MATCALS

Controlling the Marine Sky

UNISYS

The Marine Air Mission

The Marine air mission is indeed a distinct one, which primarily emphasizes the integration of Marine air and ground operations. To this end, air and ground units have become one dynamic element, the Marine Air Ground Task Force (MAGTF).

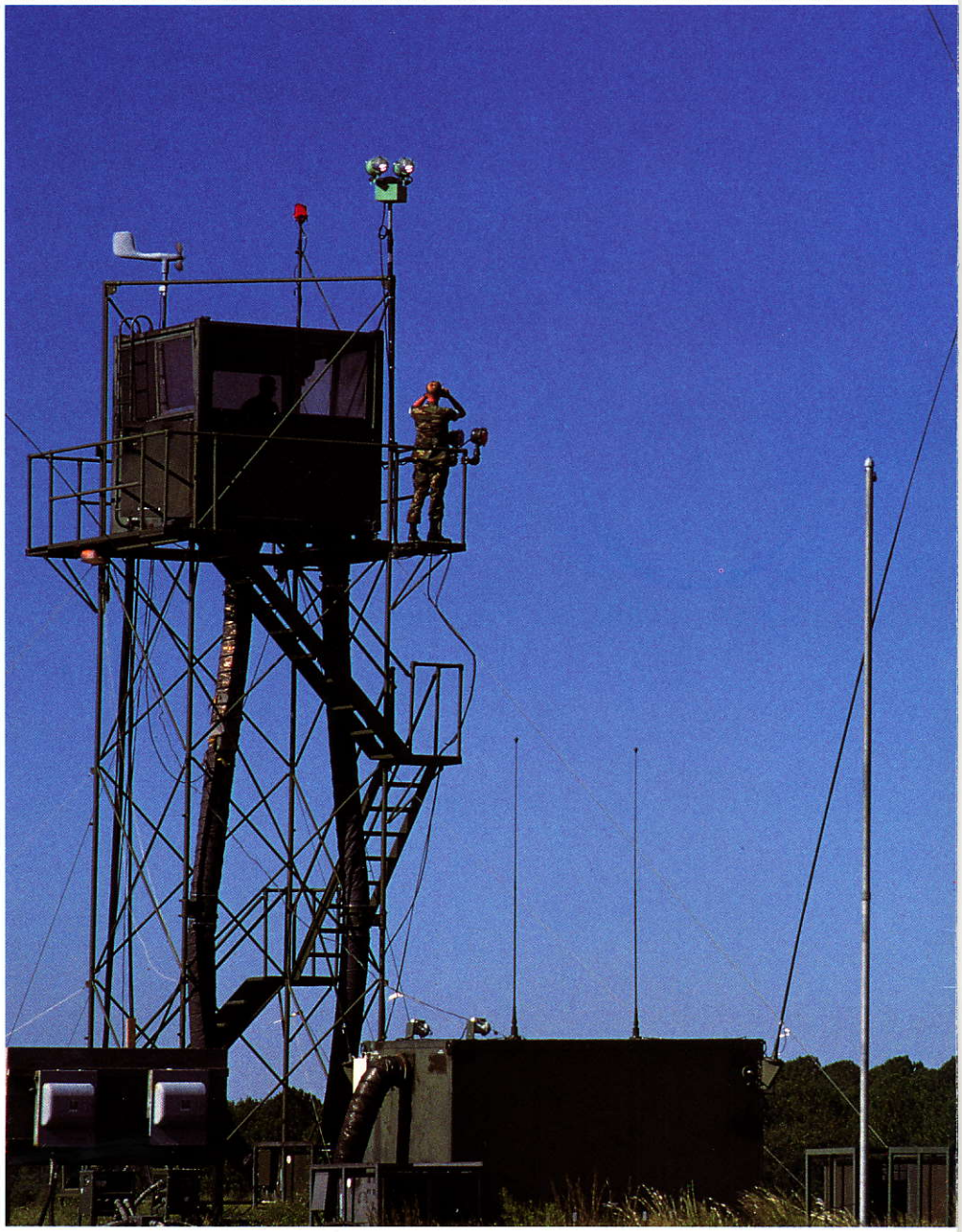
In support of the tactical integrated mission, the Corps relies heavily on such unique combat aircraft as the V/STOL AV-8A and AV-8B Harriers, for close air support. Harriers along with other Marine aircraft like F-4Js and F/A-18s, typically make up a Marine Air Wing whose mission it is to support Fleet Marine Forces.

"...to participate as the supporting air component of the Fleet Marine Forces in the seizure and defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign."

— *Marine Air Doctrine*

The men and women providing command and control support to a Corps Air Wing are organized into an integrated tactical organization called the Marine Air Command and Control System. This organization is responsible for:

- Command and control of tactical air operations
- Enroute air traffic control
- Air defense
- Close and indirect support of Fleet Marine Forces
- Defense through surface to air missiles
- Area arrival and departure air traffic control

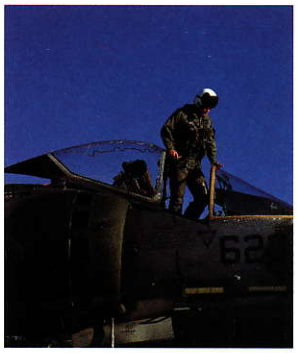


Marine Air Traffic Control and Landing System

MATCALS — the Marine Air Traffic Control and Landing System — is a rugged, transportable, self-sufficient system that provides all the air traffic control needs for a Marine Air Wing. MATCALS can be moved to the field via sea-lift flatbed truck, C-130 or heavy-lift helicopter.

Operated by a Marine Air Traffic Control Squadron, MATCALS controls all arriving and departing aircraft and airspace in a 60 mile radius of the airfield. Consisting of three subsystems, MATCALS collects, evaluates and displays data, makes control decisions and disseminates information. Its three subsystems are the All-weather Landing Subsystem (ALS), the

An AV-8B Harrier hovers near the Unisys Control and Communications Subsystem (CCS) of MATCALS. This two-shelter CCS at Bogue Field, N.C. is operated by Marine Air Traffic Control Squadron 28.



Unisys designed Air Traffic Control Subsystem (ATCS) and the Control and Communications Subsystem (CCS).

Field Proven

Since MATCALS' first delivery in 1983, Unisys has produced 15 Control and Communications Subsystems — all of them delivered on time and under budget. MATCALS' performance in the field has also been exemplary. Several systems have been used in demanding military training exercises where its capabilities have been proven over and over. Two more systems, for a total of 17, will be delivered in 1988.

Unisys System Know-How

In a tactical environment, a system's worth is often measured in terms of equipment reliability and the flexibility to adapt to fast changing situations. For MATCALS, the Control and Communications Subsystem must be both these and more.

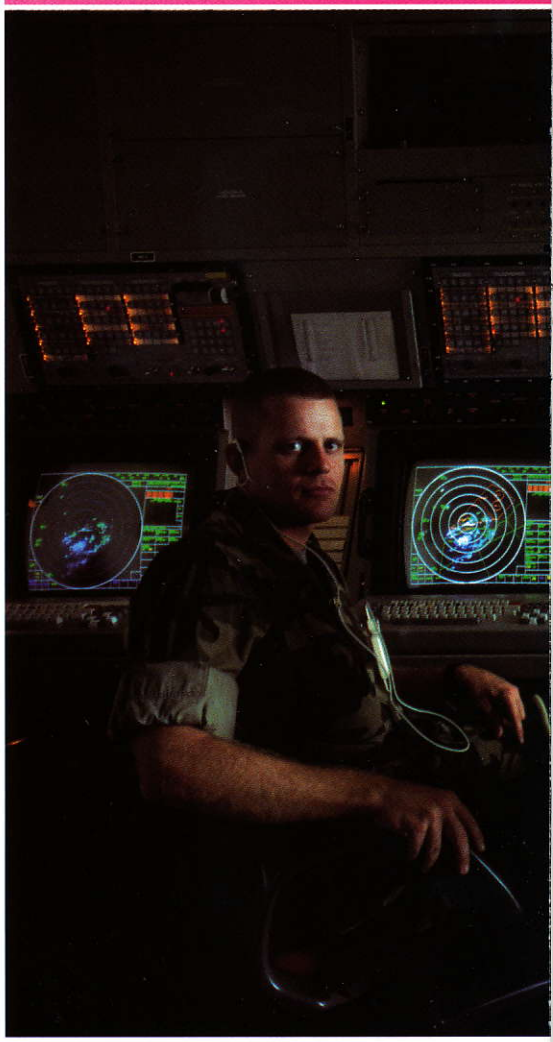
The CCS is the heart of MATCALS, consisting of two 8 x 8 x 20 foot rugged shelters joined together in an offset arrangement. Combined, the shelters house digital data processing equipment, flexible operator interfaces and data link and voice communication equipment. A single shelter can also be deployed but with decreased aircraft handling capacity.

The CCS provides centralized data processing and communications control for MATCALS using data received from the ATCS and ALS sensors and external communications sources. A few major functions of MATCALS' CCS include:

- Monitoring of conformance to nominal flight paths
- Detection and warning of potential hazard/conflicts between tracked aircraft and terrain
- Acquisition and final approach for up to six aircraft
- Computation of ground-derived landing control data for full automatic landing.

The flexible Unisys Multimode Displays (MMDs) are the major work stations in MATCALS' Control and Communications Subsystem. Each shelter contains four easy-to-operate MMDs offering a high resolution raster scan screen and color graphics. The ATCS and ALS shelters also house a MMD.

With our user-friendly MMDs, most data and command entries can be made by simply touching the screen. Each MMD contains a Unisys AN/UYK-44 16-bit computer providing you with an ample 1024 K bytes of memory.



Each Control and Communications Subsystem can accommodate up to eight air traffic controllers using high-resolution, touch-screen Multimode Displays. Controllers can track aircraft day or night, in virtually any weather.

Distributed System Architecture

To further enhance system flexibility, the CCS is designed around a distributed system architecture. To make this possible, Unisys incorporated a high-speed serial data bus into the CCS. This simply means if one of your MMDs goes down, the others will continue the mission without missing a beat.

And, if there are equipment problems, dynamic system monitoring alerts the operators to take corrective action.

Distributed architecture allows any operator mode or function to be assigned to any MMD work station within or between shelters. The four modes of operation are Arrival/Departure Controller, Final Controller, Maintenance and Training.

The high-speed serial data bus allows the MMD work station to be fully operated at remote locations away from the CCS. And if you want to expand your mission, more shelters can easily be added.

Voice Communications

To provide MATCALS' operators with complete communications for tactical air control, a digital, non-blocking communications switch is used. Operator control units are positioned at each work station, providing easy access to intercoms, telephone lines and voice radios. Remote operator control units are also provided for the ATCS, ALS, towers and maintenance van.

Reliable, Maintainable MATCALS Software

The superb accuracy, flexibility, and performance of MATCALS is the result of thorough research and development, and innovative engineering. The use of top-down design, structured programming, and design and code walkthroughs, for example, are key factors behind MATCALS' reliable, maintainable software.

The use of design tools and unit testing early in development also added to reliability by detecting any design errors. And strict adherence to programming standards and conventions consistently produced readable, maintainable code. The Unisys software development methodology, in fact, follows MIL-STD-1679 specifications.

For maximum flexibility, MATCALS uses a distributed system architecture. In this configuration, hardware processors within MMDs, and Control Distribution units are tied together via a high-speed data bus providing efficient communication between system functions. The modularity of the MMDs, coupled with a distributed data base, allows MATCALS to reconfigure itself quickly.

Long-Term Systems Experience

MATCALS is produced by a company with over 20 years of defense systems experience.

With that experience comes a continuing dedication to post-installation support. Hardware and software support is available whenever and wherever it's needed.

For more information on MATCALS or other tactical air traffic control systems, contact Unisys Corporation, Defense Systems, P.O. Box 64525, MS A2B02, St. Paul, Minnesota 55164. (612) 456-2222.

From Wisconsin to Denmark, the Unisys Control and Communications Subsystem of MATCALS has been used in numerous Marine field exercises. The results: success rates that have far exceeded expectations.

MATCALS Capabilities

Collect Data
- Remote Tracks via Tadil B
- Air Surveillance Radar
- Precision Approach Radar
- Tower Communications
- Air Tasking order from TACC
- Threat Status
- FAA Flight Data

Evaluate and Display Data
- Radar Video
- Track Symbology
- Map and Background Data
- Tracking
- Status
- Alerts
- Weather Conditions

Make Control Decisions
- Mode 1 Landing
  - Automatic
- Mode 2 Landing
  - Cockpit Indicator
- Collision Avoidance
- Conflict Detection
- Minimum Safe Altitude Warning
- A/C Guidance
- TAOC Handovers
- FAA Handoffs

Disseminate Information
- Radios
  - UHF
  - VHF
  - HF
  - Clear
  - Encrypted
- Land Lines
  - 2-Wire
  - 4-Wire
  - TRITAC
  - USA
  - Commercial
  - Eurocom
- Data Links
  - Tadil B
  - Tadil C

MATCALS Features

System Hardware Components
- Eight Multimode Displays with embedded AN/UYK-44 processors
- 10 MHZ serial data bus
- Control Distribution units interface to CMTUs, printers, data links and weather information
- Communications system

Operational Software
- High order language (CSM-2)
- Distributed system architecture
- Standard distributed executive
- Work station modularity
- Dynamic System monitoring and reconfiguration
- Standard command and control functions
  - Data collection
  - Data evaluation display
  - Control decision processes
  - Data dissemination
- MIL-STD-1679 development

Communications
- Stand-alone voice communications via TDM switch
- UHF, VHF, HF radio interfaces
- KY-75, KY-28, KY-58 crypto interfaces
- Field telephone and telephone exchange interfaces
- Operator to operator intercom
- Selectable access via operator control unit
- Data link capability
  - TADIL B
  - TADIL C
- Voice recorders

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