\vtop happens to lose the correct top of line information when it starts with a whatsit. We can reconstitute this in the following manner:

\def\fvtop#{\vtop\bgroup
  \setbox0\vbox\bgroup
  \aftergroup\fvboxii
  \let\next=}

\def\fvboxii{
  \setbox0\vtop\{\break\unvbox0\%
  \dimen0=\maxdimen
  \ifdim\dp0>0pt \advance\dimen0-\dp0 \fi
  {\splittopskip\dimen0 \setbox0\vsplit0to0pt}\%
  \advance\dimen0-\ht0%
  {\splittopskip-\maxdimen\setbox0\vsplit0to0pt}\%
  \advance\dimen0\ht0%
  \hrule height\dimen0 depth-\dimen0
  \unvbox0
  \egroup}

The trick here is to use \vsplit which pads the followup box sufficiently to reach a given line height on the top line. We essentially tell it to make this line fit \maxdimen minus a safety margin and see how far it gets. Then we remove the padding with another split and start the box with a strut that establishes the corrected height.

\def\example{\hbox{First good line}%
  \hbox{Second good line}%
  \hbox{Third good line}}

\leavevmode
\vtop{\example}%
\vtop{\write-1{\example}}%
\fvtop{\write-1{\example}}

First good line
Second good line
Third good line
First good line
Second good line
Third good line