Gloucestershire Airport DataBeacon Romeo5 Flight Information Display proposal

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1 Purpose of this document

1.1 Introduction

DataBeacon has developed a robust Flight Information Display for Air Traffic Control and Aerodrome Flight Information Service, designed for safety and maximum usability.

The safety benefits that accrue from the enhanced situational awareness gained by introducing a FID are now well recognised.

DataBeacon is delighted to propose an ATM-grade FID solution which can display aircraft position targets in real-time. This provides Air Traffic Control Officers or Aerodrome Flight Information Service Officers with the ability to have enhanced situational awareness of activity on and around an aerodrome, and provision of generalised traffic information to aircraft on frequency.

Romeo5 can be configured to receive data from various sources (ADS-B/FLARM*), which provides a comprehensive and unified view of the surrounding airspace or airport ground layout on its dedicated hardware platform.

The FID runs on a single, pre-configured standalone small form factored PC, which can be connected to a monitor of your choice. Multiple FID units can be provided for redundancy. Additionally, browser-based access of the FID is also provided, allowing for other monitoring and information away from operational positions.

1.2 Safety Benefits

The safety benefits that accrue from the enhanced situational awareness gained by introducing a FID are now well recognised. On top of that, some airports have ambitions to further the development of UAV services and FIDs are a key enabler for these future ambitions.

1.3 Enhanced-Situational-Awareness

Romeo5 enables the ATCO or AFISO to have a greater knowledge of ground and airborne activity within the vicinity. This can assist with workload reduction, as a greater understanding of the traffic situation can be obtained.

1.4 Minimal ongoing costs

Once running, the FID requires very little service/maintenance. For units where a FID may be a future replacement to traditional radar systems, this can provide large cost savings in ongoing costs of maintaining such equipment.

1.5 Data Playback

Romeo5 allows 30 day record/playback and export of all video recordings, meaning it can easily deployed where required to assist with incident investigation.

1.6 User-friendly Interface

The user-friendly interface of Romeo5 allows users to access the system functions effectively and intuitively, and with minimal training required.

1.7 Real-time data

Romeo5's ability to process vast amounts of real-time data ensures efficient handling of all air traffic and data demands with ease. Position data of aircraft or vehicles 'target' positions is updated approximately every second.

1.8 Customisable System

The customisable features allow Romeo5 to be tailored to meet the specific needs of the service provider. All mapping can be customised along with target and label display options and user defaults.

1.9 ADS-B data resilience

Romeo5 maximises accuracy and reliability by merging data from multiple ADS-B antenna. Users can see the status of each source and select which ones are in use. (Additional regulatory approval may be required. Fees for third party data may apply.)

Romeo5 is optionally able to tap into third party cloud data sources for seamless traffic monitoring. Users can switch between local or cloud data sources and visually track which ones are in us. (Additional subscriptions may be required).

1.10 Ease of Installation

The Romeo5 is designed for easy setup. Its FID comes pre-configured, ready to deploy with minimal antenna installation required. DataBeacon assists with final configuration. Additional items like screens, keyboards, and cables are not included, allowing users to choose what suits their needs and budget.

1.11 Interface Features

Romeo5 incorporates a range of intuitive control elements aligning with best practices in the industry, and has been designed with ease of use. Features include:

- Labels with pertinent information such as callsign/registration, altitude/flight level (corrected for QNH), ground speed, squawk and wake category.
- Identification of targets that are helicopters (HEL) or UAVs.
- Highlighting of aircraft squawking emergency codes.
- Indication where aircraft updates are not received from the ADS-B antenna.
- Intelligent label avoidance algorithm prevents labels from overlapping.
- Selectable historical trail for each aircraft.
- Pre-set and selectable altitude/level filters.
- Customised zoom levels
- Customisable label text size
- Light/Dark display view with adjustable brightness for optimal visibility in various ambient lighting conditions.
- North or user specified map orientation.
- Full airspace depiction, fully customisable to display all essential details such as fix points, airways, VRPs, VFR corridors and any other topographic pertinent features.
- Selectable layers to display different elements, such as names of fix points, populated areas, restricted areas, SIDS, STARS, runway centrelines, range rings.

1.12 Regulatory Approval

Romeo5 has been meticulously designed to meet the stringent standards outlined by the UK Civil Aviation Authority (CAA) in accordance with CAP670, and can easily adapt to other regulatory frameworks. While DataBeacon does not directly provide approval services, we are committed to providing all necessary information related to CAP670 compliance to support Safety Case development. In the event of any software issues that require adjustments for approval, DataBeacon will promptly provide updates as needed to ensure seamless acceptance.

1.13 Proposal

This document is our proposal for the provision of the dual system Romeo5 Flight Information Display based on ADS-B. The document includes a description of the system offered, which include all the necessary elements to setup a Flight Information Display capable of qualifying as a FID according to the UK CAA CAP670 regulations. The document also details the installation requirements and the general warranty, support offered, and maintenance required.

To facilitate clear financial planning, we propose an itemized fixed total price, encompassing the software, hardware, antennas and receivers. This approach provides transparency and certainty, ensuring that the airport can confidently plan and budget for this system.

The turn-key system includes all the necessary equipment to run a highly redundant two position system, including:
- 2x locally attached antenna(s) and receiver(s), which should be strategically positioned to maximise coverage and enhance the data feed.
- 2x Romeo5 Server.
- 2x Romeo5 Client.
- A GPS NTP Network Time Server to syncronise Server/Client system time in case the internet connection is lost.
- All default necessary cables to setup the system: servers, clients, switch and receivers. A complete list will be provided with the delivery.
- Romeo5 license(s) - a CAP670-compliant Flight Information Display solution - to run on each Romeo5 Client with additional ability to view Romeo5 via web browser.
- Customisation of the Romeo5 map and layers, as provided by the airport.
- Installation manual and remote installation support (including hardware).
- General warranty and support and maintenance.

We are not including in this offer:

- Physical installation and local setup of the antennas, receivers, and associated cabling as required.
- Romeo5 will be pre-installed on the Romeo5 Client(s) when delivered and it will need just a basic configuration to be run by the computer administrator.
- A computer screen, keyboard, mouse for each Client.
- Customised cables, e.g. longer ethernet cable, keyboard or mouse cables, power strips, etc.
- Romeo5 is fully compliant with the CAP670 regulations, however, we will respond with any software adjustments necessary to support regulatory approval.

The proposed basic configuration of the equipment is shown below.

DataBeacon - Gloucestershire Airport Romeo5 proposal
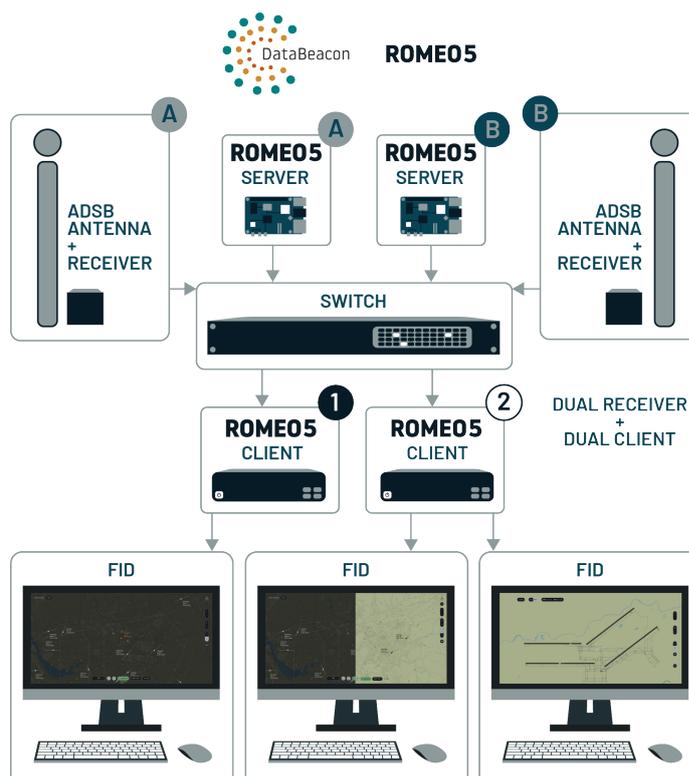
2 About DataBeacon

DataBeacon is a leading software company specialising in aviation tools. Our team comprises highly skilled data scientists, data engineers, and aeronautical engineers, along with operational experts who bring their expertise in data-driven services to the aviation industry. With a deep understanding of aircraft, airport, and airspace data, our team has accumulated industry-recognised experience.

We have developed aviation software that supports operations with reliability, scalability, and maintainability as the cornerstones of our technology. Leveraging cutting-edge advancements in technology, our aviation software is designed to support air traffic control operations and can be deployed both on-premises and in the cloud. We pride ourselves on our ability to develop innovative solutions that meet the evolving needs of the aviation sector. With our deep expertise in data-driven services, coupled with our experience in aircraft, airport, and airspace data, we are well-equipped to provide comprehensive solutions for aviation operations.

DataBeacon's mission is to unlock the full potential of data-driven services in aviation. DataBeacon supports operations with its cutting-edge technology, industry expertise, and unwavering commitment to innovation, reliability, scalability, and maintainability.

DataBeacon has experience with various aviation datasets and data formats including ADS-B/C, FMS (ARINC 717/573), A-SMGCS (multilat. radar), Radar (ASTERIX), SWIM (ADEXP v3.3), DDR2 (OPLOG, Regulations, Sectorisation/TFVs), METAR, SIGMET, SNOWTAM, runway wind profiles, and NOTAM.

DataBeacon has developed several products powered by surveillance data based on Victor5, a powerful cloud computing platform and versatile front-end receiving real-time ADS-B data feed and displaying the information provided by algorithms running on-premise or on a cloud infrastructure. With a similar look and feel of an ATC console, developed by front-end experts using modern react technology and validated with air traffic controllers and human factor experts from several ANSP's.

Based on the Victor5 platform, DataBeacon developed Romeo5, the first version of a Flight Information Display following the UK CAP670 regulations. Romeo5 is a low-complexity Flight Information Display (FID) unit for aerodromes and airports compliant with CAP670. Romeo5 is a highly accessible and cost-effective alternative to a traditional radar and surveillance data processing system. Utilising multiple data sources, including ADS-B, it offers a user-friendly interface providing increased visibility to AFISOs and ATCOs.

3 System offered

3.1 Romeo5

Romeo5 (R5) is a CAP670 compliant Flight Information Display (FID) that functions as a support system for Air Traffic Control Officers (ATCOs) or Aerodrome Flight Information officers (AFISOs) (the "users") to increase their situational awareness at the ATZ and vicinity. It shall not be used for the provision of air traffic separation.

R5 provides real-time information on traffic from a terrestrial ADS-B data feed. The data refreshes the aircraft or vehicle's "target" position approximately every second.

3.1.1 ADS-B data

Whether for coverage optimisation or redundancy, R5 can utilise multiple ADS-B data feeds, achieving exceptional precision by merging data from these multiple sources, thereby elevating the accuracy of traffic monitoring. R5 utilises data received directly from ADS-B receivers.

R5 allows the user to select the actively used data sources and provides a clear visual indication of the data sources that are active and being used to display the traffic.

Although not included within this proposal Romeo5 is optionally capable of integrating data from external cloud-based data sources.

3.1.2 About the UI

UTC
Format HH:MM:SS.
Not editable nor clickable.

ICAO airport code
Centres the map at the airport at predefined range

Runway in use
Changes to a different runway

North orientation
Established by the client at the outset and cannot be altered by the user.

Map zoom

Label size

Day/Night Configuration
Change between a brigther or a darker color sheme.

Brightness Control
Map brightness control and adjustments for targets and labels.

Map Layers
Specific selectable for each airport's maps are available.

Selectable vertical filter.
To remove the full label of higher traffic than the selected level to prevent cluttering.

Historical trail / speed vector
Changes the display of trails for historical positions and the speed vector for flight directions.

Antennas selection and status
Changes the selection of active antennas and indicates their service status.

QNH selection
Changes the QNH value adding or subtracting units with the plus or minus signal.

UTC
Format HH:MM:SS.
Not editable nor clickable.

ICAO airport code
Centres the map at the airport at predefined range

Runway in use
Changes to a different runway

North orientation
Established by the client at the outset and cannot be altered by the user.

Map zoom

Label size

Day/Night Configuration
Change between a brigther or a darker color sheme.

Brightness Control
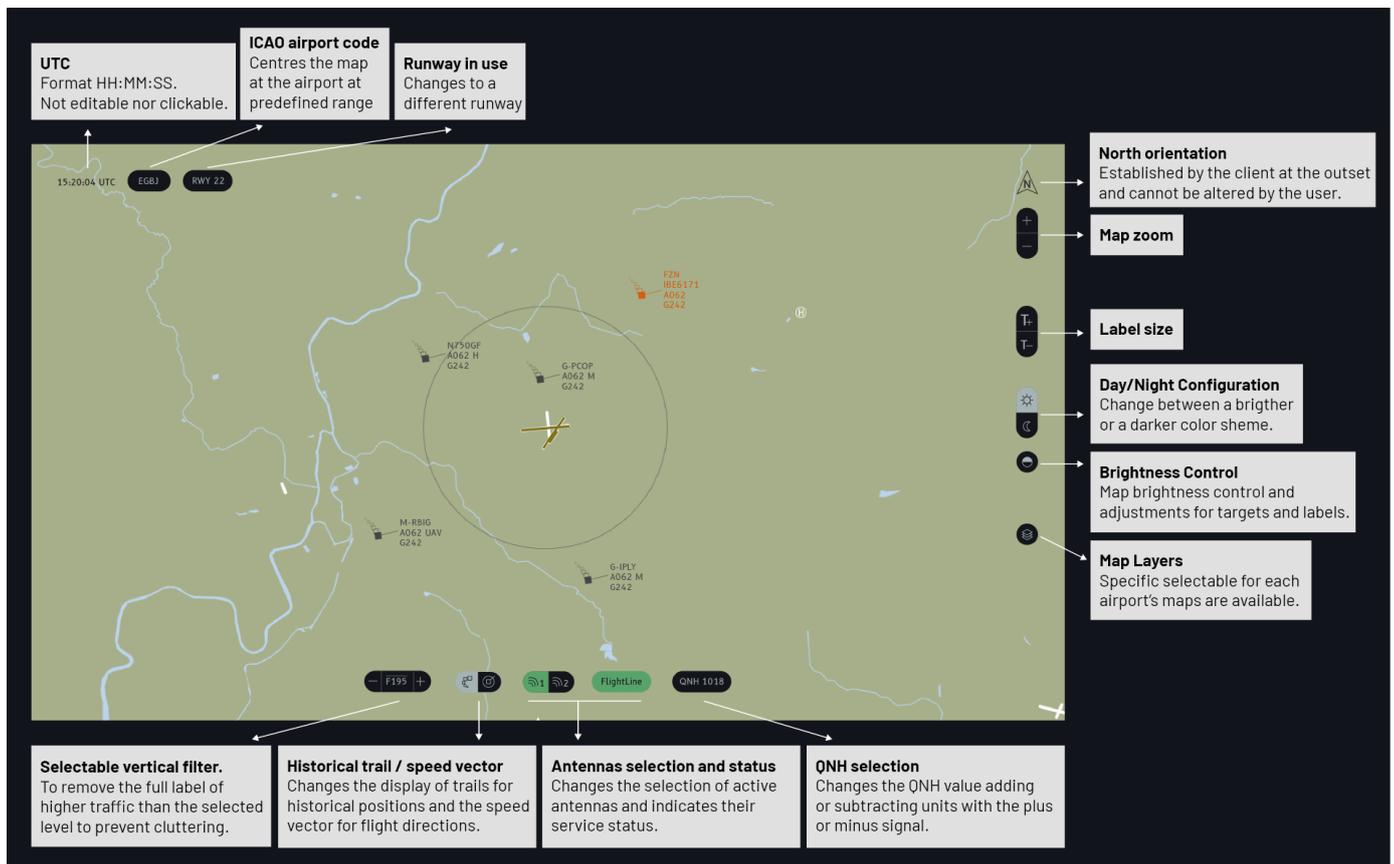Map brightness control and adjustments for targets and labels.

Map Layers
Specific selectable for each airport's maps are available.

15:20:04 UTC EGBJ RWY 22

FZN
IBE6171
A062
G242

N750GF
A062 H
G242

G-PCOP
A062 M
G242

M-RBIG
A062 UAV
G242

G-IPLY
A062 M
G242

– F195 +   🛰 1 🛰 2   FlightLine   QNH 1018

Selectable vertical filter.
To remove the full label of higher traffic than the selected level to prevent cluttering.

Historical trail / speed vector
Changes the display of trails for historical positions and the speed vector for flight directions.

Antennas selection and status
Changes the selection of active antennas and indicates their service status.

QNH selection
Changes the QNH value adding or subtracting units with the plus or minus signal.

Targets and labels

Romeo5 effectively positions aircraft on the map and generates labels containing pertinent information such as callsign, altitude/flight level, and ground speed. At the client's discretion, if ADS-B reception is available (as is typically the case), the system has the capability to incorporate the aircraft wake turbulence category and if the targets are UAVs or helicopters (HEL) on the second line of the label. Moreover, it distinguishes between traffic squawking **emergency codes** and instances where updates are not received from the ADS-B antenna (FRZ or frozen). We contend that integrating this information into the labels is crucial for enhancing situational awareness among Tower users. Furthermore, Romeo5 complies with CAP670 regulations by integrating altitude corrections determined by the current QNH.

To avoid overlapping, the labels are automatically positioned using an **intelligent label avoidance protocol**.

To further refine the understanding of traffic dynamics, Romeo5 includes a selectable historical trail for each aircraft. The system can readily accommodate the client's request for a speed vector if needed.

Control elements

R5 adheres rigorously to the regulatory standards outlined in CAP670 for FIDs, ensuring compliance and reliability in air traffic management.

The system incorporates a range of intuitive control elements, aligning with best practices in the industry. Users have the capability to zoom the map and labels independently, providing a customisable display that caters to specific operational requirements.

The system also prioritises contrast for optimal visibility, ensuring that displayed information remains clear and discernible in various ambient lighting conditions.

In instances where multiple antennas are deployed, the system allows for seamless antenna selection, providing flexibility and control over the data sources used for enhanced precision.

Maps and layers

The mapping functionality within Romeo5 is designed to align with the stringent standards set forth in CAP670 regulations, ensuring accuracy and compliance in displaying critical flight information.

During the design phase, we offer a high degree of customisation, empowering them to tailor the map orientation to either the North or align it with the perspective as seen from the tower window. This adaptability caters to individual preferences, providing a client-centric interface for enhanced operational efficiency.

Moreover, during design, the system offers comprehensive customisation options, enabling clients to personalise maps by incorporating essential details such as fix points, airways, visual reference points, VFR corridors, and any other topographic pertinent features. This level of customisation fosters a tailored user experience, streamlining the identification and tracking of specific locations in the vicinity of the airport.

Romeo5 further enhances its versatility with the integration of customisable layers. Users can selectively activate or deactivate layers to display different elements, names of fix points or populations, restricted areas, SIDs or STARs. This layering capability ensures that the displayed information is contextually relevant and aligns precisely with the operational needs of the users.

3.2 Hardware equipment

A typical configuration of the computing equipment is a small form-factored equipment like Intel NUC 12 Pro Kit (SWNUC12WSHi5000) or similar, eg. Intel i5 gen 12, iGPU Intel Iris Xe, 16GB of DDR4 RAM, 512GB NVMe HDD, 2xHDMI 2.0 and 2xUSB 3.0.

Note: The final specific configuration may vary depending on market availability and supply chain conditions.

3.2.1 Network switch

- **Netgear MS105** (https://www.netgear.com/business/wired/switches/unmanaged/ms105/)

3.2.2 GPS NTP Network Time Server

- **TimesMachines TM1000A** (https://timemachinescorp.com/product/gps-time-server-tm1000a/) or **NetBurner PK70** (https://www.netburner.com/products/network-time-server/pk70-ex-ntp-network-time-server/#)

3.3 Antenna

Romeo5 FID is capable of receiving data from a number of sources. For this proposal we have included the Avionix ADS-B receiver. However, should you wish to utilise different receivers, we would be happy to accommodate and discuss various options available from alternative suppliers.

3.3.1 Avionix ADS-B Receiver

The Avionix ADS-B receiver is a cutting-edge multi-channel receiver, setting the standards for high-performance surveillance solutions. It excels in delivering precise surveillance accuracy, rapid update rates, and comprehensive identification data, surpassing traditional surveillance systems in efficiency.

Receiver Technical Specifications

Power supply		
Input voltage	5 VDC/2A	PoE optionally
Power consumption (average)	< 5	[W]
Dimensions		
Type of enclosure	Desktop enclosure	
Enclosure dimensions (w * h * l)	70 * 30 * 100	[mm]
Weight	240	[g]
Dual band Receiver Input		
Frequencies	1090 and 868/915 or 978	[MHz]
Antenna Input	50	[Ω] SMA female
Sensitivity and dynamic range	-93 to 0	dBm (1090 MHz)
Processing	>2000	Msg/sec
Air Protocols	ADS-B/MODE-ACS, UAT978, FLARM, OGN, PilotAware, FANET, ADS-L	UAT978 alternative to 868MHz protocols
BIAS-T for active antenna	5V/200mA	Configurable
GNSS receiver		
Receiver type	72-channel u-blox M10 engine	
GNSS	GPS/QZSS, GLONASS, BeiDou, Galileo	
MLAT Timing accuracy	<50 ns	GNSS locked
Network connection		
Ethernet type	Cat. 5e, 10/100/1000BaseTX	RJ45 connector
Data protocols	TCP/IP, UDP/IP, HTTP	
Output formats	AVR, AVX, Beast, SBS1, JSON, MAVLink-v2, GDL90	ASTERIX CAT021 on request
Wi-Fi	2.4G, 802.11 a/b/g	
Bluetooth	BT 5.0	
IP address	Fixed or DHCP	
Environmental specification		
Ambient temperature	0 to 40	[°C]
Relative humidity	<80	[%]
Protection	Gas Discharge Tube Surge Protectors and ESD Suppressor on all antenna inputs	

4 Installation

4.1 Antenna(s) installation

The Antenna(s) will be supplied directly to the client. Installation instructions and support will be provided to allow the client to install the antenna(s) at a suitable location with the required network access required by Romeo5.

4.2 Romeo5 installation

Romeo5 comes pre-installed from the factory, and only minimal configurations might be needed. DataBeacon will support the client with the final configuration steps. Once the local antennas have been configured to push the data to Romeo5, the software will display the traffic received by the antennas.

Video recording is also pre-configured from the factory, and it will automatically record and keep the last 30 days. System administrators can access the recordings remotely from another computer on the same network using a terminal SSH and move the recordings to a different location if needed.

5 General Warranty, support and maintenance

5.1 General Warranty

1. Rectifications, patches, updates, and repairs will be provided by DataBeacon to ensure compliance with any specifications requested by the Civil Aviation Authority (CAA) under the CAP670 regulations. This warranty shall remain in effect indefinitely.

2. DataBeacon warrants Romeo5 to be free from software defects for a period of 12 months from the date of installation. Any defects discovered during this period will be rectified by DataBeacon at no additional cost to the customer.

3. DataBeacon also extends the warranties provided by our suppliers for the equipment that is part of the Romeo5 system. The Server and Client is covered by a minimum one-year warranty through the manufacturer, and the ADS-B antenna and receiver are also covered by a minimum one-year warranty through the manufacturer.

4. Any warranty claims must be submitted in writing to DataBeacon within the specified warranty period. DataBeacon reserves the right to inspect the system and equipment to verify the validity of the claim before proceeding with any repairs or replacements.

5. This warranty is non-transferable and applies only to the original purchaser of the Romeo5 software. Any modifications or alterations made to the software without DataBeacon's consent will void this warranty.

6. DataBeacon shall not be liable for any damages or losses incurred as a result of software defects or equipment malfunctions beyond the scope of this warranty. The customer is responsible for ensuring proper maintenance and usage of the Romeo5 system to prevent any issues covered by this warranty.

5.2 Support and maintenance

Our support team is dedicated to providing comprehensive support services to our clients during the warranty period. We offer telephone support during working hours to help diagnose and resolve any issues. Our team will work closely with local ATSEP and operational teams to quickly identify and fix faults. We will also implement a ticketing system to manage support calls efficiently. This system will allow clients to log calls easily and track them with a unique reference number. Our goal is to resolve issues quickly to minimise downtime.

We prioritise testing software updates thoroughly before deploying them to clients' systems. Updates will be tested in our secure cloud environment to ensure they are functional and do not cause any issues. Once approved, updates will go through a change management and approval process before being deployed. Our rigorous testing process ensures updates meet quality standards and do not cause downtime or issues.

We will also offer periodic security updates to ensure systems run smoothly and resolve any critical security breaches or errors. Our team will work closely with clients to implement security upgrades efficiently, minimising downtime and disruption. We understand the importance of keeping systems secure and up-to-date, which is why we offer this service as part of our ongoing support options.

6 Hardware/Software Delivery schedule

We provide an estimated schedule to deliver the system within 8 weeks, which includes all elements of customisation, internal testing, acceptance testing, shipping, and necessary mapping customisations to ensure the system is fully functional upon delivery. Our design process ensures that the final system is first deployed on a web environment for approval, simplifying feedback from our customers and ensuring deadlines are met.

Week	Milestone	Description and follow up steps.
0	Order received from customer.	Acknowledgement of reception and confirmation of the schedule. We would request the customer data to customise the maps and different layers to be displayed.
1	ADS-B equipment (antenna(s) and receiver) Ordered	Antenna(s) will be ordered for delivery direct to the customer.
2	Reception of customised data	Customer should provided customised data within 2 weeks.
3	Antenna(s) delivered	
4	Antennas expected to be installed at the airport.	Customer Antenna(s) will be installed by the customer within 2 weeks of delivery.
5	Factory Acceptance Test (FAT) candidate to be validated with customer.	The FAT is a pre-delivery in-house inspection conducted with the primary objective of ensuring that the equipment or system meets the desired functionality, technical specifications, and design requirements outlined by the client. Actions needed: 1. Coordinate FAT schedule with client. 2. Prepare Test Plan that outlines the procedures, test cases, acceptance criteria, and responsibilities. 3. Execute the FAT according to the test plan. 4. Thoroughly document all observations, test outcomes, and identified discrepancies during the FAT.
6	Review of FAT candidate and potential modifications.	We will set a report to the customer with the results of the Factory Acceptance Test and review remotely the performance of the system to ensure compliance with specifications.
7	2nd FAT if needed and shipment of Romeo5 hardware, software and user and technical manuals.	After performing the Factory Acceptance Test (FAT), the results are thoroughly reviewed internally to identify any problems. If necessary, corrective actions are taken to resolve these issues and, if necessary, further testing is performed to ensure the effectiveness of the corrective actions. Upon successful completion of the tests and resolution of the problems, all documentation, including the FAT report and other relevant documents, is finalised. The FAT results are presented to the customer for review and approval, ensuring that they meet the customer's expectations. Following customer approval, arrangements are made for delivery and installation of the Romeo5 equipment, as well as technical and user manuals.
8	Site Acceptance Test (SAT)	The Site Acceptance Test (SAT) ensures the installed equipment or system meets specified requirements in the operational scenario. It involves on-site testing, validating system integration, performance, and compliance. Coordination with the customer will be needed to establish a testing schedule and protocol as well as test execution. These tests will be performed on-site by the customer in collaboration with DataBeacon. Its successful completion will be formally documented, signifying full handover, and delivered as a sign of customer approval of readiness for operational deployment.

7 Regulatory Support

DataBeacon will provide the following information to support the application for CAA under UK Regulation (EU) 2017/373 for the proposed Flight Information Display System.

This can include,

- Technical Specifications of all hardware.
- Information as required on Hardware/Software configuration.
- Compliance Matrix to certify that CAP670 meets regulatory requirements

DataBeacon will additionally provide any modifications if deemed necessary by the regulator to ensure regulatory compliance.

8 Financial proposal

DataBeacon is pleased to provide this price quotation. Our pricing is determined using a combination of factors including hardware costs, anticipated development/setup time, Air Traffic Service level, Designated Operational Coverage and commercial/non-commercial movements figures.

Please enquire if you wish to include additional antenna, NUCs or integration with other data sources.

Databeacon is able to discuss alternative terms and payment arrangements to that proposed below.

Once only, Initial Setup Fees	
• 2x Romeo5 Servers pre-installed with Romeo5 fully configured • 2x Romeo5 Clients pre-installed with Romeo5 FID configured. • 2x ADS-B hardware (antenna and associated receivers): Avionix Antenna / Receiver. • DataBeacon Romeo5 Software Licence (includes unlimited access via web browser). • Shipping of hardware. • All customised setup/mapping.	2x FID 2x Antenna
Total Setup Fees	£14,500

Romeo5 Licence (inclusive of remote support and maintenance)		
Licence Term	Quarterly Payment	Total Payable over Term
3 Year (12 payments)	£4,969	£59,628

The licence fee is calculated to take into account service level (ATC/AFIS/Other), DOC, and annual movements (commercial and private).
For the purpose of this licence fee the following criteria has been applied.
- Service Level: ATC
- DOC: 25nm
- Movements: Commercial 17667, Private 42,353.

General Terms and Conditions

- This quotation is valid for 60 days unless otherwise agreed upon in writing by our representatives.

- Prices are quoted in GB Pounds, Taxes and shipping charges are extra except where specified.

- FID hardware and setup fees are payable in advance and include reasonable development work that may be required to support the regulatory approval.

- Romeo5 license fee and term commence upon receipt of successful regulatory approval.

- Alternative payment arrangements may be available on request.