Automatic Transfer of SAR Patterns for AUXSAR

Report No. CG-D-04-16

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Automatic Transport of SAR Patterns

Mission Need: Near real-time Search and Rescue (SAR) patterns for forward assets to effectively execute mission.

**Project Objectives:**
- Demonstrate and evaluate the near real-time transport of Search and Rescue Patterns to forward assets.
- Define required capabilities for deployment/transition.
- Provide system architecture(s), System Dataflow Diagram(s), and Concept of Operations (CONOP) documentation necessary for deployment/transition of the system.
- Inform planned Enterprise Transmit solution being coordinated by CG-761.

**Key Milestone / Deliverable Schedule:**

- Project Start: 12 Nov 14
- Auxiliary Search and Rescue (AUXSAR) Test: 10 Sep 15
- Sponsor Brief AUXSAR Test: Oct 15
- Cutter Test: Dec 15
- Sponsor Brief Cutter Test: Feb 16
- Fixed Wing Test: Nov 16
- Sponsor Brief Fixed Wing/ KDP for Rotary Wing: Jan 17
- Rotary Wing Test: Jun 17
- Rotary Wing Brief: Jul 17
- Final Summary Report: Sep 17
- Project End: Oct 17

**Expected Benefit:**
Improve operational performance/efficiency/mission execution/resiliency

**Notes:**
Response Boat testing cancelled due to SINS II Acquisition

**Sponsor:** CG-761

**Stakeholder(s):** CG-711, CG-731, CG-751, C3CEN, CG-SAR, CG-5P

**Project #:** RDC PO: 8113

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Introduction

AUXSAR

Developed by:
Mr. Dan Meigs of CG AUX
Flotilla 10-6
Wilmington NC

In Coordination with D1 and D5
Overview

• Overview of AUXSAR/System Design
• AUXSAR Field Test
• Potential CONOPS
• Path Forward to Transition
Overview of AUXSAR/System Design
Overview of AUXSAR/System Design

• Reads Search and Rescue Optimal Planning System (SAROPS) pattern summary Falcon View (FV) format
  – Recently added the ability to read text search pattern summaries

• Creates boat and aircraft navigation system input
  – CG SINS (RB-M, RB-S)
  – CG HC-130J, MH-65, MH-60T (PFPS)
  – CG GCCS .ovl for Mission Suite/Pallet (HU-144/130J)
  – Cutter VEGA (ECS/ECDIS)
  – Garmin Flight Plan (GNS-400, 500, and 600 series, G1000 etc)
  – ForeFlight with FlightStream technology

• Reads & writes GoogleEarth/CG EGIS .kml
Overview of AUXSAR/System Design – Generated AUXSAR File Types

- Response Boat – Small (RB-S) (grp, rte, wpt)
- Response Boat – Medium (RB-M) (.rou, .rat from GPSU)
- GoogleEarth /eGIS .kml (pattern name)
- .xml (PFPS: Large CG Aircraft)
- .fpl (Garmin Flight Plan: G1000 etc)
- .txt (ForeFlight)
- .sar (GPSU: to create RB-M files)
Overview of AUXSAR/System Design – General Operation

- Search planners create search action
- AUXSAR reads exported SAROPS pattern file
- AUXSAR creates Navigation (NAV) system files
- MS Outlook macro creates email with attached NAV files
- NAV files are emailed to Station/ SAR Resource Unit (SRU)
- Station/SRU uploads to NAV system
- Pattern run as Global Positioning System (GPS) route
Overview of AUXSAR/System Design – Prototype Installations

- Standard Workstation III (SWIII)
- Sector Command Centers (SCC)
- Stations in CGOne Network
- Mission Suite (130J, 144A)
- SBU notebook (Air Stations)
- Standalone notebooks
Overview of AUXSAR/System Design – Computer Environment

- Javascript in html wrapper (Web Page)
- Not installed as a “registered” program
- No changes to registry
- Interpreted by Internet Explorer (IE) 11 (already approved for Image 7)
- Program files stored locally, executed locally
- File I/O is all intranet/local
- Makes no calls to Internet
  - Launches Google Earth (or kml associated application) automatically through associated programs in Windows to display patterns
Overview of AUXSAR/System Design – AUXSAR Interface

Welcome to AUXSAR II

AUXSAR imports SAROPS Search Action Plans and creates search pattern input files for vessel and aircraft Navigation Systems.

Patterns are drawn immediately in GoogleEarth or ArcGIS Desktop ("eGIS").

NAV System files are placed in the default AUXSAR folder "c:\auxsar\package1"

BROWSE to a SAROPS Pattern, as FV. Edit the parameters & Press "Create Pattern."

<table>
<thead>
<tr>
<th>CASE:</th>
<th>Name</th>
<th>PATTERN:</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA Width:</td>
<td>mm</td>
<td>SA Length:</td>
<td>mm</td>
</tr>
<tr>
<td>CSP LAT:</td>
<td>Decimal Deg</td>
<td>(D-M-S):</td>
<td>(Deg-Min_Sec)</td>
</tr>
<tr>
<td>CSP LON:</td>
<td>Decimal Deg</td>
<td>(D-M-S):</td>
<td>(Deg DecMin)</td>
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<tr>
<td>Major Axis:</td>
<td>Deg T</td>
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<tr>
<td>Track Space:</td>
<td>in mm</td>
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<td></td>
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<tr>
<td>Move CSP to:</td>
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<tr>
<td>Search Speed:</td>
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<tr>
<td>Legs:</td>
<td>Number of Legs</td>
<td>&quot;Fitted&quot; A&amp;B</td>
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</tr>
<tr>
<td>SRU MMSI:</td>
<td>SRU MMSI</td>
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</tr>
</tbody>
</table>

Create Pattern Files

1. Browse to SAR file
2. Select the file
3. Fields are imported
4. Add missing data and/or modify search
5. Create patterns
Overview of AUXSAR/System Design – Pattern Upload

- Select pattern to upload
- Select “Browse”
- Navigate to \auxsar\SAROPS\ (or any location)
- Select a file
Overview of AUXSAR/System Design – CASE/Pattern/CSP

- **A CASE may have many PATTERNS**
  - PATTERN name becomes file name
  - CSP LAT/LON in decimal degrees
  - LAT/LON convention for sign (“-” West LON)
  - CSP LAT and LON shown in additional formats
    - Deg-Minutes_Decimal Seconds
    - Deg-Decimal Minutes
Overview of AUXSAR/System Design –
Create Pattern Files

• Press “Create Pattern Files”
Overview of AUXSAR/System Design – Pattern Viewed in Google Earth
Overview of AUXSAR/System Design – Pattern Viewed in CG EGIS
Overview of AUXSAR/System Design – Pattern Converted to ForeFlight
AUXSAR Field Test
AUXSAR Field Test – Garmin GPSmap 496 In Flight
AUXSAR Field Test – Garmin GNS 530W Autopilot In Flight
AUXSAR Field Test – ForeFlight Received In Flight Jan 2015
AUXSAR Field Test – HC-130J 0.1 TS PS, 180 kts

A/S Elizabeth City In Flight

“It flew fine without incident or issues.”

“. images of the SAP I flew today. Everything worked well. I played around ..with waypoint sequencing and found that Point to Point worked best for total coverage.”

LT Greg Rehlender
Ops Support Chief
LE/LMR Division Chief
AUXSAR Field Test – HH-65 0.1 nm TS PS, 90 kts

Aviation Training Center (ATC) Simulator

“Attached is the AUXSAR pattern on the MDL Card. The Flight Manager and Flight Director worked great; note the XTRK of 0.0 NM. This is key if the trackspace is 0.1 NM.”

(Note: flown hands’s off)

LT Ron Green
H-65 Stan Branch
ATC Mobile
AUXSAR Field Test – MH-60T 0.1 nm TS PS, 90 kts

ATC SIM
AUXSAR Field Test – SINS

CG 41481, April 2010
AUXSAR Field Test – RB-S, SOI June 2015
Potential CONOPS
Potential CONOPS – Benefits

• For an RB-S significantly less work inputting a SAR pattern
  – Over 850 key strokes for an 11 leg pattern!

• Ensures pattern accuracy
  – Prevents data entry errors
  – Ensures the pattern requested is the pattern searched

• Helps with pre voyage/per flight planning (Geographic Information System (GIS) overlays)
  – Navigation hazards
  – Weather hazards
  – Restricted/controlled area situational awareness
Potential CONOPS – Auxiliary Asset Notes

• Many Auxiliary units are using AUXSAR
• Compatible eNavigation systems required
• Post sortie feedback loop
  – Compatible eNavigation systems can download position history on the Secure Digital (SD) card
  – ForeFlight records flight history for AUX Air assets and exports the data via email in a KML format for post sortie analysis by the SAR Controller

• Email required
  – Units need to receive email underway/in flight for updates or new tasking
Potential CONOPS – Mobile Comm

- SD card writer to Android phone
- Used to transfer emailed pattern file
Potential CONOPS – Standard CG Asset Limitations

• RB-S version of SINS clears the route list when importing a pattern
  – Ensure SD card has routes backed up prior to pattern load

• HH-60 and HH-65 upload limitations
  – Only available upon initial startup
  – No in flight load capability
Path Forward to Transition
Path Forward to Transition – Policy

• Approval for AUXSAR to run on SWIII
  – Only JavaScript run from IE in SWIII
  – No communications with web services. Html page is local and self contained.
  – Uses MS Outlook and the user’s account to send email

• Trim AUXSAR to function only as a pattern translation interface to various eNav systems
  – Currently AUXSAR is capable of modifying and creating non standard patterns (Racetrack, Fast Mover, Fitted)
Path Forward to Transition – Verification & Validation

• Verification and Validation (V&V) of AUXSAR pattern translation
  – Ensure pattern imported is the pattern exported
  – Ensure pattern uploaded to various systems is the intended pattern

• If AUXSAR’s non standard patterns are desired, those must be V&V’d
  – Not recommended
Recommendations
Recommendations –
Standard CG Assets

• STEDS solves all requirements listed previously
  – Units can receive messages/patterns underway/in flight
  – SINS II will incorporate STEDS (all Boats)
  – Vega ECS/ECDIS is STEDS compliant (all Cutters)
  – Minotaur will be STEDS compliant for MPA assets
  – Automatic Identification System (AIS) offers track history through the
    Nationwide AIS (NAIS) Services through the ESB

• Recommend STEDS verses AUXSAR for standard CG assets
Recommendations – Auxiliary Assets

• Obtain approval for AUXSAR to run on SWIII
• Trim AUXSAR to function only as a pattern translation interface to various eNav systems
• V&V of AUXSAR pattern translation (trimmed version)
• Coordinate with CG-SAR to investigate SAROPS use of non-standard patterns