11 Conclusion

The practical development work needed to produce a satisfactory high-performance hydraulic system will by no means be eliminated when the system has been designed by using the methods of linear analysis described in this book. The same would be true even if more complicated methods of calculation were adopted. It is doubtful whether any such system has ever been developed from slide rule and drawing board alone. It is equally doubtful whether a system could be produced by trial and error methods alone. A satisfactory system will probably always need both practical and analytical treatment.

Some practical ruses to improve troublesome systems such as the judicious polishing of a valve spool to prevent jamming or the changing of a pipelength to eliminate an undesirable vibration are qualitatively suggested in this text (appendix E and figure 1.4 respectively). However, many practical weaknesses are less easily recognised such as uneven valve laps or variable seal friction forces or (in the case of electrohydraulic systems) electrical noise and there are many factors influencing the detailed characteristics of a system which have not been dealt with here.

The method of linear analysis is probably the most convenient and simplest method currently available for system design calculations. Any simpler method would be in danger of giving misleading results. More complicated methods may sometimes be needed to refine certain predictions but in any case the linear method would be tried first.

Perhaps the main advantages of using linear methods for design calculations are the relative ease with which predictions can be made—linear analyses are not particularly time consuming—the way in which these methods give the designer the 'feel' of a system and finally the significant reduction in development effort which comes from doing such calculations before the practical work begins.

J. Stringer, *Hydraulic Systems Analysis*