IN SUPPORT OF SEARCH & RESCUE MISSIONS

AERIAL RESCUE KIT (ARK) TESTING

Greg Campbell, CD, B.Sc., MBA
Presentation Overview

- Background
- ARK Development and Overview
- Test Objectives/Methods
- Test Conditions
- Test Results and Discussion
- Real Validation
- Conclusions and Recommendations
Background

- Problems with Current System
  - Also known as MA-1 System
  - Accuracy Limitations
  - Orientation
  - No Anchor
  - Distance to Survival Kits
  - Lack of Training Systems
  - Access Boarding Issues
Deficiencies observed in real rescue operations
Address specific deficiencies noted in current system
Desire to update the system
Improve capability, flexibility, usability
ARK Development

- Maintain similarity in operation to current system (hand launch, static line deployment)
- Minimal re-training
- Combine life rafts with contents
- Revise survival contents and stowage
- Introduce Training Kits
Manually deployed air-to-sea Rescue system
ARK OVERVIEW (cont’d)

- Hand-launched from the aft ramp of any aircraft

- Also deployable from side door

- Currently qualified by and in service with Canadian Forces for C-130 Hercules and CC-115 Buffalo
ARK OVERVIEW (cont’d)

- Kits measure 26”L x 16” Dia
- Compact design – ease in handling, portability, and storage
- Operational kit contains:
  - **inflatable life raft** (by compressed gas cylinder)
  - **survival contents** (determined by customer)
ARK OVERVIEW (cont’d)

- Two to four kits can be dropped in one pass
- Life rafts connected by buoyant rope

- Descent rate is 70 ft/sec and stabilized by drogue

- Water Activated Device
  - Proprietary/Patented Design
  - Activates inflation of life raft
  - Enhanced accuracy of placement
Training System

- Training system available that handles exactly like the operational system.
- Reduced overhead and cost associated with operational systems
Modular, identical kits

Each kit contains:

- 1 life raft (6, 8, or 10 persons); strobe light automatically activated; boarding ramp
- Vacuum packed survival kit; sustain life at sea 48 hours; inside of and secured to life raft
ARK OVERVIEW (cont’d)

- A water-activated inflation device (inflates life raft upon kit immersion in water)
- Weighted, fast-acting automatically deployed sea anchor
- 280 feet of buoyant polyethylene rope with metal V-ring on each valise
- Small drogue for stabilization and keep bundle from tumbling during the drop
Typical release altitude: 150 – 500 ft
System operation is not dependent on release altitude
Placed side-by-side for aft ramp, two-by-two for side door
ARK OVERVIEW (cont’d)

- Once placed at exit door, rope connections are made and static lines connected to the aircraft
- The kits are then simply hand-deployed out of the aircraft at 1-second intervals
- Bundles are connected to aircraft by break-away static lines, leaving nothing to pull back after dispatch
- Deployment procedure much the same as the current system. Minimal re-training required for SAR technicians.
ARK OVERVIEW (cont’d)

- Handles **exactly** like operational kit (weight, size, rigging, and deployment)
- Do not contain life rafts or survival equipment
ARK OVERVIEW (cont’d)

- Eliminates need/cost to replace/repack these equipment
- Just hose down, air dry. It is now ready for next training exercise
- Frequent training exercise more affordable
- Colour differentiates it from operational system
ARK OVERVIEW (cont’d)

- Off-the-shelf, turnkey system
- Any life raft can be easily integrated into the ARK system
- Comes complete with vacuum packed survival equipment
- OR customer may specify items
- Depending on items selected, shelf life of survival contents could be up to 5 years
- Flexibility to pack survival contents outside of life raft to facilitate quick customization
TEST OBJECTIVES

- Evaluate airworthiness
  - Safety (storage, rigging, deployment)
- Operational Suitability and Effectiveness
  - Verify the structural integrity of the kits
  - Assess life raft deployment systems
  - Accuracy, Visibility, Reliability
  - Maintainability, procedures, training
TEST METHODOLOGY

- Operational and Training System Deployments
  - Preliminary flight tests (CC130) using mechanical timer only
  - Follow on Flight tests utilized both CC130 and CC115 Buffalo aircraft.
TEST CONDITIONS

- Preliminary Flight Tests
  - Test Conditions:
    • Day VMC
    • Off coast of Halifax
    • CC130 platform
    • Winds light to moderate (16-23 kts)
    • Sea state variable 1-4 on Beaufort scale
  - Test Points:
    • Altitude: 300 ft AWL (+ 30 ft)
    • Airspeed: 130, 140, 150 KIAS
    • Deployments: ramp and side door
    • 26 multi kit deployments (9 operational, 17 training runs)
TEST RESULTS

- Preliminary Flight Tests
  - Results:
    - No anomalies with handling or dispatch (static lines)
    - Several valise structural failures occurred at drogue and rope attachment points in initial drops
    - All life rafts deployed and inflated:
      - 28 operational kits, 3 life rafts were inverted on the surface
      - Life raft visibility assessed as good
      - Training kits visibility in the water rated poor
      - Accuracy – dependent on timing, some drift noted
TEST RESULTS

- Preliminary Flight Tests
  - Corrective Action:
    - Reinforce attachment points
    - Consideration be given to breakaway static lines
    - Training valise colour changed to bright yellow
    - WAID design and integration
TEST RESULTS

- Follow-On Flight Tests
  - Results – Life Raft:
    - All inflated upright
    - Additional testing required in heavy seas
    - Water Activated Inflation Device
  - Results – Training Kits:
    - Training Kit visibility much improved over preliminary tests
    - matched size, weight, handling, rigging of operational units
    - Modification to core to resist rolling tendency (completed)
    - Very valuable, positive training tool
TEST RESULTS

- WAID allows altitude to be adjusted as required without affecting system operation
- As per observations from CF - Training Kits provide excellent training
REAL VALIDATION

- ARK is already in service with the Canadian Forces.
- Since operational use in September 2006, two live deployments have been made:
  - LIVE RESCUE AT JACKSON BAY – April 20, 2007
  - LIVE RESCUE NEAR BERMUDA – November 9, 2006

La Pierva, a Quebec-registered boat which also got into trouble, lost its navigation equipment in a lightning strike. (Department of National Defence)

The pilot and his six passengers from the overturned floatplane were able to climb into the life rafts dropped by the Buffalo aircraft.
SUMMARY

- Airworthiness clearance confirmed
- Accurate delivery
- Modular system, all units are identical
- Small, easy to handle units
- Inflation of life raft on water entry
- Survival contents packaged inside of life raft for easy access
- Wide coverage on the water:
  - § 2 bundles - 560 ft  /  4 bundles - 1120 feet
- Right-side up inflation of life rafts
- Fast acting, self deploying anchor
SUMMARY
(Cont’d)

- Training system saves operational assets and provides low cost positive training for SAR crews
- Customization of survival contents
- Wide range of deployment configurations and conditions to accommodate largest possible rescue scenarios
- Easy to rig and dispatch
- Turnkey system – no training or special skills necessary
- Virtually no maintenance (contents vacuumed packed to increase life)
A new ARK designed for use on Rotary Wing Platforms is under development.

This product will undergo the same rigorous testing and validation as its fixed wing predecessor.
QUESTIONS?