

WaPUG AUTUMN MEETING
5 NOVEMBER 1985 : BIRMINGHAM
DEVELOPMENT, TESTING AND MAINTENANCE OF WASSP

1. The adage that 'a chain is as strong as its weakest link' can and is often applied to software which breaks down unexpectedly and without apparent reason. The user, in his frustration, may well conclude that the whole program is useless and dismiss it accordingly. This attitude is very common and arises partly from the view that software, especially commercial software, should be completely error/bug free, and partly from a deep sense of helplessness in that most users either do not know how to get round the problem (if they can define it in the first place) or how to resolve it (other than going back to the developer). Whereas this attitude is appreciated, it is often based on the unreasonable assumption that large software can be made to be completely bug-free. The helplessness experienced by the user can be mitigated by support from others who can define the problem, to solve or circumvent it.
2. WASSP, like other software, has suffered from adverse criticism of its reliability and support. As the developer of much of the software I would defend it with the following points.
3. WASSP, as a simulation modelling tool, is very complex. The source code is made up of approximately 40,000 FORTRAN statements designed to implement a number of separate hydrological and hydraulic models based on non-linear partial differential equations and using a wide variety of different algorithms. The original code was written for the research project that led to the development of the Wallingford Procedure. Possibly the software should have been redesigned and coded at the end of the project. This could not however be done because of shortage of funds. Also the number of enhancements made to the software and modelling since then would have limited the value of rewriting the software anyway.
4. Bugs in WASSP are of three main types :
 - (a) execution bugs
 - (b) coding bugs
 - (c) modelling bugs

I take these to have the following meanings :

Execution bugs are when a program crashes, coding bugs make the program give incorrect information to the user, and modelling bugs generate incorrect results. For example, a coding bug is where a wrong value is assigned to a given variable. A modelling bug could be an obviously incorrect oscillation in a hydrograph or a volume balance at an ancillary. Obviously execution bugs can theoretically be eliminated by thorough testing, as can coding bugs. It may however be impossible to eliminate modelling bugs and these would then have to be lived with.

5. Testing is the key to producing software that is free of execution and coding bugs. The difficulty is whether all the tests which need to be done on WASSP can be done. In fact the number of paths through the software is very great. For example, there are over 150 different types of data item, some items can take several alternative values, many others have built-in default values. Also, given a 100 pipe system there will be over 1000bits of data, and the number of different configurations of a 100 pipe system with several ancillaries is very large indeed.
6. We have looked very carefully at testing, and we are following the approach generally adopted in the software industry on software validation, internal and external testing. As so often happens the pressure is always to release software earlier than it should be, and because the ideal testing program is infinite a decision to release has to be made in the light of incomplete information.
7. Finally, the level of support given to WASSP has also been criticised. Admittedly this has been of a lesser standard than on some other software. This however is primarily a matter of funding. Large software packages are expensive both to develop and maintain. Although maintenance and support can be made more efficient, the steady introduction of improvements and the support of 100 users will require at least two programmers/engineers working full time. The conclusion is that better maintenance will mean higher charges!

ROLAND K PRICE
Hydraulics Research
Howbery Park
Wallingford
OXON OX10 8BA
Tel : 0491 35381