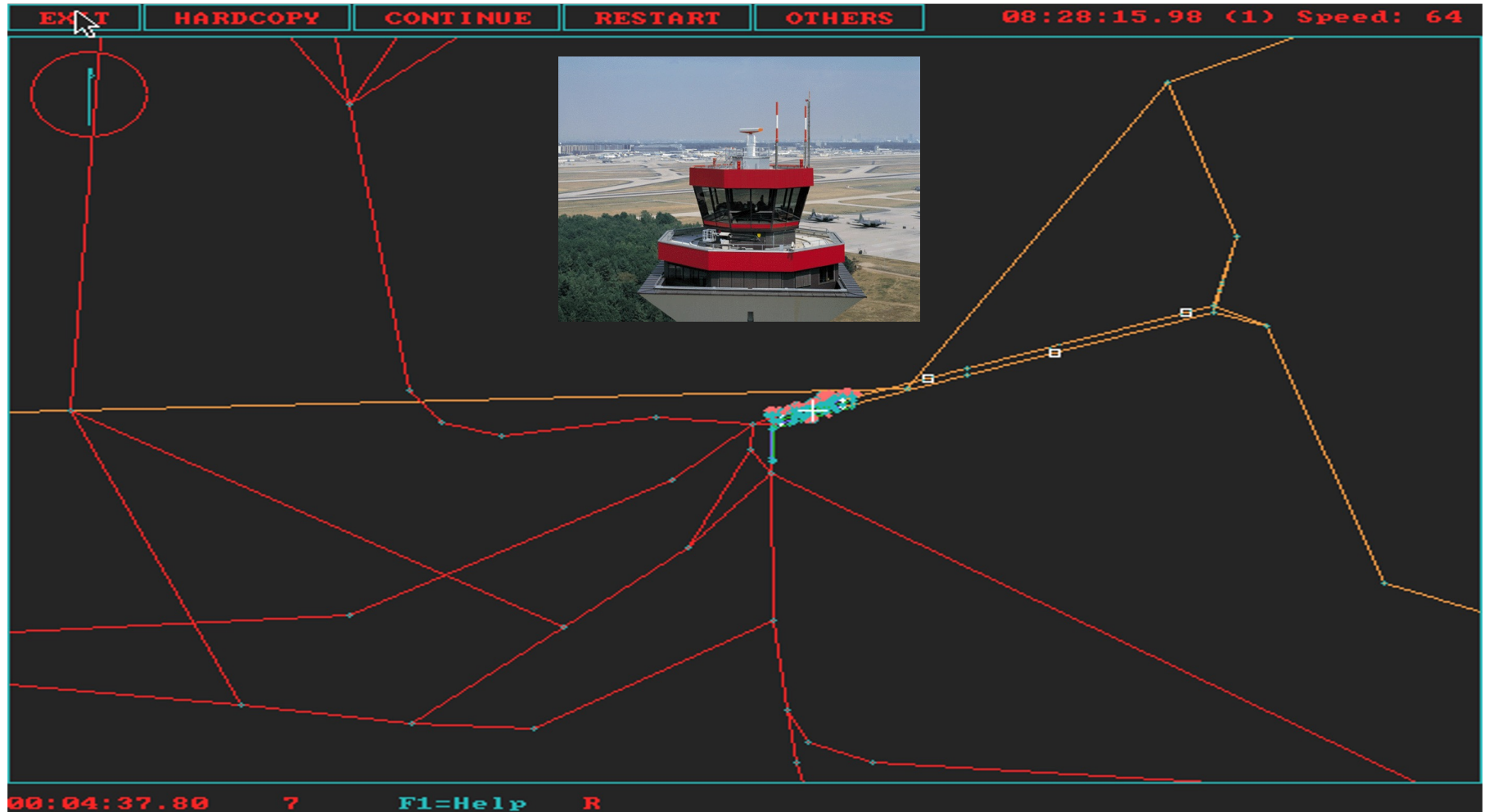
Surface Movement Guidance and Control

Airport Machine 3D



Surface Movement Guidance and Control

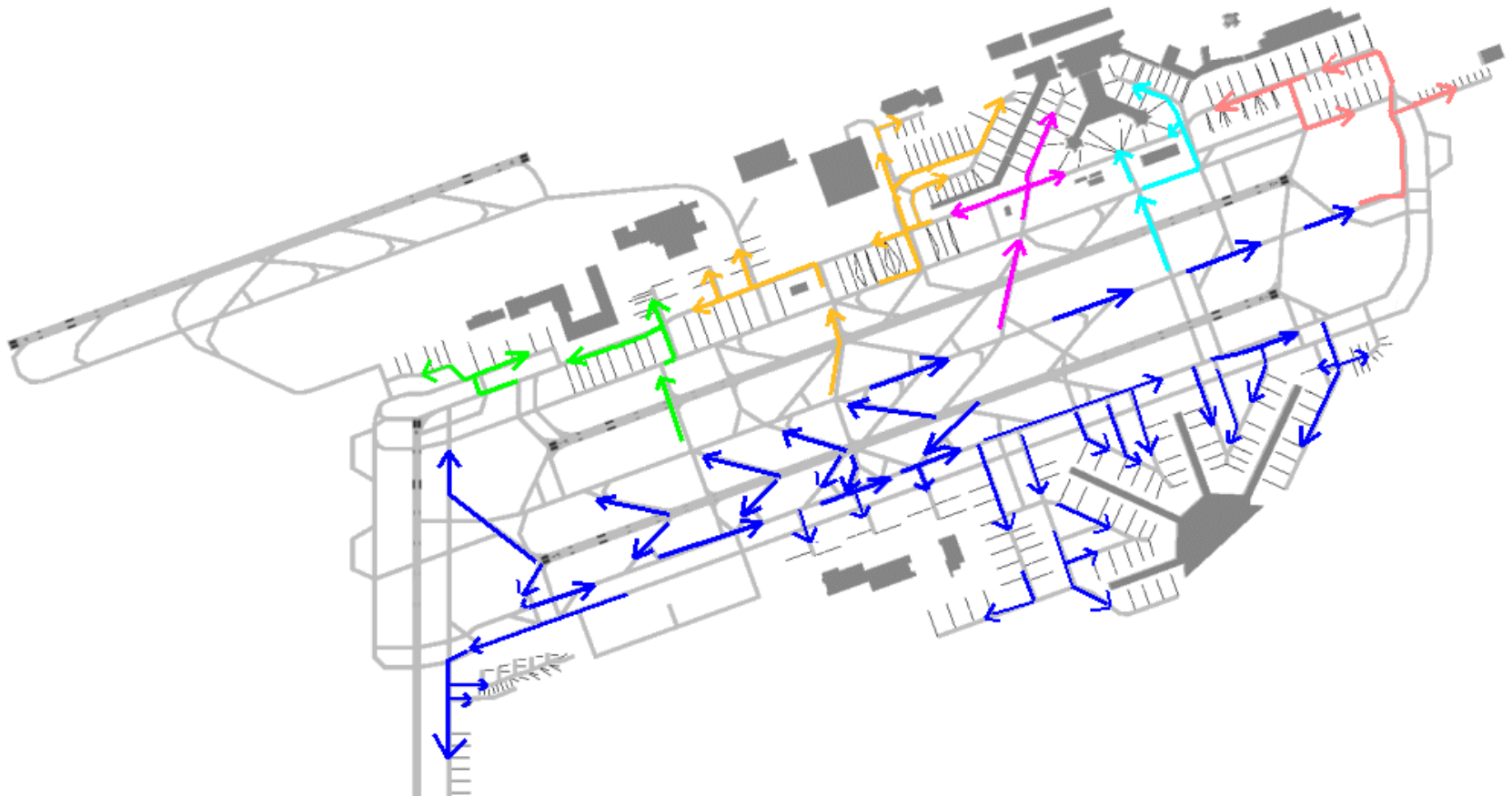
SIMMOD



Surface Movement Guidance and Control

Concept Frankfurt

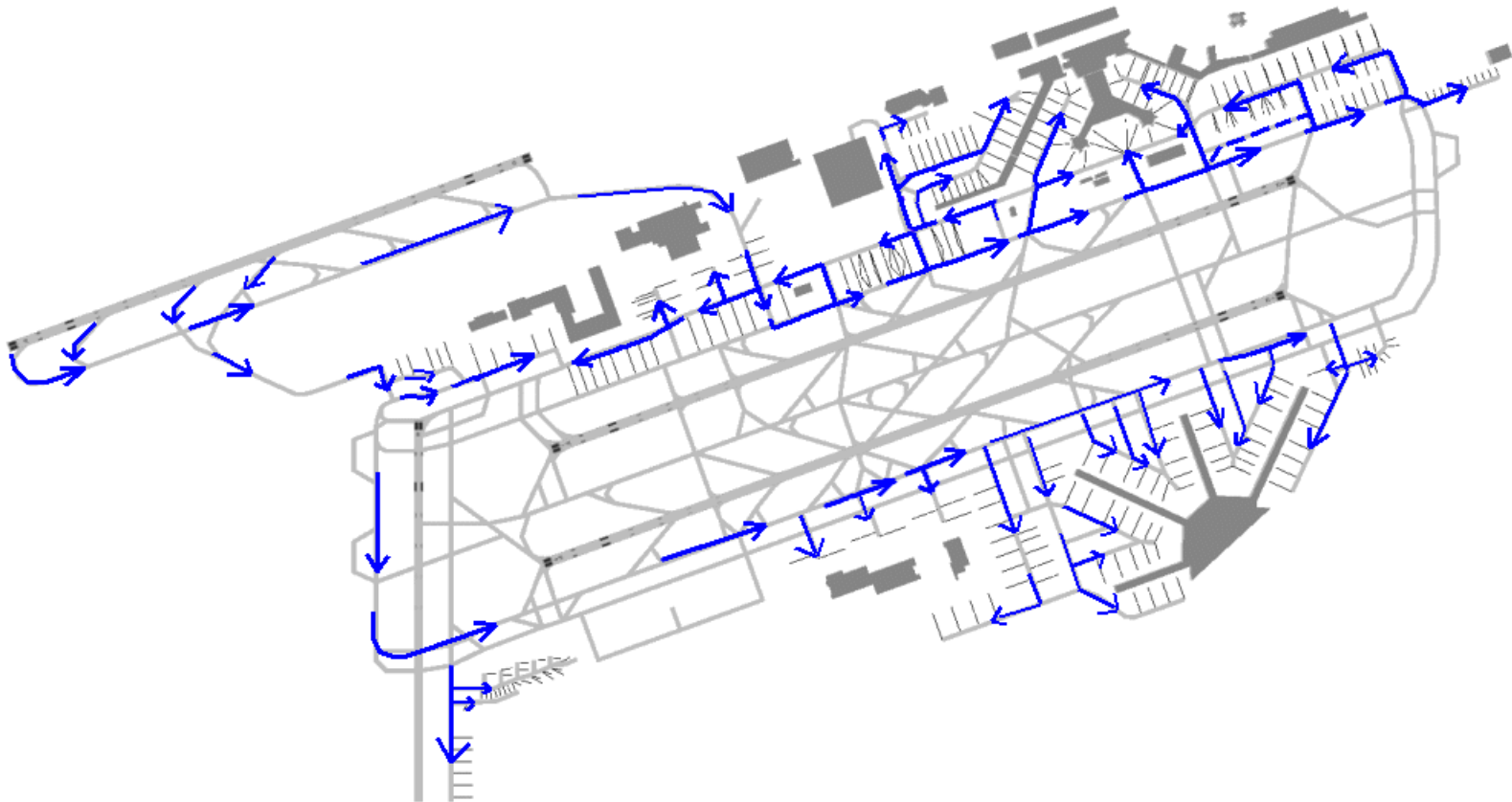
ARR 25L



Surface Movement Guidance and Control

Concept Frankfurt

ARR 25N



Surface Movement Guidance and Control

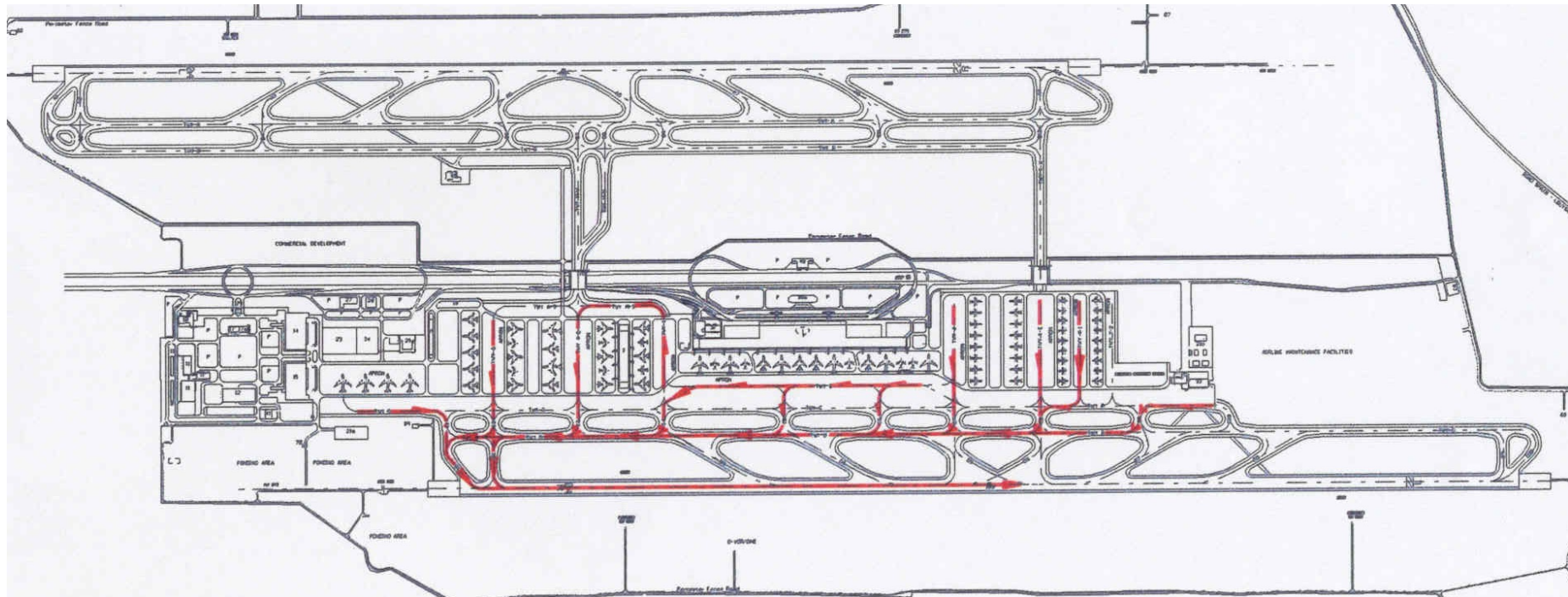
Concept Frankfurt

DEP 25R



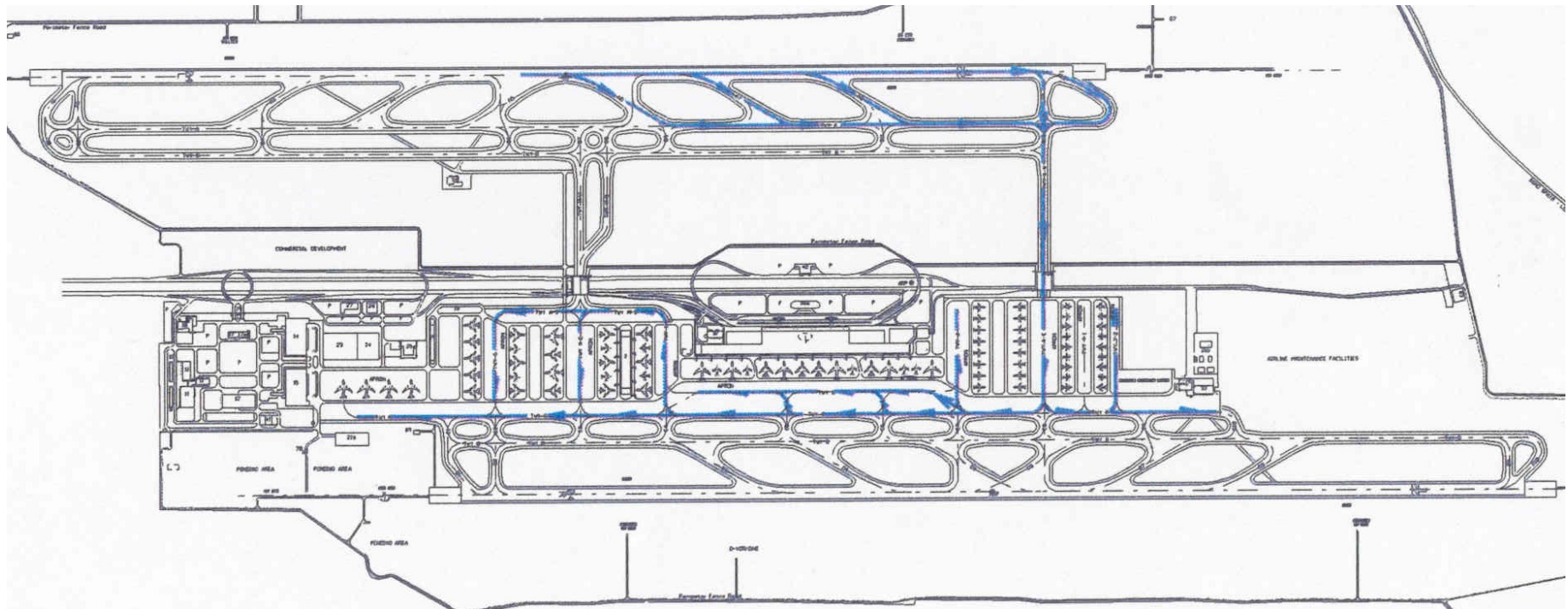
Surface Movement Guidance and Control

Concept Athens



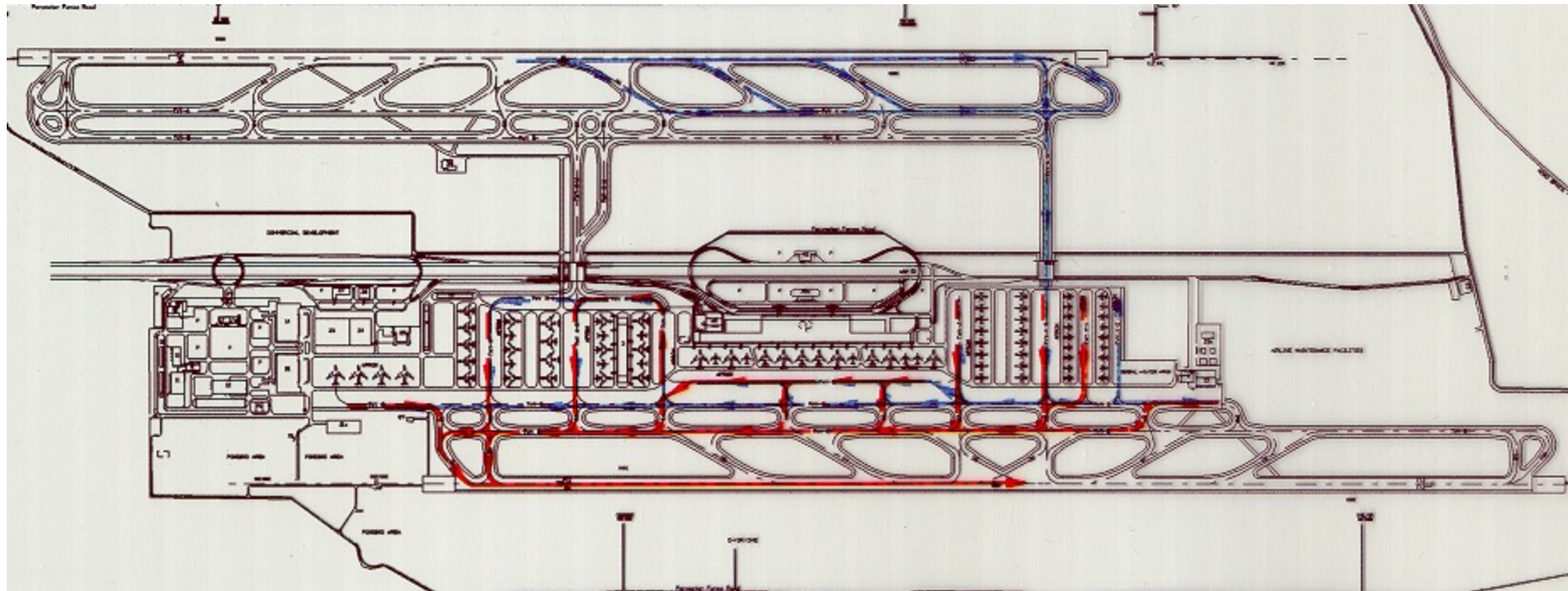
Surface Movement Guidance and Control

Concept Athens



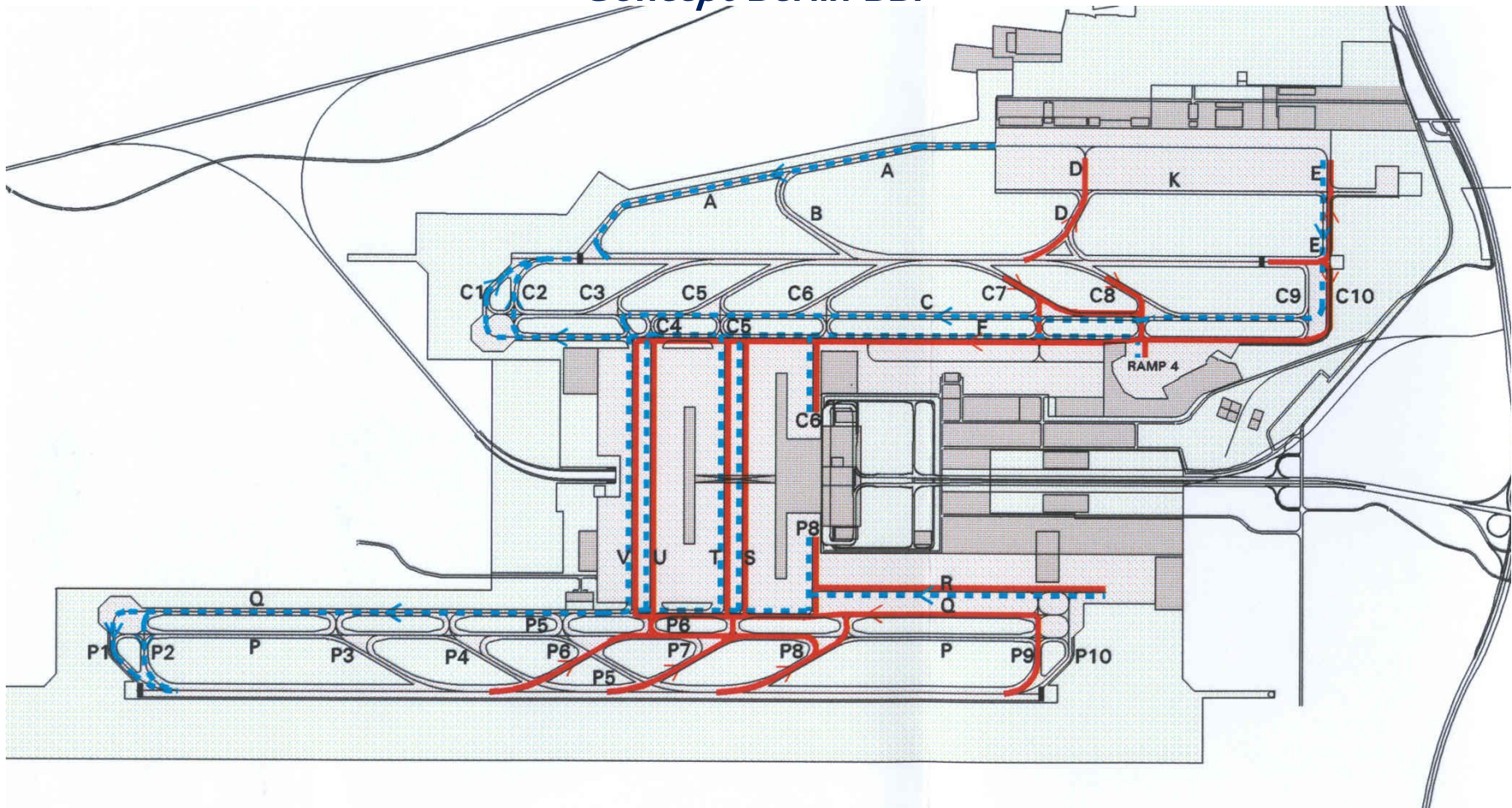
Surface Movement Guidance and Control

Concept Athens



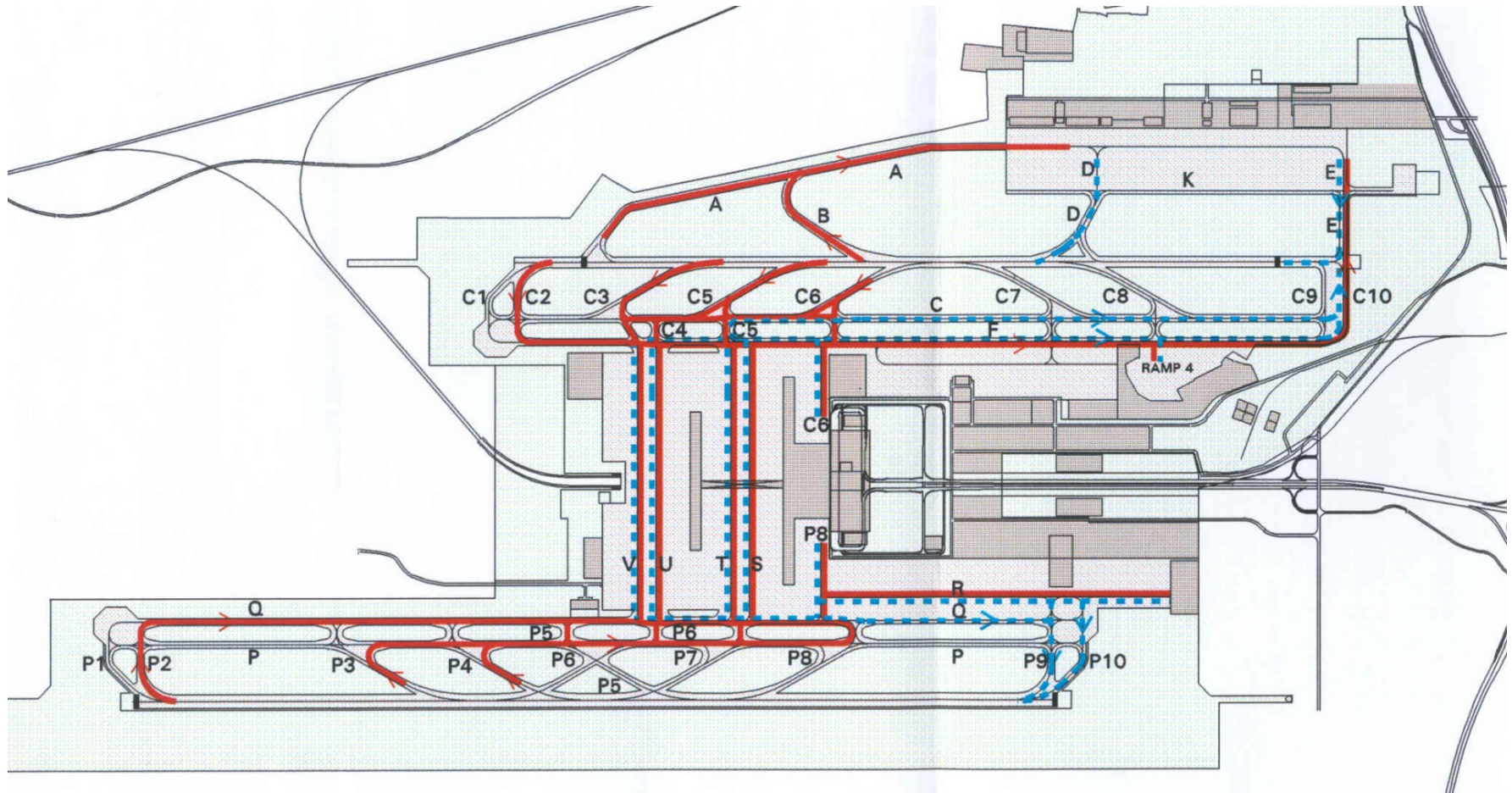
Surface Movement Guidance and Control

Concept Berlin BBI



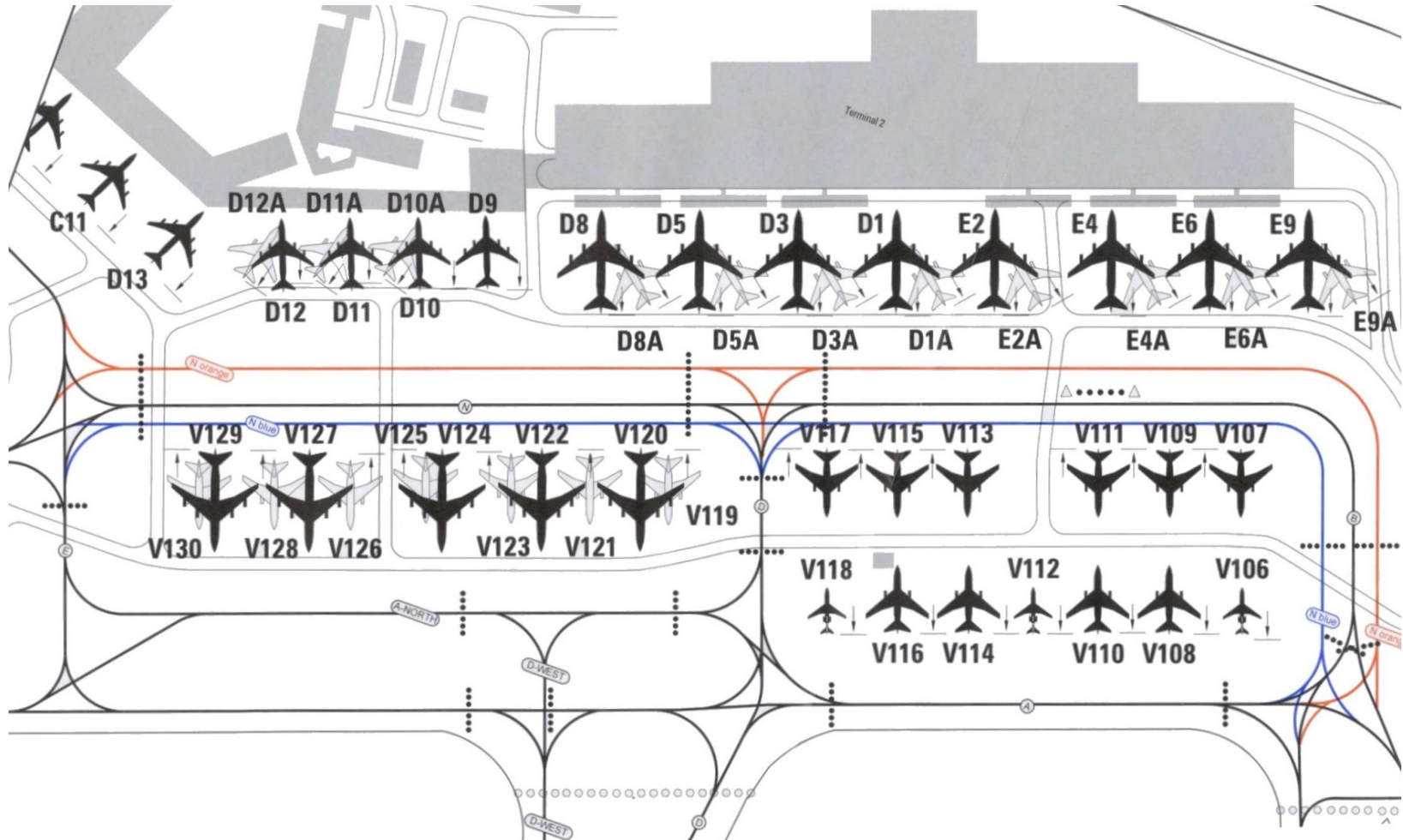
Surface Movement Guidance and Control

Concept Berlin BBI



Surface Movement Guidance and Control

Single/Double-Lane Procedure (FRA)



Airport Operations

Initiative

Legal Framework

Areas of competency

Nomenclature

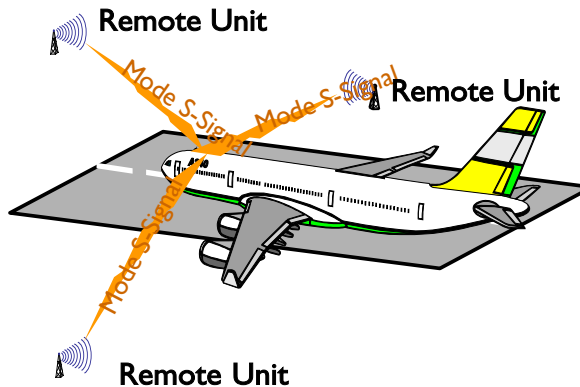
Surface Movement Guidance and Control

Outlook

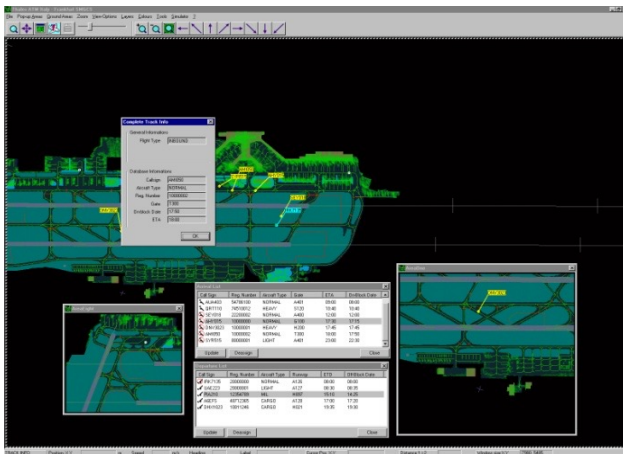
Outlook

Systems at Frankfurt Airport derived from airside R & D

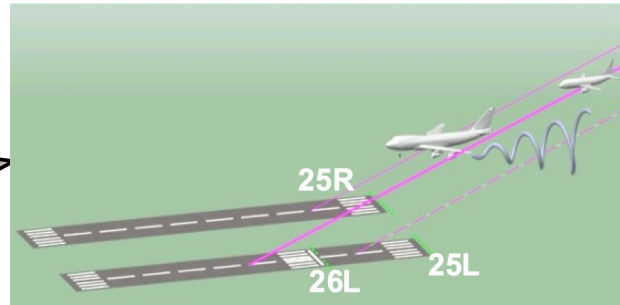
Multilateration Principle



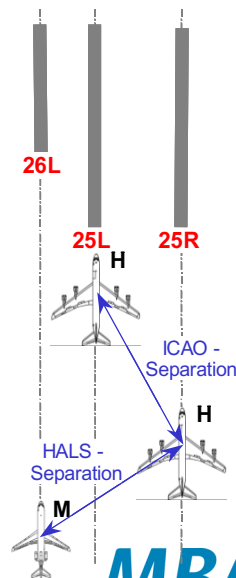
TACSYS-Display



HALS-Principle



DTOP-Principle



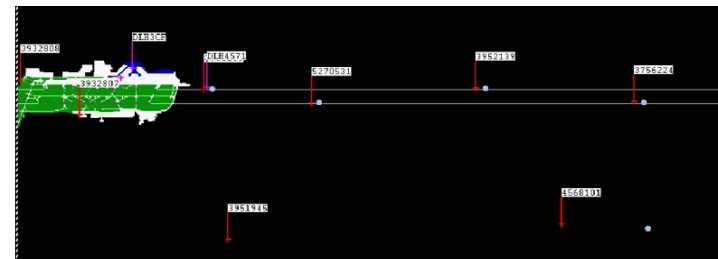
ETNA Vehicle Navigation



ETNA Onboard Display



Approach surveillance by PAM



Outlook

Key Words

- A-SMGCS: Advanced Surface Movement Guidance and Control
- CDM: Collaborative Decision Making
- Gate – to – Gate
- Integrated Operation
- AMAN – SMAN – DMAN
- SESAR: Single European Sky ATM Research
- Interoperability

Basic Principle:

„Keep the system as simple as possible and it runs!“



THANKS
For your attention!

Any Questions?