

# The Design of the 928 Sovereign Cornet (1984)

A reprint of *'Improved Brass Instrument Design Methods'* by R. A. Smith, given to the Kraslice-Czechoslovakia Acoustics Conference 1983, and first published in the Proceedings of The Institute of Acoustics, 1984

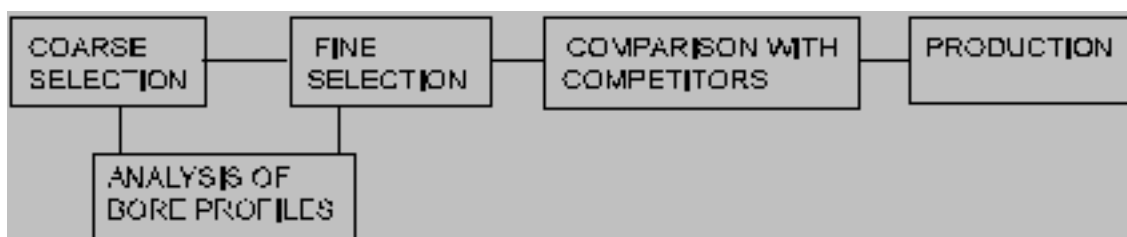
## Abstract

A combination of tests by semantic differential scaling and instrument bore analyses have produced a new method of instrument design which increases the acceptability of the product by the player and significantly reduces the development time.

## Introduction

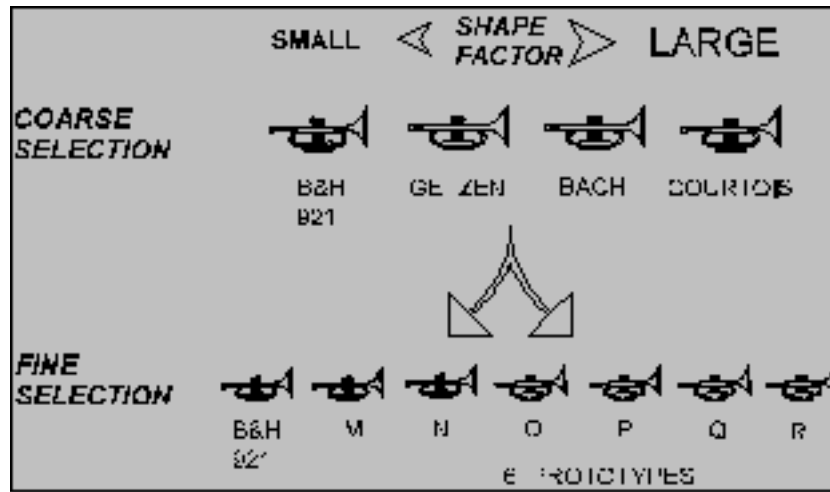
The most universally acceptable B short model cornets were first introduced in 1972 by Boosey & Hawkes as the # 921. Although no tests were made then, we can assume that since that date, players' skills may well have improved and probably the tastes of some musicians, including conductors, have changed.

The semantic differential scaling procedures developed for wind instrument assessment have been used for some time by the author to evaluate the requirements of players. Using three of these tests in conjunction with bore profile analyses a rapid method of design has developed:



## Test 1

As a coarse indicator, a few leading cornet players were blindfold tested on four popular makes of cornet. These instruments were readily available and their purchase price was far less than the one-off manufacture of prototypes. As only a rough idea of the players preferences was required, the effect of any physical variations such as valve action, weight and balance were assumed to be small. Therefore, if the player uses the same mouthpiece for each instrument, any significant differences detected by the player would be a consequence of the different bore profiles of the instruments. Hence a 'preferred' bore profile may be deduced in a rather coarse fashion.



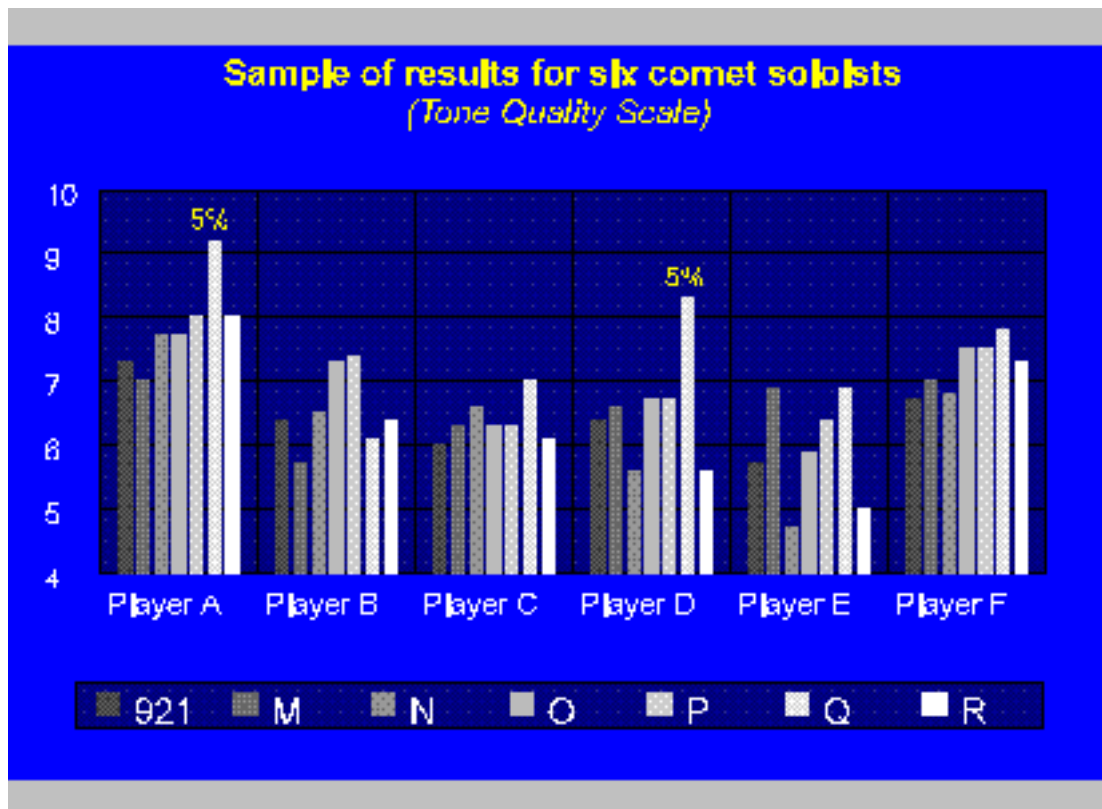
As part of a larger study concerned with the design and analysis of wind instruments, the profile of the complete instrument bore can be represented by a series of mathematical functions blended appropriately together to form an overall composite function. The small number of parameters defining the functions may be related to the subjective and acoustical measurements.

## Test 2

For the next series of tests, six prototypes were prepared encompassing the preferred region of bore profile. New tooling was required for mouthpipes and bells, but this had the advantage in allowing production to start more quickly once a suitable model had been chosen. The results of these tests would be more reliable than those of the *coarse selection* since the mechanical action of the pistons and the weight and balance of the instruments was uniform. A standard *large bore* B&H cornet (#921) was included in these tests as a reference.

Nine of the best British cornet players (all classed as soloists) were invited to London on different occasions to undergo the test with seven instruments. None had played any of the prototypes previously nor were they necessarily playing on British cornets. They wore industrial leather gloves and were blindfolded throughout the tests. Each player was presented with each cornet eight times in a prescribed random order and asked to score on a 0-10 scale for both tone quality and response.

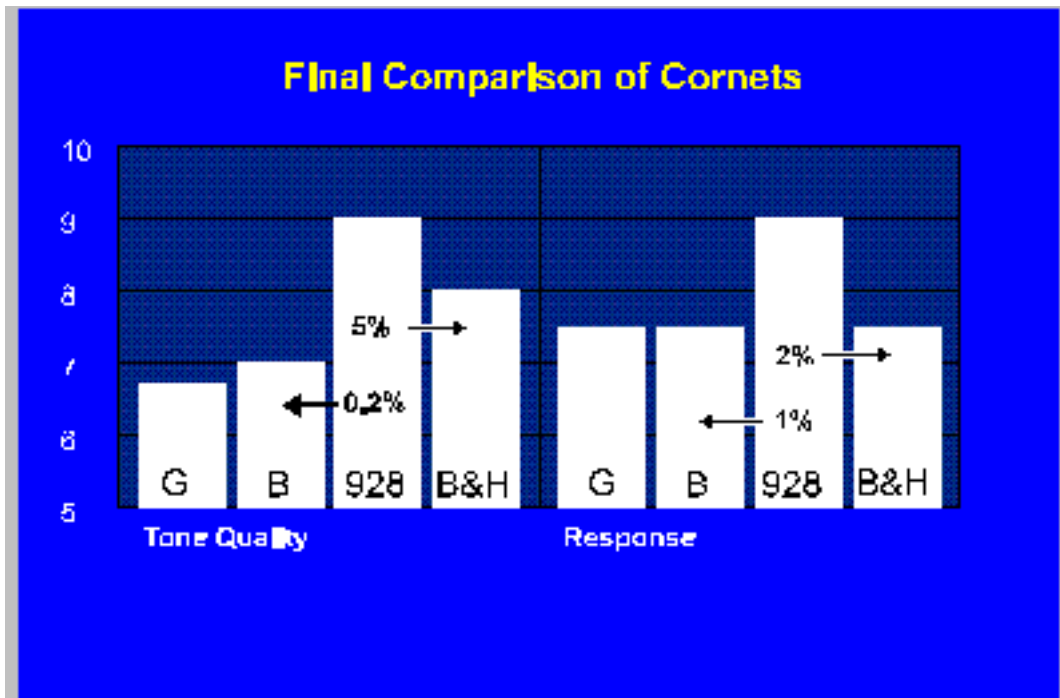
The results for *tone quality*, given here as an example, show a definite preference for prototype Q by most of the players and although many of the instrument pairs were statistically indistinguishable all players judged the difference between the 'worst' and 'best' instruments to be better than the 10% level. Two players gave outstanding performances reflected in their score for Q above all other instruments at a level higher than 5%, i.e. the difference between Q and its closest rivals (P and O) would have arisen by chance in less than five out of one hundred cases. For the *response* scores the statistical analysis is very similar and, in fact, one of these two players selected Q again at an even higher significance of 3%.



### Test 3

Having found an instrument judged by the best players to be superior to the current cornet in production and five other prototypes, a final short test was conducted to assess its relationship with two leading American cornets. This chart shows Q (renamed model 928) compared with the standard B&H 921 cornet and its nearest rivals.

In both tone quality and response the new model confirms its outstanding position.



Not only has this sequence of development reduced the normal development time from years to just a few weeks, but it has also encouraged the players to look favourably towards the instrument *they* judge to be the best.

### Authors Comments in 1996

\* The new range of Smith-Watkins Cornets, also designed by Richard Smith, are the culmination of 10 further years of research with professional players, and represent the state of the art in brass instrument design.