Flight Mission Computer

The FMC consists of 4 modules, namely the flight computer, mission computer, payload data management computer and the inertial navigation system. Between them they orchestrate the following key functions:

- The flight computer controls the flight path of the fixed wing UAV by commanding the flight control surfaces and throttle with instructions to actuators, based on inputs from the onboard sensors;
- The mission computer interfaces to the ground components, sending status information and receiving commands. It sends waypoint information to the flight computer and also manages all voice communications and the flight information for the onboard IFF transponder;
- The payload data management computer is responsible for routing and management of payload video to the data links. Data compression, encryption, annotation and recording functions are hosted in the payload computer;
- The inertial navigation system is responsible for geospatial positioning in the absence of GPS.

The FMC can operate as a redundant pair mitigating a potential failure of this subsystem. Features of the FMC contributing to the improved architecture are:

- STANAG 4586 interoperability allows the FMC to be retrofitted into an identically compliant UAS architecture. In the case of a new UAS program, interoperability risks are considerably reduced;
- The handover of flight and payload links in a multiple TCS environment is managed from the FMC contributing to the architecture range extension goal;
- The multiple remote tracking and communications architecture requires a far richer RTB feature hosted in the mission computer. The potential of returning to multiple bases requires many more waypoints, and the RTB trigger criteria becomes quite complex, including activities that need to be managed while on an RTB flight path. This contributes to the maintaining of the flight safety requirements of the architecture goal;
- The ATOL feature allows deployment of a UAV operator instead of a skilled RC pilot, at each multiple remote tracking and communications system equipped with a runway, reducing operational staffing costs.

Hardware In the Loop Simulator

The HILS is a synthetic UAV flight environment used for subsystem integration, validation and verification. It is also a pilot and operator training simulator, eliminating the need to execute actual flights. The risks and costs associated with these activities are thereby greatly reduced.

The HILS goes even further to replicate the real world scenario by simulating all the control surface actuators (including flaps and throttle), magnetometer, barometric pressure sensor, airspeed transducer, GPS and a complete inertial measurement unit as well as the primary and backup data links. It is a complete testing and training tool in one package allowing development testing, fault finding and burn-in of existing UAS hardware as well as technician and operator simulator training.

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Unnamed Aerial Systems Subsystems

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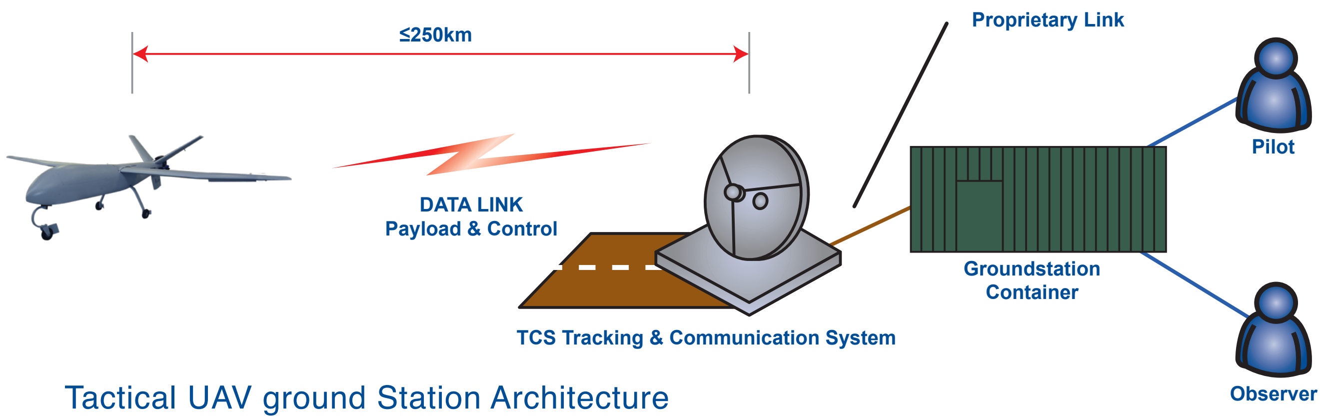
Overview

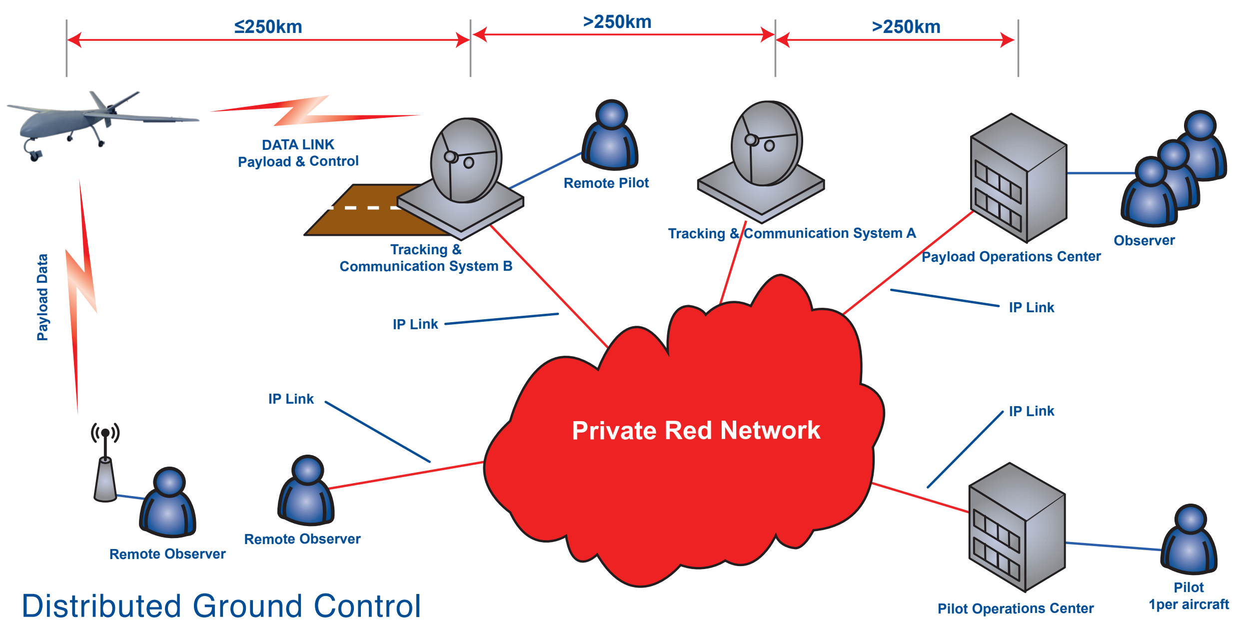
Traditional tactical Unmanned Aerial Systems (UAS) architectures of a ground and air node connected by a data link for platform and payload control purposes, illustrated below, hamper the operational use of Unmanned Aerial Vehicles (UAV). A single Ground Control Station (GCS) limits the area of UAV operations to Line-Of-Sight (LOS) from the GCS. To move beyond that requires the deployment of a second ground station along with the required infrastructure, support and staffing costs.



Tactical UAV ground Station Architecture

The management of the platform and payload information is co-located. This is not in line with the concept that the air node is merely a platform for placing the payload in a location for a specific mission. It would be exorbitant from an infrastructure and manpower cost perspective, to deploy a tactical UAS architecture in remote sensing, active response and surveillance applications, which have a large Beyond-Line-Of-Sight (BLOS) component.

Additional applications are border and coastal patrol, pipeline (oil, gas and water) observation and power line monitoring. Tellumat provides an alternative UAS architecture, shown below, using terrestrial data links to address the limitations above, preserving current UAS / UAV investments without compromising flight safety.



Distributed Ground Control

Key to this architecture is that pilot and payload operations and flight Tracking and Communication System (TCS) are separated and networked by a private "red" broadband static IP network, allowing geographic distribution of the elements to be flexible and diverse enough to meet all mission objectives.

The benefits of this architecture are:

- Flight range extension by deploying networked remote TCS, capable of maintaining air platform communication, seamless hand over to adjacent units and remote landing, as opposed to the rollout of additional costly full ground stations.
- Cost effective terrestrially networked remote TCS in diverse geographical locations compared to networking with satellite communications.
- Centralised skilled UAV pilot operations allowing cost effective scheduling of highly skilled staff:
  - In the case of a remote TCS with a landing capability, the role of the remote pilot is limited to the landing and take off of the UAV for refuelling, by means of a mobile flight terminal.
  - In the case of a remote TCS with a landing capability and the UAV is equipped with an Automatic Take Off and Landing (ATOL) capability this remote role is reduced to that of an operator.
- Payload operation is centralised and separated from pilot operations and is presented and effectively utilised at a C4ISR location.
- Tactical use of the payload information by a remote observer is preserved by using a mobile video terminal, receiving video feed directly from the air platform or via the network.

Flight safety is maintained by the:

- UAV supporting a Return-to-Base (RTB) capability, initiated when the communications link is compromised.
- Use of a red (secure), private resilient IP broadband network for connecting the remote tracking and communications centres to the respective payload and pilot operations centres, or
- Use of a black (unsecure), public resilient IP broadband network with High Assurance IP Encryptors (HAIPE) connecting the remote TCS centres to respective payload and pilot operations centres.
- When using this architecture, UAV remote sensing roles are more cost effective through minimizing deployable infrastructure and the effective use of existing staff while protecting the current tactical UAS investment, since the Tellumat provided kit of UAS subsystems is retrofitted onto existing tactical UAS platforms.

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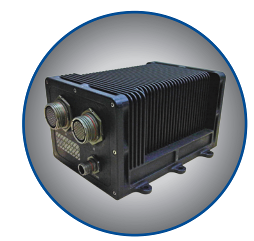
Air Component Subsystems

Tellumat supplies a suite of UAS subsystems that supports an alternative UAS architecture carrying out several additional roles while protecting clients' current investment in tactical fixed wing UASs. This does not exclude Tellumat collaborating with current and aspirant UAS vendors in enhancing the capabilities of their offerings into the market, by providing these supporting subsystems and their benefits.



Data Links

Data link units form the first portion of the communications chain from the airborne platform to the "point of use". This point of use, in the case of flight status and control, is the pilot operations centre or a remote pilot stationed at the runway-equipped remote TCS. For payload data, this is the payload operations centre or anyone acting in an observer role on an intranet or secure public internet connection.

The data link contributes to the overall improved Tellumat architecture by extending flight range without compromising flight control, safety and payload quality. The data link unit hosts the combined communication requirements for the following capability:

- Electro-optical payloads covering video from thermal and daylight camera payloads and data from synthetic aperture radar payloads and electronic sensor measurement payloads;
- A two-way audio channel to the airborne broadband UHF tactical communications radio;
- A two-way audio channel to the VHF airborne civilian ATC radio;
- A two-way audio channel to the UHF airborne broadband military ATC or tactical communications radio;
- A primary long range bi-directional data link for flight and payload control and status;
- A backup long range bi-directional data link for flight and payload control and status;
- Optional primary and backup bi-directional data links for flight and payload control and status.