SIKORSKY INTERNATIONAL BLACK HAWK HELICOPTER

S-70A Technical Information
Since its introduction, the Black Hawk helicopter and its derivatives have amassed over five million flight hours.
H-60/S-70 PROGRAM STATUS

UNITED STATES MILITARY CUSTOMERS

H-60 BLACK HAWK SERIES
- Delivered: 1,725
- Fleet Flight Hours: 3,200,000

SH-60 NAVAL HAWK SERIES
- Delivered: 354
- Fleet Flight Hours: 1,500,000

INTERNATIONAL CUSTOMERS MISSIONS

S-70A/B INTERNATIONAL HAWK
- Delivered: 583
- Fleet Flight Hours: 700,000
- Countries: 24
Weights and Performance

**WEIGHTS**

- Maximum takeoff gross weight: 22,000 lb (9,977 kg)
- Empty weight, standard configuration: 11,744 lb (5,326 kg)
- Maximum gross weight, external load: 23,500 lb (10,658 kg)
- Maximum external load: 9,000 lb (4,082 kg)

**POWERPLANT**

*ratings per engine, standard day, sea level*

- **Type**: Two General Electric T700-GE-701C
- 2.5-minute OEI contingency: 1,940 shp (1,447 kw)
- 10-minute takeoff power: 1,890 shp (1,409 kw)
- 30-minute intermediate power: 1,800 shp (1,342 kw)
- Maximum continuous power: 1,662 shp (1,239 kw)
- Normal fuel capacity, usable: 359.7 gal (1,362 l)

**PERFORMANCE**

*22,000 lb gross weight, standard day, sea level unless otherwise noted*

- Maximum speed (Vne): 195 kts (361 km/hr)
- Maximum cruise speed (Vnh): 149 kts (276 km/hr)
- Maximum rate of climb: 2,250 ft/min (11.43 m/sec)
- Service ceiling: 13,200 ft (4,021 m)
- Hover ceiling, out of ground effect: 4,300 ft (1,311 m)
- Hover ceiling, in ground effect: 9,000 ft (2,743 m)
- OEI service ceiling: 3,700 ft (1,128 m)
- Range at Long Range Cruise Speed*:
  - Internal fuel: 248 nm (460 km)
  - Internal fuel plus two 230 US gallon external aux tanks: 591 nm (1,095 km)

* 4,000 feet, 132 knots, 20-minute reserve

BLACK HAWKS are powered by two T700-GE-701C engines, which provide efficient, reliable power in all types of operating conditions.

[Image of Black Hawks]
Specifications

**DIMENSIONS**

- Overall length: 64.83 ft, 19.76 m
- Overall width: 53.67 ft, 16.36 m
- Overall height: 17.50 ft, 5.33 m
- Fuselage length: 50.04 ft, 15.26 m
- Fuselage width: 14.33 ft, 4.37 m
- Folded length*: 41.33 ft, 12.60 m
- Folded width*: 9.72 ft, 2.96 m
- Folded height*: 8.98 ft, 2.74 m
- Wheelbase: 28.92 ft, 8.82 m
- Main wheel tread: 8.88 ft, 2.71 m

**ROTORS**

- Main rotor diameter: 53.67 ft, 16.36 m
- Tail rotor diameter: 11.00 ft, 3.35 m

*Air transport configuration: main rotor hub lowered, main rotor blades, stabilator and tail pylon folded.*
Cabin Dimensions

<table>
<thead>
<tr>
<th>GENERAL DATA</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabin length</td>
<td>12.58 ft</td>
<td>3.84 m</td>
</tr>
<tr>
<td>Cabin width</td>
<td>7.00 ft</td>
<td>2.14 m</td>
</tr>
<tr>
<td>Cabin height</td>
<td>4.50 ft</td>
<td>1.37 m</td>
</tr>
<tr>
<td>Cabin area</td>
<td>88.00 sq ft</td>
<td>8.18 sq m</td>
</tr>
<tr>
<td>Cabin volume</td>
<td>396.00 cu ft</td>
<td>11.22 cu m</td>
</tr>
<tr>
<td>Storage compartment volume</td>
<td>20.34 cu ft</td>
<td>0.58 cu m</td>
</tr>
<tr>
<td>Capacity, normal</td>
<td>12 passengers plus 2 pilots</td>
<td></td>
</tr>
<tr>
<td>Capacity, maximum</td>
<td>20 passengers plus 2 pilots</td>
<td></td>
</tr>
</tbody>
</table>

Large sliding cabin doors on both sides of the aircraft allow fast and easy ingress and egress.
### S-70 Offers Flexible Cabin Arrangements

<table>
<thead>
<tr>
<th>CASUALTY EVACUATION</th>
<th>TROOP TRANSPORT</th>
<th>SEARCH AND RESCUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six litters</td>
<td>12-20 troop seats</td>
<td>Ten rescuees</td>
</tr>
<tr>
<td>Five crew</td>
<td>Two crew</td>
<td>Two crew</td>
</tr>
</tbody>
</table>

Well-placed tie-down fittings contribute to S-70 cabin flexibility

Roomy cabin and large doors enhance HAWK helicopter effectiveness in SAR missions
Survivability and Crashworthiness Design Features

- Designed with state-of-the-art safety and reliability features
- Padded cabin designed to FAA regulations for G-loading, egress, flammability
- Load limiting crew and troop seats
- Jettisonable cockpit doors
- Crashworthy fuel cells (65 foot drop)
- Energy absorbing landing gear (30 fps limits)
- Anti-plow keel beams
- High mass components are retained in 20/20/18G crash conditions

Troop seats with five-point harness provides maximum protection for cabin passengers

Swing-out armor side panels protect pilot and co-pilot from ballistic threats

Large cabin doors and windows allow quick escape in emergency conditions

Landing gear absorb energy of up to 30 feet per second and provide wirestrike protection
**Utility Configuration**

**AIRFRAME**
- Nose and transition section equipment compartments
- Two hinged jettisonable cockpit doors with emergency “pop-out” windows
- Two cabin gunner stations with sliding hatches
- Two cabin sliding doors with two jettisonable windows each
- Heated glass windshields
- Windshield and gunners’ stations windows defogging and defrosting
- Dual windshield wipers
- Bleed-air heating system
- Blower ventilation system
- Armored pilot and copilot seats
- 410 cubic foot cabin with 300 psf cabin floor and provisions for up to 20 seats
- Crashworthy cabin troop seating for 15 troops
- Quilted cabin head and side liners
- Two 20 cubic foot storage compartments
- Upper and lower wire strike protection systems
- Door and ignition locks
- 9000 lb capacity cargo hook
- Gunner station hardpoints for 7.62 mm pintle-mounted guns
- Fixed, tail-wheel type main landing gear
- Dual oleo main landing gear with kneeling capability for transport configuration
- Swiveling tail wheel with locking capability
- Two hand-held fire extinguishers
- Hard points for External Stores Support System (ESSS) or External Tank System (ETS)
- Manual tail pylon fold
- Low reflective paint
- Slewable stabilator with automatic and manual control

**POWERPLANT AND FUEL SYSTEM**
- Two General Electric T700-GE-701C engines with integral particle separators
- APU for engine start, ground power, and in-flight emergency power
- Dual suction fuel systems with self-sealing lines, breakaway fittings and crossfeed capability
- Dual crashworthy, self-sealing fuel tanks with a total capacity of 360 gallons
- Fuel boost pumps for prime and high altitude operation
- Single point gravity and pressure fueling and defueling
- Low level fuel warning system
- Engine and APU fire detection and extinguishing systems
- Engine anti-icing system
- Hover Infrared Suppression System (HIRSS)
- Main transmission with two isolated input/accessory modules
- Intermediate and tail gearboxes with interconnecting drive shafts
- Magnetic chip detectors with fuzz burn-off capability

**ROTOR AND CONTROLS**
- Four-blade articulated main rotor system with one-piece titanium hub and elastomeric bearings
- Ballistically tolerant main rotor blades with titanium spars, fiberglass skins, and honeycomb cores
- Bifilar vibration suppression system
- Provisions for manual blade fold (four blades aft)
- Dual, redundant and isolated pilot flight controls
- Dual, redundant parallel primary and tail rotor servos with jam protection
- Tail rotor centering quadrant
- Dual, independent, transmission-powered 3000 psi hydraulic systems
- Third, back-up, electrically-powered 3000 psi hydraulic system
- Redundant stability augmentation system with airspeed, attitude and heading hold
- Four-blade, cross beam tail rotor
- Complete provisions for main and trail rotor blade de-ice systems
- Manual rotor brake

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BLACK HAWKs can lift external loads up to 9000 pounds.

Tail landing gear swivels to improve maneuverability of aircraft when on the ground.
Utility Configuration

**ELECTRICAL**
- Two 30/45 KVA AC generators
- Two 200 amp DC converters
- Single 20/23.8 KVA APU-driven AC generator
- Single 10.0 amp-hour battery
- External power monitor panel
- Controllable landing light
- Controllable IR searchlight
- Standard and IR position lights
- Two anti-collision strobe lights
- NVG-compatible cockpit and cabin lighting
- Portable maintenance/inspection light
- Two cabin DC receptacles
- Two cabin AC receptacles
- Controllable search light

**AVIONICS**
- Command instrument system
- Dual AN/ARC-222 VHF/AM-FM communication radios
- FM homing system for single AN/ARC-222
- Five-station C-6533 ICS
- Single AN/ASN-43 gyro magnetic compass
- Single AN/ARN-149 ADF
- Single AN/ARN-147 VOR/ILS/MB
- Single TNL-8100 GPS
- Single AA-300 radar altimeter
- Single AN/APX-100 IFF transponder
- Complete provisions for:
  - AN/APR-39(V)1 radar warning system
  - AN/ALQ-144 IR jammer
  - M-130 chaff dispenser
  - Single AN/ARC-164 UHF-AM

**INSTRUMENTS**
- Airspeed indicators (2)
- Vertical velocity indicators (2)
- Barometric altimeter
- Encoding altimeter
- Standby magnetic compass
- Outside air temperature indicator
- Master warning panels (2)
- Caution advisory panel
- Vertical situation indicators (2)
- Horizontal situation indicators (2)
- VSI/HSI mode selectors (2)
- Stabilator angle indicators (2)
- Digital clocks with sweep second hands (2)
- Dual, heated pitot static system
- Vertical Instrument Display System (VIDS) containing:
  - Dual power turbine tachometers
  - Dual main rotor speed tachometers
  - Dual engine torque meters
  - Fuel quantity indicators and totalizer
  - Main transmission oil temperature and pressure indicators
  - Engine oil temperature and pressure indicators
  - Power turbine inlet temperature indicators
  - Rotor overspeed monitor

The BLACK HAWK’s cockpit features large, easy-to-read displays and well-organized controls.
Optional Mission Equipment
S-70 flexibility is enhanced with a wide range of optional mission equipment

- External Stores Support System (ESSS)
- External Tank System (ETS)
- 30-million candlepower Nightsun
- Six-patient litter system
- 600-pound capacity external rescue hoist
- Loudhailer
- Emergency flotation system
- ANVIS/HUD
Optional Electronic Equipment
Available optional electronics satisfy the most stringent mission requirements

<table>
<thead>
<tr>
<th>NAVIGATION/COMMUNICATIONS</th>
<th>MISSION SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ ADF-60</td>
<td>■ Color weather radar</td>
</tr>
<tr>
<td>■ MDF-124</td>
<td>■ FLIR</td>
</tr>
<tr>
<td>■ DME-42</td>
<td>■ Digital map</td>
</tr>
<tr>
<td>■ FMS-800 flight management system</td>
<td></td>
</tr>
<tr>
<td>■ TDR-90 transponder</td>
<td></td>
</tr>
<tr>
<td>■ ELT</td>
<td></td>
</tr>
</tbody>
</table>

“Glass” cockpit

Digital multi-function display panels combine information from multiple analog displays, reducing cockpit clutter and aircrew workload.

Moving digital map displays are offered as a component of the digital “glass” cockpit.

Weather radar and FLIR
Overhaul Periods and Retirement Times

**SCHEDULED OVERHAUL PERIOD (TBO)**

The following overhaul periods apply to the latest configuration of the affected component. Please refer to Manual TM 1-70-23AW-2 for current official TBOs.

**COMPONENT**

- Main rotor blade spindle nut 500 hours
- Oil cooler axial fan 2,000 hours
- Tail rotor pitch change shaft 2,000 hours

**SCHEDULED RETIREMENT TIMES**

The following retirement times apply to the latest parts and components available for the S-70A helicopter. The list below includes all significant items with retirement life limits less than 5,000 flight hours. Please refer to Manual TM 1-70-23AW-2 for current official life limits.

**LIFE LIMIT**

- Oil cooler viscous bearing 500 hours
- Tail rotor drive shaft bearing 2,000 hours
- Pitch control shaft bearing 2,000 hours
- Main rotor blade spindle nut 2,500 hours
- Tail landing gear shock strut piston 3,000 hours
- Main rotor blade expandable pin 4,700 hours

Retractable steps and recessed hand- and foot-holds allow easy access to entire aircraft.
The following information is supplied to aid in the preparation of estimates of the cost of operation for the S-70A helicopter in utility service. Costs have been calculated in general accordance with the practices described in Guide For Presentation of Helicopter Operating Cost Estimates, published by the Committee on Helicopter Operations Cost. The estimates presume a mature operation in which there has been opportunity for costs to stabilize and assumes no benefit from warranties.

Direct operating costs are calculated for an S-70A flying 345 hours per year for eight years. Unscheduled removals and overhauls are based on historical fleet-wide data.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel and Lubricants</td>
<td>$335.39</td>
</tr>
<tr>
<td>- Average fuel consumption at 162 gallons/hour</td>
<td></td>
</tr>
<tr>
<td>- Fuel cost per gallon: $2.01</td>
<td></td>
</tr>
<tr>
<td>- Cost for lubricants at 3% of fuel</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>$245.43</td>
</tr>
<tr>
<td>- 4.55 Total maintenance MH/FH</td>
<td></td>
</tr>
<tr>
<td>- Labor rate at $54 per hour</td>
<td></td>
</tr>
<tr>
<td>Reserve for Retirement Items</td>
<td>$152.00</td>
</tr>
<tr>
<td>Reserve for Overhaul and Unscheduled Repairs</td>
<td>$365.00</td>
</tr>
<tr>
<td>- Airframe and avionics</td>
<td></td>
</tr>
<tr>
<td>- Engine parts</td>
<td></td>
</tr>
<tr>
<td>Reserve for Engine Overhaul</td>
<td>$188.00</td>
</tr>
<tr>
<td>Total direct cost per hour</td>
<td>$1,285.82</td>
</tr>
</tbody>
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The operating data provided herein are estimates only. Sikorsky endeavors to ensure that this data is current and meaningful for operating cost evaluations. Sikorsky, however, does not warrant, and you should not rely upon, this data as defining the operating costs or overhaul/retirement times for any particular S-70 aircraft or its components.
Payload/Range Performance
Basic Configuration

MISSION

- Takeoff at maximum gross weight
- Cruise at 4,000 feet, ISA, Long Range Cruise Speed*
- Reserve: 20 minutes at Long Range Cruise Speed*

WEIGHTS

<table>
<thead>
<tr>
<th></th>
<th>Clean</th>
<th>ESSS with two 230 gallon tanks</th>
<th>ESSS with four 230 gallon tanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Empty Weight</td>
<td>11,744 lb</td>
<td>11,744 lb</td>
<td>11,744 lb</td>
</tr>
<tr>
<td>ESSS and External Fuel Provisions</td>
<td>60 lb</td>
<td>60 lb</td>
<td>60 lb</td>
</tr>
<tr>
<td>ESSS (Four Station)</td>
<td>–</td>
<td>660 lb</td>
<td>660 lb</td>
</tr>
<tr>
<td>230 US Gallon Aux Fuel Tanks (0, 2, 4)</td>
<td>–</td>
<td>320 lb</td>
<td>640 lb</td>
</tr>
<tr>
<td>Crew (3)</td>
<td>705 lb</td>
<td>705 lb</td>
<td>705 lb</td>
</tr>
<tr>
<td>Fluids</td>
<td>60 lb</td>
<td>60 lb</td>
<td>60 lb</td>
</tr>
<tr>
<td>Operating Weight</td>
<td>12,569 lb</td>
<td>13,549 lb</td>
<td>13,869 lb</td>
</tr>
</tbody>
</table>

* Speed for 99% best specific range
Hover Ceiling
Five Foot Wheel Height, Ten Minute Rating, HIRSS Active

Pressure Altitude
Meters

Feet

20,000

5,500

5,000

4,500

4,000

3,500

3,000

2,500

2,000

1,500

1,000

500

0

-30 -20 -10 0 10 20 30 40 50 °C

-20 0 20 40 60 80 100 °F

Hot and high, Arctic cold… and everything in between - Black Hawks perform their missions safely and reliably.
Hover Ceiling - Out of Ground Effect
Ten Minute Rating, HIRSS Active

![Graph showing hover ceiling for different temperatures and weight categories.](image)
The Black Hawk’s legendary ruggedness and survivability have made it the world’s premier medium utility helicopter.

Twin Engine Service Ceiling
IRP, 100 fpm ROC, $V_{BROC}$
Single Engine Service Ceiling
IRP, 100 fpm ROC, V_BROC

Pressure Altitude
Meters     Feet
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
3,000
2,000
1,500
1,000
600
400
200
0

Temperature
-20  0  20  40  60  80  100  °F
-30 -20 -10  0  10  20  30  40  50  °C

Gross Weight-Pounds
22,000
20,000
18,000
16,000
14,000
External fuel tanks extend the range of the S-70, allowing it to cover the vast distances required in many SAR missions.
Level Flight Fuel Consumption - 4,000 Feet
-70C Engines, Clean, HIRSS Active
Level Flight Fuel Consumption - 8,000 Feet
-701C Engines, Clean, HIRSS Active
Level Flight Fuel Consumption - 12,000 Feet
-70C Engines, Clean, HIRSS Active