

Re: Unmanned sub crosses ocean

Source: <http://sci.tech-archive.net/Archive/sci.geo.satellite-nav/2004-11/1467.html>

From: Mark Borgerson (*m-a-r-k_at_oes.to*)

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In article <pbo4q09fgoop9ts5jim138gsc3j3m0s8eb@4ax.com>, hans-georgNoEmailPlease@michna.com says...

> *On Sun, 21 Nov 2004 15:45:03 -0500, Alan Browne*

> *<alan.browne@FreeLunchVideotron.ca> wrote:*

>

> *>A sailboat requires control of sails (via winches), rudder, etc. An energy
> >outlay similar to that required by the device described for the ride it gets for
> >free from gravity v. buoyancy. (It's just moving some fluid a few cm every hour
> >or so, the rest is indeed 'free').*

>

> *Alan,*

>

> *the whole story prompted me to try to invent a GPS-navigating
> robotic sailboat. The rough theory is finished. I'm thinking of
> a mostly submerged vessel with a ballasted keel and only one
> sail consisting of an airfoil, looking a bit like an upwards
> protruding paddle, that can be moved in two axes, rotation and
> forward-backward inclination. No rudder. Control is similar to a
> windsurfing board.*

If your vessel is semi-submerged, how will it react to waves where the wave height is a significant fraction of the sail height?

It would seem that you would need a lot of steering energy to overcome turbulent wave action at the surface. If you have ever tried to steer a normal sailboat down wind with the seas behind you, you know what I mean about steering energy.

>

> *The aim is for simplicity and ruggedness. Such a vessel could
> transport some load over very long distances at a leisurely pace
> and actually quite quickly in strong winds. It could also serve
> as a fixed buoy, sailing a figure of 8 all the time to
> essentially keep its GPS-defined position.*

I think there are critical scale factors relating vessel length, wave height and period, and sail height.

>

> *If the robotic vessel is too sluggish to tack, it would be*

- > *programmed to always jibe instead. No big deal, as it could then*
- > *sail mile-long tacks on the open ocean.*

How is this robotic vessel going to obey the rules of the road? A 5-m long research glider which spends most of its time far below the surface is a lot less dangerous to passing surface traffic than a 50-m multi-ton vessel with no maneuverability and no clue about surface traffic in its vicinity.

- >
- > *Arriving at its destination, it would again sail a figure-of-8*
- > *pattern until collected.*
- >
- > *It could be designed to be stable in relation to the wind*
- > *direction to minimize energy consumption, i.e. it would adjust*
- > *its direction, then freeze and sail roughly straight for a long*
- > *distance without using any electricity at all, while accepting*
- > *some deviation from the programmed track. The next adjustment or*
- > *tack would then compensate for the accumulated track error. This*
- > *way the vessel could move on very little energy, possibly*
- > *economically enough to be recharged from solar panels during the*
- > *day. But this is probably not required, as controlling the sail*
- > *wouldn't use much energy anyway.*
- >
- > *Apart from the buoy task the only thing I could think of that it*
- > *could be used for is smuggling. (:-) As the thing isn't all that*
- > *difficult to conceive, I'm sure somebody will actually build it*
- > *soon.*

- >
- > *Hans-Georg*
- >

Mark Borgerson