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Standard Form 901 (11-18)
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CUI



NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, DC

John S McCain and Alnic MC Collision Motion Study

June 8, 2018

D.A. Crider

A. ACCIDENT: DCA-17-MM-024

Accident Type: Collision
Location: Near Singapore
Date: August 21, 2017
Time: Approximately 05:24 Singapore Standard Time
(2124 UTC on August 20)
Vessel: *John S. McCain* and *M/V Alnic MC*

B. GROUP IDENTIFICATION:

No group was formed for this activity

C. SUMMARY

At approximately 0524 local time on August 21, 2017 (2124 UTC on August 20), the US Navy destroyer *John S McCain* and the Liberian-flagged tanker *Alnic MC* collided in the Middle Channel passage of the Singapore Strait Traffic Separation Scheme while transiting southwest. The *John S McCain* sustained extensive external and internal damage and flooded. Ten Navy sailors died. The *Alnic MC* sustained significant damage. The combined damage to both vessels was estimated at over \$100 million. There was no reported pollution.

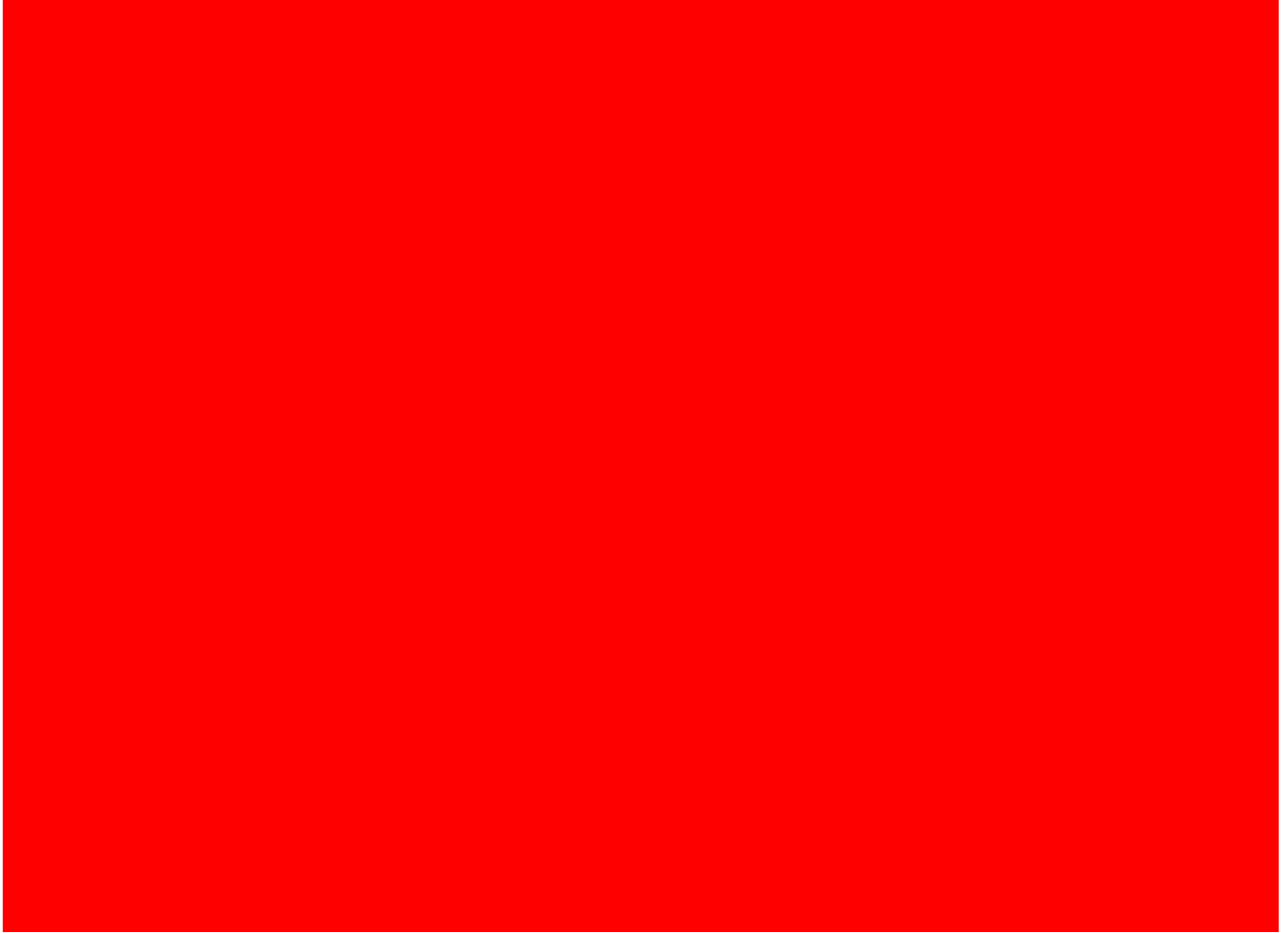
D. DETAILS OF INVESTIGATION

The USS *John S. McCain* is an *Arleigh Burke* class destroyer fitted with a port and starboard variable pitch propeller and independent (not mechanically connected) port and starboard rudders. [REDACTED]

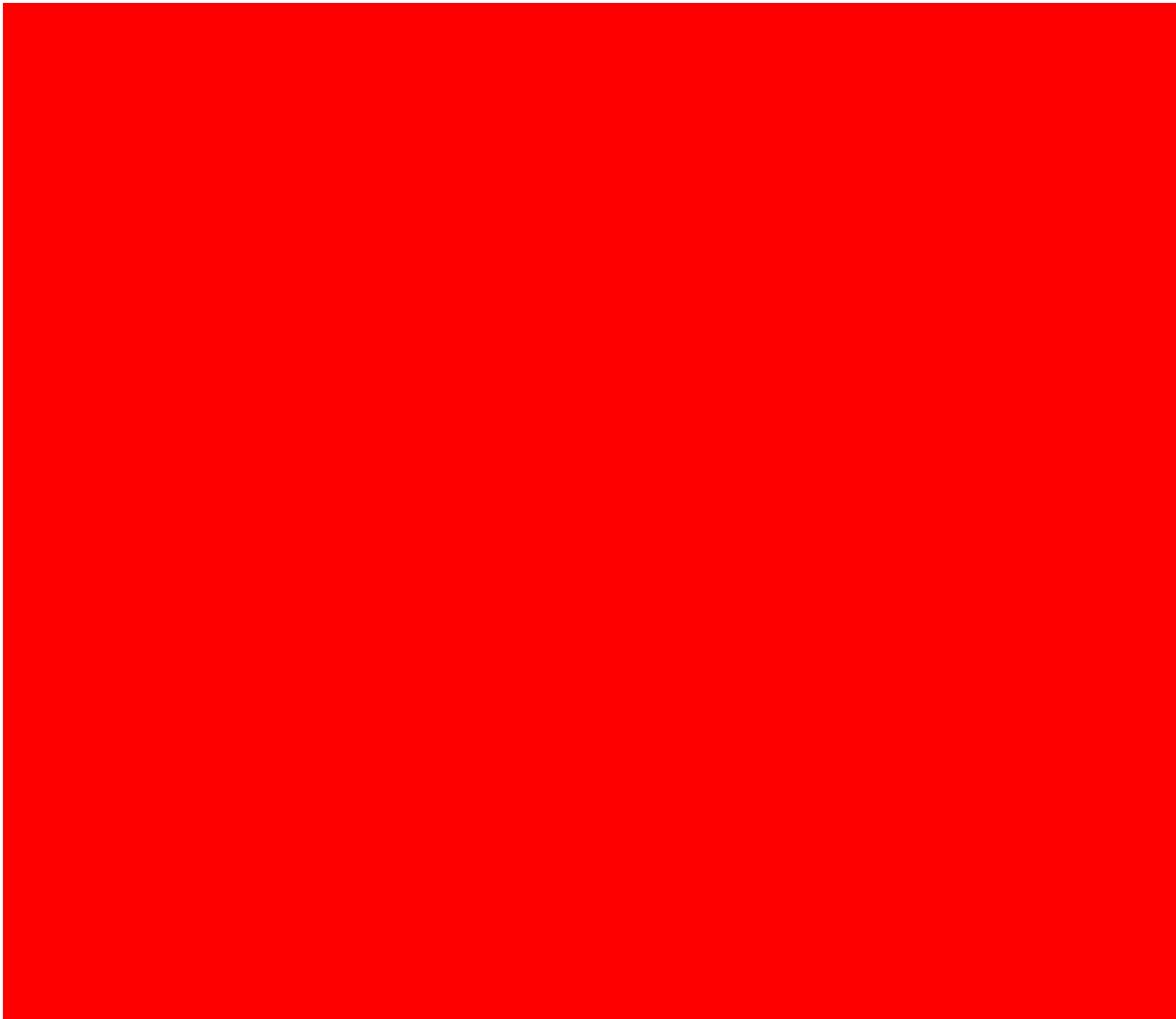
[REDACTED] The rudder had five modes of control, four of which were computer assisted. The US Navy provided spreadsheets with recorded propulsion, steering, speed and heading parameters around the time of the collision for the *John S McCain*. Propulsion parameters [REDACTED]

[REDACTED] were obtained from the thrust [REDACTED] log [REDACTED]. Rudder parameters [REDACTED] were obtained from the steering [REDACTED] log [REDACTED]. Heading and speed were obtained from the [REDACTED]. Speed is plotted together with actual port and starboard propeller pitch and actual port and starboard RPM in figure 1. A collision time of 21:23:58 was obtained from a video on the *John S. McCain*. The relation between ordered and actual RPM and propeller pitch are shown in figure 2.

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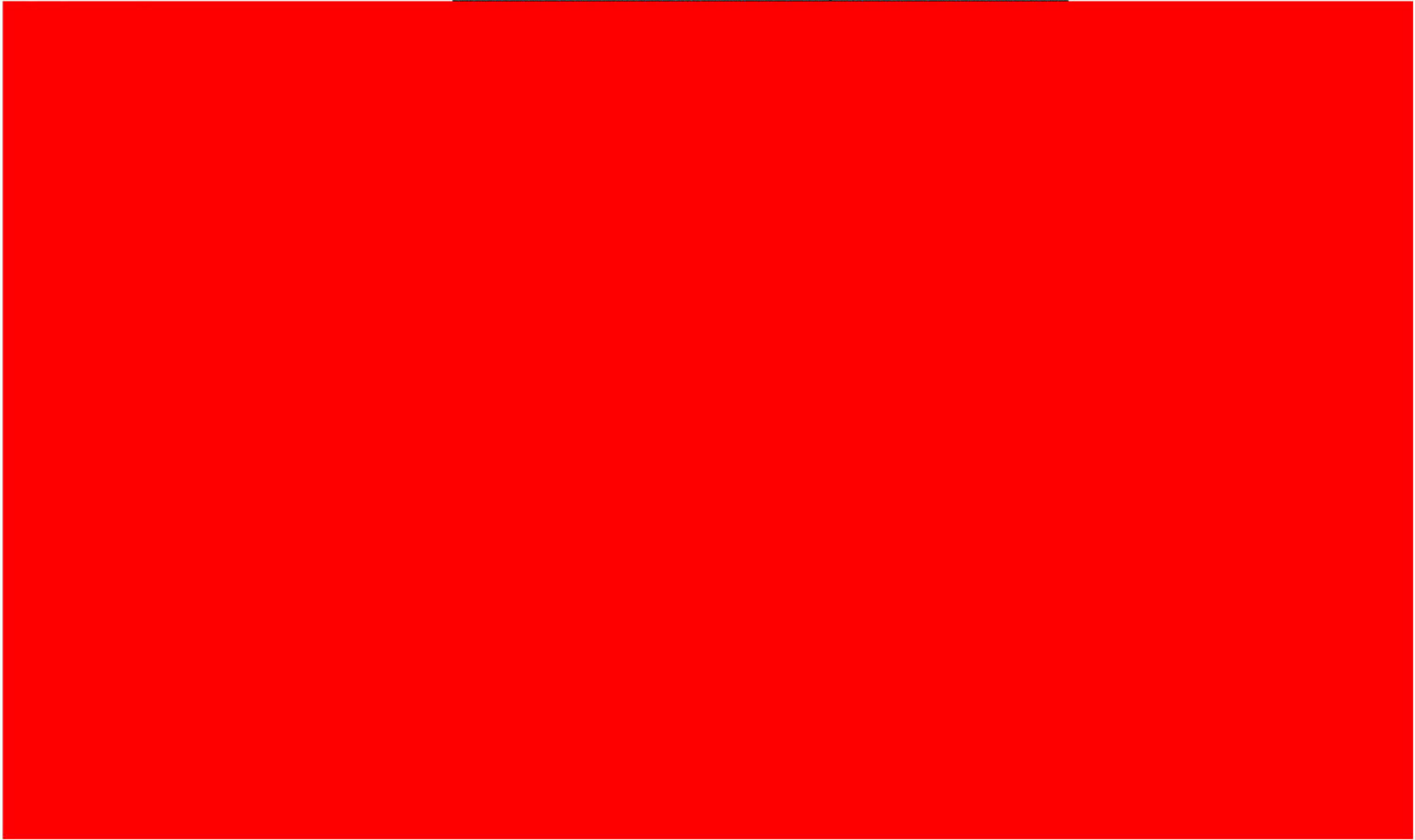
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The recorded commanded rudder is plotted together with actual rudder, the rudder mode and the control station in the top portion of figure 3. The McCain held heading at about 230 deg with starboard rudder varying from zero to five degrees until about 21:20:40 when the rudder centers and the ship begins to turn to port. This corresponded to a change in rudder mode to [REDACTED]. The bottom portion of figure 3 shows heading with actual port and starboard propeller pitch and RPM. The RPM asymmetry that develops just after 21:22 produced a port thrust asymmetry that corresponded to an increase in the port rate of turn. [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

John S. McCain Rudder & Propulsion Parameters



Speed, heading, track angle, rudder and main propeller RPM for the *Alnic MC* from the voyage data recorder (VDR) with the data samples between 1 and 26 seconds apart are plotted in figure 4. The varying sample rate is shown with the symbols in the figure. For details on the VDR see the Recorder Group Chairman's factual report.

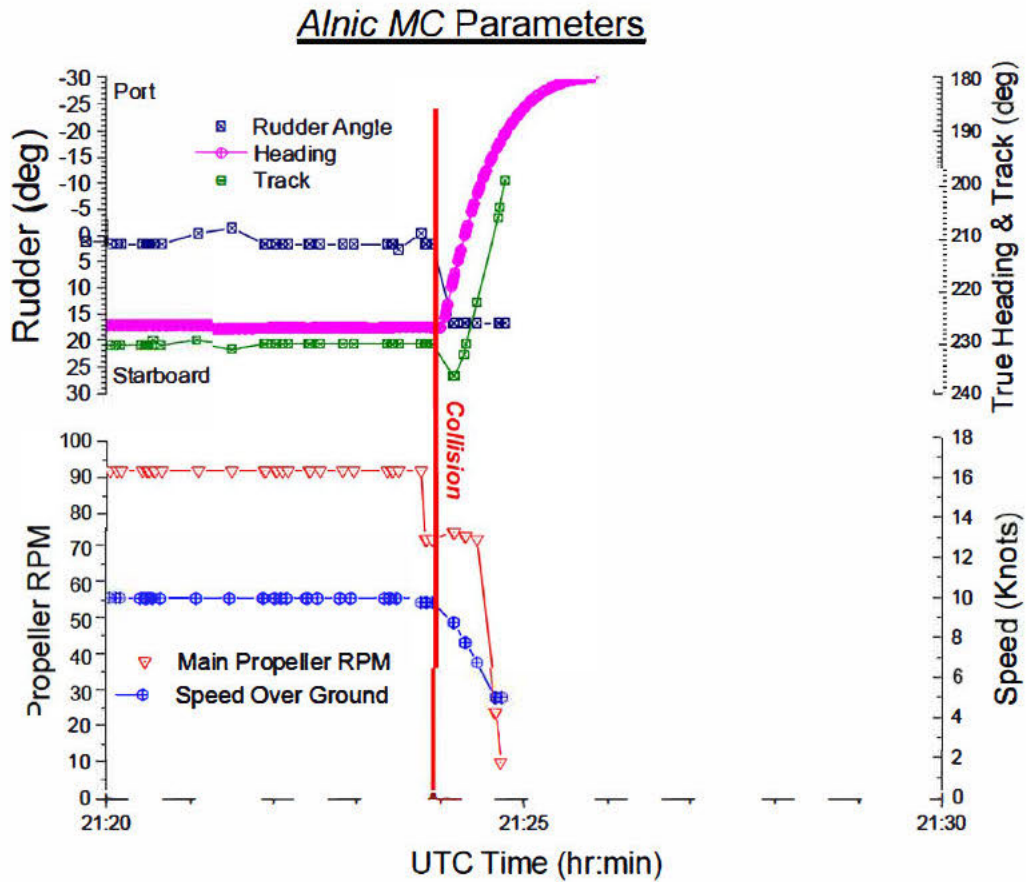


Figure 4 *Alnic MC* Speed, RPM, rudder, track and heading