Tilt-rotor UAV System to Monitor Illegal Fishing

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Tilt-Rotor Family of KARI

TR-100 (Smart UAV)

TR-60

TR-40

TR-100 Smart UAV

TR-60
Merit of Tilt-Rotor

- **Comparison to Helicopter**
  - Can Fly Faster, Higher, and Farther
  - even More Quietly

![Graph comparing Typical Helicopter vs AW609 flyover, showing EPNL near certification airspeed, centerline mic.](image)
Concept of TR-60 WE

TR-60 + Wing Extension

TR-60 WE
## TR-60 vs TR-60 WE

<table>
<thead>
<tr>
<th></th>
<th>TR60</th>
<th>TR60 WE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTOW (kg)</td>
<td>200</td>
<td>same</td>
</tr>
<tr>
<td>Payload (kg)</td>
<td>20</td>
<td>same</td>
</tr>
<tr>
<td>Powerplant</td>
<td>55hp Rotary</td>
<td>same</td>
</tr>
<tr>
<td>Overall Length (m)</td>
<td>3.0</td>
<td>same</td>
</tr>
<tr>
<td>Wing Span (m)</td>
<td>3.0</td>
<td>4.8</td>
</tr>
<tr>
<td>Wing Area (m²)</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Rotor Radius (m)</td>
<td>1.1</td>
<td>same</td>
</tr>
<tr>
<td>Blade Twist (deg)</td>
<td>29.0</td>
<td>same</td>
</tr>
<tr>
<td>Disk Loading (kg/m²)</td>
<td>52.6</td>
<td>same</td>
</tr>
<tr>
<td>Max Speed (km/h)</td>
<td>240.0</td>
<td>220</td>
</tr>
<tr>
<td>Loitering Speed (km/h)</td>
<td>160.0</td>
<td>140.0</td>
</tr>
<tr>
<td>Max Altitude (km)</td>
<td>4.0</td>
<td>same</td>
</tr>
<tr>
<td>Endurance (hrs)</td>
<td>5.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Fuselage</td>
<td>Upswept aft fuselage</td>
<td>same</td>
</tr>
<tr>
<td>Landing Gear</td>
<td>3 pts fixed tricycle</td>
<td>same</td>
</tr>
</tbody>
</table>
Flow Visualization

- FLUENT Analysis

- Flow Visualization

- CL vs AOA (deg)

- TR60 and TR60 Subwing

- Lower surface AOA 8°

- Upper surface AOA 8°

- Lower surface AOA 12°

- Upper surface AOA 12°

- Lower surface AOA 16°

- Upper surface AOA 16°
Flight Control System

- Upgrade of Flight Control Hardware

Avionics Bay of TR-60
- Hardware come from TR-100
- Communication Range < 5km
- GPS/INS

Avionics Bay of TR-60 WE
- Optimized for TR-60 Series
- Communication Range < 50km (~200km)
- Relative GPS/INS for Deck Operation
Flight Test Results

- Flight Test Results
  - Preprogram on a map

Trajectory and wind estimation

Wind Estimation - 2D

- Track
- 2DW
- 2DW<sub>F</sub>
R&D Roadmap

- Development Plan

Personnel Air Vehicle

CIVIL

MILITARY
Development for Operation

- Monitor Illegal Fishing

Identification of Illegal Boats
Monitor Illegal Fishing

- Development for Operation

- AIS+V-PASS
- Integrated Small/Light Weight Identification System
- Data Link Interface Development
- Improved Video Display
- Electronic Mapping Display
Conclusion

**Accomplishments**

- TR-60 WE was successfully developed
  - To increase endurance in airplane mode
  - World 1st design concept for performance enhancement of tilt-rotor

- Series of Tilt-rotor UAV showed the possibility of Commercial Operation
  - TR-40
  - TR-100
  - TR-60 and TR-60WE

**Next Plans**

- Co-Development of production type TR-6X with Korean Air
- TR-80 will be considered for another Production Type
- Initial operation of TR-60 to monitor illegal fishing
Thank you for your attention!

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