The system is a packaged, install-ready solution that seamlessly integrates internal shipboard communications.
A simpler approach to C4ISR systems procurement

Naval vessels are increasingly deployed into diverse and challenging operational environments, creating a greater need for robust and reliable intra-ship communications. A dedicated wireless onboard communications system would enable all ship hands to perform their duties more effectively. The Harris HYDRA (Hierarchical Yet Dynamically Reprogrammable Architecture) System provides just such a comprehensive and cost-effective solution.

Procuring a complex Command, Control, Communications, and Computers (C4) system is usually no easy matter. Too often customers spend substantial time and resources, only to find themselves behind schedule and over budget, with a system that does not meet their requirements. Harris Corporation’s new, simplified approach to C4ISR* systems procurement uses pre-engineered system configurations that provide fast, cost-effective solutions to today’s most critical operational needs, such as shipboard wireless communications.

Instead of designing a unique system for every customer, Harris has developed a comprehensive family of preconfigured systems. Each system is fully integrated and includes all equipment, cables, software, and manuals, with training and installation available. Every system has undergone extensive testing and can be relied upon to meet its objectives.

This executive summary describes the Harris HYDRA System and outlines the advantages of our packaged C4ISR systems:

- **Low Risk** – Field proven and comprehensively tested systems provide existing, cost-effective solutions
- **Fast Delivery** – Complete systems can be delivered in a matter of months to meet urgent operational needs
- **Simplified Procurement** – Systems can be purchased as off-the-shelf items, eliminating long system definition and development phases
- **Phased Implementation** – Packaged systems form building blocks that enable the incremental acquisition of capability
- **Flexibility** – Systems are readily customized and can be integrated by in-country partners

All this from Harris, a company with over 50 years of large-scale international communications systems experience, the most comprehensive range of tactical communications products, and world-class systems engineering and integration capabilities.

*C4ISR = Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance*

Contact Harris now to discuss your C4ISR systems needs:  
www.harris.com/systems
In today’s fast-paced world, naval vessels are deployed on a multitude of missions, often during the same operation. In addition to performing their traditional roles of interdiction, UN-sanctioned peacekeeping, and warfare, ships’ crews also might be called upon to deal with the growing asymmetric threats of terrorism, smuggling, and piracy. Such diverse tasking demands that all hands communicate efficiently, quickly, and capably. An effective shipwide wireless communications system would provide this capability, facilitating the coordination of onboard personnel and resources.

Current phone-based systems are wired and susceptible to battle damage, as well as being antiquated and difficult to maintain due to parts obsolescence. Integrated flight deck communications are often required, and few situations match the intensity of or require the level of coordinated communication that is needed for an on-deck landing or takeoff. Interoperability of shipboard communications equipment is another important requirement, for enabling instant, coordinated connections. Too often, the disparate communications systems on board a ship are provided by different vendors and use dissimilar protocols, and therefore fail to meet this need.

Survivability of shipwide communications in the event of battle damage is crucial, both for continuing the ship’s fight and coordinating a response to the damage, such as fire suppression. In addition, interoperability with off-board VHF radio assets, such as those deployed on landing craft, is desirable. Finally, Emission Control (EMCON) is a matter of much concern in the shipboard environment—both at sea (to reduce the probability of detection) and in harbor (to reduce mutual interference).

The Harris HYDRA System addresses these needs. It is a well-proven system providing the advanced wireless communications technology that permits all ship hands to remain in contact with each other, and with the ship’s command authority, at all times.

The Harris HYDRA System provides commanders:

- **Interoperability** – A single, interoperable shipwide communications system which optionally interfaces seamlessly with existing VHF radios on landing craft and with the Flight Deck Announcing System, if required
- **Survivability** – HYDRA can accommodate the loss of one or more repeaters with graceful degradation
- **Low Power Consumption & RF Output** – Low power design and minimal RF power output reduce onboard space requirements and system interference
- **Flight Deck Communications** – Specialized capabilities for the high-intensity, high-noise flight deck environment include optional knockdown (or preemption) capability for larger ships
- **EMCON** – The system’s antenna switching solutions enable emergency communications which are difficult to detect off-ship
- **A Shipboard Ready System** – The system is designed for the shipboard environment, meets MIL specs, and includes audio and power interfaces compatible with shipboard interface requirements
The Harris HYDRA System provides interoperable, survivable, intra-ship communications that can interface with flight deck announcing systems.
There are many scenarios in which the Harris HYDRA secure, trunked shipboard communications system would provide crucial functionality, for example:

- The Officer of the Deck on the ship’s bridge wishes to communicate with a seaman on the forecastle of the ship to disseminate an order, to inquire about the status of a previous order, or to acquire intelligence verbally.
- A seaman manning a binocular station needs to communicate a visual sighting of a suspected pirate ship to the Bridge Watch Officer. The Watch Officer may then use available intelligence and other data sources to determine the intent or identity of the suspected vessel. Should interdiction be deemed appropriate, the Harris Maritime Interdiction System (described in a separate executive summary) could be used.
- A fire containment party leader must communicate status to the Bridge Watch Officer to ensure that accurate and up-to-date information is available. The Damage Control Officer can then determine the appropriate course of action such as flooding a compartment, augmenting the fire-fighting staff, etc.
- A Combat Team is deployed via landing craft. The Operations Officer can maintain command and control of the operation, using HYDRA to communicate with the Combat Team’s VHF radios.
- While involved in action with an enemy combatant, the host vessel needs to deploy a helo from the flight deck. HYDRA enables the Air Boss to remain in contact with flight deck crew to keep them apprised of the deployment status, even when the flight deck becomes noisy.
- During battle the ship has taken a hit, and damage containment parties have been dispatched to fight fires, repair damage, etc. These forces must maintain contact with the Bridge Command at all times.

In all cases, the communications resources are allocated as quickly as possible by the trunking technology built into the system, which is transparent to HYDRA users. In the event of battle damage and the loss of a repeater station, failover occurs automatically and is also transparent to the radio user.
Key Features:

- **Optimized Equipment Configuration** – For a naval vessel with about 50 users
- **Scalability** – Easily modified (up or down) for number of users or ship size
- **Trunking Capability** – Instantaneous prioritized communications maximize use of system resources and minimize user waiting time; requiring fewer channels also minimizes frequency planning issues
- **Flight Deck Communications** – Optimized equipment supports the stringent communications requirements of the noisy flight deck environment, if required
- **Interoperability** – Above and below deck, all shipboard communications are supported by the single Harris system, which also can interoperate with VHF radios on board landing craft
- **Low Power System** – Reduces onboard equipment footprint and RF interference, per many EMCON policies
- **Security** – AES and DES encryption ensures confidentiality of conversations
- **Redundant Antenna Designs** – Permit shipwide communications during battle situations when all compartment doors are closed
Delivery of the HYDRA System is a low-risk proposition. The equipment has been installed in more than 60 U.S. and international naval vessels. The underlying advanced trunking technology developed by Harris also has been deployed by public safety users around the world.

A standard HYDRA System includes:
- Low-Power Repeater Cabinet with three repeaters, a trunking controller, low-power amplifiers, and RF combining equipment
- Uninterruptible Power Supply (UPS)
- Make-Before-Break (MBB) Switch
- Fixed Command Radio Station(s)
- P7100 Radios with holsters
- Battery Conditioner and Six-Position Charger
- Programming Devices

This configuration is very flexible, and additional equipment and capabilities can be integrated at initial purchase or as a subsequent system upgrade. Options include a specialized flight deck helmet and related communications equipment; antennas, cabling, and connectors; and a Communications System Director (CSD). Typical customizations include the number of system channels, fixed stations, and portable radios. Adding channels will make the system suitable for a larger vessel, but an extra rack may be needed to host the equipment.

The standard system can be delivered within five months, as shown on the opposite page. If customization is required, the delivery schedule may be impacted. Harris will work with every customer to provide the appropriate system, without the need for long hardware or software development cycles.

As with all of the Harris packaged system offerings, the HYDRA System can be easily incorporated into larger systems and customized to reflect different concepts of operations (CONOPS), based on the requirements of various naval forces.
Low-Risk System Characteristics:

- Pre-engineered system implementation
- Integration risks are eliminated
- Standard interfaces and protocols ease incorporation of future enhancements
- Leverages our advanced trunking radio technology
- Tailorable, with system configurations available for various vessel sizes
The HYDRA System is a flexible, capable, shipboard-ready solution.

The system is designed to operate in the UHF frequency band (380 to 430 MHz) using mature, advanced trunking technology for interior and exterior communications. The main site equipment includes a Repeater Cabinet and a Make-Before-Break (MBB) switch that is hard-mounted to the bulkhead to provide connectivity with the ship's power. A single, central location is used for this equipment and—due to the low-power configuration—minimal space and air conditioning are required, reducing installation efforts and associated cost and schedule.

Secured by shock mounts, the Repeater Cabinet is MIL-STD-901D Grade A shock-qualified, with a sway brace mounting on top. The cabinet is designed to meet stringent EMI requirements and includes EMI air filters in the doors and at the top of the cabinet. All wires penetrating the cabinet are filtered. The cabinet provides easy access from the rear and front, facilitating maintenance activities. A rack-mounted uninterruptible power supply (UPS) includes internal batteries that provide an additional 30 minutes of run time.

HYDRA is a three-channel, low-power system that will support at least 50 radio users. The system's cornerstone, the MASTR® III, provides reliable, fault-tolerant, trunked operation. The trunking function of the base station is supplied by a SitePro Controller which provides digital signaling and transmitter control.

The base station's distributed processing architecture enables every repeater to serve as either a control channel or a working channel. This full functional redundancy means that if the control channel repeater fails, one of the working channels will automatically assume the role of the control channel, allowing continued operations. The multi-channel system thus allows for continuing, trunked operations in the event of repeater loss, providing for graceful degradation in service for centrally controlled functions. Multiple levels of fault tolerance and fail-safe features ensure that the system maintains communications, even if some of its components are lost.

The trunking aspect of the system also ensures that each user will be assigned to an open channel so that calls are not lost, as is possible in a conventional system. The system includes a Site Interface Module (SIM) that works with the Repeater Subsystem to route audio, mobile data, and encrypted digital voice data between these devices and support a single line of telephone interconnect. This will enable radio communications with the ship’s telephones through the ship’s PBX.

The optional Communications System Director (CSD) allows dynamic re-programming of radios, permitting changes to user and talkgroup priorities. The CSD allows the user to define databases, adjust system parameters, and monitor system activity.

The HYDRA System is designed to operate in the UHF frequency band (380 to 430 MHz) using mature, advanced trunking technology for interior and exterior communications.
The HYDRA System is a flexible, capable, shipboard-ready solution.

**RF-7600P-Iv601 HYDRA System Equipment**

### STANDARD CONFIGURATION

- Low-Power Repeater Cabinet
  - Three MASTR® III Repeaters
  - SitePro Trunking Controller
  - Low-Power Amplifiers
  - Power Supplies
  - RF Combining Equipment (Duplexer, Multicoupler, Six-Channel Combiner, Switch Shelf, and Reference Oscillator)
- Uninterruptible Power Supply (UPS)
- Make-Before-Break (MBB) Switch
- Fixed Command Radio Station – for the ship’s Bridge
- P7100 Radios with holsters – 50 are included, with an optional flight deck holster available
- Battery Conditioner and Six-Position Charger
- Programming Devices

### OPTIONAL CAPABILITIES

- Flight Deck Helmet
- Additional Flight Deck Communications Equipment (audio processor shelf, Tx and Rx radio shelves, and Priority Select computer)
- Additional Fixed Command Radio Station for the Flight Deck
- Communications Systems Director (CSD)
- Antennas, cabling, and connectors to cover Bridge, Ship Compartments, and Flight Deck
ENABLING TECHNOLOGIES

Our advanced trunking technology is fielded around the world

MASTR III Repeaters
The MASTR® III Base Station provides secure digital trunked communication. The MASTR III provides the flexibility to commission a base station that will meet critical communication needs today and into the future. Its modular design makes maintenance and servicing simple and fast.

SitePro Trunking Controller
In an advanced trunking station site, the SitePro Controller provides command and control of the associated base station, communicates with other SitePro Controllers (if required), and routes voice or digital data. The SitePro unit consists of a single microprocessor-controlled shelf that fits above the MASTR III station in a cabinet or 19-inch rack. The RF channel SitePro cards enable the trunking operation by providing both high- and low-speed signaling generation and detection, control channel repeater control, and working channel repeater control. Most importantly, the MASTR III base station can operate in a fail-safe trunking mode.

P7100 Handheld Radios
Manufactured by Harris for the public safety user, the P7100 II is a rugged radio meeting MIL-STD-810F specifications. The P7100s used in the HYDRA System have been developed to operate at 20 to 100 mW power in the 380 to 430 MHz frequency band. Both the P7100 II System and P7100 II Scan radios have large alphanumeric, 16-character, 2-line, back-lit LCDs and up to 15 status icons. The P7100 II is a system radio that also features a 15-button keypad for direct entry of individual calls. It has been successfully used on board multiple US Naval vessel types and is capable of operating in driving rain, snow, and extreme heat and cold. It has been tested to MIL-STD-461E.
<table>
<thead>
<tr>
<th>FEATURES</th>
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<tr>
<td><strong>MASTR® III Repeater</strong></td>
<td></td>
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<tr>
<td>Integrated Digital Signal Processor (DSP)</td>
<td>Provides advanced audio processing for improved voice quality as well as tone generation and detection</td>
</tr>
<tr>
<td>RS-232 Port</td>
<td>Enables local configuration and programming</td>
</tr>
<tr>
<td>380 – 430 MHz Operating Frequency</td>
<td>Ideally suited to shipboard communications, allowing for long-range, reliable conversations</td>
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<tr>
<td><strong>SitePro Trunking Controller</strong></td>
<td></td>
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<tr>
<td>Controls the MASTR III</td>
<td>Allows for reliable communications with minimal wait times for system access; minimizes lost calls</td>
</tr>
<tr>
<td>Fail-Safe Trunking Support</td>
<td>Enables graceful system degradation in the event of a repeater failure due to battle damage</td>
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<tr>
<td><strong>P7100 Radios</strong></td>
<td></td>
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<tr>
<td>MIL-STD-810F Compliant</td>
<td>Provides reliable operations in the demanding shipboard environment</td>
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<tr>
<td>Large, Back-Lit LCD Display</td>
<td>Allows the user to easily configure the radio and monitor status under difficult lighting conditions, even when wearing protective clothing</td>
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<tr>
<td>20 – 100 mW Transmit Power</td>
<td>Enables reliable communications while minimizing RF interference with other equipment</td>
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<tr>
<td>AES and DES Encryption</td>
<td>Ensures confidentiality of all conversations</td>
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</table>
Harris has earned a worldwide reputation as the low-risk vendor of choice for tactical radios and systems, with 99 percent of our international program customers reporting that Harris meets or exceeds their expectations. Our responsive program management team and customer service organization will deliver and support a highly capable shipwide communications system.

An agile manufacturing process enables Harris to modify production to meet customer demands. With one of the highest-volume defense communications manufacturing facilities in the world, we have the commitment and capability to deliver on our promises.

Unlike many other companies, Harris has “boots on the ground” experience, supporting our products from initial fielding to obsolescence. In fact, we are currently servicing systems that have been deployed for more than 20 years, underscoring our absolute commitment to customer satisfaction. Our customers rate Harris an average of two times higher than our nearest competitor.

As a proven provider of advanced radio, sensor, and integrated systems to customers in over 120 countries, Harris has extensive experience in providing logistics and sustainment support throughout the world. We have developed highly successful processes for fielding, maintaining, supporting, repairing, and upgrading our equipment, no matter where it is deployed.

Many of our product and technical service representatives have prior military experience, and establish a close, personal bond with our customers. Our comprehensive service offering includes classic telephone and email support as well as web-based services. The Harris Premier website (https://premier.harris.com/) provides customized access to:

- Computer-based training courses and manuals
- Frequently asked questions
- Application notes
- Purchase of accessories and ancillaries

Customers also can use the website to:

- Download and track software upgrades
- Receive warranty and maintenance support, including RMA numbers and returned goods status

System training is another important consideration. Harris trains approximately 5,000 students per year on the installation, operation, and maintenance of its equipment and systems. This process occurs in our company classrooms, at customer locations, and in the field. Our students (our customers) consistently rate the training they receive as meeting or exceeding their expectations.
The Harris HYDRA System provides economic benefits throughout its entire life cycle:

**Low Risk** – Our customer knowledge, program management, technical expertise, and world-class customer support serve to reduce fielding risk.

**High Performance** – The open architecture design capitalizes on technology refresh of components, maximizing the value of customers’ investments over an extended time period.

**System Sustainment and Supportability** – Sustainment issues are reduced by the use of rugged military equipment (with existing training and ILS packages) and the availability of Harris field service representatives.

**Life-cycle costs are reduced by:**
- Use of common equipment and software applications
- 24/7 support capabilities
- Available in-country training and training material
- Common equipment interfaces and programming
- Availability of installation and maintenance by in-country partners
- Availability of extended warranties beyond the standard 12 months
- Low-cost upgrade paths
Harris RFCD supplies tactical and public safety radio products in over 120 countries worldwide

Millions of people and hundreds of government agencies throughout the world rely on assured communications® solutions from Harris to deliver critical information to the right place at the right time. They know there is too much riding on the outcome to risk anything less. What sets Harris apart is our depth of expertise, breadth of experience, and focus on providing the most advanced products, systems, and services that meet or exceed the requirements of our customers.

Harris is one of the only companies in the world specializing in advanced technology for capturing, aggregating, distributing, and analyzing the full breadth of wireless communications including voice, data, video, and imaging. We use this unique capability to provide systems and networks for customers in defense, intelligence, government, public safety, healthcare, broadcast, and energy markets.

Harris RF Communications Division (RFCD) is the leading supplier of tactical, secure voice and data communications products, systems, and networks to military, government, and commercial organizations worldwide. More than 50 years of international experience is leveraged into the design and deployment of Harris RFCD’s packaged C4ISR system solutions.

The HYDRA System is one more example of Harris responding to the needs of its customers.

I firmly believe that Harris RF Communications really listens to their customer base and lives by the creed: the customer is king. I truly feel that sense of partnership with Harris, and I’ve been dealing with Harris for years now.

– NATO Staff Member

Harris has internationally acclaimed products which have left everyone else in the dust.

– International Customer
Always connected. Never alone.

Our proven solutions provide:

- Voice, data, and video where it’s needed, when it’s needed
- Cost effectiveness throughout the life cycle of the system
  - No long, costly development cycle
  - Unsurpassed in-country support during and after delivery
- Scalability and growth options
- Configurable solution sets
- On-time delivery of quality systems
As your partner, Harris is committed to your success

Harris Corporation welcomes the opportunity to discuss the HYDRA System in more detail, and how it can be applied to your missions and applications.

We believe that our packaged systems provide a significant value to you, our customer, in the following ways:

- Our advanced trunking technology is already proven in worldwide deployments, and an earlier variant of HYDRA is in use on approximately 60 naval vessels.
- The systems are available now, eliminating long and expensive development and procurement cycles.
- Software-defined radio technology uses open architectures and standard interfaces, allowing the system to incorporate new capabilities and stave off obsolescence.
- Pre-engineered system designs emphasize commonality of equipment and resources to reduce life-cycle sustainment costs such as training, sparing, and maintenance.
- Our systems engineers and in-country partners can readily customize the solution, as required.
- The systems are supported by our world-class customer service organization that operates in every part of the world and is second to none.

With approximately $6 billion (USD) in annual revenue, Harris is an international communications and information technology company serving government and commercial markets worldwide. We are confident that our packaged C4ISR system solutions represent the best value with the lowest schedule, cost, and technical risks for meeting your complex operational challenges.

Our solutions leverage:

- Mature and widely deployed Public Safety radio technology
- Fast access trunking for speed of user access
- Distributed processing for reliability and fault tolerance
- Focused program teams
- Over 50 years experience providing state-of-the-art military systems
- Product service teams that deploy to our customer
- Nearly 7,000 engineers and scientists throughout the corporation
Seamlessly connected with wireless shipboard communications