CASE WESTERN RESERVE UNIVERSITY

SCHOOL OF DENTISTRY

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APPLICATION OF FACTOR ANALYSIS TO CEPHALOMETRIC TECHNIQUE

by

GUS SPILLAS, D.D.S.

Submitted in partial fulfillment of the requirements for the Degree of Master of Science in Dentistry

Thesis Advisor: Suchitra Nelson, Ph.D.

Department of Orthodontics
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August 13, 1993

APPLICATION OF FACTOR ANALYSIS TO CEPHALOMETRIC TECHNIQUE

ABSTRACT

by

Gus Spillas, D.D.S.

Contemporary cephalometric analyses are designed to assess growth changes and describe morphology in the craniofacial skeleton. However, conventional analyses utilize only a few clinically derived measurements, hence are only measuring a small part of the total biologic variability within the craniofacial complex.

The purpose of the present study was, first, to reduce, using Factor Analysis, the substantial number of cephalometric variables required to thoroughly define craniofacial morphology. Secondly, the objective was to identify, and then delineate, the obtained (least number of) underlying dimensions ("factors") that account for the (most) variability in the craniofacial complex.

One hundred and fifty cephalometric radiographs compiled from 15 males and 15 females (taken at 6, 9, 12, 15, and 18 years of age) comprised the data base. Belonging to the original Bolton records located at Case Western Reserve University, these radiographs originally formed the sample used to produce the "Bolton Standard" templates.

Cephalometric data, acquired by utilizing 134 unique measurements (assessing hard and soft-tissues) obtained from the contemporary cephalometric analyses, allowed the extraction of 14 factors which accounted for 83.4% of the total craniofacial variation. These factors included the following: (1) Vertical and AP aspects of craniofacial development (2) Lower incisor position (3) Relationship of the cranial base to the facial complex (4) Relationship of the maxilla and the mandible to each other (5) AP position of the maxilla and mandible with respect to the cranial base (6) Anterior limits of lips (and nose) (7) Degree of divergence of the horizontal planes of the craniofacial complex (8) Mandibular shape (angle) (9) Degree of backward divergence of the (posterior) face (10) Angular position of the upper incisor (11) Vertical facial proportion (12) Chin and Nasal projection (13) Soft-tissue contour of the lower third of the face (14) Slope of the occlusal plane with respect to the mandible.

The Jarabak and Ricketts Analysis are most comprehensive, accounting for 74.7% and 65.2% (respectively) of the total variation in the craniofacial skeleton. Finally, a cephalometric analysis was developed (from the 14 factors) accounting for at least 84.3% of the craniofacial variation.

Dedicated to the happy memory of my brother:
Dr. George Spillas
I owe it all to you!
I wish you were here.
God Bless.

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LIST OF ABBREVIATIONS

AB-Plane angle.....ABPLANE
ANB angle.....ANB
Angle of Convexity.....ANGOFCON
ANS to Nose-Tip (mm).....ANSNOSTP
Anterior Cranial Base (mm).....ANTCRBSE
Anterior Cranial Length (mm).....ANTCRLGT
Anterior Face Height (mm).....ANTFACHT
A-point Convexity (mm).....APTCONVX
A-point to Nasion-perpendicular (mm).....APTNPERP
A-point to Soft-Tissue A-point (mm).....APONTSTA
Articular angle.....ARTANGLE
Basion to Nasion (mm).....BASNASON
Body Length (mm).....BODYLGTH
Bolton to Facial Plane angle.....BOLFACPL
B-point to Soft-Tissue B-point (mm).....BPONTSTB
Canine Relation (mm).....CANINREL
Corpus Length (mm).....CORPLGTH
Cranial Base angle.....CRBASAGL
Cranial Deflection angle.....CRANDEFL
Facial angle.....FACEANGL
Facial Axis angle.....FACAXAGL
Facial Convexity angle.....FACLCNVX
Facial Convexity Angle.....FCCONAGL
Facial Depth (mm).....FACLDPTH
Facial Depth angle.....FACDEPTH
Facial Length (mm).....FACLLGTH
Facial Taper angle.....FACTAPER
Frankfort Horizontal to NA angle.....FHNA
FMIA angle.....FMIA
Gonial angle.....GONANGLE
H angle.....HANGLE
H-Line angle.....HLINE
ILS Distance (mm).....ILSDISTN
Incisor Overbite (mm).....INCISROB
Incisor Overjet (mm).....INCISROJ
Interincisal angle.....INTERINC
Interlabial Gap (mm).....INTLABGP

Lip Embrasure to Occlusal Plane (mm)..... LIPEMBOP
LL Distance (mm)..... LLDISTAN
Lower 1 to A-Po (mm)..... LOW1APO'
Lower 1 Extrusion (mm)..... L1EXTRSN
Lower 1 to Facial Plane (mm)..... LO1FACPL
Lower 1 to GoGn (mm)..... LO1GOGN'
Lower 1 to GoGn angle..... LOW1GOGN
Lower 1 to Mandibular Plane angle..... LOWR1MPL
Lower 1 to NB (mm)..... LOWR1NB'
Lower 1 to NB angle..... LOWER1NB
Lower 1 to Occlusal Plane angle..... LOW1OCPL
Lower 1 to Palatal Plane angle..... LO1PALPL
Lower Anterior Dental Height (mm)..... LOANDNHT
Lower Anterior Facial Height (mm)..... LOANFCHT
Lower Face Height (mm)..... LFH
Lower Facial Height (mm)..... LOWFACHT
Lower Face Height angle..... LOWFHAGL
Lower Gonial angle..... LOGONIAL
Lower Lip to E Plane (mm)..... LOWRLIPE
Lower Lip to H-Line (mm)..... LOLPHLIN
Lower Lip Length (mm)..... LOLIPLTH
Lower Lip Thickness (mm)..... LOLIPTHK
Lower Posterior Dental Height (mm)..... LOPSDNHT
Lower Soft-Tissue Facial Height (mm)..... LOSTFCHT
Mandibular Arc angle..... MANDARC
Mandibular Arch Length (mm)..... MNARCLTH
Mandibular Incisor to A-Pogonion angle..... LOWR1APO
Mandibular Length (mm)..... MANDLGTH
Mandibular Plane angle..... MANPLAGL
Mandibular Prognathism (mm)..... MANPROGN
Mandibular Unit Length (mm)..... MNUNTLTH
Maxillary Arch Length (mm)..... MXARCLTH
Maxillary Depth angle..... MAXDEPTH
Maxillary Height angle..... MXHEIGHT
Maxillary-Mandibular Differential (mm)..... MXMNDIFF
Maxillary Prognathism (mm)..... MAXPROGN
Maxillary Unit Length (mm)..... MXUNTLTH
Mentolabial Sulcus (mm)..... MLSULCUS
Midface Length (mm)..... MIDFCLTH
MLS to H-Line (mm)..... MLSHLINE
Molar Relation (mm)..... MOLRRELN
Nasion to Soft-Tissue Nasion (mm)..... NSTNASON
Nasofacial Angle (mm)..... NASOFACL

Nasofrontal angle..... NASOFNTL
Nasolabial angle..... NASLBANG
Nasomental angle..... NASOMNTL
Nose to Chin Length (mm)..... NSCHNLTH
Nose Length (mm)..... NOSELGTH
Nose Prominence (mm)..... NOSEPROM
Occlusal Plane angle..... OCCLPLAN
Occlusal Plane to GoGn angle..... OPGOGN
Occlusal Plane Inclination angle..... OPINCLIN
Occlusal Plane to Xi-point (mm)..... OCCLPLXI
Palatal Plane angle..... PALPLANE
PNS to ANS (mm)..... PNSANS
PNS to A-point (mm)..... PNSAPONT
PO and Lower 1 to NB (mm)..... POL1NB
Pogonion to Nasion-perpendicular (mm)..... POGNPERP
Pogonion to NB (mm)..... POGONNB
Pogonion to Soft-Tissue Pogonion (mm)..... POGSTPOG
Porion Location (mm)..... PORIONLC
Posterior Face Height : Anterior Face Height (%)..... PFH/AFH
Posterior Face Height (mm)..... POSFACHT
Posterior Facial Height (mm)..... POSTFCHT
Posterior Cranial Base (mm; Jarabak)..... POSTCRBS
Posterior Cranial Base (mm)..... POSCRNBS
Ramus Height (mm)..... RAMUSHGT
Ramus Position angle..... RAMPOSTN
Saddle angle..... SADANGLE
SE (mm)..... SE
Sella-Nasion (mm)..... SELLANAS
Sella-Nasion-A point angle..... SNA
Sella-Nasion-B point angle..... SNB
Sella-Nasion-Pogonion angle..... SNPG
Skeletal Profile Convexity (mm)..... SKPRFCON
SL (mm)..... SL
SLS Distance (mm)..... SLSDISTC
SN to Facial Plane angle..... SNFACPLN
SN to Frankfort Horizontal angle..... SNFH
SN to GoGn angle..... SNGOGN
SN to H-Line (mm)..... SNHLINE
SN to Lower 1 angle..... SNLOWER1
SN to Mandibular Plane angle..... SNMANDPL
SN to Occlusal Plane angle..... SNOCCPLN
SN to Palatal Plane angle..... SNPALPLN
Soft-Tissue Convexity angle..... STCONVEX

Soft-Tissue Facial angle..... STFACAGL
SP Distance (mm)..... SPDISTNC
Stomion-Incision Length (mm)..... STOINLTH
Total Face Height (mm)..... TFH
UL Distance (mm)..... ULDISTAN
Unit Difference (mm)..... UNITDIFF
Upper Face Height : Lower Face Height (%)..... UFH-LFH
Upper Lip Curl (mm)..... UPLPCURL
Upper Lip to E-Plane (mm)..... UPERLIPE
Upper Lip Length (mm)..... UPLIPLTH
Upper Lip Thickness (mm)..... UPLIPTHK
Upper 1 to A-Pg (mm)..... UPR1APO'
Upper 1 to A-Pogonion angle..... UPPR1APO
Upper 1 to AV (mm)..... UPPER1AV
Upper 1 to FH angle..... UPPER1FH
Upper 1 to Facial Plane (mm)..... U1FACPLN
Upper 1 to NA (mm)..... UPPR1NA'
Upper 1 to NA angle..... UPPER1NA
Upper 1 to Palatal Plane angle..... UP1PALPL
Upper 1 to SN angle..... UPPER1SN
Upper 6 to PTV (mm)..... UPPR6PTV
Upper Anterior Dental Height (mm)..... UPANDNHT
Upper Face Height (mm)..... UFH
Upper Gonial angle..... UPGONIAL
Upper Lip to E-Plane (mm)..... UPERLIPE
Upper Lip Length (mm)..... UPLPLGTH
Upper Posterior Dental Height (mm)..... UPPSDNHT
Upper Soft-Tissue Facial Height (mm)..... UPSTFCHT
Vertical Lip to Chin Ratio (%)..... VERLPCHN
Witts Analysis (mm)..... WITSANAL
Y-Axis angle..... YAXIS
Y-Axis Length (mm)..... YAXSLGTH
Y-Axis to SN angle..... YAXISSN
Z-Angle..... ZANGLE
Zero Meridian (mm)..... ZEROMRDN

GLOSSARY

Communality (h^2): the variance of an observed variable accounted for by the common factors; in an orthogonal factor model, it is equivalent to the sum of the squared factor loadings.

Common factor: unmeasured (or hypothetical) underlying variable which is the source of variation in at least two observed variables under consideration.

Correlation: a measure of association between two variables; generally assumed to be the product-moment r (or Pearson's r); equivalent to the covariance between two standardized variables; also used as a general term for any type of linear association between variables.

Covariation: a crude measure of the degree to which two variables co-vary together; measured as the sum of cross-products of two variables which are expressed as deviations from their respective means; also used as a general term for describing the association between variables.

Covariance: a measure of association between two variables; covariation divided by the number of cases involved; expected value of the sum of cross-products between two variables expressed as deviations from their respective means; the covariance between standardized variables is also known as the correlation.

Eigenvalue (or characteristic root): a mathematical property of a matrix; used in relation to the decomposition of a covariance matrix, both as a criterion of determining the number of factors to extract and a measure of variance accounted for by a given dimension.

Eigenvector: a vector associated with its respective eigenvalue; obtained in the process of initial factoring; when these vectors are appropriately standardized, they become factor loadings.

Exploratory Factor Analysis: factor analysis which is mainly used as a means of exploring the underlying factor structure without prior specification of number of factors and their loadings.

Extraction of Factors or Factor Extraction: the initial stage of factor analysis in which the covariance matrix is resolved into a smaller number of underlying factors or components.

Error Component: the part of the variance of an observed variable that is due to random measurement errors; constitutes a portion of the unique component.

Factors: hypothesized, unmeasured, and underlying variables which are presumed to be the sources of the observed variables; often divided into unique and common factors.

Factor Loading: a general term referring to a coefficient in a factor pattern or structure matrix.

Factor Pattern Matrix: a matrix of coefficients where the columns usually refer to common factors and the rows to the observed variables; elements of the matrix represent regression weights for the common factors where an observed variable is assumed to be a linear combination of the factors; for an orthogonal solution, the pattern matrix is equivalent to correlations between factors and variables.

Factor Score: the estimate for a case on an underlying factor formed from a linear combination of observed variables; a by-product of the factor analysis.

Factor Structure Matrix: a matrix of coefficients where the coefficients refer to the correlations between factors and variables; it is equivalent to a pattern matrix in the orthogonal case.

Factorial Compexity: a characteristic of an observed variable; the number of common factors with (significant) loadings on that variable.

Factorial Determination: the overall degree to which variations in observed variables are accounted by the common factors.

Kaiser Criterion: a criterion of determining the number of factors to extract; suggested by Guttman and popularized by Kaiser; also known as the "eigenvalue greater than one" criterion.

Linear Combination: a combination in which variables are combined with only constant weights.

Linear System: relationship among variables referred to as a whole, in which all the relationships are linear; factor analysis model in which all of the variables are assumed to be linear functions of underlying factors.

Orthogonal Factors: factors that are not correlated with each other; factors obtained through orthogonal rotation.

Orthogonal Rotation: the operation through which a simple structure is sought under the restriction that factors be orthogonal (or uncorrelated); factors obtained through this rotation are by definition uncorrelated.

Principal Components: linear combinations of observed variables, possessing properties such as being orthogonal to each other, and the first principal component representing the largest amount of variance in the data, the second representing the second largest and so on; often considered variants of common factors, but more accurately they are contrasted with common factors which are hypothetical.

Postulate of Factorial Causation: the assumption that the observed variables are linear combinations of underlying factors, and that the covariation between observed variables is solely due to their common sharing of one or more of the common factors.

Postulate of Parsimony: this stipulates that, given two or more equally compatible models for the given data, the simpler model is believed to be true; in factor analysis, only the model involving the minimum number of common factors is considered appropriate.

Scree Test: a rule-of-thumb criterion for determining the number of significant factors to retain; it is based on the graph of roots (eigenvalues); claimed to be appropriate in handling disturbances due to minor (unarticulated) factors.

Simple Structure: a special term referring to a factor structure with certain simple properties; some of these properties include that a variable has factor loadings on as few common factors as possible, and that each common factor has significant loadings on some variables and no loadings on others.

Specific Component: the part of the variance of an observed variable that is due to a factor which is specific to a given variable; used to designate the part of the unique component that is not due to random errors.

Variance: a measure of dispersion of a variable; defined as the sum of squared deviations from the mean divided by the number of cases or entities.

Variation: a measure of dispersion in a variable; loosely used as a general term for describing any type of dispersion around some central value; sum of squared deviations from the mean.

Varimax: a method of orthogonal rotation which simplifies the factor structure by maximizing the variance of a column of the pattern matrix.

Unique Component: the part of the observed variance unaccounted for by the common factors; the proportion that is unique to each variable; it is often further decomposed into specific and error components.

Unique Factor: the factor which is believed to affect only a single observed variable; often stands for all the independent factors (including the error component) that are unique to a variable.

INTRODUCTION

Researchers frequently face data involving a large number of correlated variables. These variables may constitute a set of potential predictors, a set of potential responses, or simply a set of variables needing to be described together.

One such method of describing variables together is through the application of factor analysis (and principal components analysis). Factor analysis is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables.

When studying the craniofacial complex, a host of interrelated morphologic considerations exist. Thus, a complete description of craniofacial morphology should involve the assessment of the magnitude and relationships of a host of these interrelated morphologic entities (Cleall et al., 1979). However, a major limitation is that we are dealing with the size and shape of a very irregular three-dimensional object assessed in two dimensions (i.e., in the conventional lateral cephalometric radiograph).

To describe faces cephalometrically as "high Frankfort-mandibular plane angle cases" or to depend upon the relationship of the lower central incisors to the mandibular plane (e.g., Tweed analysis) as almost the sole

diagnostic criterion is a gross oversimplification. Cephalometricians must realize that they are measuring only a very small part of the total biologic variability of the craniofacial region. The chances of accurately measuring and predicting craniofacial growth from no more than a lateral cephalometric radiograph, therefore, would seem somewhat remote.

Furthermore, the use of cephalometric norms derived from samples often selected on the basis of dental criteria (e.g., "Class I" molar relationship) is fraught with difficulties where the individual patient is concerned. Treatment goals based upon these norms are open to question, not only because of the many ethnic, racial, and geographic groups of patients with whom the clinician must deal with, but also because of the variability in morphology within any sample.

Interestingly, factor analysis can provide a multivariate method for analysis of growth patterns, assuming ontogenetic regularity of association. Yet, in spite of the methodologic and conceptual advances in craniofacial research, morphologic growth patterns of the face are not well understood (Krogman, 1974). Since assessment of pattern requires simultaneous information about several variables, traditional bivariate and univariate descriptions are insufficient. Factor analysis, being a family of procedures extracting latent composites of observed variables under various sets of restrictions (Cooley et al., 1971; Thorndike, 1978), goes beyond data reduction in identifying the effects of higher-order correlations, establishing sources of variation, and determining priorities between variables and

groups of variables. Of the various factor procedures, principal components analysis proves especially useful. Accounting for the greatest possible variation, the derived components are analogous (related) to the predictor variables and are orthogonal (independent of each other).

Applied to craniofacial growth, principal components analysis creates multivariate composites which, because of their independence, express primary dissimilarities in patterns of growth and development (Howells, 1971). For growth problems complicated by allometry (i.e., referring to variation in proportions related to the increase in size), the first factor or component provides a multivariate generalization of size. Factors residual to and independent of the first size factor discriminate shape. Shape must be defined independent of size in order to remove the effects of growth, including variation in age and size. Consequently, the first principal component may be interpreted as size and subsequent factors designated as shape.

Since data from large samples may be processed readily via computers, computer technology has proved to be most useful in the handling of mass data. One approach might be to define as many morphologic landmarks as possible and to determine from these a large number of angular and linear measurements. Those variables indicating the assessment of similar parameters may be grouped together into a series of interrelated variables or factors by using techniques to eliminate the redundant measurements. Such a data-reduction approach can be

achieved by subjecting cephalometric radiographic data to factor analysis (and principal components analysis). With this approach, an attempt can be made to subgroup a large sample mathematically into similar morphologic types on the basis of clusters of related variables.

As a multivariate technique, factor analysis can be applied to a set of observed variables (e.g., a set of cephalometric measurements) in order to produce a new set of uncorrelated variables known as components. With this technique, it can be demonstrated that a substantial portion of the variation in a given sample is included in a subset of principal components. These components have certain special variance properties in that the first component accounts for the greatest portion of variance among the measurements, and subsequent components successively account for smaller amounts of variance. A point is reached, therefore, where components cease to describe, in a meaningful manner, the system being considered because the portion of variance ascribed to the component is minimal.

Relethford (1978) stated that the study of human biological variation can profit from the application of multivariate methods such as principal components analysis. With the correlation matrix as a base, these methods allow individuals within populations to be treated as integrated biological units (Howells, 1969), and can reduce variation to a small number of vectors, which will hopefully reveal biological patterns (Blackith and Reyment, 1971). These characteristics can be useful in the assessment of human growth and

development where the identification of growth types, and the effect of genetic and environmental influences upon them, is a central issue.

Since their introduction to craniofacial studies (Howells, 1957), factor analysis procedures have been extensively applied to the assessment of adult variation (Solow, 1966; Landauer, 1962; Brown et al., 1964, 1965; Carlson, 1976). The limited application of factor and principal components analyses to craniofacial and growth data is unfortunate, as knowledge about the associations producing ontogenetic changes in size and shape might provide insights into the growth mechanisms that coordinate and produce the patterns of variation in adult morphology.

The present study attempts to reduce, via a statistical approach (i.e., factor analysis) the substantial number of cephalometric variables required to thoroughly define craniofacial morphology. Specifically, a group of uncorrelated dimensions (i.e., factors) are sought which will account for the greatest amount of the total variation in the craniofacial complex. By interrelating a large number of craniofacial variables, and then eliminating all redundancy, data analysis can be simplified, and a more parsimonious and conceptually meaningful interpretation of the variation within the craniofacial complex will result.

REVIEW OF THE LITERATURE

Growth and Development of the Craniofacial Complex:

A. Early Studies

The anthropological literature contains reports of many quantitative and descriptive studies. Much of this work has been concerned with the adult's facial shape in connection with racial differences, its growth pattern, and the changes it undergoes. To study the craniofacial morphology, the use of anthropometric planes was introduced: anthropometric lines and angles were identified. Studies of note in this area include the works of Camper (1792), Welker (1862, 1866), Thering (1872), Consorti (1899), Schroder (1902), Simon (1924), and Krogman (1951).

Camper suggested that anthropometric planes be employed to measure the facial angle to represent the position of the chin relative to the cranial base in the lateral view. Measurements of this angle demonstrated, to some extent, that as the angle changed so did the facial profile. In addition to defining the facial angle, Camper also described the proportions existing among the various parts of the human face at different ages, and tried to employ comparative anatomy techniques to show facial morphological differences among individuals of the same race.

In 1884, at the anthropological congress held at Frankfort, Von Ihering presented the horizontal plane. This plane passes through "Anatomical Porion" which is the most superior point of both skeletal external auditory meatus, and the left "Orbitale" , the lowest point on the anterior margin of the left orbit. This plane has subsequently become known as the Frankfort horizontal plane. At present, this plane (determined radiographically) has been utilized as one of the primary reference planes for diagnostic evaluation of orthodontic patients.

At the turn of the century, many researchers believed that the human face is composed of a number of bones which jointly perform various functions. They showed that these bones and the areas to which they contribute vary in the rate and time of growth.

Hellman concerned himself with facial growth. Through the use of American Indian skulls, whose age he determined by the stage of dentition at the time of examination, he made important and new contributions in the area of anthropometric observations of the width and length of the head and face. In a series of papers (1927a, 1927b, 1932, and 1935), he stated that the development of the face was brought about by increase in size, change in proportion, modification in form, and variation in position of facial components. Hellman's study, although based on material which did not lend itself to an exhaustive study, brought out some important facts about facial growth. It was clear from his measurements that the changes were not uniform in all directions and that all the dimensions showed acceleration in

the rate of growth at 2 periods: the first and lesser between infancy and childhood, the second and greater between childhood and pubescence. Furthermore, this was the first thorough statistical study of this kind. In 1935, using the same method and material as in his 1927 investigation, he introduced the idea that changes in facial morphology are of such magnitude that the character of the face changed due to a swinging out of the jaws from beneath the cranial base.

Meanwhile, in the 1930's, Todd (1930, 1932a, 1934) focused on the concepts of "facial growth and mandibular adjustment" among blacks ranging in age from 21 days to 19 years and gave valuable illustrations of the direction of facial growth. Two years later (1932b), he concluded from a comparative study that, contrary to what happens among animals, there was no true prognathism in man and stated that the face grew horizontally, vertically, and transversely. Moreover, in addition to active growth in the face itself, he felt that forward cranial growth carries the face passively forward. However, the statistical material upon which Todd's work was based was not published.

Continuing the investigations of Hellman, Goldstein (1936) found a large degree of variation in changes of the linear dimensions of the face. He concluded that growth in facial height was the largest, width next, and facial depth the smallest. His contribution to the knowledge of facial changes due to age was a very significant one, although due to its cross-sectional nature, his research did not clarify individual behavior in terms of growth. Unlike

Hellman, who had used dead skulls for his study, Goldstein based his observations on living samples of American Jews which he selected in groups of 50, ranging in age from 3 to 21. Following Hellman's indication that in many facial dimensions the annual increases are too small to be statistically perceptible, Goldstein took his measurements every 2 years.

Krogman and Washburn, too, conducted studies on facial growth in children. In a succession of publications (1930, 1950, 1951), Krogman studied the growth and development of the face of children, during periods of mixed dentition. He stated that the face gains in height mostly in the upper segment, i.e., in the nasorespiratory area. It gains in breadth at bicondylar and bizygomatical levels, less so at bigonial level. And it finally gains in depth at quite a uniform rate, i.e., evenly in both upper and lower segments. Washburn (1936, 1937), commenting on the observations of the growth of children at the Child Research Council, brought forward much evidence to prove that there are differences in the growing individuals. Davenport (1940) conducted a longitudinal growth study of several hundred children. He found that the growth pattern of the head varied strikingly from individual to individual and that the rate at which it grew increased during adolescence. Thus, his findings strongly confirmed the work of Hellman (1927) and Goldstein (1936).

B. Radiographic Cephalometric Studies

In 1931, Hofrath and Broadbent simultaneously introduced a new technique for taking standardized radiographs of the living head. Hofrath employed teleroentgenography in orthodontic diagnosis to estimate the individual size variations of the face, and for the superimposition and correlation of its bony structures. Broadbent (1931) designed a very precise head and cassette holder to take standardized head radiographs. With the use of this cephalometer, Broadbent felt that it would be possible to make accurate determinations of age changes in the living head that may be due to growth or orthodontic treatment. During the same period of time, Waldo (1936), Higley (1940), and Margolis (1940) contributed to the development of cephalometric radiology as a research tool for the study of head growth as well as for orthodontic treatment.

Different and contradictory opinions have been expressed about the constancy of pattern in the craniofacial morphology during the growth period. One holds that the pattern, once attained, remains constant. Among the investigators who believed in the stability of the facial pattern are Broadbent, Brodie, Tirk, and Cohen.

By 1937, Broadbent had accumulated sufficient records to establish growth standards for the normal child. The results of his observations indicated that all facial parts grow uniformly with a "developmental adjustment" in the downward, forward, and outward directions at the

completion of eruption of the primary dentition and remain stable thereafter.

In 1941, Brodie reported on a serial cephalometric study of the growth pattern of the human head from 3 months to 8 years of age. He confirmed Broadbent's findings and indicated that the pattern of the head and face was established by at least the third month of life and that in the following years of growth and development the proportional and angular relationships of the facial structures were changed only slightly. His longitudinal study showed no "spurts of growth" up to 8 years of age. He, therefore, expressed doubts about the presence of an adolescent growth spurt.

Tirk (1948) employed a planimeter on serial tracings of lateral cephalometric radiographs after dividing the face into its functional areas. His findings indicated an early establishment of the facial pattern, and consistent proportionality in those functional units throughout the growth period.

Cohen (1955), prepared a clinical analysis of the face using both depth and height. While he recognized that size, form, and growth of all structures vary, he found constancy in their proportions between the ages of 8 and 16 and recognized that the form of the face was a result of the integration of a multitude of parts.

Certain issues were raised regarding Brodie's work. Brodie's earlier work suggested that the face developed along a predestined pattern without changes in proportions. Yet in later works, Bjork, Lande, Nanda, Moore, and many others, reported changes in the transition from infant to adult faces. In

order to achieve these changes, certain skeletal elements must grow at different rates and at different times. These investigators observed that there are stages in facial growth, of retardation and acceleration reflecting the rhythmic growth of the entire body.

Bjork, in 1947, made a cephalometric radiographic investigation by comparing the facial prognathism of 322 twelve year old Swedish boys and 281 adult males of 22 years of age. He found that on the average both jaws increased in prognathism, the lower more than the upper : the profile became straighter, the maxillary and mandibular incisors more upright.

Lande (1951) studied the growth of the human facial profile from the cephalometric radiographs of boys. (The age range covered was from 4.4 to 17.1 years.) His findings indicated that the convexity of the face almost always decreased with age and that the increase in the mandibular prognathism, on the average, occurred after 7 years of age. Thus, the mean growth behavior up to age 7, according to Lande, was similar to that shown by Brodie but it did change thereafter. Lande's work (1951) also confirmed Bjork's 1947 findings on prognathism.

Nanda (1955) studied facial growth from the serial cephalograms of individuals between 4 to 21 years of age. Instead of using the angular measurements, linear measurements were taken so that rates of growth could be studied. He concluded that not all dimensions grow at the same relative rate and , thereafter, the form of the face changes during growth.

In 1959, Moore opposed the strict interpretation by some investigators on the constancy of the facial pattern. He believed that it applied to the population as a whole only and not to the individual and felt that the development of the facial pattern is governed by the fact that the various growth sites of the facial complex change at different rates.

Bjork (1963, 1974) focused his investigations on longitudinal radiographic cephalometric studies of facial growth where metallic implants were used. He demonstrated the displacement of the mandible and maxilla, and rotation of these bones were produced by a curvilinear type of growth. These changes were not always proportional so that in a given individual height could exceed depth and, therefore, growth did not proceed in straight lines.

Introduction to Multivariate Analysis:

The analysis of craniofacial morphology and growth has presented many difficulties statistically: the researcher has been faced with a multiplicity of variables which had to be studied simultaneously, as well as with the transient nature of the observable conditions of the growing individual (Bjork, 1955). Moreover, in most clinical analyses, the sample used was small and the series of selected measurements rather limited. Therefore, the normative patterns of craniofacial morphology and growth (Downs, Tweed, Steiner, Wylie, Ricketts) currently used have been based either on small samples from rather special populations, or purely subjective

judgements about what constitutes a "balanced face" and "normal development."

It was, therefore, thought that the application of multivariate analyses to cephalometric radiography in order to calculate and process a large number of variables involved in craniofacial growth would be fruitful.

Application of Computer Technology:

The purpose of the first application of computers in the field of cephalometric analyses was to reduce the amount of manual work required in such processes. The first computerized cephalometric program was implemented in New Zealand and in Denmark in the late 1950's (Walker,1967; Solow,1969). Linear and angular measurements could then be subjected to routine statistical evaluation; extensive analysis of the correlations among cephalometric variables (Bjork and Solow, 1962) became possible. In the 1960's these methods were introduced in this country by Walker who was responsible for applying this new approach to the Philadelphia Growth Center materials. Between 1963 and 1967, Walker and colleagues (1972) advanced the technical aspects of computer programs markedly: information storage and quality control in 1963, processing of data in order to compute group averages, development of morphologic standards in 1965, development of a program to extract desired linear, angular, or area measurements from the data in 1966 as well as a

system of composite vectograms for mathematical analysis of longitudinal data. In 1964, Walker produced the first computer plot for craniofacial structures.

The difficulty of combining numerical data on the growth of individual subjects into descriptive statistics for the sample as a whole was overcome by Solow (1969) with the development of a computerized multivariate system for the analysis of growth data.

Cleall and Chebib (1971) developed a computerized method for the analyses of cephalometric orthodontic data providing 2 standardized coordinates for each landmark. They calculated linear and angular measurements, means and standard deviations. Finally, they identified plots for the landmarks in each radiographic cephalogram so that a polygon diagram could be constructed.

Brown and Barrett (1969) developed a computer based system of growth analysis in conjunction with the use of a semi-automatic record reader for serial growth analysis.

In 1976, an on-line computer interactive program was developed (Chebib, Cleall and Carpenter) for the clinical analysis of cephalometric radiographs, and for the diagnosis and case progress evaluation in which both analyses and facial plots could be retrieved immediately after the digitization of cephalometric records. This system could be used in orthodontics either for research purposes if a cross-sectional or a longitudinal approach for growth study was used, or for clinical purposes.

Historical (Multivariate Analyses):

After the development of computer programs which automated the routine standard cephalometric analyses (Bjork and Solow, 1962; Walker, 1967), attention was focused on statistical analyses that could not have been performed manually because of the extended computational requirements. Multivariate analyses were gradually applied to cephalometric radiography in order to overcome the difficulties of dealing with a large number of variables. Such analyses, commonly utilized by researchers include factor analysis (Brown et al., 1965; Solow, 1969), discriminant analysis (Lawley and Maxwell, 1963), and principal component analysis (Anderson, 1958).

Solow (1969, 1970) applied factor analysis in cephalometric research and found it to be a useful technique in the study of the compensatory mechanism in dentofacial development. BeGole (1973) suggested the use of discriminant analysis in clinical dentistry, thus providing a method for determining those linear combinations of the original variables which best separate the groups of interest.

Principal component analysis was first used by Pearson in 1901 (Amick and Walberg, 1975), and greatly improved by Hotelling in the 1930's. It underwent further developments (Blackith and Reyment, 1971) with Jolicoeur and Mosiman in 1960 who demonstrated size vector, for which Rao (1964) gave a mathematical justification. However, it was mainly

Anderson (1958) who suggested the use of principal component analysis in physical anthropology.

Application (of Multivariate Analysis) in Dentofacial and Craniofacial Research:

Harris, Johnston, Walker, and others applied multivariate analyses to study dentofacial growth. Harris (1963) examined a population of moderate class II division I which he compared with individuals having normal occlusion. The sample was divided according to sex and a series of selected cephalometric measurements. These variables were then evaluated by multivariate approaches of co-variance analysis, principal components, multiple correlation coefficients, and stepwise regression. This study stressed the significance of mandibular size, morphology, and position in the malocclusion cases of class II division I and indicated the interrelation between the craniofacial skeleton and the developing dentition.

Johnston (1968) examined statistically the predictive significance of a wide variety of measurements obtained from the lateral cephalograms. Applying Pearson product-moment coefficient to test the linear relationship between variables as well as multiple regression and correlation to a limited number of independent variables, he suggested that prediction of maxillomandibular relation and maxillary prognathism was possible.

Walker (1971) introduced a two-dimensional coordinate model for craniofacial morphology. Data accumulated from lateral cephalometric

radiographs were used in conjunction with the model to derive measurements of facial growth with respect to rate, direction, location, and timing. He produced normative patterns of growth for various population groups.

Specific Studies:

In 1957, Howells explored the natural variation of human head form (i.e. cranial vault) by carefully selecting a series (i.e., 100 male skulls) of human skulls. He measured the brain case in a large number of different ways (i.e., 54 measurements) to discover if some relationship between size and shape existed. In addition, the study observed at what points growth or variation tended to be independent of other sites of growth. Since it is difficult to accurately predict the geometric form which the skull tends toward during cranial development, and which particular parameters or measurements tell us the most about the remainder, a factor analysis method was utilized. In this case, the objective was to search for those particular measurements (i.e., "aspects of cranial development") whose variation appears to be responsible for the variation in all the measurements used.

Specifically, the use of partial correlation was used whereby, for example, the correlation of two traits may be measured after removing the influence of a third trait with which both of them are correlated. In this method

of factor analysis, some broad common factor is extracted from the correlations to determine its nature and effect. When a given measurement is a particularly good "factor", or important as representing some aspect of growth or development, its influence can then be eliminated from the whole set of correlations, to judge its effect. Essentially, this is merely a factor analysis using known or predetermined factors.

In this study, it was decided to remove head length, breadth, and height as "factors" as well as remove the factor of size itself. This left a matrix of residual correlations (free of any correlations with the first three measurements) which yielded seven further "factors", or measurements having significant variation not accounted for by general size, or by growth in any of the three main dimensions. Therefore, in performing an analysis of the correlations, by removing the influence of, or partialing out, the correlation of certain measurements which give evidence of being important and independent of one another, 10 measurements were found.

These measurements or factors, which were more or less independent of one another, accounted for virtually all of the correlation in the cranial vault proper. It was suggested that these factors are not types, but rather tendencies expressed in all skulls in varying degrees, mutually determining the size and shape of individual skulls in this study. The first three factors: length, breadth, and height, accounted for much of the variation, especially in general size of the cranial vault. The other seven factors did not influence size so much as they did details of shape of the cranial vault. In particular,

the seven factors related to smaller but significant variation in specific regions: the supraorbital ridges, forehead breadth. In addition these factors accounted for much of the variation, the overall dimension of the parietals, height of the obelionic region, fullness of the lower occiput, and breadth of the base at the auricular meatus.

Howells' (1957) study was an extensive factor analysis of the cranial vault, but the investigation did not include measurements of the face. Many researchers agree that the facial skeleton and the cranial vault have different growth rates and belong to different systems of variation. The vault attains approximately 90% of its adult size at the age of five years, while the face has not accomplished this until twelve. The dependence in development of the two is made obvious in microcephaly, where almost normal faces are attached to underdeveloped brain cases.

Landauer (1962) performed a study to first search for factors of variation in measurements of the facial skeleton, to complement factors of the vault found in the study of Howells, and specifically to examine the factorial relations of the brow ridges, and the allocation of the variation in minimum frontal diameter and in this immediate region. The investigation attempted to answer several questions. Is minimum frontal diameter a measure of the breadth of the forebrain, or the breadth of the face, or a compromise of the two? How independent are face size and skull size? What kind of a face is in harmony with large brow ridges, and how do these ridges relate to the musculature? What parts of the face vary independently

of one another, and thus give rise to the various faces (e.g., long, broad, oval, square, vertical, prognathic).

Landauer (1962) studied these questions by factor analysis carried out on measurements of the face specially selected or devised for this purpose. This was accomplished on a series of 70 Egyptian skulls used without reference to sex. Twenty-three facial breadth measurements were used, in order to relate facial skeleton and cranial vault in the respect mentioned above. A total of five factors were extracted by factor analysis of the data, by first obtaining orthogonal (i.e., uncorrelated) factors and then rotating them so as to obtain oblique (i.e., correlated) factors. These factors were: general size of the skull as a whole, size of the skeletal mass and muscular strength, breadth across the malar bones, frontal fullness, and the lower-facial breadth. The first three factors all affect the zygomatic region of the skull, but apparently in diverse ways as the result of different growth forces acting on this particular region. Minimum frontal diameter appears to be an ambiguous measurement reflecting two factors, breadth across the malars and frontal fullness.

The application and aims of factor analysis in cephalometric research and craniometric data were studied by Brown, Barrett, and Darroch in 1965(a). In their investigation, a sample based on selected body measurements of Central Australian Aborigines was used as part of the material for a longitudinal growth study. Eight body variables (i.e., head breadth, bizygomatic diameter, femoral condyle diameter, weight, head

length, head circumference, radius length, and stature) were measured to illustrate the statistical method. Since the study included only eight measures in the sample, no generalizations were to be expected from the results. Many additional variables would normally be required to provide more detailed information.

The information that was gained from the factor analysis of the eight body variables included three common factors and eight unique factors which contributed to the total variance found in the battery of variables. The common factors appeared to be associated with head length, head breadth and general skeletal length. The circumference of the head, bizygomatic diameter, weight and femoral condyle diameter were composite variables being determined by more than one factor. Lastly, head length and head breadth were determined by different factors and neither of these factors had any association with the one influencing general skeletal length.

In their paper (Brown, Barrett, and Darroch, 1965a) the aims, methods, and application of factor analysis (one of several multivariate methods), were outlined with particular reference to the treatment of biometric data. It was shown that the relationships between variables can be described mathematically in terms of factors which are computed from the coefficients of correlation between the variables. The factors are of two types, common factors affecting more than one variable of a set and unique factors affecting single variables. The results of factor analysis provide a guide to the biological influences underlying the observed dependent and

independent variation in the original variables.

A further application of factor analysis was made in a study by Brown, Barrett, and Darroch (1965b) in which craniofacial relationships of Swedish males and Australian aborigines are compared. They analyzed the lateral roentgenocephalograms of 243 young adult Swedish males, along with 31 male and 27 female young adult Australian aborigines by factor analysis of groups of 11 craniofacial variables. The factor analysis was carried out for each group separately on the coefficients of correlation between the variables.

Five factors were extracted for each group from the eleven variables. These factors being: mandibular length, anterior nasal height, posterior nasal height, mandibular ramus height (Swedish sample only), and anterior cranial base which affects maxillary length. No measurements of craniofacial width were included and consequently this represented only a two-dimensional study. Furthermore, it should be noted that the factors were objectively determined by mathematical procedures from a correlation matrix and any variation in the nature or number of the variables used would produce quite different factor solutions. Therefore, the choice of variables in factor studies is important and will determine the final solution.

By factor analysis also, Solow (1966) obtained 19 factors from 38 measurements from profile and postero-anterior cephalometric radiographs, and forearm radiographs of 102 Danish students. Eight factors were considered to be representative of the craniofacial region. These factors

included: anterior cranial length, face width, length of clivus, mandibular height, flexion of cranial base, maxillary prognathism, anterior maxillary height and maxillary inclination, and mandibular inclination.

In his analysis of craniofacial associations in young adult males, Solow (1966) stressed the difficulties in interpreting the biological meaning of morphological variation. He noted, for example, that a correlation between two or more variables may only demonstrate a "biological coordination", and does not necessarily provide direct evidence of cause-effect relationships. Nevertheless, understanding these patterns is of major interest "because of the insight they may give into the mechanisms coordinating the growth and development of facial components" (Solow, 1971). Similarly, an understanding of the biological coordinations which affect the growth of the craniofacial complex will ultimately provide invaluable information concerning the function and adaptive significance of specific craniofacial components, and thus clearer insight into the evolution of the hominoid skull.

Ishiguro (1970) used lateral cephalometric radiographs of 50 patients with malocclusion as well as corresponding radiographs of their parents (100), and siblings (43). Thirty points registered in a coordinate system were categorized into three regions as maxilla, mandible, and cranial base. All points were re-registered under the new standard axes. Nine points were selected for the cranial base (i.e., nasion, anterior and posterior clinoid processes, basion, ethmoid registration point, ethmoidale, point of intersection between orbital roof and inner surfaces of frontal bone,

supraorbitale, and rhinion). Three components were extracted: the first component, anterior cranial base length; the second component, middle cranial base height; and the third component, anterior cranial base height.

Souma (1971) obtained a series of 18 lateral cephalometric radiographs biannually from 7 through 17 years from 26 boys and 24 girls who had not received orthodontic treatment. After registering 13 points in a coordinate system, principal component analysis was applied to determine a set of uncorrelated components. Five components were extracted: rotation of maxilla and mandible, depth of maxilla and mandible, depth of middle face, depth of alveolus of the mandible, and height of the middle face.

Following the extraction of these five components, Souma projected the principal component score on pentagons, and pattern classification was then attempted. Five categories were obtained for each sex using discriminant analysis. Then the shift of the pattern for each individual over the four age cohorts (2, 7, 12, and 17 years) was checked, and 48 out of 50 (96%) continued to belong to the same category over the age cohorts.

Horowitz et al., (1976) performed a factor analysis of craniofacial morphology in patients with repaired complete unilateral clefts of the lip and palate. Thirty-nine lateral cephalometric radiographs of caucasoid male and female children were utilized, along with 22 spatial, angular and linear measurements used to evaluate skeletal morphology. The aim of the study was to analyze patterns of co-variation among the variables measured in order to determine combinations of craniofacial skeletal features that best

describe the cleft lip and palate patient. Using factor analysis, covariation between variables was reduced to a set of six factors: (1) nasopharyngeal-maxillary complex; (2) cranial base; (3) mandible; (4) lower face; (5) ramus; (6) palate. The six-factor solution accounted for 92% of the variance, with factors (1) and (4) providing the best discrimination between cleft and non-cleft individuals.

In a similar second study, Horowitz et al., (1980) performed a factor analysis to describe and analyze skeletal relationships (esp. those of the cranial base and posterior face) in a group of individuals with repaired complete bilateral clefts of the lip and palate. Data for this study were derived from the lateral cephalometric radiographs of 29 white Swiss children born with this condition. Factor analysis of 21 linear and angular variables was reduced to a set of six factors: (1) cranial base; (2) mandible; (3) palate; (4)lower face; (5) nasomaxillary-pharyngeal complex; (6) clivus. The six-factor solution accounted for 91.7% of the variance. Factors (2), (3), and (5) provided the best discrimination between the bilateral cleft and the noncleft individuals.

Carlson (1976) performed a study to isolate and describe the major patterns of variation in the human midface and upper face. Principal components analysis was used to extract patterns of morphological-statistical associations from a relatively large sample of crania from prehistoric Lower Nubia. Each pattern was discussed in detail in order to explore, in particular, the interrelationships which may have affected

phylogenetic change in the human midface and upper face during the past several thousand years. Thus, the goal of the investigation was to generate ideas concerning evolutionary change in the craniofacial complex.

Fourteen variables describing the upper face were reduced to six primary components of variation. The first eigenvector accounted for the greatest single proportion of intrapopulation variation on the basis of general size (25%). The remaining components described the major patterns of shape variation in the upper face, explaining 15%, 12%, 9%, 7%, and 6% of the variation, respectively, for a total of 74% of the variation within the Nubian sample. The second component axis described the size and position of the midface.The third component described a pattern of variation relating to the shape and position of the maxillary complex with respect to the size and position of the temporalis muscle. The fourth component axis dealt primarily with the shape of the zygomaxillary region. The fifth component axis was most highly related to maxillary basal prognathism. The final major component axis also described variation relating to prognathism, but focused upon maxillary alveolar prognathism.

In 1977, Liebgott used factor analysis to study a large number of radiographic measurements representing craniofacial depth, height, and width. In addition, he assessed the degree of mandibular prognathism or retrognathism in an effort to locate specific areas of variability within the skeletal craniofacial complex. Thirty cephalometric measurements were obtained from lateral and posteroanterior radiographs of 66 boys, 8 years of

age. Following a multivariate factor analysis, twelve uncorrelated factors were extracted which accounted for 91% of the total variance in the original 30 measurements. These were identified as: retrognathic facial type, anterior dentoalveolar height, maxillary body length, cranial base and facial width, mandibular ramus height, anterior maxillary body height, mandibular length, cranial vault height, vertical position of the condyles, cranial vault and clivus length, bigonial width, and cranial vault width.

In a Master of Science Thesis, based on the research done by Cleall et al. (1976), Adeli-Nadjafi (1977) used 33 landmarks to measure 56 linear and angular measurements. A statistical technique was utilized to identify 6 principal components whose positive and negative extremes represented 12 various facial types (principal components). The investigation of Adeli-Nadjafi was undertaken to ascertain if the growth of these various facial types were distinct and unique. Of the 53 individuals studied at eight different time points, only 6 grew in a distinct manner, and the remainder grew in such a manner that their assigned classification was more a function of time than uniqueness of growth pattern. Hence, the hypothesis that each facial type grew in a unique and distinct manner was rejected.

It was also found that the component scores for each facial type changed with age. These changes varied in magnitude depending on the group being examined. Components 3-positive and 3-negative showed a narrow range of change while the remaining groups exhibited considerable

changes during the ages studied. The changes in component scores and the lack of constancy in classification signify that changes in facial proportions occur with growth. This is in keeping with the curvilinear type of growth reported by Bjork.

Furthermore, most individuals had a high degree of blending of the various facial types. Principal component 2 group exhibited the least degree of blending and was, therefore, closer to a pure facial type while principal component 3 group demonstrated the highest amount of blending. If a larger number of pure facial types could have been studied, Adeli-Nadjafi felt that they could exhibit unique patterns of growth.

A comparative study by Moore (1977) was made of the correlations between numerous linear and angular dimensions of the facial skeleton of man and the three great apes. A total of 246 hominoid adult skulls were measured and 33 variables were employed. The Varimax (rotated orthogonal) factor analysis was found to be an essential aid in analyzing the very large correlation matrices obtained. It indicated that three groups of associations could be identified in the hominoid skull. The first reflected co-ordinated variation in total skull size; the second, co-ordinated variation within common anatomical regions; the third, co-ordination between the jaws and dentition. A broadly similar pattern was found in each group for all four genera. The principal contrasts between man, on the one hand, and the apes, on the other, were found in groups 1 and 2. The most prominent of these was a generally much tighter degree of association between the size

and position of upper and lower jaws in the apes, and a consequently reduced tendency for disruption of the occlusal relationship of the teeth.

Cross-sectional data, consisting of 33 anthropometric measures of the body and head, were collected on a sample of 256 Irish male children between the ages of 8 and 12 years in a study by Relethford (1978). Principal components extraction followed by Varimax rotation produced five orthogonal components accounting for nearly 79% of the total variation. These components represent general body size, body mass, head breadth, upper craniofacial height, and head length. To assess the relationship of the components with age, Relethford et al. described the changes in component score means over age cohorts (8, 9, 10, 11, 12 years). Only the first component, general body size, showed a significant difference between the age cohorts ($p<0.05$), whereas all subsequent components were considered age-independent and represented non-growth-related vectors of variation.

The use of component and factor analytic methods has been applied to the study of growth types and their relationship with age by a number of other authors (McCloy, 1940; Mullen, 1940; Hammond, 1953; Waliszko and Welon, 1975; Welon et al., 1976) as well. These studies were mainly involved in the assessment of change in physical factors with age. That is, principal components, or factor analysis, was applied to separate age cohorts and the resultant loadings matrices were compared across time.

In a study by Cleall et al. (1979), their purpose was, initially, to define facial morphology in terms of principal components, followed by an

evaluation of the influences of age and sex on the components. Also, a subsequent longitudinal study of the behavior of components was carried out, followed finally by an evaluation of the effects of orthodontic treatment on facial type as evidenced in the principal components. They used 622 individual cephalometric radiographs and subjected the obtained cephalometric data to a principal components analysis. The subjects ranged in age from 8 years through adulthood and included persons with no dentofacial abnormalities (normal) as well as those with marked malocclusions and facial disproportions.

The usual cephalometric measurements were included relating to both hard- and soft-tissue structures. A smaller subgroup of the sample was previously examined statistically several times to establish which measurements were most useful and which were redundant. A total of some 120 measurements were tested in this manner. The final 56 measurements were then subjected to a principal components analysis which resulted in the extraction of six principal components, each of which was identifiable as a discrete facial pattern and accounted for 68% of the variability in the sample. These factors, represented in general terms and in rank order of their percentage sample variability, and were as follows: Vertical facial characteristics, Anteroposterior aspects of facial morphology, Midfacial and dental protrusion, Relationship of the mandible and dentition to the profile, Horizontal base-line relationships (internal or deep), maxillary incisor relationships.

These principal components and the variables contained within them were shown to have sex and age interactions. Demonstrable age changes were verified for Factors 1, 2, and 3, and Factors 1 and 3 were observed to show patterns of change which were statistically different from each other and the remaining principal components. In an orthodontically treated sample of patients, Factors 1 and 2 were found to show statistically reliable changes resulting from treatment and/or growth. The remaining factors showed no statistically supportable alteration.

In a study using measurements on a sample of 1337 models which represented 500,000 15-18 year old children in upstate New York, Proshek et al. (1979), attempted to identify the range of occlusal conditions and examples thereof from normal to extreme. This study, using Cocstoc's method of measuring occlusal traits on each individual tooth and segment of the jaw, combined the original 54 measurements into 18 factor dimensions (occlusal patterns) and five unique traits, thus reducing the number of variables to be used in an instrument for measuring public acceptability of occlusal conditions. The first 18 factors accounted for 69.5% of the total variance, and were the minimal number of factors that maximally correlated with the original data. The five variables or measures that were uniquely independent of any of the other measures, as identified by their low communalities, were the dental anomalies of supernumerary, malformed, impacted, transposed, and missing teeth. The frequency of occurrence of each of these anomalies were not related to any other occlusal measures.

In a paper by Buranarugsa et al. (1980), it was stated that the factors that resulted from a factor analysis indicated significant groupings of shared variability among the variables, or measurements. Also, the presence of such variability was generally accepted as "evidence of biological co-ordination occurring at some stage during the period of growth and development." Thus a factor analysis of data from, for example, adult skulls, claimed to offer information on the growth of the skull. Factor analysis has therefore emerged as a valuable tool for interpreting detailed data available from craniological studies, offering the possibility of obtaining biological meaning. However it is hardly to be expected that the method itself should present no problems.

In 1958, Jowett commented "Factor analysis has long been the black sheep of the statistical fold, partly because of the crudity of some of its mathematical theory, and partly because of the indeterminacy, from a strictly objective point of view, of the conclusions which can be drawn from it." Some of the mathematical uncertainty remains, and on the side of interpretation there exist such problems as "spurious correlation" and "topographical correlation" between variables, problems particularly discussed by Solow (1966).

To overcome these problems Buranarugsa et al. (1980), considered not distances and angles between various points, but the Cartesian (three dimensional) co-ordinates of cranial landmarks, an approach which was suggested by Karl Pearson (1933) more than half a century ago. Sixty intact

skulls of Polynesian people from New Zealand's prehistoric era were used. Both male and female skulls were represented. While a disadvantage of such mixing is that one group does not provide a check on the other, some multivariate studies (Landauer, 1962; Benfer, 1975) have included males and females without mentioning sexual dimorphism, while Moore (1977) found a broadly similar pattern of loadings of variables in factor analysis of both sexes.

A factor analysis of the three dimensional cranial data, extracted twenty-five factors from the varimax orthogonal rotations of the initial loading factors. Seventy-five per cent of the common variance was accounted for by 13 factors, each of which contributed more than 3%. The remaining 12 factors contributed 25% of the common variance, less than 3%, and thus these factors were not considered any further.

A problem in the presentation and interpretation of the results of a factor analysis is deciding the level at which a loading achieves significance. In several previous studies (Solow, 1966; Brown, 1973) a level of 0.20 has been taken as the level at which a loading reaches significance. Benfer (1975), in an analysis of co-ordinate data, took a level as high as 0.70. In this study of Buranarugsa (1980), a loading of 0.50 was taken as the level of significance. Hence, there appears to be no firm criteria for deciding the appropriate level.

A study involving a factor analysis of cranial base and vault measurements in children was carried out by Ohtsuki et al. (1982). The

objective was to find any possible age changes in factor patterns in the cranial base and vault dimensions. Lengths within the cranial base and vault were measured in cephalometric radiographs of 220 boys and 177 girls ranging in age from 0 to 15 years. Mixed longitudinal data were derived from 1640 radiographs for boys and 1260 radiographs for girls.

Factor analysis was applied separately for boys and girls for each age group (i.e., 0-3, 4-6, 7-9, 10-12, and 13-15 years). For the 0-3 year age group, two factors were extracted in each sex, whereas four factors were extracted in the rest of the age groups. The factor structures were similar in the three older age groups of boys (7-9, 10-12, and 13-15 years). The first four factors for these groups were labelled, respectively: cranial vault size, posterior cranial base length, presphenoid length, and basisphenoid length. The order of the third and fourth factors were reversed in the 7-9 year old subjects.

For girls, the factors extracted were also the same in both the 7-9 and 10-12 year age groups, even though the order of factors was different between age groups (i.e., anterior cranial base length, cranial vault size, basisphenoid length, and basioccipital length).

The authors postulated that the changes in factor patterns were due to the differential growth rates among the cranial base dimensions. The obliteration of the spheno-occipital synchondrosis (i.e., occurs about two years earlier in girls than in boys; Powell and Brodie, 1963; Hight, 1980) was proposed as the mechanism responsible for the change of factor pattern in

the girls. Closure of this synchondrosis would have occurred too late to affect the patterns in boys.

Buschang et al. (1982), applied an "exploratory" principal components analysis to examine facial growth. Based on the derived multivariate components of variation, they placed emphasis upon their ability to delineate age and sex differences in facial growth patterns. The data for this investigation were derived from lateral cephalograms for a mixed-longitudinal sample of 999 white schoolchildren, obtained as part of a normal growth study conducted by the Philadelphia Center for Research in Child Growth between 1948 and 1968. Seven linear measures were analyzed, including sella-basion, sella-nasion, nasion-prosthion, infradentale-menton, articulare-gnathion, gonion-gnathion, and articulare-gonion.

Three principal components, explaining 83% of the common variation for the 999 males and females between 6 and 22 years of age, were extracted to describe the ontogenetic patterns of relationship for the seven facial dimensions. The first component, which accounted for 65% of the variation, was a general component associated with both size and shape and defined size-required changes in proportion during growth. Independent patterns of regional variation associated with alveolar remodeling (second component) and condylar growth (third component) described specific sources of facial modification.

The mean multivariate component scores revealed that sexual dimorphism, which progressively favored males over females with age, resulted from accumulating differences in size and related proportional changes in shape. The timing of the condylar growth spurt, as evidenced from variation in ramus height, produced secondary dimorphism which diminished following the adolescent phase in males. Significant age effects were indicated also for alveolar remodeling and mandibular growth of the condyle.

In a study of occlusion and arch size in families (Harris et al., 1982), 17 parameters of occlusion and arch size were analyzed to identify a smaller number of independent factors. The heritability of these composite factors to estimate relative genetic and environmental contributions to the variation were then evaluated. A total of 761 Melanesian subjects from 112 families were included in the analysis. Using principal components analysis based on the total sample with the sexes pooled (i.e., inspection showed none of the 136 correlations to be significantly different between the sexes), five principal components were extracted from the correlation matrix accounting for 76% of the total variance.

The five components with eigenvalues exceeding one were rotated to an orthogonal varimax solution (Kaiser, 1958). Components with eigenvalues less than one were excluded because they accounted for trivial portions of the overall variation (Harris, 1975). Component I was a composite measure of arch size, and did not include any of the several

occlusal variables. This is a common feature of principal components analysis to extract an overall size effect as the first component (Blackith, 1971; Olson, 1958). Component II was primarily a measure of arch shape as represented by the ratio between arch length and molar arch width. Component III was most highly correlated with incisor crowding, especially of the lower arch. Component IV was composed of high correlations on the upper and lower width ratios (cuspid arch width divided by molar arch width). Component V accounted for only 6% of the total variation. Overjet and overbite were highly correlated with this component, while molar relationship had a moderate negative correlation.

Sato et al. (1990), performed a study to investigate the effects of parameters on using the principle components analysis for the evaluation of the craniofacial structures. Materials consisted of lateral roentgenocephalograms of 100 adult Japanese females. They were divided into three groups by ANB angle. Linear and angular measurements were selected as parameters to apply the principal components analysis, and scattergrams made by the first and second principal component were compared. The results of the analysis were varied by the parameters. There, especially, was a great difference between the real size and the value corrected by isometric method on scattergrams made by the first and second components. Results indicated the importance of using appropriate parameters for this research purpose.

Summary:

As a multivariate technique, factor analysis (and principal component analysis) reduces a large number of correlated variables into a small number of uncorrelated ones. Hence, it can be demonstrated that most of the variation resides in several hypothetical variables and in linear combinations of measurements, called factors (principal components).

Since multivariate analysis was introduced to the field of craniology (Howells, 1957), many studies have used factor analysis (principal component analysis) on craniofacial dimensions (Schwidetzky, 1959; Landauer, 1962; Brown et al., 1965a,b; Solow, 1966; Ishiguro, 1970; Souma, 1971; Relethford et al., 1978; etc.). These methods of analysis are useful in the assessment of human growth and development where the identification of growth patterns among many variables gives rise to discussion.

Furthermore, cephalometric radiology has been as an essential aid to assess craniofacial morphology and to study growth changes of the dentofacial complex. With the introduction of standardized cephalometric radiography by Broadbent (1931), this made possible the study of the craniofacial skeleton in the living subject. Subsequent cephalometric studies have provided valuable standards and diagnostic criteria for the orthodontist but have provided little insight into the basic dimensions or determining factors of craniofacial skeletal morphology.

Studies in the past utilizing factor analysis (principal components analysis) in cephalometric research have not fully explained what the underlying dimensions that thoroughly characterize the variation in the craniofacial region are or many have utilized a relatively fewer number of variables to explain craniofacial variation. To get a full appreciation of craniofacial growth and morphology, it is more beneficial to the clinician to study the craniofacial complex as a whole, rather than in incomplete parts (as is the case in most of the conventional cephalometric analyses). In addition, among the many cephalometric analyses, most contain several (redundant) measurements (i.e., within any one particular cephalometric analysis) that are in essence, measuring the same dimension of the craniofacial complex. What is needed, therefore, is a cephalometric analysis that contains measurements that characterize the full set of underlying dimensions that describe craniofacial variation thoroughly.

It is apparent that the analysis of measurements from a classical cephalometric study employing univariate techniques tends to fragment individual subject information into bulky and unwieldy data. Considerable overlap of the underlying common dimensions exists among standard measurements used in contemporary cephalometric analyses. By removing this overlap from many cephalometric measurements, it is possible to isolate or reconstitute considerably fewer basic dimensions or factors of craniofacial size. These factors can be isolated through a multivariate technique, factor analysis, which makes it possible to group certain measurements reflecting

a common dimension or factor (Harman, 1967). In essence, a factor analysis will provide the simplest description of the observed data.

Some of the standard comprehensive cephalometric analyses designed to describe morphology in use in the orthodontic profession today are: Tweed, Begg, Witts, Holdaway, Steiner, Downs, Jarabak, Ricketts, Reidel., McNamara, Burstone and Legan, Powell and Humphreys, etc. Orthodontists will usually select one or a combination of these cephalometric analyses to employ routinely for diagnostic purposes. The selection of what analysis is chosen is based on personal criteria of the orthodontist, and the type of orthodontic philosophy followed, and thus in general can vary significantly from one clinician to another. Hence, one clinician may be assessing certain specific craniofacial characteristics, while another clinician will assess a different set of craniofacial characteristics during the diagnostic process.

As mentioned earlier, a complete description of craniofacial morphology should involve the assessment of the magnitude and relationships of a host of interrelated morphologic entities. If cephalometricians are measuring only a very small part of the total biologic variability of the craniofacial region, it would be of value if there was a universally accepted cephalometric analysis that provided a more complete interpretation of the changes in the craniofacial complex.

Therefore, by incorporating all the individual interrelated measurements across the many contemporary cephalometric analyses in a

system, and then eliminating all redundant information, such a universal analysis could result. Having knowledge of the underlying dimensions that characterize the craniofacial complex, clinicians and researchers could better appreciate its variation, with regards to growth and morphology.

STATEMENT OF THESIS

Many of the cephalometric analyses used today describe only a portion of the total variability in the craniofacial complex. Thus, a comprehensive assessment of the variation of the craniofacial complex would entail utilizing a host of measurements carefully selected from among several contemporary cephalometric analyses. Orthodontic diagnosing and treatment planning thus becomes tedious as a result.

Hence, it would be beneficial to identify the least number of (biologically meaningful) underlying dimensions that can account for as much of the total variation of the craniofacial complex as possible. By incorporating all the various measurements across all the contemporary analyses, eliminating all redundancy, and then subjecting the remaining data to factor analysis, a group of factors (i.e., unique underlying themes) will ensue that will represent relationships among sets of many interrelated craniofacial variables parsimoniously.

Once identified, the acquired factors may be used to assess the thoroughness of the various contemporary cephalometric analyses in terms of the degree of factor participation in a given analysis. Furthermore, a recommended cephalometric analysis may then be developed using the identified factors, and statistically selecting at least one measurement

that characterizes each factor. A cephalometric analysis with fewer measurements that describe a greater proportion of the total variation of the craniofacial complex should follow.

The purpose of the present study is to test the hypothesis that by eliminating repetition and redundancy among cephalometric measurements selected from the various contemporary cephalometric analyses, more parsimonious and conceptually meaningful measures of the craniofacial variation would result. Specifically, the aims of this study are two-fold:

(1) To reduce, via a statistical approach, the substantial number of cephalometric variables required to thoroughly define craniofacial morphology. A collection of cephalometric measurements (i.e., on soft- and hard-tissues) made on a selected set of "Bolton Standard" cephalometric radiographs, will be subjected to Principle Components Analysis and Factor Analysis.

(2) To identify, and then explain, the obtained (least number of) underlying dimensions (i.e., "principle components" and "factors") that account for the most variability in the craniofacial complex.

METHODS AND MATERIALS

Study Population:

The study population consisted of 15 males and 15 females, who have been previously investigated in a longitudinal manner. Cephalometric radiographs taken on each subject at 6, 9, 12, 15, and 18 years (± 6 months) of age were obtained and then analyzed. Hence, a total of 150 lateral cephalograms became the data base from which information and statistics were collected. The age groups of: 6, 9, 12, 15, and 18 years, were selected on the basis of availability of specific records, (See Table I for a summary display of the specific age groups selected for study, utilizing the same 15 males and 15 females who were investigated longitudinally). These specific records being the soft-tissue tracings drawn by Michael M. Taylor, Class of 1991, Case Western Reserve University, Department of Orthodontics, for his Master's Thesis. The relevance and importance of these required records will be described later.

The lateral cephalograms used in this investigation were obtained from the Bolton Study archives, and were the original radiographs that were employed in the Bolton Study of the Development of the Face of the Growing Child (1928-1959) carried out at Case Western Reserve University, School

of Dentistry, in Cleveland, Ohio. The intent of the Bolton Study was to determine what occurred in the facial skeleton and dental areas during growth and development. Since the study recruited subjects for some 30 years, with ongoing studies continuing for many years on the original children, the ages obtained in 1959 included many young adults. An average of 15 films (obtained using the Bolton radiographic cephalometric technique, as described in Chapter 3 of Bolton Standards of Dentofacial Developmental Growth, Broadbent et al., 1975), were taken per participant. The percentages of radiographic enlargement for the different ages and film distances are presented in Tables 2A and 2B.

Table I. **A summary display of the specific age groups selected for study, utilizing the same 15 males and 15 females who were previously investigated longitudinally. Lateral cephalograms were obtained for each subject at each age period, providing a total of 150 radiographs.**

AGE (Years ± 6 mo.'s)	No. Of Males	No. Of Females	TOTAL
6 yrs.	15	15	30
9 yrs.	15	15	30
12 yrs.	15	15	30
15 yrs.	15	15	30
18 yrs.	15	15	30
			150

The momentous era between 1973-1975 marked the period that lead to the development of the universally acclaimed "Bolton Standards", which provided clinicians and researchers with an invaluable tool for understanding and assessing the growth of the craniofacial complex. William H. Golden, a senior research associate with the Bolton Study from 1945 to 1981, was co-author of the Standards, contributing his unique artistic and technical abilities to both the research and the teaching activities of the Bolton-Brush Growth Study Center.

The Bolton Standards are a series of averages of individual cases (for ages 1 through 18 years) that have optimum facial and dental developmental growth. Impressively, these Standards are still currently utilized today for diagnostic assessment purposes in orthodontic treatment and also, in a host of other dental disciplines.

The population of the Bolton Study contains records of some 4,309 individuals, many of whom had serial cephalometric recordings made on a three-month basis for the first year of life, on a six-month basis for the age range of one to five years, and thereafter (i.e., greater than five) on an annual basis to young adulthood. From this group of longitudinal records, individual cases were specifically selected to be what has been termed "Bolton Faces", which comprised the Bolton Standards (optimums).

According to B. Holly Broadbent, Sr. et. al. (1975), the following criteria were established as the framework for the Bolton Face selection process in creating the Bolton Standards of dentofacial developmental

Table 2A. Cephalometric radiographic enlargement.

The Bolton Standard tracings were made from cephalograms produced by the Bolton cephalometric technique. This method dictates that the anode-object distance of 5 feet be maintained and that the object-film distance be kept to a minimum. The object-film relation in the lateral cephalogram is termed: midline-lateral film distance (ML). Table 2A. shows the average ML distances that were used at each chronologic age and the resultant enlargement inherent in the Bolton Standards. It is important to consider this percentage of enlargement when the Standards are compared to cephalometric films from other sources. This chart may also be used to obtain a direct reading of enlargement for a specific cephalometric radiograph in which the fundamental technique has been used and the ML distance is known.

The columns to the right of the chronologic ages are the ML distance of the lateral film with its percentage of enlargement. The ML recordings were made at the time that the films were exposed.
(Courtesy of Broadbent et al., 1975)

AGE	ML	% ENLARGEMENT
1	80	5.2
2	80	5.2
3	80	5.2
4	81	5.3
5	82	5.4
6	83	5.4
7	84	5.5
8	84	5.5
9	85	5.6
10	86	5.6
11	87	5.7
12	88	5.8
13	89	5.8
14	89	5.8
15	90	5.9
16	90	5.9
17	90	5.9
18	90	5.9

Table 2B. The relationship between film distance and percentage enlargement.

C.C. FILM DISTANCE	% ENLARGEMENT
70	4.6
75	4 9
76	5.0
77	5.0
78	5.1
79	5 2
80	5.2
81	5.3
82	5.4
83	5.4
84	5.5
85	5.6
86	5.6
87	5.7
88	5.8
89	5.8
90	5.9
91	6.0
92	6.0
93	6.1
94	6.2
95	6.2
96	6.3
97	6.4
98	6.4
99	6.5
100	6.6
101	6.6
102	6.7
103	6.8
104	6.8
105	6.9
110	7.2
115	7.6
120	7.9
125	8.2
130	8.5
135	8.9

growth: (1) Excellence of static occlusion (i.e., no subject received prior orthodontic treatment) as viewed in the dental study casts that were taken at the same time that the serial cephalometric records were made, (2) A good health history, which precluded those who had significant debilitating diseases from becoming part of the group, (3) Faces that conformed in a favorable manner to a statistically derived mean of craniofacial measurements, (4) Aesthetically favorable faces as viewed arbitrarily by the investigators, (5) Availability of long-term records, which would mean that the individual case was recorded annually from 1 year to 18 years of age on a longitudinal basis.

The Bolton Standards are Caucasian in derivation and the participants (i.e., the best normal people or "well born") were selected from middle-class families. The heritage of these children has also been characterized as American-born children of Anglo-Saxon or Teutonic origins, children of Sicilian immigrants or black children. Subjects, also, had a permanent residence in Cleveland, Ohio or its vicinity.

Each of the individuals included in the series of Bolton Faces, at the time that the cephalometric radiographs were exposed, had study casts made as well as records of height and weight and a hand-wrist x-ray film taken for evaluation of skeletal age. This group was equally divided as to sex (sixteen males and sixteen females), and their cephalometric radiographs were traced by William H. Golden in the manner that is described in Chapter 3 of Bolton Standards of Dentofacial Developmental

Growth, Broadbent et al. (1975). This method, in the tracing of the lateral x-ray film, transfers bilateral structures into a single-outline tracing that is comparable to projection of the right and left structures on the midsagittal plane.

A subsequent process of averaging pairs of tracings to form a composite, and then in turn averaging composites to form another single tracing was carried out. This method of interpolation was continued until the sixteen tracings of individuals in the male group were interpolated into one optimum face, and the sixteen tracings of individuals in the female group were interpolated likewise. This process was followed for each chronologic age.

The reasons for the selection of sixteen individuals in each sex group were that it afforded a large enough sample to be statistically valid, lent itself numerically to the averaging technique and interpolation, and also constituted a majority of the optimum longitudinal records that were available in the Bolton data collection (Broadbent et al., 1975).

Data Collection:

By means of an X-Y coordinate digitizer, a standardized series of 152 recognized cephalometric landmarks (selected by the research committee at Case Western Reserve University, School of Dentistry, Department of Orthodontics in 1992; See Figure 1 for a graphical display of the "CWRU Cephalometric Regimen" and Appendix A for a description of each of the

involved landmarks) were recorded for each of the 150 radiographs. Their coordinates were used to generate 187 linear and angular variables, which included measurements relating to both hard- and soft- tissue structures.

The original cephalometric radiographs from which were derived the renowned Bolton Standards, and the corresponding tracings of William H. Golden (Senior Research Associate, Bolton-Brush Growth Study Center, Case Western Reserve University, Cleveland, Ohio) became the data base from which the sample for this investigation was selected (See Figure 2 for one randomly-selected example of William Golden's lateral cephalometric tracing that was used in this study).

Since Golden's tracings did not include any of the pharyngeal soft-tissues and related structures, the total 152 cephalometric landmarks could not be digitized. Therefore, the original tracings (raw data) of Michael M. Taylor (Case Western Reserve University, School of Dentistry, Dept. of Orthodontics, Class of 1991) that were used in his Master's Thesis project, supplemented each corresponding tracing of William H. Golden (See Figure 3 for an example of one of Michael Taylor's soft-tissue tracing).

Michael M. Taylor developed lateral cephalometric standards for the pharyngeal soft-tissues and related structures using the same original Bolton lateral cephalograms that were part of the sample used to produce the Bolton Standard Templates (Broadbent et al., 1975). The sample that Michael M. Taylor used in his study consisted of sixteen males and sixteen females at each of the ages 6, 9, 12, 15, and 18 years, totalling one

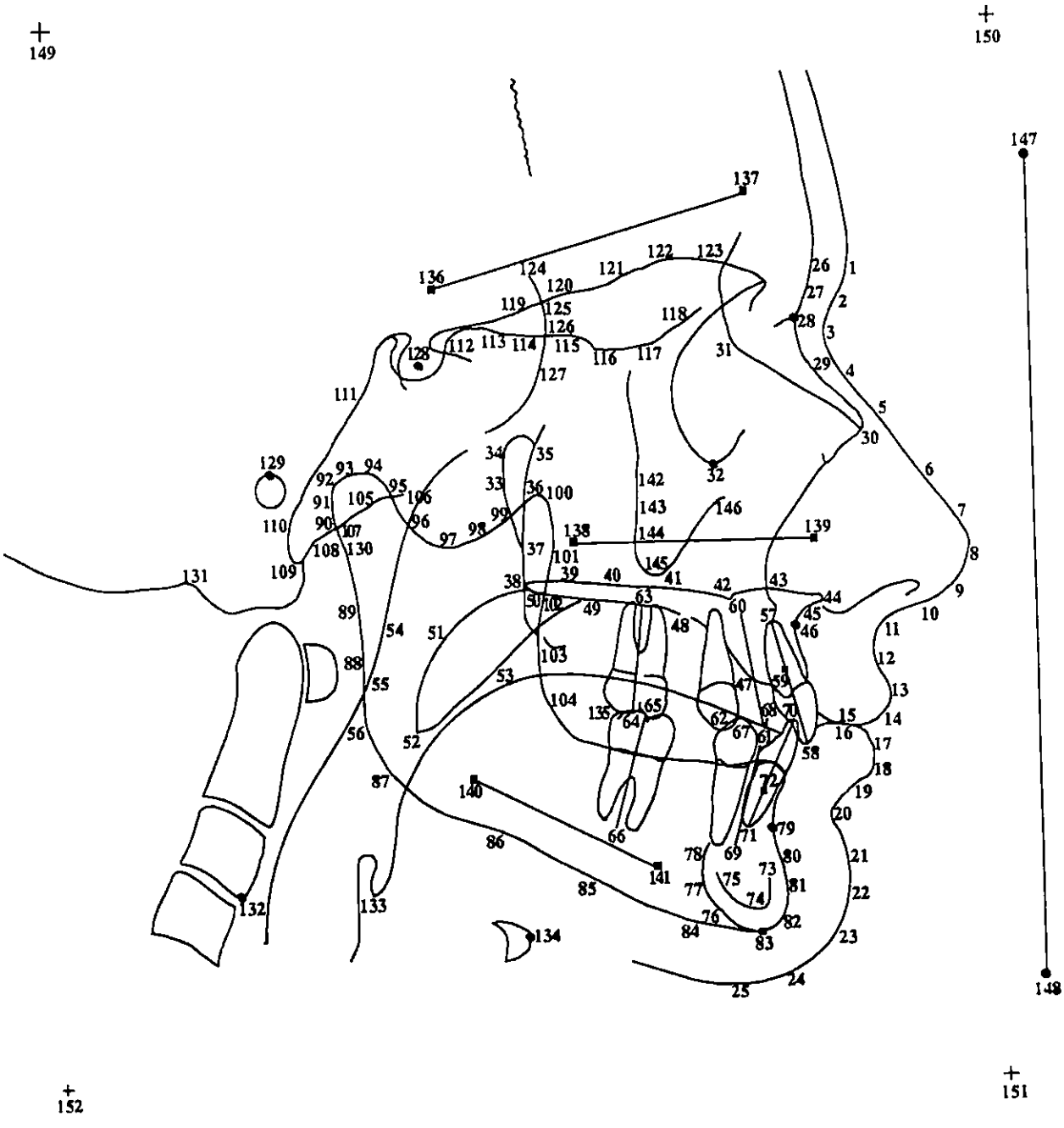


Figure 1. CWRU Cephalometric Regimen.

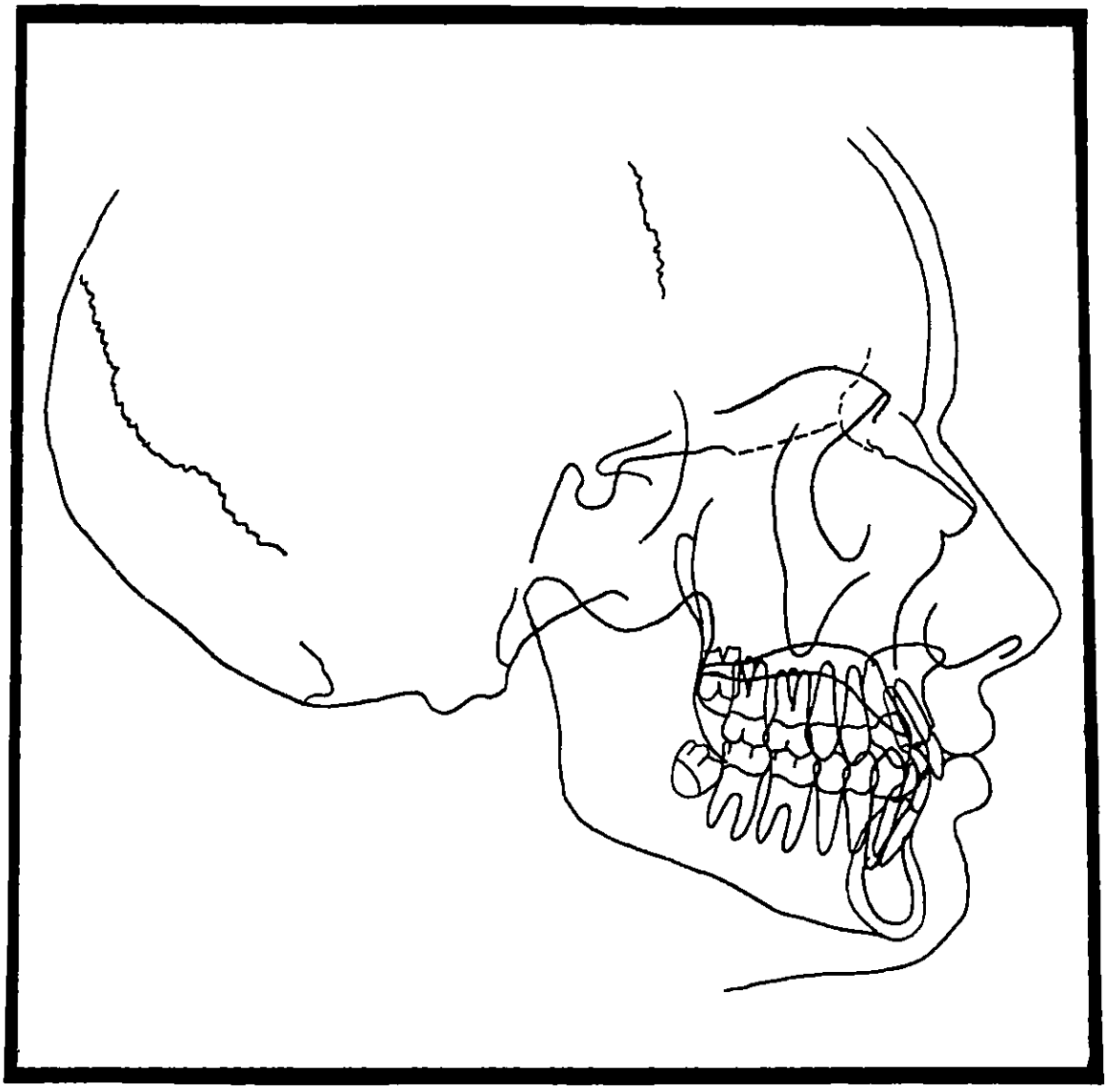


Figure 2. **An example of one of William H. Golden's cephalometric tracing.**

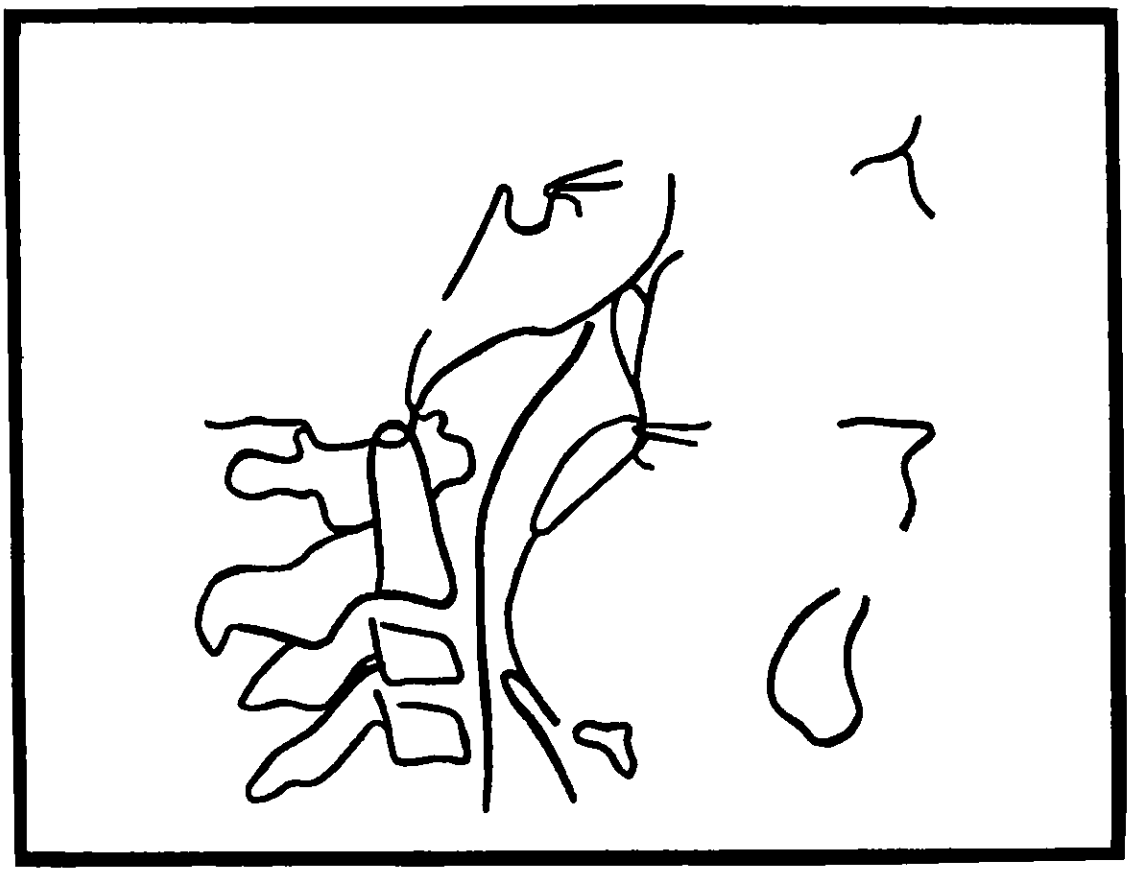


Figure 3. **An example of one of Michael M. Taylor's soft-tissue tracing.**

hundred and sixty lateral cephalometric radiographs. Taylor's raw data included hand-tracings of these selected 160 lateral cephalometric radiographs which specifically contained the following anatomical structures the pharynx, vertebrae (C1 through C4), soft palate, hyoid bone, posterior wall of the cranial base, Nasion, A-point, mandibular symphysis, Sella turcica, and pterygomaxillary fissure. The landmarks: pterygomaxillary fissure, Nasion, Sella, A-point, mandibular symphysis, and Basion, were used to precisely orient Taylor's tracings onto Golden's tracing, and also onto their corresponding cephalometric radiographs.

By superimposing the corresponding tracings of William H. Golden and Michael M. Taylor on the original lateral cephalogram of each subject, a third, blank, acetate tracing transparency (.003 inches in thickness) allowed for graphically mapping out, via a sharpened, and hard lead pencil, the total standardized series of 152 recognized cephalometric landmarks. This procedure permitted digitization of the 152 landmarks in an accurate manner. The third acetate tracing transparency was used to avoid making any alterations to the original tracings. The landmarks and measurements selected in this study are described in Appendix A and Appendix B, respectively.

As each of the 150 cephalograms and tracings were mapped out with the 152 landmarks, all landmarks were recorded into a computer for each subject by means of the X-Y coordinate digitizer, as already mentioned. An IBM computer was used to digitize all the landmarks in this study, while the

computer software utilized was Dentofacial Planner™ (Dentofacial Software Incorporated. P.O. Box 950, Station A, Toronto, Canada, M5W 1G5, tel: (416) 360-0494).

The coordinates of each cephalogram were used to generate 187 multiple linear and angular measurements that included variables relating to both hard- and soft-tissue structures. The 187 measurements were chosen to come from the most widely accepted and preferred cephalometric analyses currently used in orthodontic diagnosis and treatment planning (See Appendix B for a description of all the measurements selected from the various cephalometric analyses). Since several measurements across these various analyses repeated themselves (e.g., SNA, SNB, ANB, IMPA) and were (exactly) identical measurements, approximately 25 of the measurements were eliminated to avoid any repetition. This left a remaining net total of 162 (different) measurements.

All digitized tracings were then subjected to these various contemporary cephalometric analyses which included Jarabak, Ricketts, Downs, Harvold, Steiner, Reidel, Tweed, McNamara, Begg, Witts, and other commonly used soft-tissue analyses, such as Powell and Humphreys, Holdaway, Spradley et al., Merrifield, Burstone et al., and Gonzales analyses. The raw data (i.e., 162 measurements) for each subject were then transferred (using an IBM formatted diskette and Lotus 1-2-3™ as the computer software) into a second (separate) IBM computer. The data were then subjected to a principal-component analysis and factor analysis, using

a statistical data analysis package program abbreviated SPSS / PC+ Statistics™ 5.0.1 (Marketing Department, SPSS Inc., 444 North Michigan Avenue, Chicago, Illinois, 60611; Tel: (312) 329-3500). The purpose of this step was to allow for the extraction of a number of principal components or factors

Statistical Analysis:

Craniofacial morphology cannot be reduced satisfactorily to a collection of discrete, univariate measurements without offending the concept that skeletal growth is an integrated process (Bronowski and Long, 1951; Dulleneijr, 1972). As a working hypothesis, it is assumed that cephalometric measurements of different parts of the craniofacial skeleton are not independent, but are correlated in some undefined way best expressed as a vector of measurements (Howells, 1969).

It is feasible, if no assumptions of dependence or independence of the variables is made, to apply factor analysis to "explore" the patterns of co-variation among various skeletal areas (Horowitz et al,1976).

Hence, the present study employed a statistical approach to study the craniofacial complex. In particular, an "exploratory" principal-components was used to permit cephalometric data reduction. Thereafter, using factor analysis, a quest for the extraction of factors, from the 162 variables (which represent the hard- and soft-tissue measurements), was attempted.

The objective of principal-components analysis is to explain as much of the total variation in the data as possible with as few factors (i.e., principal components) as possible. The total variation in the data is mathematically defined as the sum of the sample variances. Conceptually, the total variation is a measure of the amount of uncertainty associated with the observations on all the variables. By "uncertainty", this refers to how much the observations on the units of study differ from one another.

The first principal component, PC(1), is the weighted linear combination of the variables that accounts for the largest amount of the total variation in the data (but will not exceed the total variation). That is, PC (1) is that linear combination of the X's, say:

$$\mathbf{PC}\,(1) = \mathbf{w}_{(1)1}\mathbf{X}_1 + \mathbf{w}_{(1)2}\mathbf{X}_2 + \ldots + \mathbf{w}_{(1)p}\mathbf{X}_p$$

(p = the number of variables)

where the weights $\mathbf{w}_{(1)1}, \mathbf{w}_{(1)2}, \ldots, \mathbf{w}_{(1)p}$ have been chosen to maximize the quantity:

$$\frac{\text{variance of PC (1)}}{\text{total variation}}$$

In other words, no other linear combination of the **X**'s will have as large a variance as PC (1). When the **X**'s are in standardized form (so that the

analysis is based on the correlation matrix), the proportion of the total variation in the data accounted for by PC (1) is:

$$\frac{\text{variance of PC (1)}}{\text{the number of variables (p)}}$$

The second principal component, PC(2), is the weighed linear combination of the variables that is uncorrelated with PC(1) and that accounts for the maximum amount of the remaining total variation not already accounted for by PC(1). In other words,

$$\mathbf{PC}\ (2) = \mathbf{w}_{(2)1}\mathbf{X}_1 + \mathbf{w}_{(2)2}\mathbf{X}_2 + \ldots + \mathbf{w}_{(2)p}\mathbf{X}_p$$

is the linear combination of the **X**'s that has the largest variance of all linear combinations which are uncorrelated with PC (1).

In general, the **i**th principal component PC(i) is the linear combination:

$$\mathbf{PC}\ (\mathbf{i}) = \mathbf{w}_{(i)1}\mathbf{X}_1 + \mathbf{w}_{(i)2}\mathbf{X}_2 + \ldots + \mathbf{w}_{(i)p}\mathbf{X}_p$$

that has the largest variance of all linear combinations which are uncorrelated with all of the previously determined **i** - 1 principal components. Actually, it is possible to determine as many principal components as there are original variables. However, in most practical applications, most of the total variance in the data is usually accounted for by the first few components. Furthermore, these components are chosen to

be mutually uncorrelated. Thus, the analytic goals of parsimony and independence are quite often achieved via this method.

In summary, principal components analysis is a separate technique from factor analysis. That is, it can be used whenever uncorrelated linear combinations of the observed variables are desired. All it does is transform a set of correlated variables to a set of uncorrelated variables (principal components).

The general goal of factor analysis is to reduce the total number of variables to the smallest possible number of sets. This creates a new group of completely separate measures (factors), each of which is independent of the other computed factors. Thus, the correlation between any two factors is zero. Applications of factor analysis to problems of human craniofacial morphology are in the reports of Howells (1951, 1957), Landauer (1962), Brown et al. (1965), Solow (1966), Brown (1967), Kanda and Kurisu (1967), and Rigal (1973).

In arithmetical terminology factor analysis is based on the hypothesis that correlations may be accounted for in terms of a linear model (see Table 3), the magnitude of each variable being determined by a number of factors operation additively.

In the arithmetical terminology, the object of factor analysis is to calculate the coefficients a_{jm} in the linear model, and such a set of coefficients is, in fact, the numerical result of a factor analysis.

Table 3. Linear model employed in factor analysis

$$z_{1i} = a_{11}F_{1i} + a_{12}F_{2i} + \ldots + a_{1m}F_{mi} + u_{1i}$$
$$z_{2i} = a_{21}F_{1i} + a_{22}F_{2i} + \ldots + a_{2m}F_{mi} + u_{2i}$$

.....

$$z_{ji} = a_{j1}F_{1i} + a_{j2}F_{2i} + \ldots + a_{jm}F_{mi} + u_{ji}$$

z_{ji} is the value of variable z_j in subject i. F_{mi} is the value of factor F_m in subject i. a_{jm} is the factor coefficient for variable z_j and factor F_m. u_{ji} accounts for the variation which is specific for variable z_j.

Factor analysis provides a useful tool for determining which particular skeletal components interact on a common developmental basis. Factors are drawn from the total number of variables until no further significant residual relationships are found among the independent measurements. After the most parsimonious set of factors is found, each variable is scaled in respect of its degree of participation in each factor, specified as a coefficient of loading. These loadings, like correlation coefficients, vary between 0 - 1 and are positive or negative depending on whether the variable participates directly or inversely in the factors. The squares of loadings define the percentage of variance accounted for by a variable, whence a high loading implies a strong contribution to a factor.

To assist in the decision of how many factors is necessary to represent the data, it is helpful to examine the percentage of the total variance explained by each. The total variance is the sum of the variance of each

variable. The total variance explained by each factor is called the Eigenvalue. The Eigenvalue is a mathematical property of a co-variance matrix and is used in relation to the decomposition of such a matrix. It is utilized both as a criterion of determining the number of factors to extract and as a measure of variance accounted for by a given dimension. For instance, it is common to suggest that only factors that account for variances greater than 1 (the Eigenvalue is greater than 1) be included in a model. Factors with a variance less than 1, are no better than a single variable, since each variable has a variance of 1.

Another tool that can assist in determining the number of factors to use in a model is the scree plot. This is a plot of the total variance associated with each factor. Typically, the plot shows a distinct break between the steep slope of the large factors and the gradual trailing off of the rest of the factors.This gradual trailing off is called the scree (Cattell, 1966) because it resembles the rubble that forms at the foot of a mountain. Experimental evidence indicates that the scree begins at the **k**th factor, where **k** is the true number of factors.

Moreover, the factor pattern matrix obtained in the extraction phase indicates the relationship between the factors and the individual variables, and it is usually difficult to identify meaningful factors based on this matrix. Often the variables and factors do not appear correlated in any interpretable pattern. Most factors are correlated with many variables. Since one of the goals of factor analysis is to identify factors that are substantively

meaningful (in the sense that they summarize sets of closely related variables), a rotation phase of factor analysis attempts to transform the initial matrix into one that is easier to interpret.

Rotation does not affect the goodness of fit of a factor solution. That is, although the factor matrix changes, the communalities and the percentage of total variance explained do not change. The percentage of variance accounted for by each of the factors does, however, change. Rotation redistributes the explained variance for the individual factors. Different methods of rotation may actually result in the identification of somewhat different factors.

The most commonly used method for orthogonal (i.e., there is a 90 degree angle between the two new axes) rotation is the varimax rotation method, and thus was used in the present study. This method was used because it attempts to minimize the number of variables that have high loadings on a factor. Hence, this should enhance the interpretability of the factors.

Summarizing, therefore, it is in the factor extraction phase where the number of common factors needed to adequately describe the data is determined. Essentially, a search for which variables are highly correlated with the different factors is performed. This decision is based on eigenvalues, a scree plot, and percentage of the total variation accounted for by different numbers of factors. In order to achieve more interpretability, a rotation to alter the initial factor solution is carried out.

Data Analysis:

The main justification for the application of factor analysis in the study of craniofacial variables seems to be the analysis of the associations between different sources of variability represented in the correlation matrix, for example, between the length of the lower jaw and the length of the upper jaw. While the number of factors and their relative importance may be influenced by the investigator in the choice of variables, the relationship between the factors expresses properties in the data that cannot be influenced by the investigator. The individual sources of variability may be more or less well-represented in the set of variables but, once present, their relation to other sources of variability is not affected by further additions of variables. Additionally, in the analysis of craniofacial variables, although the investigator may influence the number, identity, and magnitude of the factors in selecting the variables, he does not know exactly what vector configuration (i.e., linear combination) will result. Not all sources of variability are, therefore, equally well defined in the original set of variables. The common practice of using factor analysis for the detection and subsequent measurement of hidden biological factors seems less fortunate, because the factors will often be fortuitous, reflecting the bias of the investigator.

According to Solow (1971), the most rewarding use of factor analysis in cephalometry seems to be its application to the analysis of the

relationships between different sources of variability. For technical reasons, this analysis should be carried out in two steps: first, a selection of representative variables based upon one or more exploratory factor analyses of the initial set of variables, and then a final analysis of these selected variables. This solution will then provide the key to understanding of the source of variability influencing each of the associations in the original matrix of correlations.

Thus, the data analysis in this study was carried out in a similar fashion. The original 187 variables were initially reduced to 162 by the investigator because of (identical) repetition of measurements, as already mentioned. The resulting different 162 measurements, were then subjected to an "initial" exploratory principal components and factor analysis to assess the associations between the craniofacial variables. Furthermore, a correlation (coefficients) matrix for the remaining 162 variables was developed as well. Once accomplished, an examination of the initial resulting factor matrix (i.e., consisting of variables having a factor loading $\geq$ 0.60, and Eigenvalues greater than 1) was performed to eliminate all variables which were similar (e.g., two or more variables having identical factor loading values for the same factor), or highly related (e.g., two or more variables having factor loading values of closely related magnitude) to other variables for a given factor. A similar approach was performed using the correlation matrix. All values greater than 0.90 (r score) were observed. Any two variables that were related by an r score of this amount or greater

were recorded, along with the corresponding r score, and then were assessed on the basis of how related these variables were to each other. Employing such a technique, via an initial exploratory factor analysis, and an assessment of the correlation matrix, allowed the investigator to select subjectively which variables could be further eliminated. This decision was based on whether the involved variables were measuring more or less the same entity of the craniofacial complex, as evidenced by identical or closely related r scores, or factor loading scores for a given factor.

The selected (remaining) variables so obtained were then used in a final principal components and factor analysis. In this second instance, several criteria were used to determine the factor pattern solution. In this case, a scree plot was used to determine what the cut-off point for the Eigenvalue was. Following the determination of this cut-off point, a final factor analysis, pursuing a "forced" and "restricted" factor solution of the factors, was then performed.

Therefore, this allowed for a diminished number of extracted factors (which is our main objective), yet simultaneously still accounting for a large portion of the total variability. Each factor was then assessed to determine and explain the underlying dimension(s) being measured based on what the associated variables were actually measuring and how they were related to each other. This was done for each of the extracted factors. For a factor to be deemed significant, it would have had to satisfy two criteria. One criterion being, a minimum of at least three variables would have to be

present to define a factor. Another criterion being, Eigenvalues had to be greater than or equal to 2.

Lastly, the selection of names for the total factors extracted was achieved. The selection of factor names was influenced by the nature of the measurements displaying the largest loadings or correlations with each factor under consideration. For each factor, loadings of single measurements or groups of measurements stood out from the others. The interpretation and subsequent naming of the factors then centered around this particular measurement or group of measurements provided that the interpretation was consistent with the remaining measurements loading on a given factor.

Error Of The Method: Double-Determination:

To examine the accuracy of the digitizing system in terms of reproducibility of the coordinate measurements, 20 randomly selected lateral cephalometric radiographs (i.e., 2 films from each age and gender group) were redigitized on one other separate occasion. These radiographs were digitized approximately 20 days following the completion of digitization of the final lateral cephalogram from the main sample. Fifty randomly selected variables were then submitted to a matched paired t-test, and correlation coefficients.

RESULTS

Tests For Error Technique:

Observation of the resulting data for the double-determination process, indicated that for the measurements, there was no significant difference (at $p<0.05$) between the two sets of cephalometric data. That is, there was an insignificant "mean difference" between the two sets of data for any given variable, and correlation coefficients were also high. A portion of the results and data from the double-determination process, is presented in Table 4.

Initial Statistics:

A total of twenty factors were extracted in the initial round of exploratory principal components analysis, using Eigenvalues ≥ 1. Actually twenty-two factors were extracted, but since factors 17 and 21 did not have any associated variables with factor loadings ≥ 0.60, they were not observed as being significant. The varimax rotated factor matrix solutions, including the corresponding factor loadings for the initial exploratory principal components analysis, are presented in Tables 5 through 24. Each table has 3 columns with the first column in each table denoting the names

Table 4. **A partial display of the Double-Determination data is depicted.**

Variable	Mean Difference	t-Statistic	p-Value	Corr. Coeff.
Articular Angle	-0.380	-2.850	0.010	0.996
Incisor Overbite	-0.215	-2.770	0.012	0.966
OP to Xi-Point	0.310	2.720	0.014	0.991
Saddle Angle	0.325	3.350	0.003	0.994
L1 Extrusion	0.105	2.670	0.015	0.965

Note: There is no significant difference between corresponding cephalometric measurements at $p<0.05$. Also, there exists a high correlation between these corresponding cephalometric measurements.

of all the associated variables that have loaded high (≥ 0.60) for the given factor. The second column denotes the factor loading values for each involved variable. The third column presents the specific variables, if present, that replaced an identical or closely related variable, as shown in the corresponding row in column one. For example, in Table 5A, the variable: Total face height, was replaced by Anterior face height because these measurements had identical factor loadings, as well as a high degree of correlation between them.

Based on the initial factor pattern matrix, a total sum of 28 variables were eliminated because of identical or highly related factor loadings between two or more variables, which indicated the involved variables, more or less, were measuring the same entity within the craniofacial complex.

For factor 1, a total of 13 measurements were deemed redundant, and therefore were eliminated from any further factor analysis. These included (in order as seen in the corresponding table): Total face height (TFH), Y-axis length, Mandibular unit length, Maxillary unit length, Posterior face height, Lower face height (LFH), Lower 1 to GoGn', PNS to A-point, Body length, Anterior cranial length, Sella-nasion, Posterior cranial base, Unit difference.

Factor 2 had two redundant variables, which were the following measurements: Lower 1 to GoGn, and Pogonion & Lower 1 to NB.

For Factor 3, three measurements were eliminated. These being: SNPg, SN to Facial Plane, SN to GoGn.

Table 5A. Initial factor analysis solution for Factor 1.

VARIABLES	FACTOR 1	REPLACEMENT VARIABLE
ANTERIOR FACE HEIGHT	0.97	
TOTAL FACE HEIGHT	0.97	ANTERIOR FACE HEIGHT
FACIAL DEPTH	0.97	
MANDIBULAR LENGTH	0.95	
Y-AXIS LENGTH	0.95	FACIAL LENGTH
FACIAL LENGTH	0.95	
MANDIBULAR UNIT LENGTH	0.95	MANDIBULAR LENGTH
MIDFACE LENGTH	0.92	
MAXILLARY UNIT LENGTH	0.92	MIDFACE LENGTH
POSTERIOR FACE HEIGHT	0.91	POSTERIOR FACE HEIGHT
CORPUS LENGTH	0.90	
LOWER FACE HEIGHT	0.90	LOWER ANTERIOR FACE HEIGHT
LOWER ANTERIOR FACE HT.	0.90	
LOWER ANT. DENTAL HGT.	-0.90	
POSTERIOR FACE HEIGHT	0.90	
LOWER 1 TO GOGN'	0.90	LOWER ANT. DENTAL HEIGHT
PNS TO A-POINT	0.89	PNS TO ANS
UPPER FACIAL HEIGHT	0.89	
BODY LENGTH	0.89	CORPUS LENGTH
NOSE TO CHIN LENGTH	0.89	
ANTERIOR CRANIAL LENGTH	0.89	ANTERIOR CRANIAL BASE
PNS TO ANS	0.88	

Note: Column one represents variables that have loaded onto the involved factor in the initial round of factor analysis. Column two represents the corresponding factor loadings. Column three represents related variables that replaced corresponding variables in column one. (The same format applies in Tables 5B through 24 that follow).

Table 5B. Initial factor analysis solution for Factor 1 (continued).

VARIABLES	FACTOR 1	REPLACEMENT VARIABLE
ANTERIOR CRANIAL BASE	0.88	
SELLA-NASION	0.88	ANTERIOR CRANIAL BASE
BASION-NASION	0.88	
RAMUS HEIGHT	0.87	
NOSE-LENGTH	0.85	
LOWER POST. DENTAL HT.	-0.82	
UPPER POST. DENTAL HT.	-0.80	
POSTERIOR CRANIAL BASE	0.80	POSTERIOR CRANIAL BASE
LOWER SOFT-TISSUE FACE HT.	0.79	
ANS TO NOSE TIP	0.79	
UPPER SOFT-TISSUE FACE HT.	0.78	
LOWER LIP LENGTH	0.78	
POSTERIOR CRANIAL BASE	0.77	
MAX.-MAND. DIFFERENTIAL	0.75	
SE	0.73	
PORION LOCATION	0.73	
UNIT DIFFERENCE	0.70	MAX.-MAND. DIFFERENTIAL
UPPER ANT. DENTAL HEIGHT	-0.70	
A-POINT TO SOFT-TISS. A PT.	0.66	
SL	0.64	
UPPER LIP LENGTH	0.61	
NOSE PROMINENCE	0.61	
POGONION TO NB	-0.60	

Table 6. Initial factor analysis solution for Factor 2.

VARIABLES	FACTOR 2	REPLACEMENT VARIABLE
LOWER 1 TO NB	0.95	
FMIA	-0.90	
LOWER 1 TO OCCLUSAL PL.	0.89	
LOWER 1 TO GOGN	0.87	LOWER 1 TO MANDIBULAR PL.
SN TO LOWER 1	-0.87	
LOWER 1 TO MAND. PLANE	0.87	
LOWER 1 TO PALATAL PLANE	-0.86	
LOWER 1 TO NB	-0.84	
LOWER 1 TO APO	0.76	
UPPER 1 TO FACIAL PLANE	0.74	
LOWER 1 TO FACIAL PLANE	-0.74	
LOWER 1 TO APO'	-0.74	
UPPER 1 TO APO'	-0.72	
POGONION & LOWER 1 TO NB	-0.66	LOWER 1 TO FACIAL PLANE

Table 7. Initial factor analysis solution for Factor 3.

VARIABLES	FACTOR 3	REPLACEMENT VARIABLE
SNB	0.93	
SOFT-TISSUE FACIAL ANGLE	0.90	
SNPG	0.87	SN TO FACIAL PLANE
SN TO FACIAL PLANE	0.87	SNB
SNA	0.83	
Y-AXIS TO SN	-0.79	
SN TO FRANKFORT HORIZ.	-0.69	
SN TO GOGN	-0.68	SN TO MANDIBULAR PLANE
SN TO MANDIBULAR PLANE	-0.67	
SL	0.67	
POST. FACE HT.: ANT. FACE HT.	0.66	
SN TO OCCLUSAL PLANE	-0.64	
BOLTON TO FACIAL PLANE	0.60	

Table 8. Initial factor analysis solution for Factor 4.

VARIABLES	FACTOR 4	REPLACEMENT VARIABLE
ANB	-0.93	
A-POINT CONVEXITY	0.88	ANGLE OF CONVEXITY
SKEL. PROFILE CONVEXITY	0.88	A-POINT CONVEXITY
ANGLE OF CONVEXITY	-0.87	
AB PLANE ANGLE	-0.86	
UPPER 1 TO NA'	-0.77	

Table 9. Initial factor analysis solution for Factor 5.

VARIABLES	FACTOR 5	REPLACEMENT VARIABLE
FACIAL DEPTH ANGLE	0.83	FACIAL CONVEXITY
FACIAL CONVEXITY	0.83	
FACIAL ANGLE	0.83	FACIAL CONVEXITY
Y-AXIS	-0.78	
MAXILLARY DEPTH	0.75	
FRANKFORT HOR. TO NA	0.75	MAXILLARY DEPTH
CRANIAL DEFLECTION	0.74	
RAMUS POSITION	-0.73	
SN TO FRANKFORT HORIZ.	0.69	
PALATAL PLANE	-0.64	
MANDIBULAR PLANE ANGLE	-0.62	

Table 10. Initial factor analysis solution for Factor 6.

VARIABLES	FACTOR 6	REPLACEMENT VARIABLE
UPPER 1 TO APO'	0.93	
UPPER 1 TO FRANKFORT HZ.	0.91	
UPPER 1 TO SN	0.90	UPPER 1 TO FRANKFORT HORIZ.
UPPER 1 TO PALATAL PLANE	0.89	UPPER 1 TO FRANKFORT HORIZ.
UPPER 1 TO NA	-0.87	
INTERINCISAL	0.82	
WITS ANALYSIS	-0.62	

Table 11. Initial factor analysis solution for Factor 7.

VARIABLES	FACTOR 7	REPLACEMENT VARIABLE
UPPER LIP THICKNESS	0.94	
SN TO H-LINE	0.93	UPPER LIP THICKNESS
UL DISTANCE	-0.86	
LOWER LIP THICKNESS	0.76	
UPPER LIP CURL	0.72	
LOWER LIP TO E-PLANE	0.65	
UPPER LIP TO E-PLANE	0.61	

Table 12. Initial factor analysis solution for Factor 8.

VARIABLES	FACTOR 8	REPLACEMENT VARIABLE
MANDIBULAR PROGNATHISM	0.89	
ZERO MERIDIAN	0.88	MANDIBULAR PROGNATHISM
POGONION TO N-PERPEND.	0.86	
A-POINT TO N-PERPEND.	0.81	
SP DISTANCE	-0.71	
MAXILLARY PROGNATHISM	0.65	

Table 13. Initial factor analysis solution for Factor 9.

VARIABLES	FACTOR 9	REPLACEMENT VARIABLE
FACIAL TAPER	-0.94	
LOWER GONIAL	0.83	
MANDIBULAR PLANE ANGLE	0.69	
SN TO MANDIBULAR PLANE	0.64	
SN TO GOGN	0.64	SN TO MANDIBULAR PLANE

Table 14. Initial factor analysis solution for Factor 10.

VARIABLES	FACTOR 10	REPLACEMENT VARIABLE
UPPER FACE HT.: LOWER FACE HT	0.90	
SN TO PALATAL PLANE	0.69	
LOWER FACIAL HEIGHT ANGLE	-0.67	

Table 15. Initial factor analysis solution for Factor 11.

VARIABLES	FACTOR 11	REPLACEMENT VARIABLE
ARTICULAR ANGLE	0.88	
UPPER GONIAL ANGLE	-0.86	
GONIAL ANGLE	-0.77	

Table 16. Initial factor analysis solution for Factor 12.

VARIABLES	FACTOR 12	REPLACEMENT VARIABLE
MENTOLABIAL SULCUS	0.83	
MENTOLAB. SULCUS TO H-LINE	0.82	
B-POINT TO SOFT-TISSUE B PT.	-0.74	
ILS DISTANCE	-0.60	

Table 17. Initial factor analysis solution for Factor 13.

VARIABLES	FACTOR 13	REPLACEMENT VARIABLE
NASOMENTAL ANGLE	0.90	
NASOFACIAL ANGLE	0.80	
SOFT TISSUE CONVEXITY	0.73	

Table 18. Initial factor analysis solution for Factor 14.

VARIABLES	FACTOR 14	REPLACEMENT VARIABLE
INCISOR OVERJET	0.72	
MAXILLARY ARCH LENGTH	0.60	

Table 19. Initial factor analysis solution for Factor 15.

VARIABLES	FACTOR 15	REPLACEMENT VARIABLE
OCCLUSAL PLANE TO XI PT.	-0.71	
OCCLUSAL PLANE TO GOGN	0.71	
OCCLUSAL PLANE INCLIN.	0.70	

Table 20. Initial factor analysis solution for Factor 16.

VARIABLES	FACTOR 16	REPLACEMENT VARIABLE
CRANIAL BASE ANGLE	-0.61	

Table 21. Initial factor analysis solution for Factor 18.

VARIABLES	FACTOR 18	REPLACEMENT VARIABLE
POGONION TO SOFT-TISS. PG.	0.84	

Table 22. Initial factor analysis solution for Factor 19.

VARIABLES	FACTOR 19	REPLACEMENT VARIABLE
VERTICAL LIP TO CHIN	0.69	

Table 23. Initial factor analysis solution for Factor 20.

VARIABLES	FACTOR 20	REPLACEMENT VARIABLE
INTERLABIAL GAP	0.70	

Table 24. Initial factor analysis solution for Factor 22.

VARIABLES	FACTOR 22	REPLACEMENT VARIABLE
CANINE RELATION	0.63	

Factor 4 had two redundant measurements which allowed for elimination. The measurements were: A-point Convexity, and that which assessed the Skeletal profile convexity.

In Factor 5, there were three measurements that were accounted for by 2 other variables for Factor 5. These repetitious measurements included: Facial Depth angle, Facial angle, and Frankfort horizontal to Nasion-A point.

Factor 6 had two redundant measurements and included: Upper 1 to SN, Upper 1 to Palatal plane.

Finally, for Factors 7, 8, and 9, only 1 measurement could be eliminated from further study. These measurements were: SN to H-Line, Zero Meridian, and Sella-Nasion to GoGn plane, respectively.

Using the correlation coefficients matrix (See Table 25 for a display of a portion of the correlation matrix; see Appendix C for display of entire correlation matrix and Initial Factor Analysis Solution), a total of 28 similar measurements were also deemed redundant and were therefore eliminated. The elimination of these variables was possible because the involved variables were highly correlated, as indicated by an r score ($\geq .90$), to another given variable that was different, yet described a similar dimension of the craniofacial complex. Examples of these measurements consisted of the following: Lower 1 extrusion, Pogonion and Lower 1 to Nasion-B point, Zero Meridian, PNS to A-point, Sella-Nasion to Pogonion, Sella-Nasion to H-Line, Upper 1 to palatal plane, Upper 1 to Sella-Nasion, which resembled those eliminated via factor loading comparisons.

In summary, observation of the initial factor analysis loading scores, in combination with the Correlation Coefficients Matrix, permitted the elimination of 28 measurements which were redundant enough to allow for their disposal. Hence, a net total of 134 remaining measurements were deemed indispensable.

Final Statistics:

Following a second round of factor analysis of these 134 unique measurements, two criteria were utilized to define whether a factor was significant or not (i.e., Eigenvalue ≥ 2.0, as determined by the scree plot, and at least three variables had to load (≥ 0>52) onto a given factor), (See Figure 4 for a graphical display of the scree plot utilized, and Table 26 for a display of the different Eigenvalues for each of the obtained factors). Preparation of the final (varimax-orthogonal rotated) factor matrix solution (See Appendix D) allowed for the extraction of 14 factors. At this Eigenvalue (≥ 2.0), precisely 83.4 % of the common variance was accounted for by 14 factors, each of which contributed 1.8 % or above. Each factor described a unique and different dimension of the craniofacial complex. Table 26 shows the percentage contribution of the varimax factors to the common variance. An arbitrary factor loading score of 0.52 and above, was considered significant and thus any variables loading onto a factor of this amount was observed. This factor loading value was chosen after critical assessment of the factor pattern matrix by the investigator, because it allowed for more items to load onto the different factors. Also, this loading score allowed for a total of three

Table 25. A summary display of the correlation-coefficients matrix used to further eliminate redundancy among measurements.

VARIABLE ONE	VARIABLE TWO	r	r-squared
ANTERIOR CRANIAL LENGTH	SELLA-NASION	0.91	0.83
A-POINT CONVEXITY	ANGLE OF CONVEXITY	-0.99	0 98
BODY LENGTH	CORPUS LENGTH	0.98	0.96
FACIAL ANGLE	FACIAL CONVEXITY	1.00	1.00
FRANKFORT HORIZ. TO NA	MAXILLARY DEPTH	1.00	1.00
LOWER 1 EXTRUSION	INCISOR OVERBITE	-0.99	0.98
LFH	LOWER ANTERIOR FACE HGT.	1.00	1.00
LOWER 1 TO GOGN'	LOWER ANTERIOR DENTAL HT.	-0.97	0.94
LOWER FACE HEIGHT	LOWER ANTERIOR FACE HGT.	0.99	0 98
LOWER FACE HEIGHT	LFH	0.99	0.98
LOWER 1 TO GOGN	LOWER 1 TO MAND. PLANE	0.99	0.98
MANDIBULAR UNIT LENGTH	FACIAL LENGTH	0.97	0.94
MANDIBULAR UNIT LENGTH	MANDIBULAR LENGTH	1.00	1.00
MAXILLARY UNIT LENGTH	MIDFACE LENGTH	0.99	0.98
PNS TO A-POINT	PNS TO ANS	0.95	0.90
POGONION & LOWER 1 TO NB	LOWER 1 TO FACIAL PLANE	0.98	0.96
POSTERIOR CRANIAL BASE	POSTERIOR CRANIAL BASE	0.96	0.92
POSTERIOR FACE HEIGHT	POSTERIOR FACE HEIGHT	0.94	0.88
SELLA-NASION	ANTERIOR CRANIAL BASE	1.00	1.00
SKEL. PROFILE CONVEXITY	ANGLE OF CONVEXITY	-0.99	0.98
SKEL. PROFILE CONVEXITY	A-POINT CONVEXITY	1.00	1.00
SN TO FACIAL PLANE	SNB	0.96	0.92
SN TO GOGN	SN TO MANDIBULAR PLANE	0.97	0.94
SN TO H-LINE	UPPER LIP THICKNESS	0.99	0.98
SNPG	SN TO FACIAL PLANE	1.00	1.00
SNPG	SNB	0.96	0.92
TFH	FACIAL LENGTH	0.97	0.94
TFH	ANTERIOR FACE HEIGHT	1.00	1.00
UNIT DIFFERENCE	MAX.-MAND. DIFFERENTIAL	0.96	0.92
UPPER 1 TO PALATAL PLANE	UPPER 1 TO FRANKFORT HOR.	0.98	0.96
UPPER 1 TO SN	UPPER 1 TO FRANKFORT HOR.	0.99	0.98
UPPER 1 TO SN	UPPER 1 TO PALATAL PLANE	0.99	0.98
Y-AXIS LENGTH	MANDIBULAR LENGTH	0.98	0.96
Y-AXIS LENGTH	MANDIBULAR UNIT LENGTH	0.97	0.94
Y-AXIS LENGTH	TFH	0.97	0.94
Y-AXIS LENGTH	ANTERIOR FACE HEIGHT	0.97	0.94
ZERO MERIDIAN	MANDIBULAR PROGNATHISM	0.96	0.92

Note: The 28 variables in column one were eliminated from further study. The variables in column two replaced variables in column one.

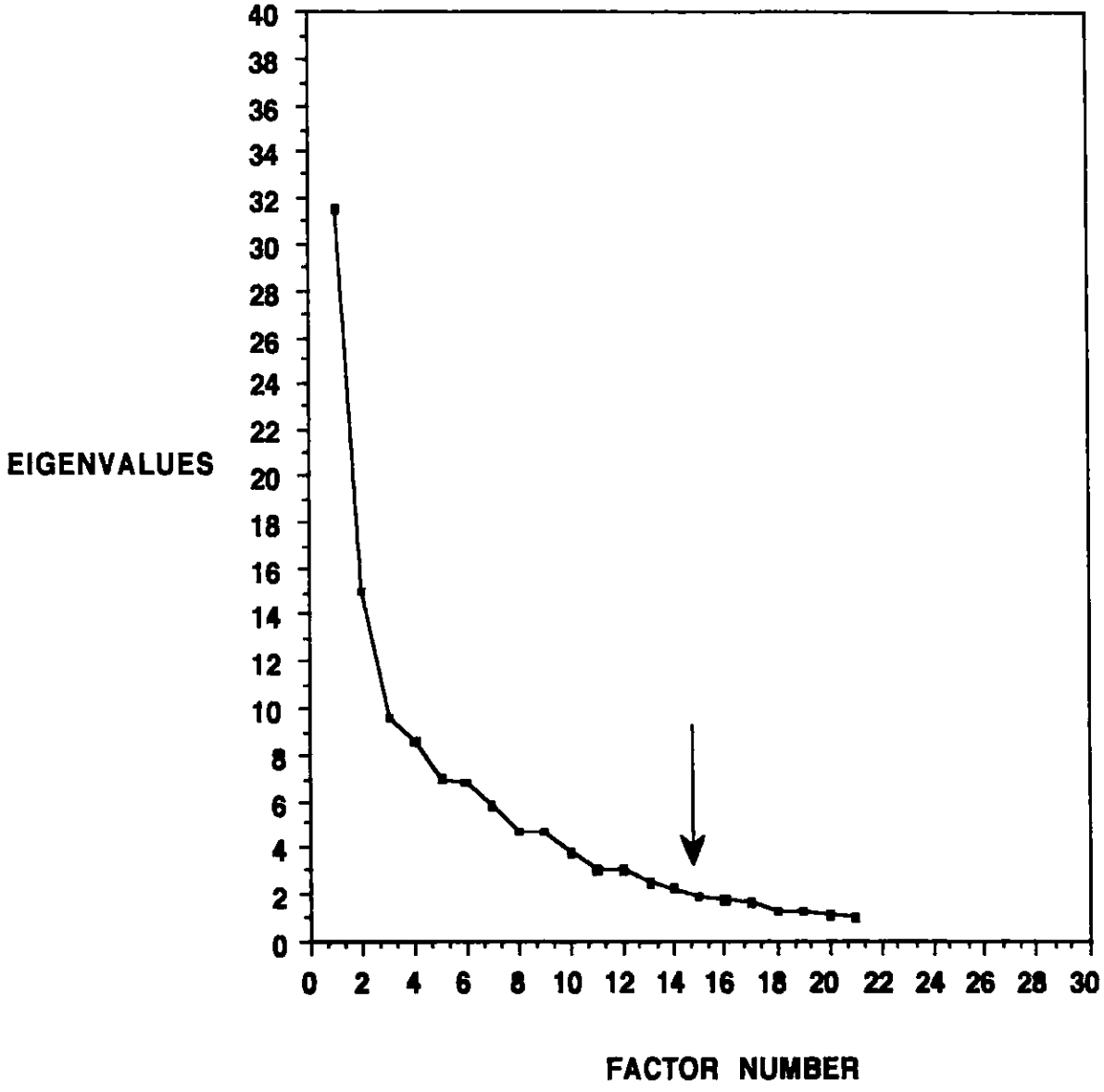


Figure 4. Scree plot. Arrow indicates where the distinct break in the graph occurs (i.e., the true number of factors).

Table 26. Percentage contribution of the varimax factors to the common variance.

FACTOR	EIGENVALUE	% OF VARIANCE	CUMULATIVE %
1	31.49	24.20	24.20
2	15.07	11.60	35.80
3	9.62	7.40	43.20
4	8.62	6.60	49.80
5	6.94	5.30	55.20
6	6.81	5.20	60.40
7	5.85	4.50	64.90
8	4.71	3.60	68.50
9	4.64	3.60	72.10
10	3.81	2.90	75.00
11	3.07	2.40	77.40
12	2.99	2.30	79.70
13	2.54	2.00	81.70
14	2.31	1.80	83.40
15	1.94	1.50	84.90
16	1.74	1.30	86.30
17	1.59	1.20	87.50
18	1.28	1.00	88.50
19	1.22	0.90	89.40
20	1.18	0.90	90.30
21	1.05	0.80	91.10

variables to load onto factor 14. our last factor. Using a factor loading of 0.60, would allow for only 1 variable to load onto factor 14. Thus, 0.52 was the highest factor loading score that provided a minimum of 3 variables to load onto each factor.

In a factor analysis solution, the more variables that load onto the distinct factors, the better each factor is defined. A factor matrix was then constructed based on the above criteria. The remaining 7 factors (i.e., 15 through 21; See Table 26) contributed another 7.7 % (for a total of 91.1 %) of the common variance, less than 1.5 % for each. Also, less than three variables loaded onto each of these factors. Therefore, these factors were not considered significant enough to warrant further assessment. For all of the (significant) 14 factors, Tables 27 through 40 depict the variables that associated with each factor, as well as the significant loadings (factor co-efficients) on the various measurements, (For a summary of the steps involved in obtaining the 14 factors, see figure 5).

Interpretation:
(See Figures 6 - 19 for a graphical display of the associated measurements for each factor)

Factor 1

The entire set of variables that loaded onto factor 1, were all linear measurements. Thus, factor 1 essentially relates to general size of the craniofacial complex (i.e., involving the hard- and soft-tissues), and contributes 24.2 % of the common variance. The first factor was identified as

relating to "**vertical and anteroposterior aspects of craniofacial development**", based on the associated measurements. Factor 1 is a composite of the interactions from, especially, the high loadings which relate to the facial complex. These variables correlated in a positive manner with factor 1. In particular, these linear measurements were: Anterior face height, Facial depth, Mandibular length, Facial length, Midface length, Corpus length, Posterior face height, and Upper face height. The remaining variables which correlated in a positive manner, but to a lesser extent, were: Lower anterior face height, Nose to chin length, PNS to ANS, Basion to Nasion, Ramus height, Anterior cranial base, Nose length, ANS to nose tip, Upper soft-tissue face height, Lower soft-tissue face height, Posterior cranial base, Lower lip length, Maxillary-Mandibular difference, SE, Porion Location, A-point to soft-tissue A-point, SL, Upper lip length, Nose prominence, Maxillary arch length, and Upper lip length. Negatively correlated variables included: Lower anterior dental height, Upper posterior dental height, Lower posterior dental height, Upper anterior dental height, and Pogonion to NB.

Factor 2

With a contribution of 11.6 % of the common variance, this was identified as a factor representing the "**lower incisor position**", from the positive factor loadings of the linear and angular measurements: Lower 1 to NB, Lower 1 to occlusal plane, Lower 1 to mandibular plane, Upper 1 to

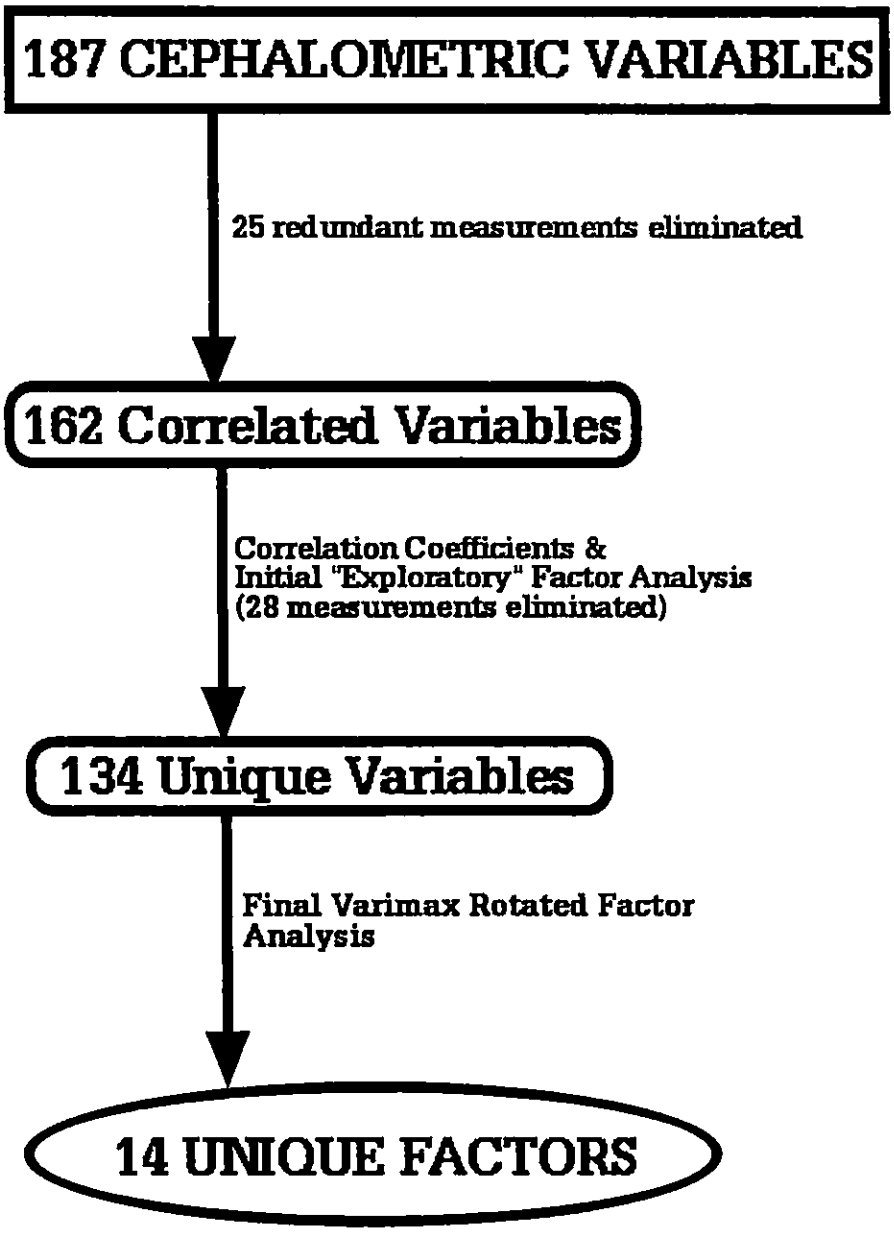


Figure 5. A flow-chart summarizing the various steps used to derive the 14 factors from the initial 187 measurements.

Table 27. Varimax rotated factor solution for Factor 1.

VARIABLES	FACTOR 1
ANTERIOR FACE HEIGHT	0.97
FACIAL DEPTH	0.97
MANDIBULAR LENGTH	0.95
FACIAL LENGTH	0.95
MIDFACE LENGTH	0.91
CORPUS LENGTH	0.90
POSTERIOR FACE HEIGHT	0.90
UPPER FACE HEIGHT	0.90
LOWER ANT. DENTAL HGT.	-0.89
LOWER ANT. FACE HEIGHT	0.89
NOSE TO CHIN LENGTH	0.89
PNS TO ANS	0.88
BASION TO NASION	0.88
RAMUS HEIGHT	0.87
ANTERIOR CRANIAL BASE	0.86
NOSE LENGTH	0.86
ANS TO NOSE TIP	0.80
UPPER POST. DENTAL HGT.	-0.80
LOWER POST. DENTAL HGT.	-0.79
UPPER SOFT TISSUE FACE HT.	0.79
LOWER SOFT TISSUE FACE HT.	0.79
POSTERIOR CRANIAL BASE	0.79
LOWER LIP LENGTH	0.78
MAX.-MAND. DIFFERENTIAL	0.76
SE	0.75
PORION LOCATION	0.74
UPPER ANT. DENTAL HGT.	-0.70
A-POINT TO SOFT-TISSUE A	0.70
SL	0.64
POGONION TO NB	-0.62
UPPER LIP LENGTH	0.61
NOSE PROMINENCE	0.61
MAXILLARY ARCH LENGTH	0.54
UPPER LIP LENGTH	0.53

Note: Column one represents the variables that loaded onto the involved factor, while column two displays the corresponding factor loadings.

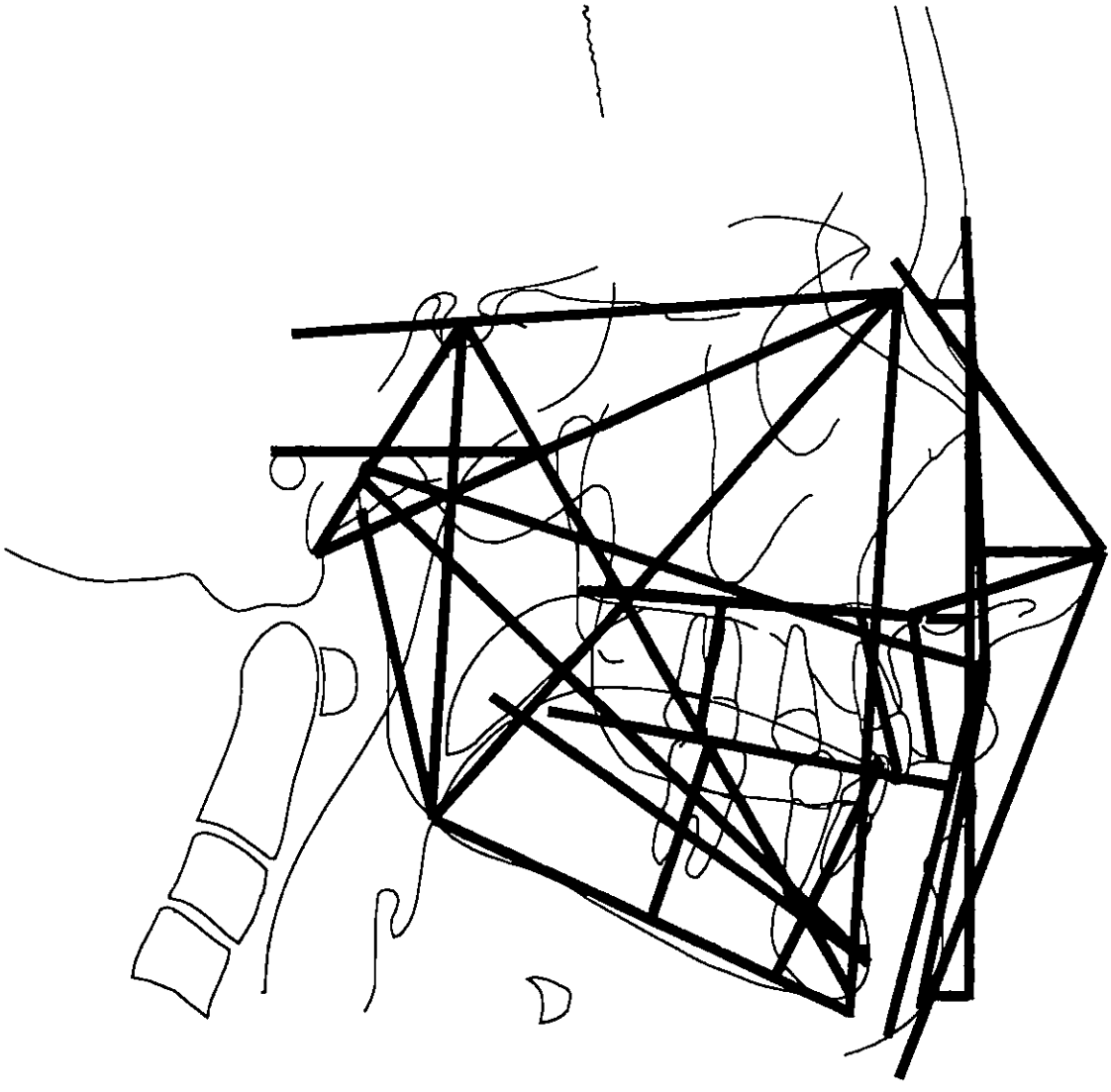


Figure 6. **Scatter of measurements for Factor 1 rotation solution. Contributes 24.2% of the common variance. (Vertical and AP aspects of craniofacial development).**

Table 28. Varimax rotated factor solution for Factor 2.

VARIABLES	FACTOR 2
LOWER 1 TO NB	0.94
FMIA	-0.89
SN TO LOWER 1	-0.86
LOWER 1 TO OCCLUSAL PL.	0.86
LOWER 1 TO PALATAL PL.	-0.86
LOWER 1 TO NB'	-0.86
LOWER 1 TO MAND. PLANE	0.84
UPPER 1 TO FACIAL PLANE	0.81
UPPER 1 TO APO'	-0.78
LOWER 1 TO FACIAL PLANE	-0.77
LOWER 1 TO APO'	-0.75
LOWER 1 TO APO	0.74

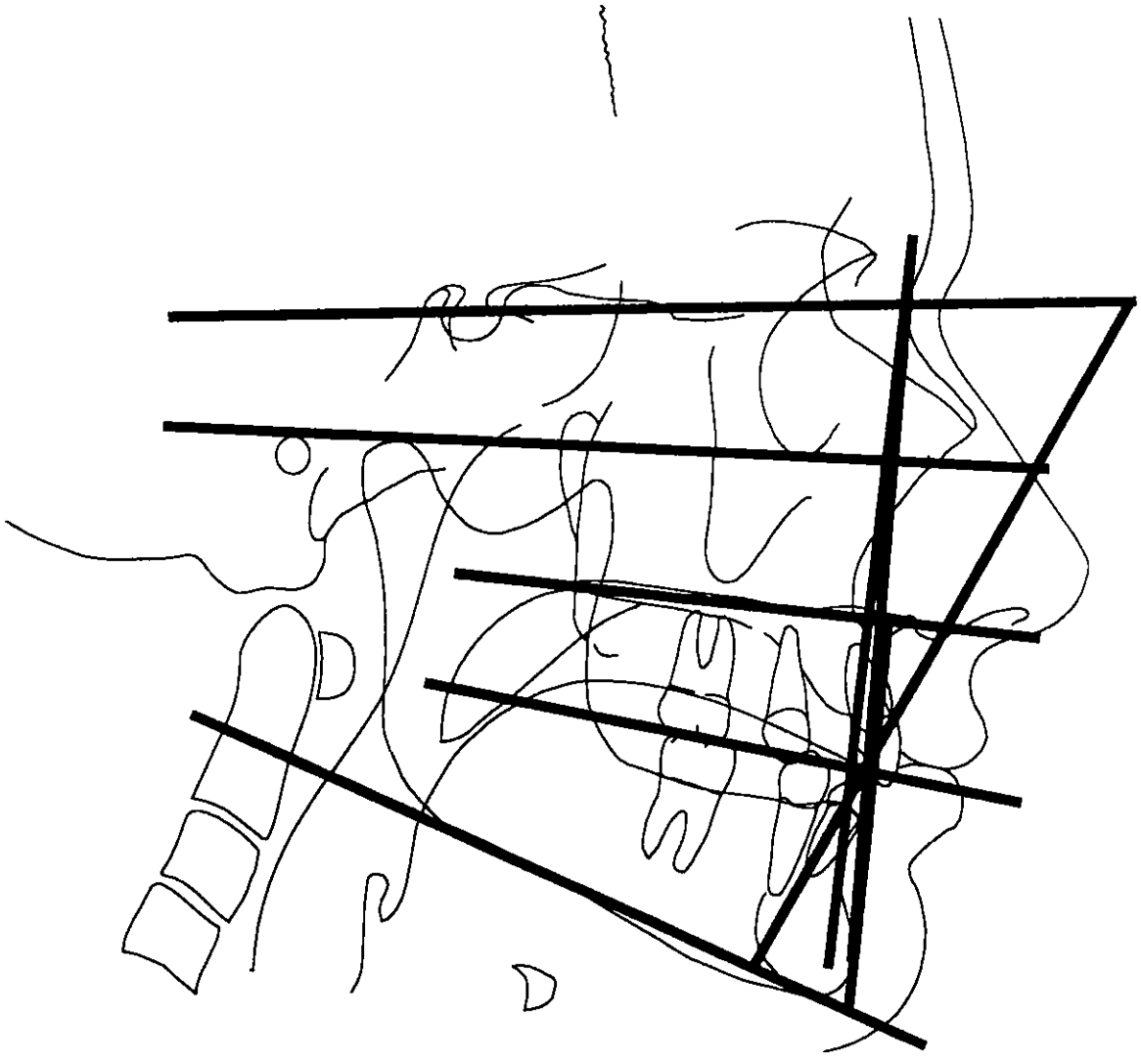


Figure 7. Scatter of measurements for Factor 2 rotation solution. Contributes 11.6% of the common variance. (Lower incisor position).

facial plane, and Lower 1 to APO. The variables: FMIA, SN to Lower 1, Lower 1 to palatal plane, Lower 1 to NB' , Upper 1 to APO, Lower 1 to facial plane, and Lower 1 to APO' were all correlated in a negative manner.

Factor 3

This was identified as a factor of that represents the "**relationship of the cranial base to the facial complex**." This factor contributed 7.4% of the common variance. Correlated in a positive manner were the variables: SNB, Soft-tissue facial angle, SNA, the ratio of Posterior face height to Anterior face height, SL, Bolton to facial plane. The variables that were correlated in a negative manner included: Y-axis to SN, SN to Frankfort horizontal, SN to mandibular plane, Cranial base angle, SN to occlusal plane, and Saddle angle.

Factor 4

Contributing 6.6 % of the common variance, factor 4 was identified as describing the "**relationship of the maxilla and the mandible to each other**." This was based on the high-to-moderate positive loadings from: ANB, AB-Plane, and Angle of convexity. The remaining variables included: Upper 1 to NA', Maxillary depth, and Facial convexity angle, which all correlated positively. Upper 1 to A-point vertical correlated in a negative manner.

Factor 5

This was identified as a factor which determines the "**Anteroposterior position of the maxilla and mandible with respect to the cranial base**." A contribution of 5.3 % of the common variance is made by this factor. The associated variables that clustered around this factor included the following: Pogonion to Nasion-perpendicular, Mandibular prognathism, A-point to Nasion-perpendicular, Upper 6 to PTV, Maxillary prognathism, and Lower lip distance, which all correlated in a positive way to factor 5. The measurement, SP distance was correlated in a negative way.

Factor 6

This factor was identified as determining the "**anterior limits of the lips (and nose)**", and contributed 5.2% of the common variance. Positive correlations include: Upper lip thickness, Lower lip thickness, Upper lip curl, Lower lip to E-plane, Upper lip to E-plane, and Nose prominence. Negative correlations included: Upper lip distance, H-angle, SLS distance, Lower lip distance.

Factor 7

Contributing 4.5% of the common variance, this factor was identified as relating to the underlying dimension dealing with the "**degree of**

Table 29. Varimax rotated factor solution for Factor 3.

VARIABLES	FACTOR 3
SNB	0.89
SOFT TISSUE FACIAL ANGLE	0.88
Y-AXIS TO SN	-0.81
SNA	0.81
SN TO FRANKFORT HORIZ.	-0.68
SN TO MANDIBULAR PLANE	-0.68
POST.FACE HT.: ANT.FACE HT.	0.67
SL	0.67
CRANIAL BASE ANGLE	-0.64
SN TO OCCLUSAL PLANE	-0.63
SADDLE ANGLE	-0.58
BOLTON TO FACIAL PLANE	0.53

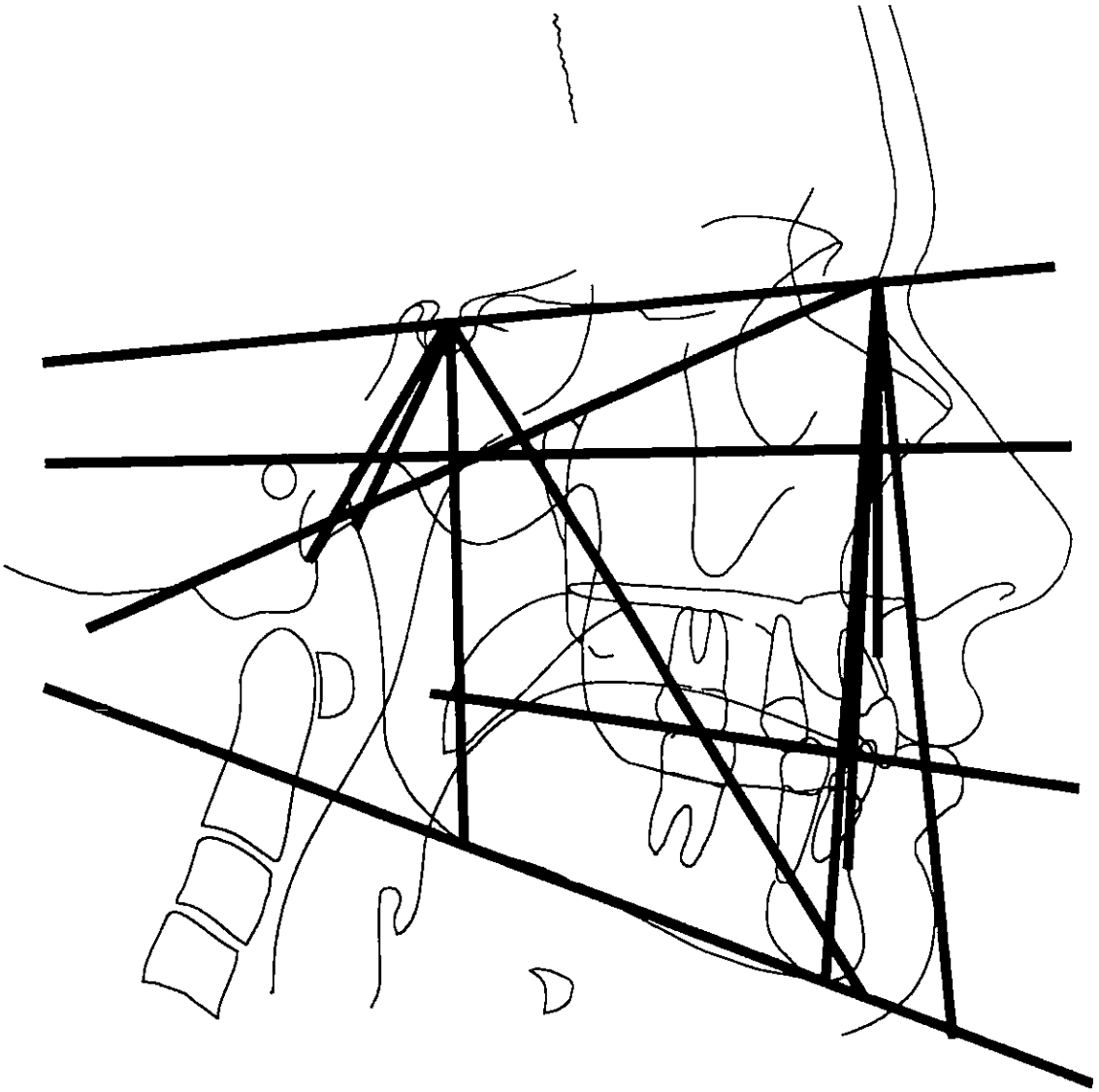


Figure 8. **Scatter of measurements for Factor 3 rotation solution. Contributes 7.4% of the common variance. (Relationship of cranial base to the facial complex).**

Table 30. Varimax rotated factor solution for Factor 4.

VARIABLES	FACTOR 4
ANB	0.91
AB PLANE ANGLE	0.85
ANGLE OF CONVEXITY	0.84
UPPER 1 TO NA'	0.76
UPPER 1 TO A VERTICAL	-0.59
MAXILLARY DEPTH ANGLE	0.56
FACIAL CONVEXITY ANGLE	0.53

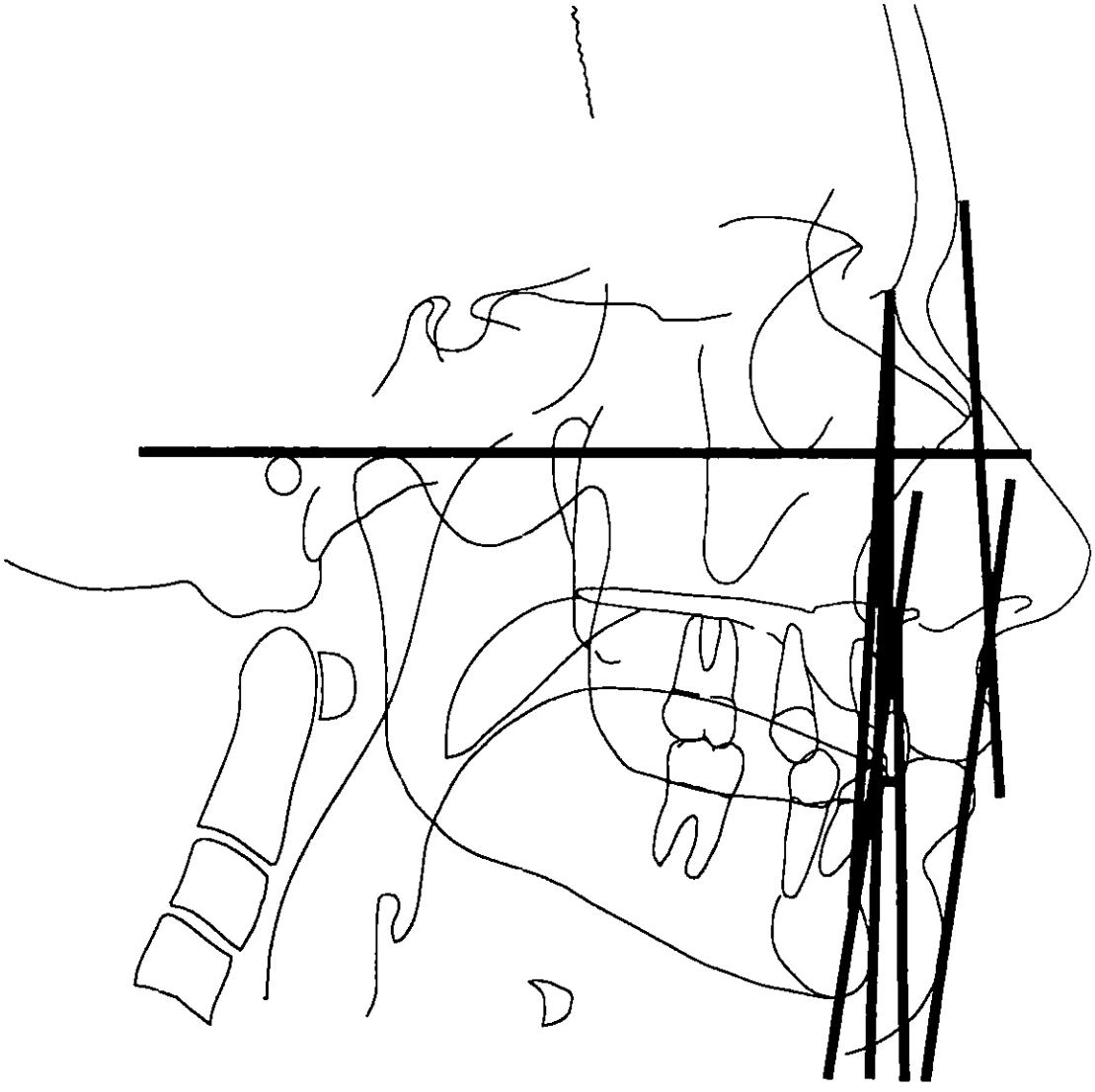


Figure 9. **Scatter of measurements for Factor 4 rotation solution. Contributes 6.6% of the common variance. (Relationship of the maxilla and mandible to each other).**

Table 31. Varimax rotated factor solution for Factor 5.

VARIABLES	FACTOR 5
POGONION TO N-PERPEND.	0.79
MANDIBULAR PROGNATHISM	0.79
A-POINT TO N-PERPEND.	0.77
UPPER 6 TO PTERYG. VERT.	0.69
SP DISTANCE	-0.62
MAXILLARY PROGNATHISM	0.59
LL DISTANCE	0.56

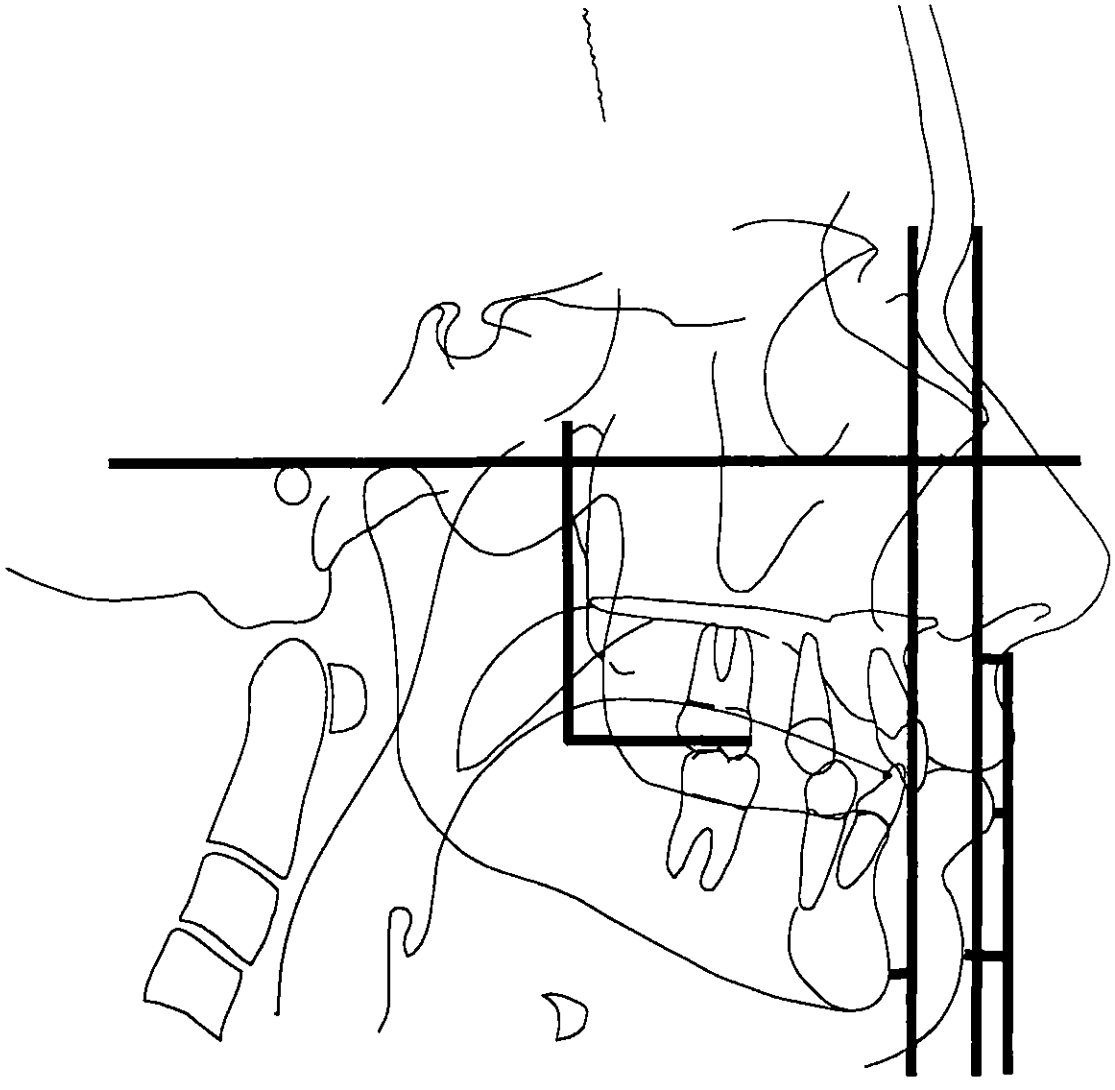


Figure 10. Scatter of measurements for Factor 5 rotation solution. Contributes 5.3% of the common variance. (AP position of the maxilla and mandible with respect to the cranial base).

Table 32. Varimax rotated factor solution for Factor 6.

VARIABLES	FACTOR 6
UPPER LIP THICKNESS	0.91
UPPER LIP DISTANCE	-0.85
LOWER LIP THICKNESS	0.76
UPPER LIP CURL	0.69
LOWER LIP TO E-PLANE	0.68
UPPER LIP TO E-PLANE	0.62
NOSE PROMINENCE	0.61
H ANGLE	-0.56
SLS DISTANCE	-0.56
LOWER LIP DISTANCE	-0.54

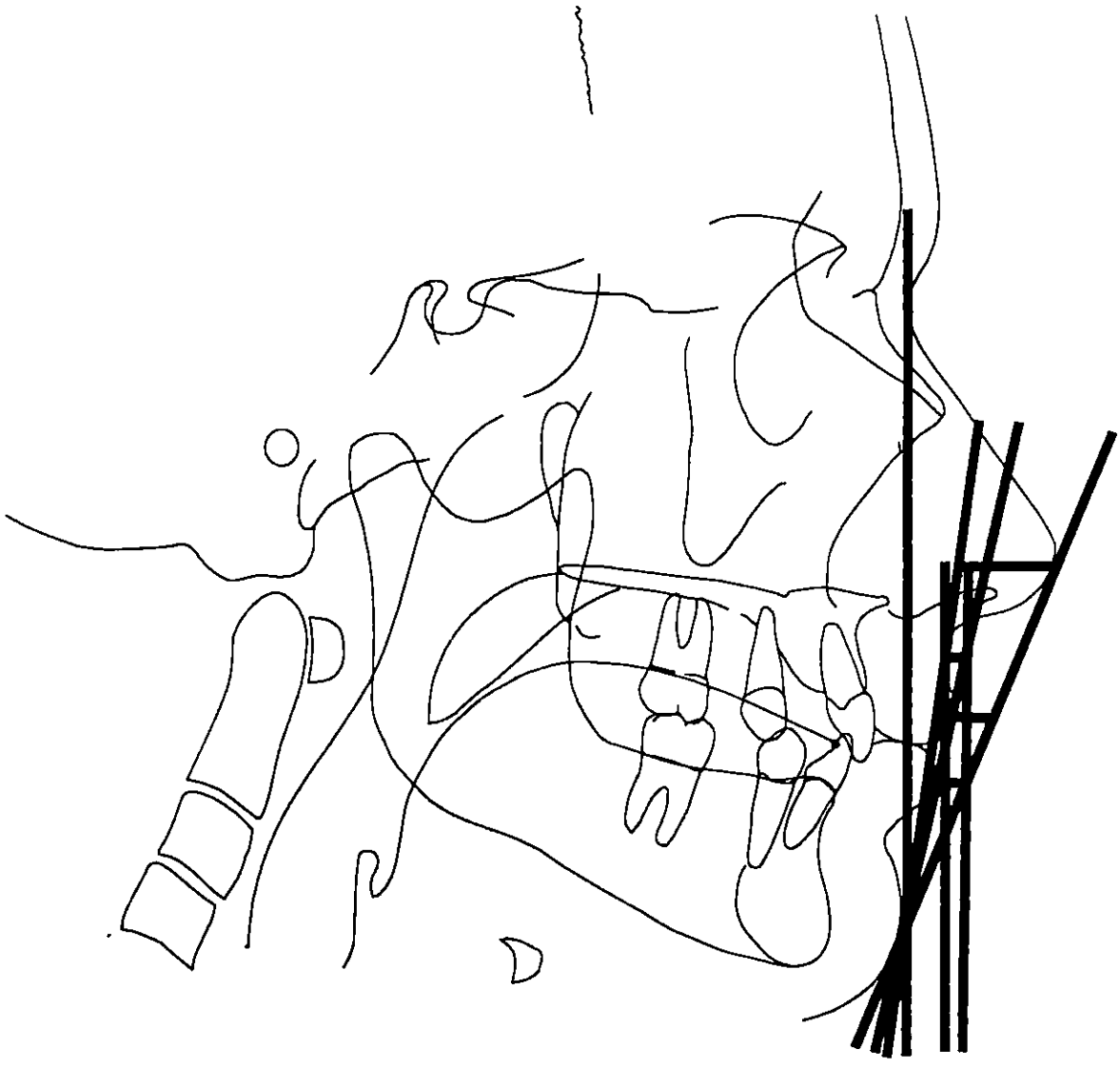


Figure 11. Scatter of measurements for Factor 6 rotation solution. Contributes 5.2% of the common variance. (Anterior limits of the lips and nose).

Table 33. Varimax rotated factor solution for Factor 7.

VARIABLES	FACTOR 7
CRANIAL DEFLECTION	0.80
FACIAL CONVEXITY	0.80
Y-AXIS ANGLE	-0.75
PALATAL PLANE ANGLE	-0.70
MAXILLARY DEPTH ANGLE	0.69
SN TO FRANKFORT HORIZ.	0.68
RAMUS POSITION ANGLE	-0.64
MANDIBULAR PLANE ANGLE	-0.61
OCCLUSAL PLANE ANGLE	-0.56

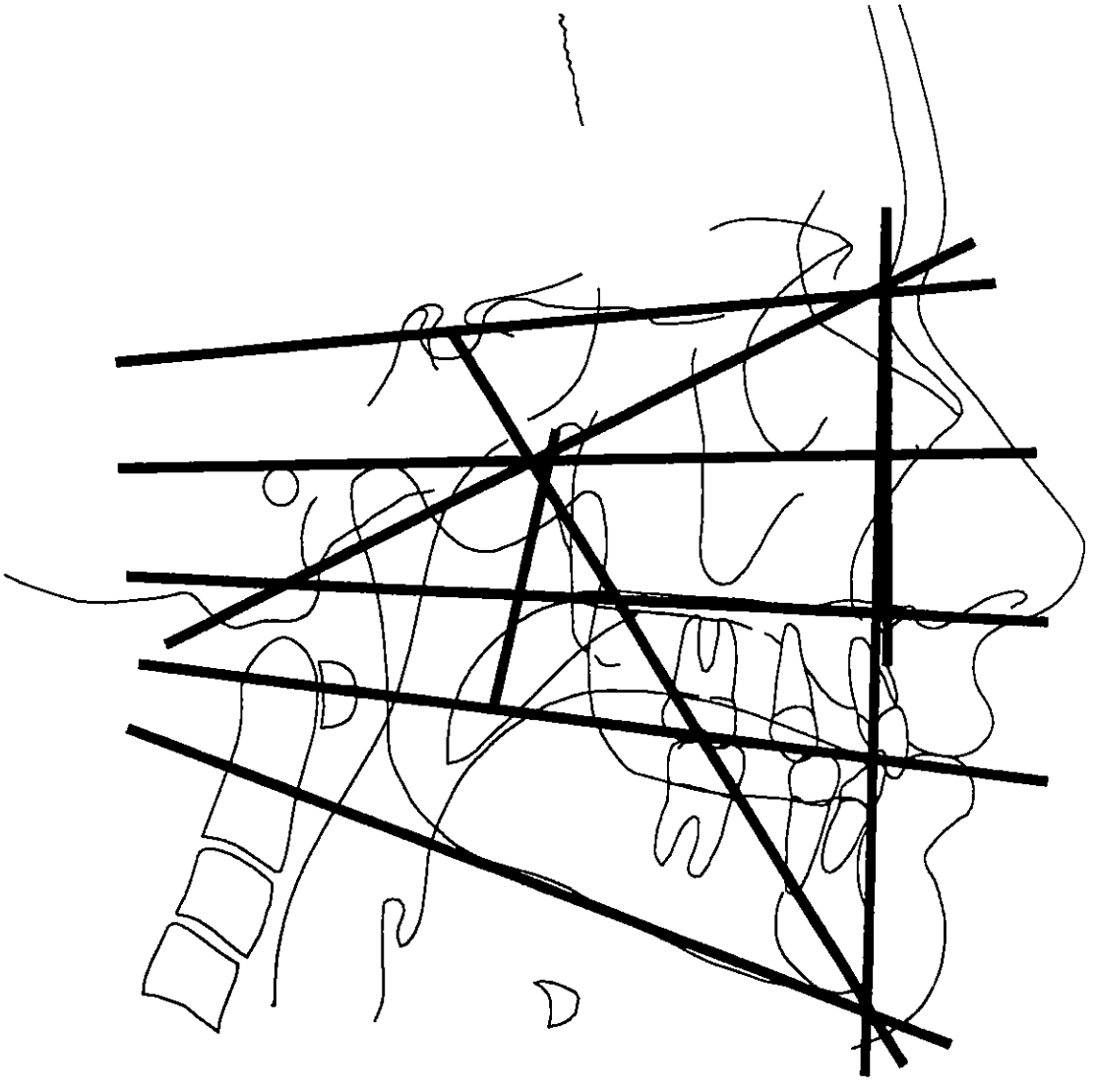


Figure 12. Scatter of measurements for Factor 7 rotation solution. Contributes 4.5% of the common variance. (Degree of divergence of the horizontal planes of the craniofacial complex).

divergence of the horizontal planes of the craniofacial complex." The variables. Cranial deflection angle, Facial convexity, Facial depth angle, Maxillary depth angle, and SN to Frankfort horizontal, all were positively correlated to factor 7. Y-axis, Palatal plane angle, Ramus position angle, Mandibular plane angle, and Occlusal plane angle were all correlated in a negative manner.

Factor 8

This factor was related to determining the "**mandibular shape (angle)**". A contribution of 3.6% of the common variance is made by this factor. Positive correlations included: Lower gonial angle, Mandibular plane angle, Gonial angle, SN to mandibular plane, and Mandibular arc. One negative correlate included the measurement: Facial taper angle.

Factor 9

With a contribution of 3.6% of the common variance, this factor was identified as bearing a relationship to the "**degree of backward divergence of the (posterior) face**." The measurements: Articular angle, Facial axis angle, and Maxillary height angle were correlated in a positive manner to factor 9. Upper gonial angle, Saddle angle, Cranial base angle, and Gonial angle, were negative correlates of this factor.

Factor 10

This factor was identified as determining the "**angular position of the upper incisor**." A contribution of 2.9% of the common variance was made by this factor. The variables that were positively correlated with factor 10 included: Interincisal angle, Upper 1 to APO', Upper 1 to Frankfort horizontal, and Incisor overbite. The variables that were negatively correlated to factor 10 included: Upper 1 to NA, Occlusal plane to GoGn, Lip embrasure to occlusal plane, and Occlusal plane inclination.

Factor 11

Contributing 2.4% of the common variance, this factor was identified as bearing relation to "**vertical facial proportion.**" The variables that loaded onto factor 11 included: the ratio of Upper face height to Lower face height, SN to palatal plane, which correlated in a positive manner, and Lower facial height angle which correlated in a negative manner.

Factor 12

This factor was identified as determining the degree of "**chin and nasal projection**", and contributed 2.3% of the common variation. All associated variables were correlated in a negative manner, and included the following: Nasomental angle, Nasofacial angle, Soft-tissue convexity.

Factor 13

This factor was identified as being related to the "**soft-tissue contour of the lower third of the face**." A contribution of 2% of the common variance was made by this factor. The variables, Mentolabial sulcus to H-line, and Mentolabial sulcus, were correlated in a positive way. The variables, B-point to soft-tissue B-point, and ILS distance were correlated in a negative way.

Factor 14

This final factor was identified as relating "**slope of the occlusal plane with respect to the mandible**." The variables (in which they all had low loading values), Occlusal plane inclination, and Occlusal plane to GoGn, were correlated to factor 14 in a positive way. One variable related in a negative manner to factor 14 which was Occlusal plane of Xi point. This factor contributed 1.8% of the common variation.

Summary:

To summarize, then, 11 factors were related to mainly hard-tissue dimensions, while 3 factors were related strictly to soft-tissue dimensions. Soft-tissue dimensions included: Anterior limits of the lips and nose (Factor 6), Chin and Nasal Projection (Factor 12), Soft-tissue contour of the lower third of the face (Factor 13).

Table 34. Varimax rotated factor solution for Factor 8.

VARIABLES	FACTOR 8
FACIAL TAPER ANGLE	-0.87
LOWER GONIAL ANGLE	0.85
MANDIBULAR PLANE ANGLE	0.67
GONIAL ANGLE	0.63
SN TO MANDIBULAR PLANE	0.62
MANDIBULAR ARC ANGLE	0.62

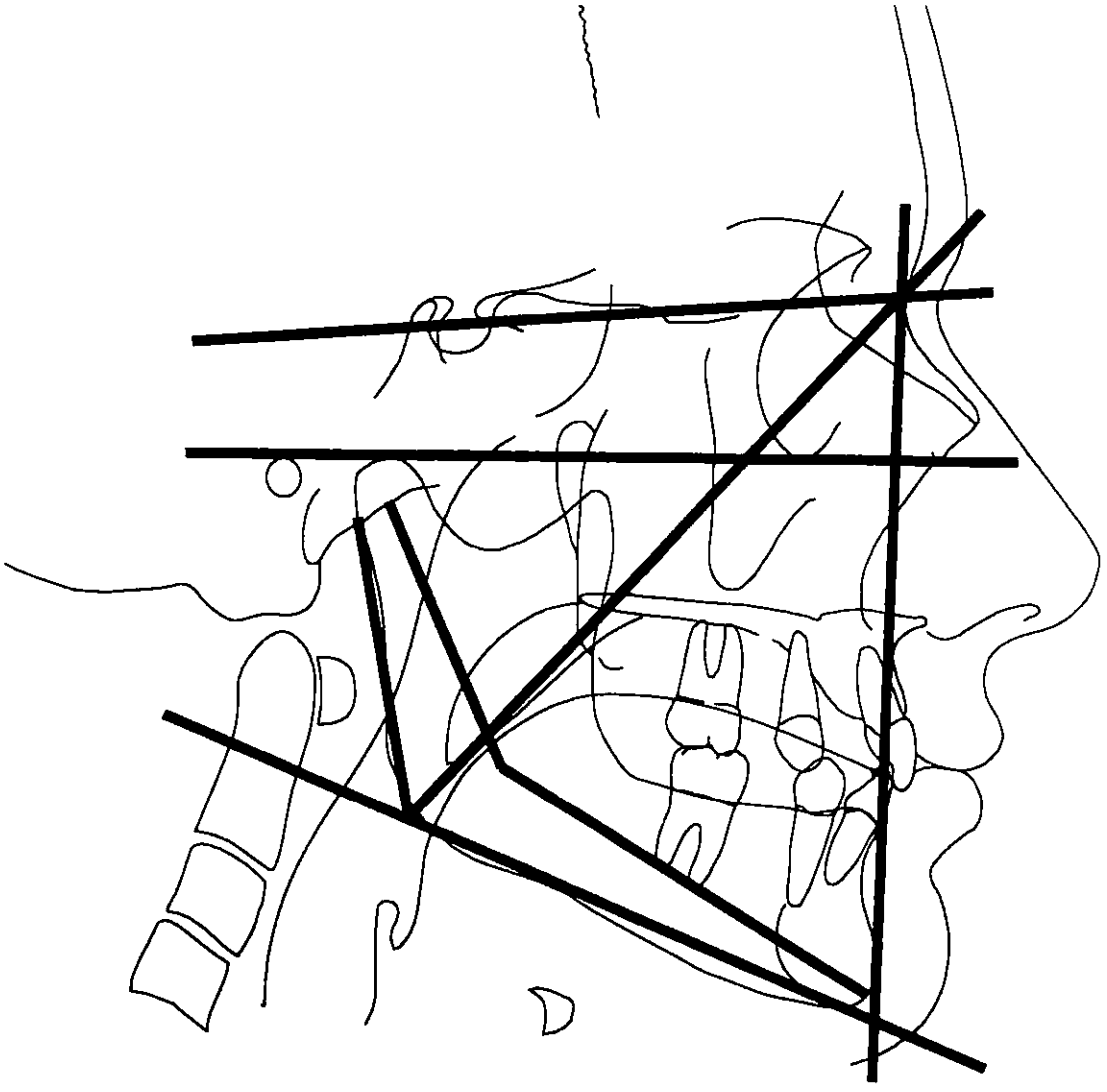


Figure 13. Scatter of measurements for Factor 8 rotation solution. Contributes 3.6% of the common variance. (Mandibular shape (angle)).

Table 35. Varimax rotated factor solution for Factor 9.

VARIABLES	FACTOR 9
ARTICULAR ANGLE	0.87
UPPER GONIAL ANGLE	-0.78
FACIAL AXIS ANGLE	0.67
MAXILLARY HEIGHT ANGLE	0.62
SADDLE ANGLE	-0.61
CRANIAL BASE ANGLE	-0.57
GONIAL ANGLE	-0.54

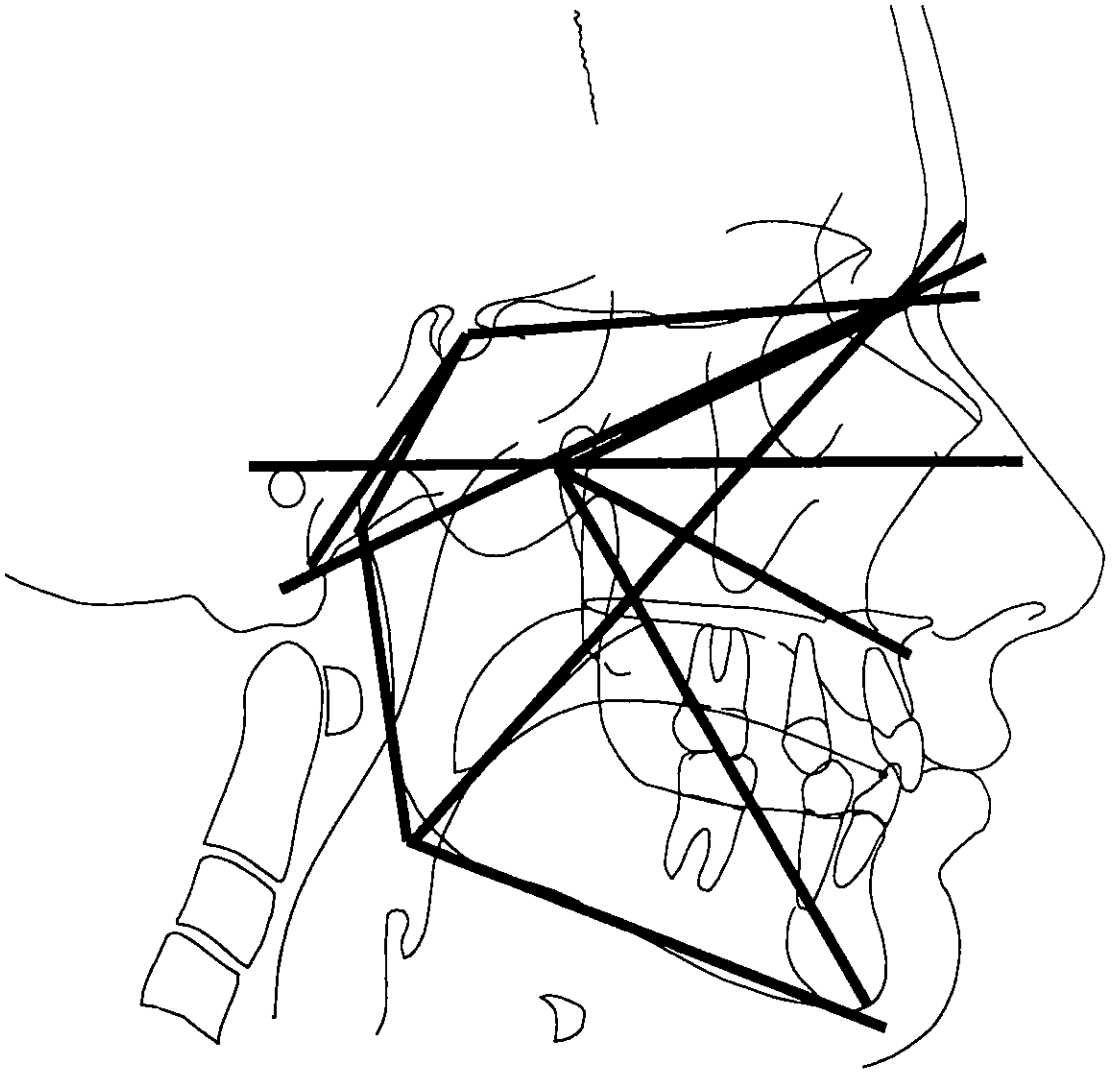


Figure 14. Scatter of measurements for Factor 9 rotation solution. Contributes 3.6% of the common variance. (Degree of backward divergence of the posterior face).

Table 36. Varimax rotated factor solution for Factor 10.

VARIABLES	FACTOR 10
UPPER 1 TO NA ANGLE	-0.92
INTERINCISAL ANGLE	0.87
UPPER 1 TO APO	0.81
UPPER 1 TO FRANKFORT HZ.	0.78
OCCLUSAL PLANE TO GOGN	-0.58
LIP EMBRAS. TO OCCL. PL.	-0.58
INCISOR OVERBITE	0.57
OCCL. PL. INCLINATION	-0.52

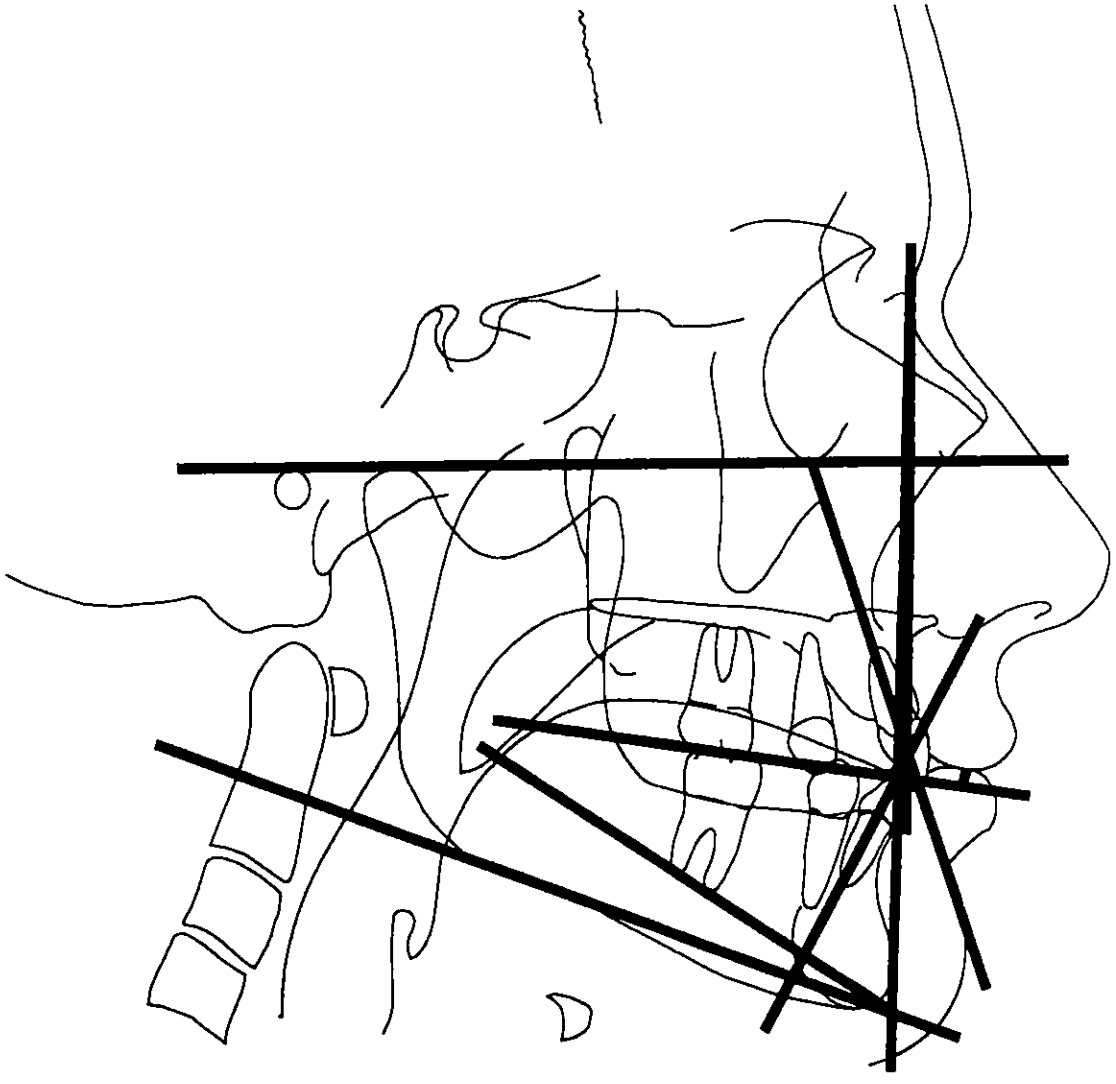


Figure 15. Scatter of measurements for Factor 10 rotation solution. Contributes 2.9% of the common variance. (Angular position of the upper incisor).

Table 37. Varimax rotated factor solution for Factor 11.

VARIABLES	FACTOR 11
UPPER FACE HT.: LOWER FACE HT.	0.90
LOWER FACIAL HT. ANGLE	-0.71
SN TO PALATAL PLANE	0.63

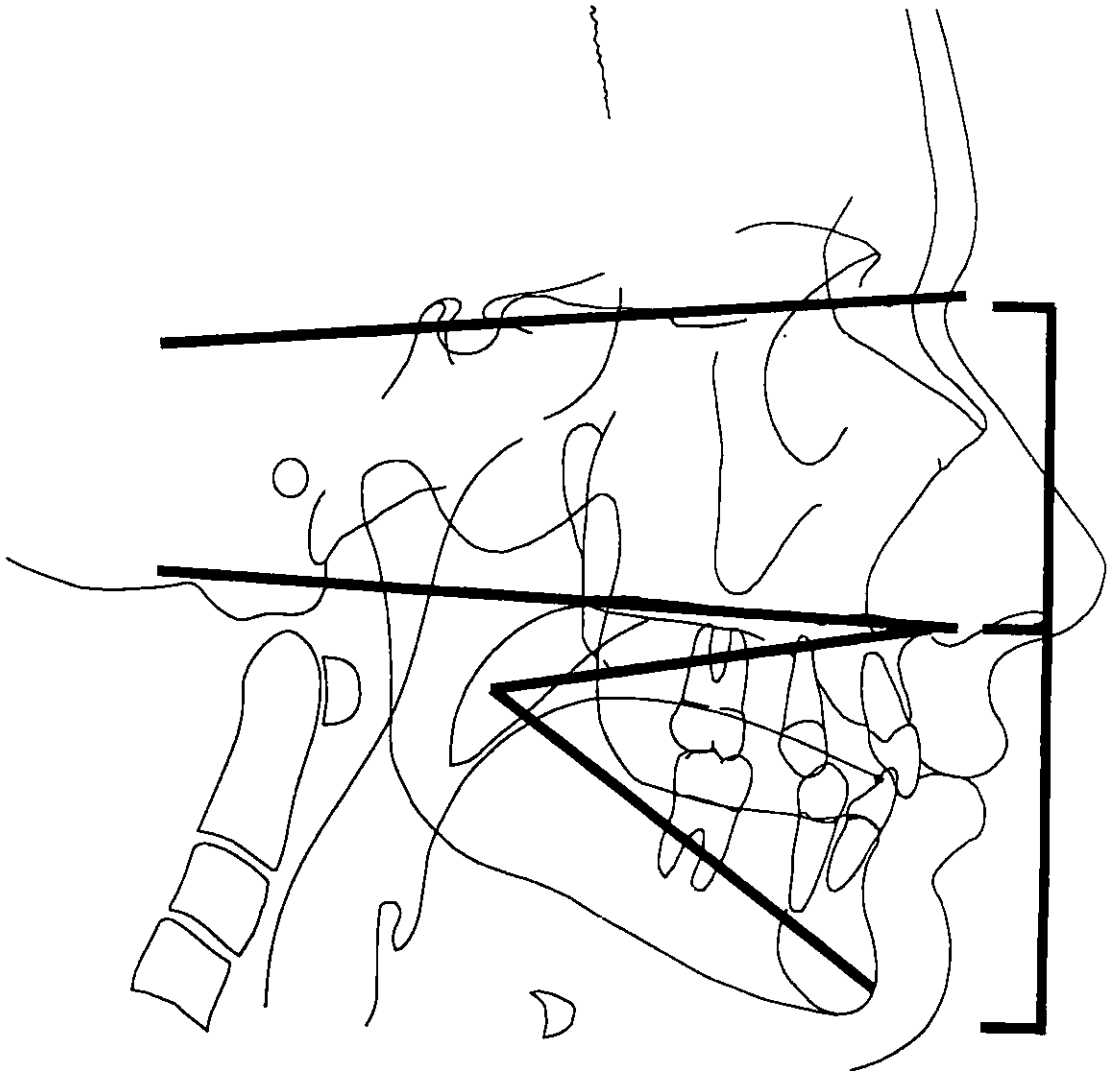


Figure 16. Scatter of measurements for Factor 11 rotation solution. Contributes 2.4% of the common variance. (Vertical facial proportion).

Table 38. Varimax rotated factor solution for Factor 12.

VARIABLES	FACTOR 12
NASOMENTAL ANGLE	-0.84
NASOFACIAL ANGLE	-0.72
SOFT TISSUE CONVEXITY	-0.71

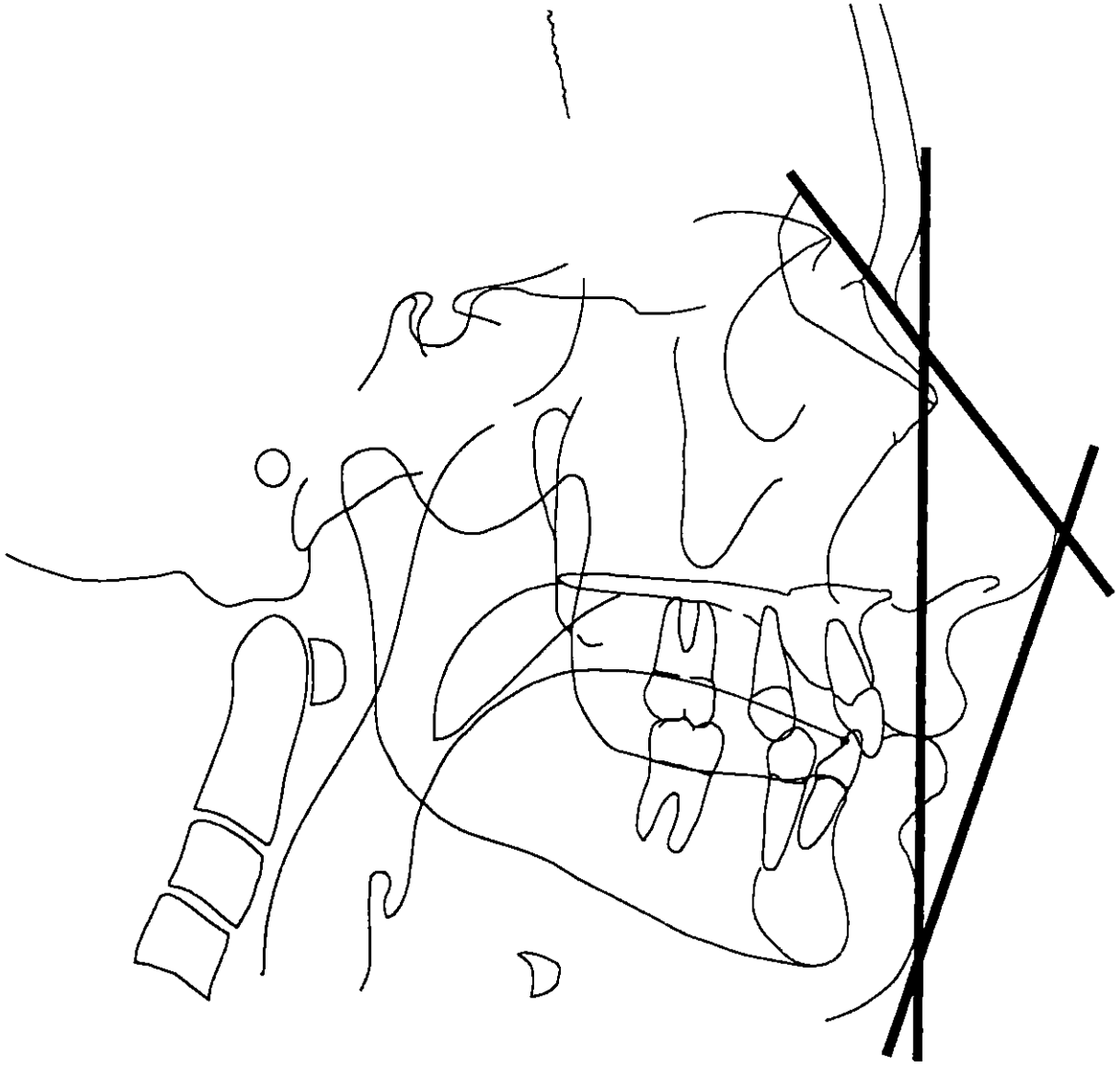


Figure 17. Scatter of measurements for Factor 12 rotation solution. Contributes 2.3% of the common variance. (Chin and nasal projection).

Table 39. Varimax rotated factor solution for Factor 13.

VARIABLES	FACTOR 13
MENTOLABIAL SULCUS TO H-LINE	0.81
MENTOLABIAL SULCUS	0.79
B-POINT TO SOFT-TISSUE B-PT.	-0.76
ILS DISTANCE	-0.55

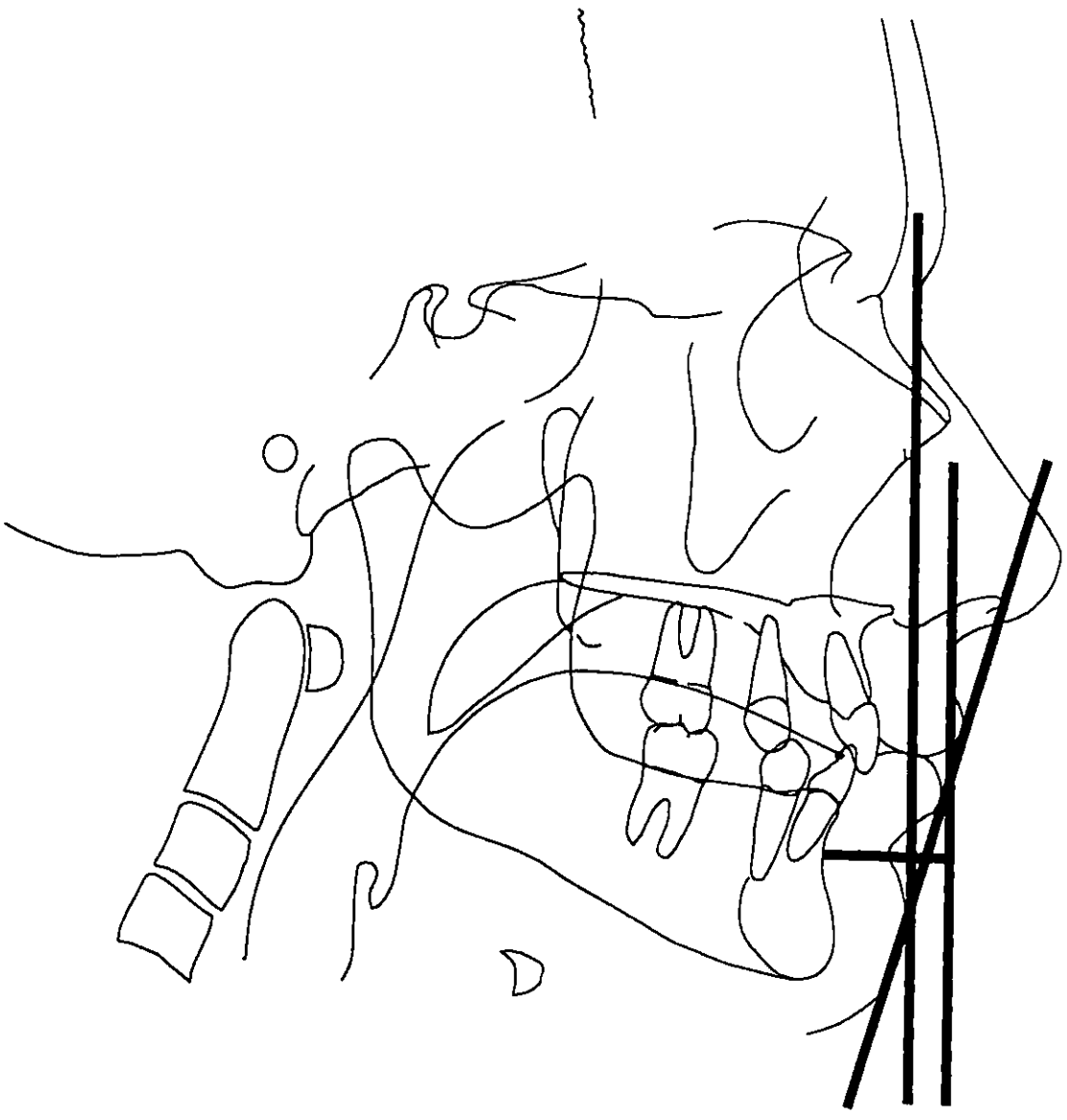


Figure 18. Scatter of measurements for Factor 13 rotation solution. Contributes 2.0% of the common variance. (Soft-tissue contour of the lower face).

Table 40. Varimax rotated factor solution for Factor 14.

VARIABLES	
OCCLUSAL PLANE TO XI PT.	-0.64
OCCLUSAL PLANE INCLIN.	0.59
OCCLUSAL PLANE TO GOGN	0.52

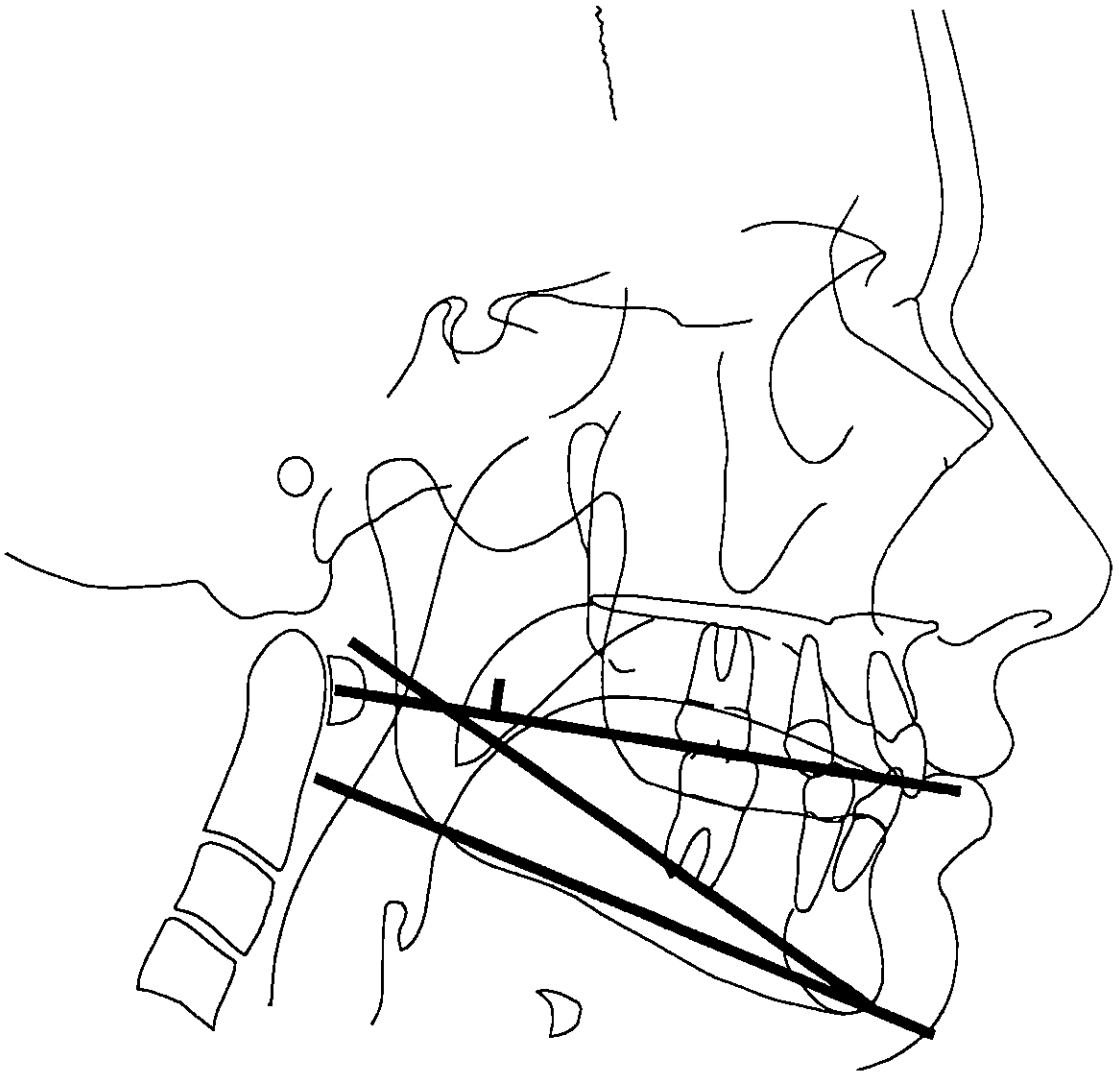


Figure 19. Scatter of measurements for Factor 14 rotation solution. Contributes 1.8% of the common variance. (Slope of the occlusal plane with respect to the mandible).

DISCUSSION

Factor Assessment:

The objective of a factor analysis is to provide the simplest description of the observed data. The analysis of 134 cephalometric measurements resulted in 14 factors (i.e., 11 of which related to hard-tissue structures and 3 of which related to soft-tissue structures) of craniofacial elements which account for virtually all the essential information contained in the original 187 measurements. Recall, to insure biologically meaningful factors were derived, several criteria had to be met before a group of variables could represent a factor. From the scree plot (Figure 4) it was determined that a 14-factor model would be sufficient to describe craniofacial morphology, which in essence, would account for 83.4% of the variance (Table 26). This was based on where the distinct break occurred between the steep slope of the large factors and the gradual trailing off of the rest of the factors. The Eigenvalue cut-off point was also determined to be ≥ 2, using the data from the scree plot. Lastly, at least three variables had to load onto each of the given factors in order for factor eligibility. A group of two variables was considered a correlation between the two, and not necessarily representing a true factor. In order for three variables to load onto each of the 14 factors, a minimum loading value of 0.52 was used to

select the associated variables from the factor matrix computer output.

Obviously, while any individual's craniofacial morphology may be characterized by a high positive or negative score for a certain factor, it should be kept in mind that most individuals represent a combination of all the factors. In the discussion below is an explanation for each factor as to why its given name is pertinent and suitable, as it relates to the associated variables that loaded onto each factor.

Factor 1, which consisted of the interactions from many (strictly) linear measurements, related to "general size" of the craniofacial complex in both "vertical and AP dimensions." Certainly, a individual with a high values in many of these associated linear measurements (e.g., Anterior face height, Mandibular length, Facial depth, Facial length, Midface length, Corpus length, Upper face height, Posterior face height, etc.) would suggest a very long-faced person, and a prognathic face with a "square jaw." The overall craniofacial structures also would appear to be somewhat enlarged. As individuals range through zero to lower values of these associated measurements, the face becomes progressively shorter and has a deep bite tendency. As the score approaches zero, the "mean" face is recognized, and then on the lower side of this factor, a retrognathic small face with a weak mandible becomes apparent.

Factor 2, essentially was a composite of the interactions of many linear and angular measurements that assessed the "lower incisor position." Low values in some of the associated measurements (e.g. FMIA,

SN to lower 1, Lower 1 to palatal plane) and high values in other measurements (e.g., Lower 1 to NB, Lower 1 to mandibular plane, Lower 1 to occlusal plane, Lower 1 to APO) would describe an individual with lower incisor proclination, decreased overjet, anterior crossbite tendency, and a protrusive lower lip as a result. Conversely, the opposite reading suggests an individual with increased overjet, upright lower incisors, with a retrusive lower lip. The participation of the variables: Upper 1 to facial plane, and Upper 1 to APO, in factor 2 may be because of some possible influence of the upper and lower incisors on each other. For example, retroclined upper incisors may have a possible effect on the position of the lower incisor, and also cause retroclining of the lower incisors. Therefore, factor 2 representing lower incisor position seems to be suitable.

Factor 3 represented the combination of variables that described the "relationship of the cranial base to the facial complex." With increased values for measurements: SNB, Soft-tissue facial angle, SL, Saddle angle, Cranial base angle, Ratio of PFH to AFH , and decreased values for Y-axis to SN, SN to mandibular plane, a facial type with prognathic mandible with a concave facial profile, and flat mandibular plane angle is described. Conversely, the opposite would manifest a retrognathic mandible with a convex facial profile, steep occlusal plane inclination, and long facial dimension. Therefore, the chosen name for factor 3 is appropriate, since any change in the cranial base will have an effect on the facial complex.

Factor 4 relates the "maxilla and mandible to each other." To justify the appropriateness of the chosen name for this underlying dimension, an example would be useful. With high values for ANB, Angle of convexity, AB-plane, Facial convexity angle, and Maxillary depth angle, this would describe an individual with a prognathic maxilla, increased convexity of the face, and a retrognathic mandible. At approximately equal values, the facial profile approaches an orthognathic situation, while a decreased reading would suggest an individual with more of a concave profile, and a prognathic mandible. Clearly, depending on the magnitude of these related measurements, this factor compares the maxilla and mandible to each other.

Factor 5 determined the "AP position of the maxilla and mandible with respect to the cranial base." A positive extreme (i.e., high values for Pogonion to nasion perpendicular, Mandibular prognathism, A-point to nasion perpendicular, Soft-tissue pogonion distance, Maxillary prognathism, Lower lip distance) would describe an individual with a bimaxillary protrusive facial profile, while a negative extreme would describe an individual with a retrognathic mandibular profile and a deficient chin.

Factor 6 was related to the "anterior limits of the lips (and nose)." The assessment of the lips with respect to the E-plane, indicates soft-tissue balance between lips and profile (nose-chin). In a case, for example, where there is a protrusive upper incisor, there will be a protrusive lower lip

(values beyond the esthetic plane) as a result. High values for measurements, Upper lip thickness, Lower lip thickness, Upper lip curl, Nose prominence, and low values for Lower and Upper lip to E-plane, Upper and Lower lip distance. and SLS distance, would suggest a facial profile with a prominent nose and protrusive lips. Conversely, an opposite reading would suggest a facial profile with retrusive lips, and a smaller nose. Thus the chosen name for factor 6 seems apropos.

Factor 7 determined the "degree of divergence of the horizontal planes of the craniofacial complex." To demonstrate the applicability of this chosen name, the following instance would be useful. Certainly, high values in all the associated measurements, (e.g., Cranial defection angle, Y-axis angle, Facial convexity, Palatal plane angle, SN to Frankfort, Mandibular plane angle, and Occlusal plane angle), would describe a facial profile with increased convexity, and with the Frankfort plane, palatal plane, mandibular plane, and occlusal plane, tipped up posteriorly relative to the sella-nasion plane. This has the effect of making the cranial base obtuse. Conversely, lower values of these measurements would manifest themselves by creating a more parallel relationship of these base lines. A negative value, for example, in the palatal plane angle measurement will actually tip up the palatal plane in front and may predispose the individual to a possible skeletal open bite due to the palate.

Factor 8 assessed the "shape (angle) of the mandible", and based on the associated variables that loaded onto this factor, it appears to be a

relevant designation. Higher than average values for any of the involved measurements (e.g., Lower gonial angle, SN to mandibular plane) certainly will manifest itself as a steep mandibular plane angle, and may also predispose an individual to a skeletal open bite, depending on how excessive these values are. Conversely, a low mandibular plane implies a skeletal deep bite and is probably due to the mandible. Thus, factor 8 appears to be identified properly.

Factor 9 was referred to as describing the "degree of backward divergence of the (posterior) face." This was named so because this dimension is, in a large measure, expressed in the angular function of the saddle angle (or cranial base angle) and articular angle. Where the saddle angle is large, future growth in the length of the posterior cranial base will carry the articular fossae and the mandibular condyles downward and backward more than where the angle is small, thus further increasing backward divergence of the face.

Conversely, a small saddle angle will cause the posterior cranial base to grow more vertically and thus carry the fossae and the mandibular condyles downward, increasing posterior facial height and thus reducing backward facial divergence. A large articular angle in the presence of a large saddle angle will make the face considerably more backward divergent than if the saddle angle is small. Another determinant of backward facial divergence is the gonial angle. A large gonial angle often makes the face markedly backward divergent.

Finally, the condition is which an open bite is caused by a large gonial angle alone is fairly uncommon. A group of measurements combine to cause a skeletal open bite. In these open bites, some of the related measurements include a large articular angle, a large gonial angle, and a saddle angle that may either be large or small.

Factor 10 was identified as assessing the "angular position of the upper incisor", because the measurements: Upper 1 to NA, Interincisal angle, Upper 1 to APO', and Upper 1 to Frankfort Horizontal, basically define the protrusion or procumbency of the upper incisor related to the jaws. These measurements have high factor loadings for factor 10. Lower factor loadings were found for Occlusal plane to GoGn, Lip embrasure to occlusal plane, Incisor overbite, and Occlusal plane inclination. An account of these variables with respect to their contribution to factor 10 would enhance the interpretation of the underlying theme for this factor. Their relationship to factor 10 may be because the occlusal plane is somewhat determined by the position of the upper (and lower) incisor. Certainly, a low interincisal angle indicates upper (and lower) incisor protrusion, while a high angle indicates a deep bite (i.e., increased incisor overbite).

Factor 11 assessed the "vertical facial proportions." This description seems appropriate based on a high loading found for the measurement: Upper face height to Lower face height. Clearly, this compares the vertical dimensions of the upper and lower facial components. Lower face height angle, which loaded moderately high onto factor 11, describes the

divergence of the oral cavity with growth. This measurement may be affected by changes in the vertical dimensions of the face, and vice versa. High values for lower face height angle may cause a skeletal open bite, while low values may predispose to a deep bite. A lower loading value was found for SN to palatal plane. Its association with factor 11 may be due to its influence on upper face height dimensions. Conceivably, an increase in this angle (i.e., because of a downward positioning of ANS relative to PNS) may somewhat cause an increase in the vertical dimensions of the face.

Factor 12 assessed the degree of "chin and nasal projection" , and such a designation is deemed suitable. The nasomental angle is described as the angle that defines the projection of the nose relative to the face. The Nasofacial angle defines the relationship of the chin (and lips) to the face. The third angle that was associated with factor 12 was the Soft-tissue convexity angle, which can be affected by any changes in the nasal and chin positions.

Factor 13 represented the "soft-tissue contour of the lower third of the face", especially the area of the mentolabial sulcus. It is noteworthy that this contour may be dictated somewhat by the underlying dentition. The angle that loaded highly (i.e., Mentolabial sulcus to H-line) with factor 13, is an indicator of how well the axial inclinations of the lower incisors are as related to an esthetically pleasing lower face. The measurement, Labiomental sulcus, can be affected by flared lower incisors, extruded upper incisors, flaccid lip tone, prominence of the bony chin, and abnormal

morphology of the lower lip itself. These instances may manifest themselves as an altering of the inclination of the lower lip and the depth of the mentolabial sulcus.

Factor 14 was identified as delineating the "slope of the occlusal plane with respect to the mandible." The three measurements that clustered around this factor all were related to assessing the occlusal plane in some way. Certainly, any changes in the shape or angle of the mandible can have an influence on the degree of canting of the occlusal plane. This factor is important because it allows a clinician to determine if an abnormally sloped occlusal plane is skeletal in nature, dental in nature, or both skeletal and dental.

Factorial Complexity

Factorial complexity is a characteristic of an observed variable, and relates to the number of common factors with (significant) loadings on that particular variable. Apparently, some of the variables in this study appeared to participate with more than one factor. A list of these "complex variables", along with the participating factors, as well as the respective factor loadings is presented in Table 41. These variables are complex in that more than one factor is necessary to describe their variation. A corollary would be that some factors are intricate enough that a given variable may load onto more than one factor. For example, Table 41 depicts the variable: SN to mandibular plane, to be loading onto factor 3, with a loading value of -0.68,

Table 41. Complex variables and their participation in more than one factor. Columns three and four depict loading values, respectively, for the factors listed in column one.

FACTOR NUMBERS	COMPLEX VARIABLE	FIRST LOADING	SECOND LOADING
4,7	FACIAL CONVEXITY ANGLE	0.53	0.80
4,7	MAXILLARY DEPTH ANGLE	0.56	0.69
7,8	MANDIBULAR PLANE ANGLE	-0.61	0.67
3,8	SN TO MANDIBULAR PLANE	-0.68	0.62
3,7	SN TO FRANKFORT HORIZ.	-0.68	0.68
5,6	LOWER LIP DISTANCE	0.56	-0.54
1,6	NOSE PROMINENCE	0.61	0 61
1,3	POSTERIOR FACE HEIGHT	0.90	0.67
1,3	ANTERIOR FACE HEIGHT	0.97	0.67
1,3	SL	0.64	0.67
10,14	OCCLUSAL PLANE TO GOGN	-0.58	0.52
10,14	OCCL. PLANE INCLINATION	-0.52	0.59
3,9	SADDLE ANGLE	-0.58	-0.61
3,9	CRANIALBASE ANGLE	-0.64	-0.57
8,9	GONIAL ANGLE	0.63	-0.54

and onto factor 8, with a loading of 0.62. Notice, that both loading values are moderate in magnitude. Such a relationship to both factors is not surprising since the angular measurement does relate the cranial base to the facial complex, and also provides an indication of mandibular shape.

Generally, when a given variable loads onto more than one factor, there is usually a very high loading value for this variable onto one given factor, while the loading values for any of the remaining factors remain low. With factorial complexity, this is not the case as all the loading values are moderate to low in magnitude.

Certainly, when investigating the craniofacial complex, numerous interrelated morphologic entities must be considered. During the growth and development period of the craniofacial complex, a host of different growth processes occur simultaneously at any given time. Thus, it is not surprising that factorial complexity occurs in the present study because of the many highly interrelated and correlated craniofacial variables under examination. As a result, there is greater difficulty to obtain a sharper and more distinct separation of the unique factors.

If, for example, a researcher was to investigate biological relationships between the arms and the craniofacial complex (in humans) using similar methods of assessment as in the present study, a more distinct segregation of any obtained factors would result. This would be due to the lesser degree of biological interrelations between the arms and the craniofacial complex. Hence, a lesser degree of factorial complexity, if any, would occur under such circumstances.

Comparison To Other Studies:

Some of the factors obtained in this investigation are related to the results of other studies. What Cleall et al. (1979), designated principal component 1, and 2 (i.e., "vertical aspects of facial development"; and "AP aspects of facial morphology") respectively, was similar to Factor 1 in this study. There was some overlap of the variables that loaded onto these principal components and Factor 1 as well. Principal components 5, and 6 (i.e., "horizontal planes within the deeper aspects of the craniofacial complex"; "maxillary incisor region") were similar to Factors 7, and 10 respectively.

Horowitz et al.'s (1976) factor 3 (i.e., "mandible") and Horowitz et al.'s (1980) factor 2 ("mandible") is somewhat similar to Factor 8 in the current study. Moore (1977) called his factor 1, "variation in total skull size", and this was related to the designation of Factor 1 in this study. Carlson (1976) extracted 6 factors to describe the upper face. His factor 1 (i.e., "general size) and factor 5 (i.e., "maxillary basal prognathism") resembled Factors 1 and 5, respectively, in this investigation. Souma (1971) identified his factor 2 as "depth of the maxilla and mandible." This apparently is somewhat similar to Factor 5 in the present study. Solow (1966) defined his factor 6 to assess "maxillary prognathism" and factor 8 which assessed "mandibular inclination" was similar somewhat to Factors 5 and 8 respectively in this

study. Landauer (1962) who assessed the facial skeleton using factor analysis, was in agreement with Factor 1 in the present study. Landauer identified factor 1 in her study to be the "general size of the skull as a whole" which is more or less similar to what related to "general size" of the craniofacial complex in this study.

Therefore, there exists a small degree of agreement of the extracted factors across the many studies. Factor 1 in most studies related to "size" and this was the only similarity for most of the studies with respect to the present study. Hence, the factors isolated in this study cannot be compared with those isolated in previous studies because of the differences in measurements chosen to be analyzed, the methods of analysis, and the differing sample characteristics.

Assessment Of The Different Analysis

Based on the obtained factors, it would be interesting to determine the number of factor participation within each of the various contemporary comprehensive cephalometric analyses used in the current study. That is, within a given cephalometric analysis, how many of the extracted factors are characterized by at least one cephalometric measurement. Table 42 shows a summary of the assessment for each analysis. It appears that the Jarabak Analysis had the greatest factor participation (accounts for 74.7% of the craniofacial variance), followed by the Rickett's analysis (accounts for

65.2% of the craniofacial variance), with respect to the underlying dimensions obtained in the study. Thus, it appears that these two analyses give a more complete interpretation of the craniofacial variation. It is easy at this point to supplement each analysis with the missing factor measurements for thoroughness in the cephalometric workup.

Accordingly, the derived factors from the current study can have clinical applications. For instance, any cephalometric analysis (e.g., one not utilized in this study) may be assessed with respect to the degree of factor participation, which in essence, gives an indication of the thoroughness of the analysis regarding percentage of craniofacial variation accounted for. Also, any clinician may develop his/her own cephalometric analysis utilizing the data from the obtained factors. As mentioned in the "Recommended Cephalometric Analysis" section (page 136), a potential cephalometric analysis can be derived to account for 83.4% of the total craniofacial variability, by selecting at least one measurement (especially those measurements which loaded highly onto a given factor), from the conventional analyses, to account for each of the 14 factors. Various combinations and quantities of measurements (and thus analyses) will result, which can satisfy the numerous biases regarding cephalometric diagnostic workups in different clinicians. Since standard cephalometric analyses utilize a small number of measurements, most are not assessing the total biological variation of the craniofacial complex. Using a derived cephalometric analysis, or supplementing a cephalometric analysis with the

Table 42. Assessment of the various cephalometric analyses with respect to the obtained factors.

ANALYSIS	FACTORS INVOLVED	SCORE / 14	% OF VARIANCE EXPLAINED
JARABAK	1,2,3,4,5,6,8,9,10,11,14	11	74.7%
RICKETTS	1,2,5,6,7,8,9,10,11,14	10	65.2%
DOWNS	2,4,5,8,10	5	30.0%
HARVOLD	1,11	2	26.6%
STEINER	1,2,3,5,7,8,10	7	59.5%
RIEDEL	3,4,10	3	16.9%
TWEED	2,8	2	15.2%
McNAMARA	1,2,5,8,10,11	6	50.0%
BEGG	2,3,4,7,8,10	6	36.6%

missing measurements (to account for all 14 factors), clinicians can assure themselves that at least 83.4% of the craniofacial variation is being evaluated.

Clinically Modifiable Factors

Cleall et al. (1979) studied the effects of orthodontic treatment on the different principal components and found changes in factor scores which reflected both growth and treatment alterations. Certainly, factor 1 would be more influenced by growth, but with orthodontic treatment, patients may show a relative increase in anterior face height (i.e., factor 1 becomes more positive). With growth, the patient may actually increase in vertical and AP dimensions, plus perhaps show downward and backward mandibular rotation resulting from distal molar movement, molar extrusion, etc.

From Cleall et al. (1979), the results showed that there were minimal effects on the remaining principal components. This suggested that the characteristics of facial form tended to change minimally on a group basis and in a fairly uniform manner during the orthodontic treatment. Treatment itself had no significant effect in terms of the pattern of development, however, individual variables contained within each factor did change. The effects of these changes are modified or compensated for by changes in other variables, so that the overall factor change is minimal.

In the present study, for example, with orthognathic surgery, it is possible to alter the values for the individual variables for factor 4, which

relates the maxilla and mandible to each other. Furthermore, depending on the type of orthodontic mechanics, and/or orthognathic surgery, the variables in each factor can probably be altered to some degree, but the same underlying dimensions will probably remain.

Recommended Cephalometric Analysis:

The results obtained so far may be useful in a clinical application. From the acquired data, it is possible to select measurements that highly loaded onto all the different factors, and create a potential cephalometric analysis that may account for at least 83.4 % of the total craniofacial variability. A recommended analysis is presented in Table 43. This of course, is one possible combination of measurements (taken from among the conventional analyses used in this study). Certainly, different combinations of measurements may also work in patient assessment, just as well, as long as at least one measurement characterizes each factor. However, utilizing the measurements in table 43 will allow for the best set of predictors (for describing craniofacial variation) with the highest variance accounted for, and there would not be a better solution. Furthermore, given the varying personal criteria for cephalometric diagnostic workup across different clinicians, numerous combinations of measurements will unquestionably result.

In the table presented, are selected measurements which had the highest factor loading values and/or were best depicted by each factor. It is evident in Table 43 that a total of 38 measurements are present. The recommended analysis apparently seems to be a long tedious list of measurements, and may actually contradict one of the primary aims of the present study, which is to reduce the number of cephalometric variables necessary to thoroughly account for the total craniofacial variation However, it should be noted that a different recommended analysis may have consisted of only 14 measurements (i.e., one variable taken from each individual factor pattern solution). Likewise, another recommended analysis may have consisted of measurements which could total to more than 38.

Table 43 contains eight variables selected from the factor 1 solution because these variables loaded very highly (i.e., ≥ 0.90) relative to the rest of the variables, and also due to the fact that all of these variables are measuring different aspects of the face (although related to the same dimension of the craniofacial complex). For instance, anterior face height, midface length, posterior face height, upper face height all measure different facial dimensions, yet all variables are characterizing the same extracted factor (i.e., vertical and anteroposterior aspects of craniofacial development). For completeness sake, the eight measurements were thus selected which statistically appear to be depicting factor 1 the best, but recall that one, two or more, or all measurements can be selected depending upon which facial dimension(s) a given clinician deems important to consider.

Table 43. Recommended cephalometric analysis derived by utilizing the data from the varimax rotated factor solutions.

MEASUREMENT	FROM FACTOR
ANTERIOR FACE HEIGHT	1
FACIAL DEPTH	1
MANDIBULAR LENGTH	1
FACIAL LENGTH	1
MIDFACE LENGTH	1
CORPUS LENGTH	1
POSTERIOR FACE HEIGHT	1
UPPER FACE HEIGHT	1
LOWER 1 TO NB	2
SNB	3
SNA	3
Y-AXIS TO SN	3
ANB	4
A-B PLANE ANGLE	4
POGONION TO N-PERPENDICULAR	5
A-POINT TO N-PERPENDICULAR	5
UPPER LIP THICKNESS	6
LOWER LIP THICKNESS	6
NOSE PROMINENCE	6
CRANIAL DEFLECTION ANGLE	7
FACIAL CONVEXITY ANGLE	7
PALATAL PLANE ANGLE	7
SN TO FRANKFORT HORIZONTAL	7
MANDIBULAR PLANE ANGLE	7
OCCLUSAL PLANE ANGLE	7
FACIAL TAPER ANGLE	8
LOWER GONIAL ANGLE	8
ARTICULAR ANGLE	9
UPPER GONIAL ANGLE	9
SADDLE ANGLE	9
GONIAL ANGLE	9
UPPER 1 TO NA	10
INTERINCISAL ANGLE	10
UPPER FACE HT.: LOWER FACE HT.	11
NASOMENTAL ANGLE	12
NASOFACIAL ANGLE	12
MLS TO H-LINE	13
OCCLUSAL PLANE INCLINATION	14

Only one measurement (i.e., Lower 1 to NB) was selected to characterize factor 2 because it loaded the highest, as seen in the factor 2 matrix solution (see page 89), and all the remaining variables in the factor 2 solution are measuring the same facial aspect (i.e., lower incisor position). In other words, from among the variables in the factor 2 matrix solution, one measurement would suffice to (more or less) arrive at the same conclusion regarding lower incisor position. Thus, in this case it is not necessary to measure the lower incisor position using two or more measurements to come to the correct inference about lower incisor position.

Three measurements were selected to characterize factor 3. Again, the same criteria were used in the selection process of measurements. The criteria being: high loading values, best depiction of the factor, and the least number of variables necessary to realize the correct conclusion regarding the dimension under consideration. The same criteria were used to select measurements for the remaining factors, and should continue to be considered when creating a different cephalometric analysis from the obtained data of the present study.

Subsequent studies of skeletal craniofacial growth and morphology should include some measure of these 14 basic factors. These measurements can be used in the form of factor scores or should at least include these variables with considerably high loadings on each of the factors. Factor scores can be used in research purposes, by employing these values in a Regression Analysis Model, for example. This process will

allow the researcher to predict growth (normal or abnormal), and facial form based on factor score norms accumulated from the different ages (See "Future Studies" section; page 141).

Limitations of this study:

The study population utilized in this investigation was limited to Caucasian males and females. Certainly, one must be cautious as to not make generalizations to the rest of the population with different races. However, it would be interesting to determine if these same underlying dimensions are also extracted for races other than caucasian.

Another limitation of this study may be accuracy of cephalometric landmark identification. In most instances, the mandibular condyle was very difficult to trace from the lateral cephalogram, and the accuracy of the landmark: Condylion, may not be anatomically correct in all cases. However, the condyles were still traced to the best of the investigator's ability.

Sample selection bias may also play a role in this study because only faces with optimum characteristics, as described by Broadbent et al. (1975), were chosen as participants for this investigation.

There is also some degree of subjectivity in using a factor analysis. In the analysis of craniofacial variables, the number, identity, and magnitude of the factors may be arbitrarily determined by the investigator in the

selection of variables. The common practice of using factor analysis for the detection and subsequent measurement of hidden biological factors seems less fortunate, because the factors will often be fortuitous, reflecting the bias of the investigator.

Lastly, it should be mentioned that in utilizing multivariate techniques, the literature states that the ratio of the number of subjects to the number of variables should be anywhere from 3 : 1 to 5 : 1. In this study, there were a total of 30 subjects and 134 variables, which gives a ratio of 1 : 0.224 or 4.46 : 1.

Future Studies

A logical sequel to the present study would be to factor analyse the same variables taken from the same individuals at different age levels. A serial factor analysis study would reveal whether there are changes in factor patterns (i.e., do the same variables load onto the same factors) across the different ages, if indeed the same factors extracted in this study can be identified throughout the age range. A comparison of factor patterns between males and females can also be an interesting study, using the same protocol as in this study.

Computing factor scores for each case (omitted in the present study), usually the fourth step in the factor analysis technique, can create new ramifications in research. These factor scores can be used in subsequent

analyses to represent the values of the factors. Plots of factor scores for pairs of factors are useful for detecting unusual observations. For instance, in a similar study as the present one, factor scores will vary for different craniofacial types, therefore, patterns of factor scores can be assigned to these varying facial types. In addition, a given factor score pattern in a growing individual can allow for possible prediction of growth direction of the craniofacial elements, based on a already collected sample of data of F-score patterns in non-growing individuals (e.g., adults).

In a study by Cleall et al. (1979), the relationship of a person's craniofacial morphology to the principal components was shown in numerical form as a factor score. A factor score is derived by weighting each variable by its respective value from the component and summing all the resulting weighted values of the variables. A zero score would usually indicate the mean for the over-all sample for any given principal component. A factor score may have a positive or a negative aspect, these being morphologic and mathematical opposites. The values of the factor scores are relative in that the greater the value, either positive or negative, the more strongly a subject relates to a specific principal component. Hence, a future study involving factor scores describing craniofacial morphology would be of value to the research field.

Other possibilities such as taking the present study one step further and subjecting the extracted unique factors to another round of factor analysis, may offer different, yet interesting results. It would behoove the

researcher to certainly verify if the obtained factors are indeed unique, uncorrelated, and having no relationship with each other.

One of the basic assumptions of factor analysis is that the observed correlation between variables is due to the sharing of common factors. Therefore, the estimated correlations between the factors and the variables can be used to estimate the correlations between the variables. Hence, by utilizing the obtained 14 factor structure in this study, one may also attempt to recreate or replicate the correlation matrix of the original interrelated variables, which could then also give rise to further research opportunities.

Another interesting prospect related to the present investigation would be to apply an oblique rotation, as opposed to an orthogonal rotation, to the initial factor solution to increase the interpretability of the obtained factors. It is probable that a slightly different end result would occur, whereby a different factor pattern matrix solution would ensue.

Finally, future studies should utilize a population sample that contains subjects across the various races, with adequate subject-to-variable ratios. In a similar study with a sample population consisting of black males and females, for example, many would hypothesize that a different pattern of variable loading activity would result, but the same factors should be extracted because the investigation is still involved with the craniofacial complex of the human species. A comparison of one race to another to see if the same underlying themes (factors) result, would certainly lend a better and more thorough interpretation of the morphology of the craniofacial complex.

Conclusions

The most rewarding use of factor analysis in cephalometry seems to be its application to the analysis of the relationships between different sources of variability. Certainly, utilizing a factor analysis approach to study the morphology of the craniofacial complex is a feasible strategy, especially when dealing with data involving a large number of correlated variables. Most conventional cephalometric analyses are assessing only a portion of the total variation of the craniofacial complex. The Jarabak and Ricketts analyses appear to be the most thorough cephalometric analyses of the total craniofacial variation, based on the data obtained in this study. There are underlying and unique dimensions of the craniofacial complex that are biologically meaningful.

SUMMARY

One hundred and thirty-four cephalometric measurements representing linear and angular assessments of the craniofacial complex were obtained from 150 lateral cephalometric radiographs. Fifteen males and fifteen females (all caucasian), which had serial cephalometric radiographs taken at selected ages, (i.e., 6, 9, 12, 15, 18 years of age), were used to collect data. Factor analysis was performed on these measurements in an effort to locate specific areas of variability within the craniofacial complex. Fourteen uncorrelated factors were extracted which account for 83.4 % of the total variance and these were identified as:

(1) Vertical and AP aspects of craniofacial development,

(2) Lower incisor position,

(3) Relationship of the cranial base to the facial complex,

(4) Relationship of the maxilla and the mandible to each other,

(5) AP position of the maxilla and mandible with respect to the cranial base,

(6) Anterior limits of lips (and nose),

(7) Degree of divergence of the horizontal planes of the craniofacial complex,

(8) Mandibular shape (angle),

(9) Degree of backward divergence of the (posterior) face,

(10) Angular position of the upper incisor,

(11) Vertical facial proportion,

(12) Chin and nasal projection,

(13) Soft-tissue contour of the lower face,

(14) Slope of the occlusal plane with respect to the mandible.

There are 14 factors which describe unique dimensions of the craniofacial skeleton. These 14 craniofacial factors account for virtually all of the essential information contained in the original 187 measurements.

An appraisal of the different analyses used in this study, was then performed to determine the degree of thoroughness, with respect to the obtained factors. The Jarabak and Ricketts analysis appear to be the most thorough accounting for 74.7% and 65.2% of the total variation in the craniofacial complex, (respectively). Finally, a derived (from the 14 factors) cephalometric analysis that accounts for at least 83.4% of the craniofacial variation, has been recommended and may prove to be a more comprehensive means of evaluation in orthodontic diagnosing and treatment planning.

APPENDIX A

CWRU LANDMARK REGIMEN

Points 1-25: **Soft tissue outline:**

1: Glabella
2: Superior Nasion
3: Nasion
4: Inferior Nasion
5: Nasal Dorsum
6: Inferior Dorsum
7: Superior Nasale
8: Pronasale
9: Inferior Nasale
10: Columnella
11: Subnasale
12: Philtrum
13: Labrale Superius
14: Middle Upper Lip
15: Stomion Superior
16: Stomion Inferior
17: Middle Lower Lip
18: Labrale Inferius
19: Superior Labio-mental Fold
20: Labio-mental Fold
21: Inferior Labio-mental Fold
22: Pogonion
23: Gnathion
24: Menton
25: Cervical Point

Points 26-31: **Frontal landmarks:**

26: Frontal 1
27: Frontal 2
28: Nasion
29: Nasal 1
30: Nasal 2
31: Nasal 3

Point 32: **Orbitale**

Points 33-38: **Pterygomaxillary fissure:**

33: Ptm 1
34: Ptm
35: Ptm 2
36: Ptm 3
37: Ptm 4

Points 38-50: **Maxilla** (Note: points **38** and **50** are similar):

38: Posterior Nasal Spine
39: Superior Maxilla 1
40: Superior Maxilla 2
41: Superior Maxilla 3
42: Superior Maxilla 4
43: Superior Maxilla 5
44: Anterior Nasal Spine
45: Sub-ANS
46: A-Point
47: Inferior Maxilla 1
48: Inferior Maxilla 2
49: Inferior Maxilla 3
50: Posterior Nasal Spine

Points 51-53: **Soft palate:**

51: Uvula 1
52: Uvula 2
53: Uvula 3

Points 54-56: **Posterior pharyngeal wall:**

54: Pharyngeal Wall 1
(The point at which a line from the most superior-posterior point on the soft palate paralleling to the B-Go (i.e., "B-point" to "Gonion") line, intersects the pharyngeal wall).

55: Pharyngeal Wall 2
(The point at which the "functional occlusal plane" intersects the pharyngeal wall).

56: Pharyngeal Wall 3
(The point at which a line from the inferior tip of the soft palate paralleling the B-Go line, intersects the pharyngeal wall).

Points 57-59: **Maxillary incisor plus the center of rotation:**

57: Upper 1 Root Apex
58: Upper 1 Cusp Tip
59: Upper 1 Center of Rotation

Points 60-61: **Maxillary canine:**

60: Upper 3 Root Apex
61: Upper 3 Cusp Tip

Point 62: **Cusp tip of maxillary first bicuspid**

Points 63-64: **Maxillary first molar:**

63: Upper 6 Root Apex
64: Upper 6 Cusp Tip (Middle)

Points 65-66: **Mandibular first molar:**

65: Lower 6 Cusp Tip (Middle)
66: Lower 6 Root Apex (Middle)

Point 67: **Cusp tip of mandibular first bicuspid**

Points 68-69: **Mandibular canine:**

68: Lower 3 Cusp Tip
69: Lower 3 Root Apex

Points 70-72: **Mandibular incisor plus the center of rotation:**

70: Lower 1 Cusp Tip
71: Lower 1 Root Apex
72: Lower 1 Center of Rotation

Points 73-75: **Inner cortical plate of mandibular symphysis:**

73: Internal Cortex 1
74: Internal Cortex 2
75: Internal Cortex 3

Points 76-78: **Outer cortical plate of mandibular symphysis:**

76: External Cortex 1
77: External Cortex 2
78: External Cortex 3

Points 79-83: **B-point to mandibular symphysis:**

79: B-point
80: Anterior Genioplasty Point
81: Pogonion
82: Gnathion
83: Menton

Points 84-87: **Lower border of mandible:**

84: Posterior Genioplasty Point
85: Antegonial
86: Inferior Gonion
87: Gonion

Points 88-90: **Posterior ramus:**

88: Posterior Gonion
89: Posterior Ramus
90: Anatomic Articulare

Points 90-95: **Condyle:**

90: Anatomic Articulare
91: Condyle 1
92: Condylion
93: Condyle 2
94: Condyle 3
95: Condyle 4

Points 96-99: Sigmoid notch:

96: Sigmoid 1
97: Sigmoid
98: Sigmoid 2
99: Coronoid 1

Points 100-104: Coronoid and anterior ramus:

100: Coronoid
101: Coronoid 2
102: Anterior Ramus 1
103: Anterior Ramus
104: Anterior Ramus 2

Point 105: Center of rotation of mandible

Points 106-111: Spheno-occipital-synchondrosis to Basion:
(Note: points **90** and **107** are similar):

106: Spheno-occipital-synchondrosis
107: Anatomic Articulare
108: Basion 1
109: Basion
110: Basion 2
111: Posterior Clinoid 1

Points 112-118: Planum sphenoidale to cribriform plate:

112: Tuberculum Sella 3
113: Planum Sphenoidale
114: Cribriform 1
115: Cribriform 2
116: Cribriform 3
117: Cribriform 4
118: Cribriform 5

Points 119-123: Anterior cranial base:

119: Anterior Cranial Base 1
120: Anterior Cranial Base 2
121: Anterior Cranial Base 3
122: Anterior Cranial Base 4
123: Anterior Cranial Base 5

Points 124-127: Ethmoid triad for superimposition:

124: Ethmoid Triangle 1
125: Ethmoid Triangle 2
126: Ethmoid Triangle 3
127: Ethmoid Triangle 4

Point 128: Sella

Point 129: Porion

Point 130: Bolton articulare

Point 131: Bolton point

Point 132: C3-anterior inferior point on third cervical vertebra

Point 133: Base of epiglottis

Point 134: Hyoidale-superior anterior point on hyoid body

Point 135: Most posterior occlusal contact of maxillary and mandibular molars on functional occlusal plane.

Points 136-137: Fiducial points for superimposition of cranial base:

136: Cranial Base Fiducial 1
137: Cranial Base Fiducial 2

Points 138-139: Fiducial points for superimposition of maxilla:

138: Maxillary Fiducial 1
139: Maxillary Fiducial 2

Points 140-141: Fiducial points for superimposition of mandible:

140: Mandibular Fiducial 1
141: Mandibular Fiducial 2

Points 142-146: Key ridge outline:

142: Key Ridge 1
143: Key Ridge 2
144: Key Ridge 3
145: Key Ridge
146: Key Ridge 4

Points 147-148: Fiducial vertical lines:

147: Vertical Fiducial 1
148: Vertical Fiducial 2

Points 149-152: Corner fiducial points:

149: Vertical Fiducial 1
150: Vertical Fiducial 2
151: Vertical Fiducial 3
152: Vertical Fiducial 4

APPENDIX B

VARIABLES USED FOR FACTOR ANALYSIS

Jarabak Analysis:

1. **Saddle angle** (The angle formed by the anatomical landmarks: Nasion, Sella, Articulare).

2. **Articular angle** (The angle formed by the anatomical landmarks: Sella, Articulare, Gonion).

3. **Gonial angle** (The angle formed by the anatomical landmarks: Articulare, Gonion, Menton).

4. **Anterior cranial base** (The (millimeter) linear distance between Sella and Nasion).

5. **Posterior cranial base** (The (millimeter) linear distance between Sella and Articulare).

6. **Upper gonial angle** (The angle formed by the anatomical landmarks: Articulare, Gonion, Nasion).

7. **Lower gonial angle** (The angle formed by the anatomical landmarks: Nasion, Gonion, Menton).

8. **Ramus height** (The (millimeter) linear distance between Articulare and Gonion).

9. **Body length** (The (millimeter) linear distance between Gonion and Menton).

10. **SNA angle** (The angle formed by the anatomical landmarks: Sella, Nasion, A point).

11. **SNB angle** (The angle formed by the anatomical landmarks: Sella, Nasion, B point).

12. **ANB angle** (The angle formed by the anatomical landmarks: A point, Nasion, B point).

13. **SN-GoGn angle** (The angle formed by the anatomical landmarks: Sella, Nasion and the plane: Gonion-Gnathion).

14. **Facial depth** (The (millimeter) linear distance between Nasion and Gonion).

15. **Facial length** (The (millimeter) linear distance between Sella and Gnathion).

16. **Y-axis to SN angle** (The angle formed by the anatomical planes: Y-axis and Sella-Nasion).

17. **Posterior face height** (The (millimeter) linear distance between Sella and Gonion).

18. **Anterior face height** (The (millimeter) linear distance between Nasion and Menton).

19. **Posterior face height : Anterior face height** (The ratio between measurement "17." and measurement "18." expressed as a percentage).

20. **SNPg angle** (The angle formed by the anatomical landmarks: Sella, Nasion, Pogonion).

21. **Facial Convexity** (The angle formed by the anatomical planes: Frankfort Horizontal and Nasion-Pogonion).

22. **OP-GoGn angle** (The angle formed by the anatomical planes: Occlusal Plane and Gonion-Gnathion).

23. **Interincisal angle** (The angle formed by the anatomical planes: long axis of Upper 1 and long axis of Lower 1).

24. **Lower 1 to GoGn** (The angle formed by the anatomical planes: long axis of lower 1 and Gonion-Gnathion).

25. **Lower 1 to GoGn'** (The (millimeter) linear distance between the planes: long axis of lower 1 and Gonion-Gnathion).

26. **Upper 1 to SN** (The angle formed by the anatomical planes: long axis of Upper 1 and Sella-Nasion).

27. **Upper 1 to facial plane** (The (millimeter) linear distance between Upper incisor edge and the plane: Nasion-Pogonion).

28. **Lower 1 to facial plane** (The (millimeter) linear distance between Lower incisor edge and the plane: Nasion-Pogonion).

29. **Upper lip to E** (The (millimeter) linear distance between the most prominent point on upper lip and the Esthetic [nose-chin] plane).

30. **Lower lip to E** (The (millimeter) linear distance between the most prominent point on lower lip and the Esthetic [nose-chin] plane).

Ricketts Analysis:

31. **Molar relation** (The (millimeter) linear distance between the distal surfaces of the permanent upper and lower first molars measured along the occlusal plane).

32. **Canine relation** (The (millimeter) linear distance between the cusp tips of upper and lower canines measured along the occlusal plane).

33. **Incisor overjet** (The (millimeter) linear distance between the incisal tips of the upper and lower incisors measured along the occlusal plane).

34. **Incisor overbite** (The (millimeter) linear distance between the tips of the upper and lower incisors measured perpendicular to the occlusal plane).

35. **Lower incisor extrusion** (The (millimeter) linear distance between the tip of the lower incisor and the occlusal plane).

36. **Interincisal angle** (The angle formed by the long axes of the central incisors).

37. **A-point convexity** (The (millimeter) linear distance between A-point and the facial plane [Nasion-Pogonion]).

38. **Lower face height angle** (The angle formed by the anatomical landmarks: anterior nasal spine, center of the ramus [Xi], PM).

39. **Upper 6 to PTV** (The (millimeter) linear distance between the anatomical plane: pterygoid vertical [the back of the maxilla] and the distal of the upper first molar).

40. **Lower 1 to A-PO'** (The (millimeter) linear distance between the cusp tip of the lower incisor and the line defining the jaws: the "A-point to Pogonion" plane).

41. **Upper 1 to A-PO'** (The (millimeter) linear distance between the cusp tip of the upper incisor and the "A-point to Pogonion" plane).

42. **Lower 1 to A-PO** (The angle formed by the anatomical planes: the long axis of the lower incisor and the "A-point to Pogonion" plane).

43. **Upper 1 to A-PO** (The angle formed by the anatomical planes: the long axis of the upper incisor and the "A-point to Pogonion" plane).

44. **Occlusal plane to XI point** (The (millimeter) linear distance between the occlusal plane and the center of the ramus [Xi-point]).

45. **Occlusal plane inclination** (The counterclockwise angle formed by the anatomical planes: the corpus axis of the mandible and the occlusal plane).

46. **Lower lip to E** (The (millimeter) linear distance between the lower lip [labrale inferius] and the esthetic [nose-chin] plane).

47. **Upper lip length** (The (millimeter) linear distance between the anatomical landmarks: anterior nasal spine and the embrasure area of the lips).

48. **Lip embrasure to occlusal plane** (The (millimeter) linear distance between the embrasure area of the lips and the occlusal plane).

49. **Facial depth angle** (The angle formed by the anatomical planes: the facial plane and the Frankfort Horizontal Plane [i.e., Downs facial angle]).

50. **Facial axis angle** (The angle formed by the anatomical planes: the facial axis plane [Pt to Gn] and Basion-Nasion).

51. **Facial taper angle** (The angle formed by the anatomical planes: the mandibular plane measured to the facial plane).

52. **Mandibular plane angle** (The angle formed by the anatomical planes: Mandibular plane measured to the Frankfort Horizontal plane).

53. **Maxillary depth angle** (The angle formed by the anatomical planes: Frankfort Horizonal plane and the plane from Nasion to Point A).

54. **Maxillary height angle** (The angle formed by the anatomical landmarks: Nasion, CF [the intersection of Frankfort and PTV] and "A-point").

55. **Palatal plane angle** (The angle formed by the anatomical planes: Frankfort Horizontal plane and the palatal plane).

56. **Cranial deflection angle** (The angle formed by the anatomical planes: Basion-Nasion and Frankfort Horizontal plane).

57. **Anterior cranial length** (The (millimeter) linear distance between CC-point and Nasion).

58. **Posterior facial height** (The (millimeter) linear distance between Gonion and CF-point).

59. **Ramus position angle** (The angle formed by the anatomical planes: the Frankfort Horizontal plane and the CF-Xi plane).

60. **Porion location [TMJ]** (The (millimeter) linear distance between the anatomical landmarks: Porion and Pterygoid vertical).

61. **Mandibular arc angle** (The angle formed between the corpus and the condyle axes).

62. **Corpus length** (The (millimeter) linear distance between Xi-point and the intersection of the planes: Xi-PM and A-PO).

Downs Analysis:

63. **Facial angle** (The angle formed by the anatomical planes: Frankfort Horizontal plane and facial plane).

64. **Angle of convexity** (The angle formed by the anatomical landmarks: Nasion, A-point, Pogonion).

65. **A-B plane angle** (The angle formed by the facial plane and the line constructed from "A-point" to "B-point").

66. **Mandibular plane angle** (The angle formed by the anatomical planes: Mandibular plane and Frankfort Horizontal plane).

67. **Y- Axis angle** (The angle formed by the Frankfort Horizontal plane and the line constructed from Sella-Gnathion).

68. **Occlusal plane angle** (The angle formed by the anatomical planes: Frankfort Horizontal plane and the occlusal plane).

69. **Interincisal angle** (The angle formed by the long axes of the central incisors).

70. **Lower incisor to occlusal plane** (The angle formed by the long axis of the lower incisor [clockwise] and the occlusal plane measured from the occlusal plane perpendicular).

71. **Lower incisor to mandibular plane** (The angle formed by the mandibular plane and the long axis of the lower incisor [clockwise]).

72. **Upper incisor to A-Pg** (The (millimeter) linear distance between the upper incisor edge to the A-point - Pogonion plane).

Harvold Analysis:

73. **Mandibular unit length** (The (millimeter) linear distance from Condylion to Pogonion).

74. **Maxillary unit length** (The (millimeter) linear distance from Condylion to Anterior Nasal Spine).

75. **Unit difference** (The unit difference between Mandibular unit length and Maxillary unit length, measured in millimeters).

76. **Lower face height** (The vertical (millimeter) distance from Anterior Nasal Spine to Gnathion).

Steiner Analysis:

77. **SNA angle** (The angle formed by the anatomical landmarks: Sella, Nasion, A-point).

78. **SNB angle** (The angle formed by the anatomical landmarks: Sella, Nasion, B-point).

79. **ANB angle** (The angle formed by the anatomical landmarks: A point, Nasion, B-point).

80. **Upper 1 to NA** (The angle formed by the long axis of Upper 1 and the Nasion - A-point plane).

81. **Upper 1 to NA'** (The (millimeter) linear distance from the Upper incisor edge to the Nasion - A-point plane).

82. **Lower 1 to NB** (The angle formed by the long axis of Lower 1 and Nasion - B-point plane).

83. **Lower 1 to NB'** (The (millimeter) linear distance from the Lower incisor edge to the Nasion - B-point plane).

84. **Pogonion to NB** (The (millimeter) linear distance from Pogonion to the Nasion - B-point plane).

85. **PO and Lower 1 to NB** (The unit difference between Lower 1 to NB' and Pogonion to NB, measured in millimeters).

86. **S L** (The (millimeter) linear distance from Sella to Pogonion measured along the Sella-Nasion plane).

87. **S E** (The (millimeter) linear distance from Sella to Articulare measured along the Sella-Nasion plane).

88. **Interincisal** (The angle formed by the long axes of the Upper and Lower central incisors).

89. **SN to OP** (The angle formed by the anatomical planes: Sella-Nasion plane and the Occlusal plane).

90. **SN to GoGn** (The angle formed by the anatomical planes: Sella-Nasion plane and the Gonion-Gnathion plane).

Reidel Analysis:

91. **SNA angle** (The angle formed by the anatomical landmarks: Sella, Nasion, A-point).

92. **SNB angle** (The angle formed by the anatomical landmarks: Sella, Nasion, B-point).

93. **ANB angle** (The angle formed by the anatomical landmarks: A-point, Nasion, B-point).

94. **Upper 1 to FH** (The angle formed by the long axis of Upper 1 and the Frankfort Horizontal plane).

95. **FH-NA** (The angle formed by the anatomical planes: Frankfort Horizontal plane and the Nasion - A-point plane).

Tweed Analysis:

96. **FMA** (The angle formed by the anatomical planes: Mandibular plane and the Frankfort Horizontal plane).

97. **IMPA** (The angle formed by the anatomical plane: Mandibular plane and the long axis of Lower 1).

98. **FMIA** (The angle formed by the anatomical plane: Frankfort Horizontal plane and the long axis of Lower 1).

McNamara Analysis:

99. **A point to N perpendicular** (The (millimeter) linear distance from A-point to Nasion-perpendicular [to Frankfort Horizontal]).

100. **Mandibular length** (The (millimeter) linear distance from Condylion to Gnathion).

101. **Midface length** (The (millimeter) linear distance from Condylion to A-point).

102. **Maxillary-Mandibular differential** (The unit difference between Mandibular length and Midface length; in millimeters).

103. **LAFH** (The vertical (millimeter) distance from Anterior nasal spine to Menton).

104. **Mandibular plane angle** (The angle formed by the anatomical planes: Mandibular plane and the Frankfort Horizontal plane).

105. **Facial Axis angle** (The angle formed by the anatomical planes: Frankfort Horizontal plane and the facial axis).

106. **Pogonion to N-perpendicular** (The (millimeter) linear distance from Pogonion to Nasion-perpendicular [to Frankfort Horizontal]).

107. **Upper 1 to AV** (The (millimeter) linear distance from the Upper incisor edge to A-point vertical [perpendicular to Frankfort]).

108. **Lower 1 to A-Pg** (The (millimeter) linear distance from Lower incisor edge to the A-point - Pogonion plane).

Begg Analysis:

109. **SNA angle** (The angle formed by the anatomical landmarks: Sella, Nasion, A-point).

110. **SNB angle** (The angle formed by the anatomical landmarks: Sella, Nasion, B-point).

111. **ANB angle** (The angle formed by the anatomical landmarks: A-point, Nasion, B-point).

112. **SN-Mandibular plane** (The angle formed by the anatomical planes: Sella-Nasion and Mandibular plane).

113. **Lower 1 to Mandibular plane** (The angle formed by the Mandibular plane and the long axis of Lower 1).

114. **SN-Occlusal plane** (The angle formed by the anatomical planes: Sella-Nasion and the Occlusal plane).

115. **Angle of Convexity** (The angle formed by the anatomical landmarks: Nasion, A-point, Pogonion).

116. **Facial plane angle** (The angle formed by the anatomical planes: Frankfort Horizontal plane and the facial plane).

117. **Upper 1 to SN** (The angle formed by the long axis of Upper 1 and the Sella-Nasion plane).

118. **Lower 1 to APog** (The (millimeter) linear distance from the Lower incisor edge to the A-point - Pogonion plane).

Witts Analysis:

119. **A-point to B-point** (The (millimeter) linear distance from the perpendicular lines drawn from the functional occlusal plane to A-point and B-point, measured along the functional occlusal plane).

Soft-Tissue Analysis:
(Powell and Humphreys)

120. **Nasofrontal angle** (The angle formed by a line tangent to soft-tissue Glabella through Nasion, [the deepest depression at the roof of the nose], which will intersect a line tangent to the nasal dorsum).

121. **Nasofacial angle** (The angle formed by a vertical line touching the forehead [Glabella] and chin [Pogonion], and intersected by the dorsal plane of the nose).

122. **Nasomental angle** (The angle formed by the nasal dorsal line and the nasomental line [nasal tip to soft-tissue Pogonion]).

Soft-Tissue Analysis:
(Holdaway)

123. **H angle** (The angle formed by a straight line from the point of the soft-tissue chin tangent to the upper lip, and the N-Po plane).

124. **H line** (The angle formed by a tangent to the soft-tissue chin and the upper lip, and the plane Sella-Nasion).

Soft-Tissue Analysis:
(Spradley et al.)

125. **SLS distance** (The (millimeter) horizontal distance from the superior labial sulcus to Subnasale [located by bisecting the angle formed by the columnella of the nose and the drape of the upper lip] vertical perpendicular to the Frankfort Horizontal plane).

126. **UL distance** (The (millimeter) horizontal distance from the most anterior point of the Upper lip [Labrale Superius] to Subnasale vertical).

127. **LL distance** (The (millimeter) horizontal distance from the most anterior point of the Lower lip [Labrale Inferius] to Subnasale vertical).

128. **ILS distance** (The (millimeter) horizontal distance from the inferior labial sulcus to Subnasale vertical).

129. **SP distance** (The (millimeter) horizontal distance from soft-tissue Pogonion to Subnasale vertical).

Soft-Tissue Analysis:
(Merrifield)

130. **Z angle** (The inferior angle formed by the intersection of the Profile line [a line tangent to the soft-tissue chin and to the most anterior point of the upper lip], and Frankfort Horizontal).

Soft-Tissue Analysis:
(Burstone)

131. **Interlabial gap** (The (millimeter) vertical distance between Upper lip stomion and Lower lip stomion).

132. **Upper lip length** (The (millimeter) linear distance from Subnasale to upper lip Stomion).

133. **Lower lip length** (The (millimeter) linear distance from lower lip Stomion to Soft-tissue Gnathion).

134. **Stomion-Incision length** (The linear distance from Upper lip Stomion to the Maxillary central incisor edge).

135. **Upper lip thickness** (The (millimeter) perpendicular distance from soft-tissue Subnasale-Pogonion plane to Labrale Superius).

136. **Lower lip thickness** (The (millimeter) perpendicular distance from soft-tissue Subnasale-Pogonion plane to Labrale Inferius).

137. **Nasolabial angle** (The angle formed by Columnella and the drape of the Upper lip).

138. **Upper soft-tissue facial height** (The (millimeter) vertical distance from Glabella to Subnasale).

139. **Lower soft-tissue facial height** (The (millimeter) vertical distance from Subnasale to Menton).

140. **UFH : LFH** (The soft-tissue ratio of Upper facial height to Lower facial height, expressed as a percentage).

Soft-Tissue Analysis:
(Burstone and Legan)

141. **Facial convexity angle** (The angle formed by the soft-tissue Glabella-Subnasale plane and Subnasale-Pogonion plane).

142. **Maxillary Prognathism** (The (millimeter) horizontal distance of Subnasale to the plane Glabella-perpendicular).

143. **Mandibular Prognathism** (The (millimeter) horizontal distance of soft-tissue Pogonion to the plane Glabella-perpendicular).

144. **Vertical lip / chin ratio** (The ratio between the measurement: Subnasale - Upper lip stomion and the measurement: Lower lip stomion - Gnathion, expressed as a percentage).

145. **Mentolabial sulcus** (The (millimeter) horizontal distance from the Mentolabial sulcus to the plane Labrale inferius - Pogonion).

Soft-Tissue Analysis:
(Holdaway)

146. **Soft-tissue facial angle** (The angle formed by the anatomic plane: Sella-Nasion and the anatomic landmark: Soft-tissue Pogonion).

147. **Nose prominence** (The (millimeter) linear distance of the tip of the nose to a line perpendicular to Frankfort horizontal and running tangent to Labrale Superius).

148. **Upper lip curl** (The (millimeter) linear distance of the Upper lip sulcus depth to a line perpendicular to Frankfort horizontal and running tangent to Labrale Superius).

149. **Sn to H line** (The (millimeter) linear distance from Subnasale to the plane soft-tissue Pogonion - Labrale Superius).

150. **Skeletal profile convexity** (The (millimeter) linear distance of A-point to the plane Nasion-Pogonion).

151. **Lower lip to H line** (The (millimeter) linear distance of Labrale inferius to the soft-tissue plane: Nasion-Pogonion).

152. **Mentolabial sulcus to H line** (The (millimeter) linear distance from the mentolabial sulcus to the soft-tissue plane: Nasion-Pogonion).

Soft-Tissue Analysis:
(Gonzales-Ulloa)

153. **Zero degree Meridian** (The (millimeter) horizontal distance from the chin to a line perpendicular to Frankfort plane through soft-tissue Nasion).

Miscellaneous:

154. **S-N** (The (millimeter) linear distance from Sella to Nasion).

155. **Y-axis length** (The (millimeter) linear distance from Sella to Gnathion).

156. **Posterior cranial base** (The (millimeter) linear distance from Sella to Basion).

157. **Basion-Nasion** (The (millimeter) linear distance from Basion to Nasion).

158. **PNS-ANS** (The (millimeter) linear distance from Posterior nasal spine to Anterior nasal spine).

159. **PNS to A-point** (The (millimeter) linear distance from Posterior nasal spine to A-point).

160. **Maxillary arch length** (The (millimeter) linear distance from the disto-buccal cusp tip of maxillary first molar to the maxillary central incisor edge).

161. **Mandibular arch length** (The (millimeter) linear distance from the disto-buccal cusp tip of mandibular first molar to the mandibular central incisal edge).

162. **Bolton to facial plane** (The angle formed by the anatomic planes: Bolton plane and the Facial plane).

163. **Nasion to soft-tissue Nasion** (The (millimeter) linear distance from Nasion to Soft-tissue Nasion).

164. **ANS-tip of nose** (The (millimeter) linear distance from Anterior nasal spine to the tip of the nose).

165. **A-point to soft-tissue A** (The (millimeter) linear distance from A-point to Soft-tissue A-point).

166. **B-point to soft-tissue B** (The (millimeter) linear distance from B-point to Soft-tissue B-point).

167. **PG to soft-tissue Pg** (The (millimeter) linear distance from Pogonion to Soft-tissue Pogonion).

168. **Nose length** (The (millimeter) linear distance from Soft-tissue Nasion to the Tip of the nose).

169. **Nose-chin length** (The (millimeter) linear distance from the Tip of the nose to Soft-tissue Pogonion).

170. **TFH** (The (millimeter) linear distance from Nasion to Menton).

171. **UFH** (The (millimeter) linear distance from Nasion to Anterior nasal spine).

172. **LFH** (The (millimeter) linear distance from Anterior nasal spine to Menton).

173. **UFH : LFH** (The ratio between UFH and LFH expressed as a percentage).

174. **SN to facial plane** (The angle formed by the anatomic planes: Sella-Nasion and the facial plane).

175. **SN to mand. plane** (The angle formed by the anatomic planes: Sella-Nasion and the mandibular plane).

176. **Cranial base angle** (The angle formed by the anatomic landmarks: Basion, Sella, Nasion).

177. **SN-FH** (The angle formed by the anatomic planes: Sella-Nasion and the Frankfort Horizontal plane).

178. **SN-Palatal plane** (The angle formed by the anatomic planes: Sella-Nasion and the Palatal plane).

179. **Soft-tissue convexity** (The angle formed by the anatomic landmarks: Soft-tissue Nasion, Tip of nose, and Soft-tissue Pogonion).

180. **SN-Lower 1** (The angle formed by the anatomic planes: Sella-Nasion and the long axis of the mandibular central incisor).

181. **Upper 1 to pal. plane** (The angle formed by the long axis of the maxillary central incisor and the Palatal plane).

182. **Lower 1 to pal. plane** (The angle formed by the long axis of the mandibular central incisor and the Palatal plane).

183. **FH-NA** (The angle formed by the anatomic planes: Frankfort Horizontal plane and the Nasion-A point plane).

184. **Upper anterior dental height** (The (millimeter) linear distance from the Maxillary incisor edge to the Palatal plane).

185. **Upper posterior dental height** (The (millimeter) linear distance from the mesio-buccal cusp tip of the Maxillary first molar to the Palatal plane).

186. **Lower anterior dental height** (The (millimeter) linear distance from the Mandibular incisor edge to the Mandibular plane).

187. **Lower posterior dental height** (The (millimeter) linear distance from the mesio-buccal cusp tip of the Mandibular first molar to the Mandibular plane).

APPENDIX C

CORRELATION MATRIX AND INITIAL FACTOR ANALYSIS SOLUTION

- - - - - - - - - - - FACTOR ANALYSIS - - - - - - - - - - -

Analysis number 1 Listwise deletion of cases with missing values

Correlation Matrix:

	ABPLANE	ANB	ANGOFCON	ANSNOSTP	ANTCRBSE	ANTCRLGT	ANTFACHT
ABPLANE	1.00000						
ANB	.89557	1.00000					
ANGOFCON	.69675	.92834	1.00000				
ANSNOSTP	-.14035	-.40322	- 55199	1 00000			
ANTCRBSE	.02238	-.19154	-.34070	72033	1.00000		
ANTCRLGT	-.05698	-.29398	-.44069	.74256	90749	1 00000	
ANTFACHT	.00599	-.21526	-.38709	79092	.81260	.82480	1.00000
APONTSTA	-.20638	-.42251	-.55805	.73276	56801	.66635	.68088
APTCONVX	-.70324	-.92824	-.99389	.51196	.28657	.38541	.31824
APTNPERP	.42765	.42841	.31678	-.12522	-.02310	-.10155	.08795
ARTANGLE	.13545	.15776	.13270	-.03442	-.18374	-.23863	02087
BASNASON	.00665	-.20732	-.34560	.73555	.91161	90728	.81202
BODYLGTH	-.00694	-.27297	-.45582	.81724	.80808	.81584	88726
BOLFACPL	-.05681	-.23674	-.37651	.43394	.31759	.30169	.35686
BPONTSTB	.09923	.02616	-.03453	.31865	.32620	.32262	.30811
CANINREL	-.20551	-.10906	-.01503	-.15421	-.28441	-.24559	-.19874
CORPLGTH	-.04057	-.31888	-.52424	.79277	.79051	.81271	.90989
CRANDEFL	.24232	.14086	.03090	-.07662	-.01703	07203	.11563
CRBASAGL	.01952	.04892	.10931	-.11920	-.00948	.06246	- 15505
FACAXAGL	.17257	.25880	.27555	-.07944	-.11599	-.14555	.14811
FACDEPTH	.09365	-.11855	-.29812	.25536	.20967	.26064	.34501
FACEANGL	.09365	-.11855	-.29812	.25536	.20967	.26064	34501
FACLCNVX	.09365	-.11855	-.29812	.25536	.20967	.26064	.34501
FACLDPTH	.06229	-.19141	-.37897	.79453	.87032	.87048	.94998
FACLLGTH	-.03621	-.27040	-.44956	.81507	81101	.80787	.96530
FACTAPER	.16994	.08877	.04719	-.08869	.09828	.04668	-.21863
FCCONAGL	.50418	.46038	.38976	.13008	16759	.17451	20902
FHNA	.57828	.56326	.45117	-.17424	- 06127	-.08687	03417
FMIA	-.18264	-.25154	-.25606	-.04290	-.00523	.04040	- 05864
GONANGLE	-.20384	-.00559	.14516	-.32064	- 17167	- 18016	-.30473
HANGLE	.37038	.47230	.51531	-.24901	-.10507	- 12631	- 22038
HLINE	-.34602	-.45449	-.50722	.31963	.09030	09855	.25162
ILSDISTN	-.29143	-.21530	-.14215	-.27688	-.22693	- 25554	- 26765
INCISROB	.12293	-.10872	-.26612	.38419	46964	51036	.35437
INCISROJ	.17926	.00627	- 13891	.28529	38007	42388	.27447
INTERINC	-.04510	-.08188	-.06450	- 01160	.01480	-.01757	-.07878
INTLABGP	-.05732	.08804	.16838	-.29203	-.21857	-.20691	-.27345
L1EXTRSN	-.10986	.12689	.29210	-.40041	-.48519	-.52068	-.37805
LFH	-.03676	-.17822	-.31096	.63579	.73980	.72815	.93341

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ABPLANE ANB ANGOFCON ANSNOSTP ANTCRBSE ANTCRLGT ANTFACHT

LIPEMBOP	.10395	.10922	.07008	-.08667	-.16332	-.13969	-.17589
LLDISTAN	-.19850	-.19025	-.19360	-.11403	-.02750	-.05523	.01044
LO1FACPL	-.14792	-.41555	-.56664	.22762	.11246	.15357	.04483
LO1GOGN_	.02690	-.12507	-.27408	.68338	.78739	.79363	.88455
LO1PALPL	-.25763	-.34812	-.35202	.18793	.07825	10862	.05450
LOANDNHT	-.05150	.08660	.22508	-.67931	- 78495	- 77353	-.88830
LOANFCHT	-.03676	-.17822	-.31096	.63579	.73980	.72815	.93341
LOGONIAL	-.12249	.02872	.10314	-.03858	-.13259	-.09003	.20539
LOLIPLTH	-.07408	-.28915	-.45159	.67891	.59919	.60756	.79293
LOLIPTHK	-.04690	-.13496	-.17639	.12435	- 07290	-.05086	-.05032
LOLPHLIN	-.24268	-.24815	-.21033	-.15910	-.31396	-.30342	- 38795
LOPSDSHT	-.10336	-.00357	.10850	-.58421	-.69261	-.60818	-.78343
LOSTFCHT	-.09618	-.25521	-.39601	.65475	.62791	.62098	.82614
LOW1APO_	.40173	.24056	.10544	-.12150	-.07880	- 10601	-.19283
LOW1GOGN	.32457	.25947	.15974	12311	14845	09437	13431
LOW1OCPL	.20178	.18894	.10840	20107	.18044	.15078	26361
LOWER1NB	.23092	.26068	.22358	08473	.03591	.00696	.16103
LOWFACHT	-.05385	-.19074	-.32086	.62399	.73073	.73119	.92650
LOWFHAGL	-.20309	.03518	.17675	-.21681	-.12736	-.11220	.04229
LOWR1APO	-.11716	-.26228	-.38319	.43835	.27317	.30228	.42174
LOWR1MPL	.31993	.23937	.12825	.13853	16320	.11861	.14204
LOWR1NB_	-.27614	-.30880	-.25614	-.18145	-.25412	-.23398	-.39519
LOWRLIPE	-.16702	-.36689	-.47978	.49344	.25992	.28709	.35084
MANDARC	-.18809	.00830	.16113	-.30200	-.20673	-.20233	-.33196
MANDLGTH	-.04587	-.29351	-.47770	.82449	.82698	.83675	.94568
MANPLAGL	-.20352	.03444	.21609	-.14845	-.24805	-.25304	-.12827
MANPROGN	.01978	-.11304	-.23715	.18038	.11911	.10798	.26844
MAXDEPTH	.57828	.56326	.45117	-.17424	-.06127	-.08687	.03417
MAXPROGN	.27751	.11033	-.05961	.37505	.33419	.33132	.53050
MIDFCLTH	.17414	-.04935	-.23302	.72045	.87494	.84750	.85571
MLSHLINE	-.07355	-.18868	-.27022	.11473	-.02154	-.00800	.02618
MLSULCUS	.08951	-.09017	-.24660	.36793	.27357	.28936	.39772
MNARCLTH	.06993	-.05451	-.14402	.29471	.45198	.54255	.42839
MNUNTLTH	-.04777	-.29480	-.47931	.81105	.82684	.84056	.93642
MOLRRELN	-.31103	-.35141	-.34307	.23486	.10863	09500	.24369
MXARCLTH	.02228	-.13871	-.25034	.39672	.52230	61157	.50825
MXHEIGHT	.01660	-.15844	-.26631	.40767	.20144	.23294	.54396
MXMNDIFF	-.34059	-.55734	-.69433	.75425	54400	.60336	.82468
MXUNTLTH	.14284	-.09018	-.27904	.70312	.86067	.85086	.85811
NASLBANG	.25932	.22852	.19350	.01747	.02379	-.00754	.00320
NASOFACL	-.00891	.11227	.17433	-.21374	-.21015	-.22480	-.22819
NASOFNTL	.04398	-.06280	-.12040	.20255	22309	.27475	.23668
NASOMNTL	.20545	.19090	.16288	.08911	.00751	.02261	.01926
NOSELGTH	.16632	-.09702	-.29563	.76486	67947	.71844	.84995
NOSEPROM	-.04032	-.26524	-.39345	72819	.50983	.53942	60010
NSCHNLTH	-.00037	-.17237	-.31650	.74936	.69814	.70547	89635
NSTNASON	.04122	-.08338	-.22568	33939	27931	26840	30660

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	ABPLANE	ANB	ANGOFCON	ANSNOSTP	ANTCRBSE	ANTCRLGT	ANTFACHT
OCCLPLAN	-.04173	.08002	.21134	-.24836	-.27194	-.29313	-.32162
OCCLPLXI	.09326	.21630	.32350	-.41337	-.22569	-.25373	-.44560
OPGOGN	-.18774	-.09946	-.07496	.15463	.07412	.11200	.24993
OPINCLIN	-.15751	-.11850	-.13664	.22466	.13292	.16485	.34709
PALPLANE	-.14266	-.18736	-.18758	.40006	.14646	.12280	.19071
PFH_AFH	.00577	-.13460	-.25978	.30724	.21178	.18631	.27521

PNSANS	.12463	-.11520	-.30316	66666	.76182	.80098	83549
PNSAPONT	.18215	-.04122	-.22011	71652	.80713	.80846	.83148
POGNPERP	.01466	-.14095	-.30335	.20433	.15933	.14424	.29724
POGONNB	-.12450	.28218	.61074	-.63923	-.54544	- 58747	-.61962
POGSTPOG	-.10533	-.00564	.09960	.01386	-.08590	-.10236	-.10637
POL1NB	-.10180	-.41884	-.61966	33544	.21967	.26495	17354
PORIONLC	-.01052	-.19423	-.33827	.64188	.66804	.75364	.68823
POSCRNBS	-.02154	-.21900	-.35552	.69501	65545	71955	75502
POSFACHT	.00866	-.22690	-.41659	75313	73325	.73065	.90862
POSTCRBS	-.00463	-.21789	-.37650	67242	.69146	72896	.78152
POSTFCHT	.14061	-.11432	-.33090	.71258	.78138	74982	.90509
RAMPOSTN	.06588	.08167	.10818	.03751	05169	-.08529	01310
RAMUSHGT	-.00626	-.22668	-.40230	71501	69467	.68740	86629
SADANGLE	.01956	-.06126	-.07193	.12761	.23948	.35819	14548
SE	.01164	-.18685	-.30405	.56659	.65440	.76059	.66147
SELLANAS	.02238	-.19154	-.34070	72033	1.00000	.90749	.81260
SKPRFCON	-.70324	-.92824	-.99389	51196	28657	.38541	31824
SL	-.08451	-.30023	- 46357	.63765	.62619	.55281	.61246
SLSDISTC	-.03581	.06429	.09924	-.33289	-.18487	-.15927	- 23417
SNA	.36466	.39077	.31727	.03635	-.04693	-.12735	.11286
SNB	-.17575	-.21473	-.24834	.29243	.07033	.05010	.25523
SNFACPLN	-.12191	-.27702	-.40406	.43813	.20811	.20245	.39272
SNFH	.22950	.18623	.14455	-.22197	-.01498	.04248	-.08165
SNGOGN	-.03013	.14739	.27851	-.31110	-.24000	-.18037	-.18757
SNHLINE	-.10263	-.19867	-.24705	.14504	-.02113	-.00333	.06169
SNLOWER1	-.29306	-.33837	-.32220	.07102	.00351	.01897	-.01478
SNMANDPL	-.01298	.18394	.32737	-.32672	-.25525	-.21288	-.19402
SNOCCPLN	.12208	.20433	.29669	-.38683	-.26309	-.24231	-.35645
SNPALPLN	.06416	-.04109	-.08547	.27299	.17201	.20735	.15859
SNPG	-.12191	-.27702	-.40406	.43813	.20811	.20245	.39272
SPDISTNC	.27585	.30491	.31686	.12467	.17830	.19310	.15488
STCONVEX	.22457	.18934	.16330	.26023	.08728	07726	.07745
STFACAGL	-.15481	-.23102	-.28970	.28623	.01626	-.00334	.16078
STOINLTH	.13540	.19402	.22100	- 03278	.03556	-.03308	-.05514
TFH	.00599	-.21526	-.38709	.79092	.81260	.82480	1.00000
U1FACPLN	.20910	.39433	.48001	-.08938	.06147	.03575	.07180
UFH	.05459	-.22206	-.41038	.83802	.76054	.79836	.90925
UFH_LFH	.20198	.17277	.17429	-.04505	-.05779	-.00795	- 15516
UFH_LFH1	.12021	-.06533	-.14455	.28156	.04940	.11027	-.00219
ULDISTAN	-.09051	-.01910	.02043	-.19598	-.09030	-.09739	-.12524
UNITDIFF	-.33780	-.53044	-.65039	.73202	.51715	.56451	.77114

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	ABPLANE	ANB	ANGOFCON	ANSNOSTP	ANTCRBSE	ANTCRLGT	ANTFACHT
UP1PALPL	-.14249	-.28547	-.31701	.34416	.26255	.27026	.22405
UPANDNHT	-.03552	.08838	.18942	-.43089	-.60060	-.60993	-.72080
UPERLIPE	-.24583	-.45705	-.57471	.56621	.33973	.36914	.48259
UPGONIAL	-.14880	-.03072	.08977	-.33708	-.10880	-.14421	-.48816
UPLIPLTH	-.04971	-.10824	-.16300	.42415	.44140	.42962	.59128
UPLIPTHK	-.09496	-.19337	-.24505	.15008	-.01738	-.00671	.06158
UPLPCURL	.09681	.09088	.06753	-.04072	-.04963	-.01419	-.04705
UPLPLGTH	.06554	.00891	-.07405	.33575	.47623	.48172	.64968
UPPER1AV	-.41332	-.52690	-.59145	.47746	.38573	.44603	.50214
UPPER1FH	-.11599	-.25176	-.28368	.27245	.23752	.24939	.19013
UPPER1NA	-.13619	-.12016	-.11738	.03148	-.00479	.05072	.05376
UPPER1S1	-.15090	-.27867	-.30382	.30486	.23775	.24044	.20127

UPPER1SN	-.15090	-.27867	-.30382	.30486	.23775	.24044	.20127
UPPR1APO	- 02571	-.09939	- 09277	.15897	16271	.15128	.08318
UPPR1NA_	.60070	.70406	.70510	-.51001	-.38041	-.47206	-.42819
UPPR6PTV	.01201	-.06242	-.15570	.36139	.37010	.32388	.41300
UPPSDNHT	.06264	.18249	.28853	-.61502	-.62238	-.59764	-.82967
UPR1APO_	.20483	.14391	.09293	-.23720	-.27145	-.30337	-.29479
UPSTFCHT	.12315	-.09241	-.25354	.68943	64232	69346	.75546
VERLPCHN	.02633	.18291	.28920	- 27175	-.15711	-.17331	-.23261
WITSANAL	-.18657	-.11905	-.06738	- 04305	-.17932	- 13023	-.07071
YAXIS	-.14313	-.04102	.03627	17151	- 02427	.01710	21794
YAXISSN	.11848	.18656	.22710	-.07802	-.04990	07180	.15504
YAXSLGTH	-.03621	-.27040	-.44956	.81507	81101	.80787	.96530
ZANGLE	-.25803	-.39322	-.46859	23249	08734	12309	22623
ZEROMRDN	-.03117	-.13419	-.23782	.13441	06789	.04871	.20579

	APONTSTA	APTCONVX	APTNPERP	ARTANGLE	BASNASON	BODYLGTH	BOLFACPL
APONTSTA	1.00000						
APTCONVX	.51421	1.00000					
APTNPERP	-.01503	-.32622	1.00000				
ARTANGLE	-.06549	-.12892	-.01188	1.00000			
BASNASON	.64788	.28879	-.00583	-.24185	1.00000		
BODYLGTH	.65796	.40255	.05964	-.01059	.80589	1.00000	
BOLFACPL	.35803	.37306	.33038	-.31586	.33776	.54499	1.00000
BPONTSTB	.29911	.01237	-.19878	.09137	.36520	.27667	-.02317
CANINREL	-.09500	.02489	-.12279	.14495	-.25516	-.21166	-.17728
CORPLGTH	.71603	.46910	.15429	-.10403	.80354	.93716	.60682
CRANDEFL	.08112	-.04101	.20937	.18311	.02693	.02159	-.21922
CRBASAGL	-.02045	-.10657	.05465	-.45581	.18775	-.08084	.00533
FACAXAGL	-.06989	-.30539	-.12740	.55495	-.10416	-.12469	-.67702
FACDEPTH	.33802	.28973	.46102	-.17615	.24918	.42786	.66236
FACEANGL	.33802	.28973	.46102	-.17615	.24918	.42786	.66236
FACLCNVX	.33802	.28973	.46102	-.17615	.24918	.42786	.66236
FACLDPTH	.65134	.31496	.02613	-.02001	.87648	.88565	.35218

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	APONTSTA	APTCONVX	APTNPERP	ARTANGLE	BASNASON	BODYLGTH	BOLFACPL
FACLLGTH	.68414	.38918	.08367	- 01430	.79092	.91183	.51370
FACTAPER	-.15439	-.02954	-.10831	- 13541	.08621	- 14817	- 17908
FCCONAGL	.26029	-.41874	.05675	.14798	.22357	13882	-.13272
FHNA	-.09385	-.45453	.66823	-.07089	-.03005	.05589	.34322
FMIA	.00370	.28886	.06305	- 26027	- 04108	06199	26150
GONANGLE	-.20721	-.13586	-.05758	-.57255	-.21197	-.41449	-.12699
HANGLE	-.04981	-.51368	-.08946	.09604	-.08612	-.24663	-.41749
HLINE	.13972	.50617	.11963	-.10049	.08884	.30733	.60659
ILSDISTN	-.24636	.17028	.27623	-.07034	-.22343	-.19239	.12884
INCISROB	.42691	.24026	-.02491	-.23297	.49104	.43889	.29492
INCISROJ	.31719	.11805	-.07153	-.19293	.40283	.32606	.16084
INTERINC	-.01121	.08201	-.00022	-.13525	-.03934	-.01604	.05223
INTLABGP	-.24510	-.14925	-.05485	.08521	-.23766	-.27493	-.21195
L1EXTRSN	-.44637	-.26643	-.03990	.23851	-.50644	-.46005	-.34026
LFH	.52974	.24687	.17120	.02316	.71263	.77271	.33144
LIPEMBOP	-.05510	-.05942	.12804	.04995	-.20668	-.11583	.03675
LLDISTAN	-.01127	.19783	.37632	- 07396	.00172	.01676	.23771
LO1FACPL	.15506	.60191	-.08103	-.12745	.06097	.19502	.30923

LO1GOGN	.62314	.20751	.09872	- 09453	.78008	.79395	39656
LO1PALPL	.15827	.37538	-.05969	- 19874	04552	.19238	29901
LOANDNHT	-.59938	-.15797	-.10829	.07641	-.78660	-.76768	-.38629
LOANFCHT	.52974	.24687	.17120	.02316	.71263	.77271	.33144
LOGONIAL	.05821	-.13071	.00502	.15905	- 14702	-.12269	-.24697
LOLIPLTH	.59435	.40683	.21878	-.01148	60687	73679	51877
LOLIPTHK	.03099	.18974	05200	-.09502	- 07130	.01937	.16647
LOLPHLIN	-.27170	.25035	-.02731	- 12994	-.35904	-.25823	05719
LOPSDSHT	-.45094	-.05521	-.17593	-.03299	-.65739	-.63394	-.30877
LOSTFCHT	.54725	.34715	.27849	.04317	.59589	.71811	.44838
LOW1APO	-.21929	-.06781	.16390	-.06318	-.14192	-.06795	.09074
LOW1GOGN	.08081	-.18905	13255	11894	20253	06061	-.01579
LOW1OCPL	.15093	-.14519	.15142	14948	22890	16491	.03342
LOWER1NB	.08873	- 26155	.18173	18736	09958	.06248	.00427
LOWFACHT	.52864	.25717	.15020	02652	70232	76915	.31848
LOWFHAGL	-.24102	-.18887	-.15697	.21147	-.18863	-.24026	-.43928
LOWR1APO	.44065	.34303	.02384	.10603	.33104	.37357	.26151
LOWR1MPL	.10247	-.15832	.13089	.11141	.21531	.09461	.00000
LOWR1NB	-.22319	.31317	-.14940	-.16274	-.30587	-.24662	.03695
LOWRLIPE	.28046	.47522	.06396	-.13860	.26134	.40306	.43756
MANDARC	-.23965	-.14472	-.22176	-.31283	-.20538	- 33952	-.20610
MANDLGTH	.70366	.41974	.11061	-.13934	.83327	.92829	.59010
MANPLAGL	-.16878	-.22211	-.30701	.24740	-.27230	-.25012	-.42614
MANPROGN	.31126	.22428	.77981	-.10469	.17470	.26922	.47565
MAXDEPTH	-.09385	-.45453	.66823	-.07089	-.03005	.05589	.34322
MAXPROGN	.53061	.01984	.70806	.00256	.40383	.45856	.39674
MIDFCLTH	.60112	.17226	.16263	-.28221	.87939	.86196	.54393
MLSHLINE	.09442	.27572	.15854	-.14048	-.02965	.06047	.23002
MLSULCUS	.37949	.22405	.22415	- 06087	.28671	36170	.29932

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	APONTSTA	APTCONVX	APTNPERP	ARTANGLE	BASNASON	BODYLGTH	BOLFACPL
MNARCLTH	.35991	.09151	-.12443	-.18339	.51740	.41421	.11015
MNUNTLTH	.70086	.42143	.11553	-.16321	.83549	.92014	59621
MOLRRELN	.20744	.33975	-.01172	11638	.08624	.20906	22639
MXARCLTH	.45159	.19699	-.14151	-.17989	.58173	.50174	.18812
MXHEIGHT	.43976	22228	-.19078	36589	.23903	37983	-.13655
MXMNDIFF	.66297	.65524	.00997	09633	55151	.77864	50095
MXUNTLTH	.63845	.21759	.13855	- 28937	87490	85190	53756
NASLBANG	-.01819	-.20403	.03841	06541	09851	- 00242	- 01303
NASOFACL	-.17581	-.15180	.02712	- 01534	-.22966	-.22381	.06228
NASOFNTL	.20575	.09875	.05164	.01210	.24288	.23225	.00173
NASOMNTL	.07210	-.16094	-.01017	-.01018	03073	.03864	12786
NOSELGTH	.64065	.23482	.02478	.00034	.72056	.78923	34313
NOSEPROM	.37754	.36071	-.28929	-.01905	.50655	60916	.31363
NSCHNLTH	.62155	.25790	.10175	.08912	.69732	.78270	.34010
NSTNASON	.38730	.21734	.40469	-.00198	.25706	.35753	.45076
OCCLPLAN	-.24037	-.20276	-.32827	.15296	-.29394	-.34623	-.43773
OCCLPLXI	-.35931	-.30615	-.12956	-.11303	-.28579	-.46210	-.35301
OPGOGN	.13648	.05804	.04855	.07056	.06982	.19566	.08630
OPINCLIN	.19617	.11573	.03217	.12675	.14458	.24113	.08121
PALPLANE	.26823	.17421	-.21376	.08353	.14485	.23440	.08754
PFH_AFH	.22434	.25429	.10780	-.06467	.20660	.21639	.43652
PNSANS	.62569	.24947	.07851	-.14923	.78938	.79787	.47125
PNSAPONT	.56161	.16789	.13636	-.16149	.81560	.82878	.50565
POGNPERP	.32222	.29703	.80334	-.08517	.18255	.32532	.57156

POGONNB	-.57371	-.59255	-.06686	- 00165	-.52750	-.67564	-.48003
POGSTPOG	.01859	-.10665	-.02919	- 13410	-.01982	-.15039	- 11662
POL1NB	.26075	.64593	-.05431	-.11596	.17104	.31650	.37345
PORIONLC	.68878	.29449	.13202	-.18946	.70978	.71807	.49473
POSCRNBS	.64531	.30479	-.01916	-.01543	.83181	.70903	.29517
POSFACHT	.63175	.36006	.11725	- 00745	.72860	.79114	46711
POSTCRBS	.55998	32337	-.03321	-.13096	.72537	.73056	.35360
POSTFCHT	.60867	.27023	.18014	- 00967	.78708	.81740	43813
RAMPOSTN	-.10600	-.12101	-.13867	.20740	.02926	.02572	-.29542
RAMUSHGT	.60821	.34995	.16253	- 12044	.68820	73509	53289
SADANGLE	.14252	05111	-.01505	-.69091	.37363	19582	.10277
SE	.49532	.25155	-.01169	-.56525	78003	65655	.33509
SELLANAS	.56801	.28657	-.02310	-.18374	.91161	.80808	.31759
SKPRFCON	.51421	1.00000	-.32622	- 12892	28879	.40255	.37306
SL	.50228	.44069	17469	-.14494	.55910	71566	79990
SLSDISTC	-.00475	-.09288	.28801	-.08549	-.15933	- 17038	.00865
SNA	-.03631	-.32027	.47159	.06917	-.05546	.15357	.54878
SNB	.22757	.24519	.23003	-.02485	.07225	.33510	.73091
SNFACPLN	.36433	.39657	.22825	-.02904	.20567	.48662	.80130
SNFH	-.06082	-.14501	.21220	-.14708	.02717	-.10138	-.21376
SNGOGN	-.18553	-.28494	-.13660	.10951	-.23343	-.28087	-.57388
SNHLINE	-.00860	.24919	.10187	-.10165	.01388	.11484	.34519
SNLOWER1	.03514	.35429	-.04478	-.17946	-.05225	.11279	.36330

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	APONTSTA	APTCONVX	APTNPERP	ARTANGLE	BASNASON	BODYLGTH	BOLFACPL
SNMANDPL	-.21525	-.33347	-.12759	.12164	-.24475	-.32835	-.59069
SNOCCPLN	-.26485	-.28898	-.15362	.04013	-.25437	-.39340	-.55772
SNPALPLN	.28576	.06732	-.03304	-.05491	.22256	.19109	-.12504
SNPG	.36433	.39657	.22825	- 02904	.20567	.48662	.80130
SPDISTNC	.08585	-.34018	-.47398	.17189	16576	07383	-.32809
STCONVEX	.14128	-.16461	-.06436	.04409	.12041	.09880	.01456
STFACAGL	.23224	.29486	.19311	-.07159	.03250	.26019	.70035
STOINLTH	.01624	-.21786	-.05020	.08773	.02129	-.07385	-.20433
TFH	.68098	.31824	.08795	.02087	.81202	.88726	.35686
U1FACPLN	-.01587	-.52229	.02765	.03255	.11533	-.05484	-.24444
UFH	.74184	.34758	-.02339	.01471	79090	.87110	.32640
UFH_LFH	-.03030	-.17614	-.29685	-.07910	.03219	- 08561	- 21025
UFH_LFH1	.30256	.14368	- 25431	-.00153	.12689	.15058	.00077
ULDISTAN	-.04221	-.00960	.20141	.00494	-.08865	-.10813	-.05976
UNITDIFF	.58436	.61619	04227	08801	.51461	.74383	50481
UP1FALPL	.31654	.29780	-.14209	-.16267	26766	28201	.22203
UPANDNHT	-.37151	-.13374	-.03848	-.01955	-.59747	-.57239	-.14452
UPERLIPE	.26984	.55947	.07025	-.11508	.34601	.52686	55768
UPGONIAL	-.27571	-.06004	-.07948	-.75251	-.14406	-.38659	.01967
UPLIPLTH	.32779	.12055	.11918	.13471	.36748	.43728	.07833
UPLIPTHK	.00042	.24689	.09571	-.09813	.00723	.10457	.32337
UPLPCURL	.05687	-.07707	-.01120	-.09102	-.02701	-.00944	.09558
UPLPLGTH	.26984	.02088	.11878	.14654	.43407	.46559	.05889
UPPER1AV	.61251	.55423	.14202	-.11702	.45100	.47482	.39300
UPPER1FH	.26860	.26681	-.10446	-.17923	.24222	.24074	.20674
UPPER1NA	.03225	.11182	-.11068	.05931	.03222	.02837	-.02730
UPPER1S1	.27569	.28719	-.13680	-.15469	.23587	.25448	.23860
UPPER1SN	.27569	.28719	-.13680	-.15469	.23587	.25448	.23860
UPPR1APO	.13916	.07745	-.13713	-.13742	.16079	.11262	.04924
UPPR1NA_	-.56512	-.67509	.34818	.11040	-.43139	-.41571	-.21228

UPPR6PTV	34097	14303	.61729	-.10429	35118	.42613	49692
UPPSDNHT	-.45387	-.23779	-.15073	-.08273	- 61355	-.68831	-.31579
UPR1APO_	-.32354	-.04739	.17776	.05870	-.33406	-.20560	.03411
UPSTFCHT	.58459	.19436	-.01777	-.04496	.70929	.71117	.27331
VERLPCHN	-.28731	-.28452	-.10062	.08617	-.22647	-.29927	- 39443
WITSANAL	-.02857	.06807	-.02608	.18726	-.17132	-.11769	-.02125
YAXIS	.07311	-.06599	-.35448	.32590	00965	.04563	- 31237
YAXISSN	.00812	-.26310	-.15569	.20400	04375	- 07643	- 64501
YAXSLGTH	.68414	.38918	.08367	-.01430	.79092	91183	.51370
ZANGLE	.11845	.46743	22747	-.17590	.10550	27667	54144
ZEROMRDN	.25285	.23081	.76406	-.13911	12229	20749	46491

	BPONTSTB	CANINREL	CORPLGTH	CRANDEFL	CRBASAGL	FACAXAGL	FACDEPTH
BPONTSTB	1.00000						
CANINREL	-.04479	1.00000					

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	BPONTSTB	CANINREL	CORPLGTH	CRANDEFL	CRBASAGL	FACAXAGL	FACDEPTH
CORPLGTH	.23152	-.18994	1.00000				
CRANDEFL	.11053	-.07713	.07896	1.00000			
CRBASAGL	-.05647	-.06960	-.10107	-.09246	1.00000		
FACAXAGL	.19299	.16794	-.13470	.37769	-.32689	1.00000	
FACDEPTH	-.02124	-.21386	.53846	.53768	-.00291	-.36360	1.00000
FACEANGL	-.02124	-.21386	.53846	.53768	-.00291	-.36360	1.00000
FACLCNVX	-.02124	-.21386	.53846	.53768	-.00291	- 36360	1.00000
FACLDPTH	.35587	-.21291	.88239	.09088	-.11434	08130	.30101
FACLLGTH	.28182	-.21673	.94073	.03163	-.27388	-.00375	.41670
FACTAPER	.09473	-.05767	-.20989	.00458	.08576	-.11559	-.20032
FCCONAGL	.31347	-.08180	.09850	.12455	.03735	.24869	-.05901
FHNA	-.05589	-.21021	.11395	.52194	.07400	-.13787	.71565
FMIA	-.14301	-.14614	.09964	.14553	.05596	-.40703	.39976
GONANGLE	-.19569	.00770	-.30367	-.13679	.15906	- 15482	- 14007
HANGLE	.22462	.01950	-.31761	.06178	10921	25861	- 34053
HLINE	-.15278	-.04929	.38904	- 13713	- 28961	-.33562	43758
ILSDISTN	.24526	.08302	-.16010	03642	07275	- 21942	.14573
INCISROB	.18768	-.25416	45734	.13456	- 01141	- 22024	.30474
INCISROJ	.16552	-.21288	.33043	.14099	- 03771	- 12575	.21570
INTERINC	-.09764	-.11607	-.02788	-.00765	03214	- 17630	.04077
INTLABGP	-.17954	.15304	-.28531	.04997	02666	08850	-.14276
L1EXTRSN	-.17859	.24830	-.49019	-.13721	.00894	24414	-.34540
LFH	.24548	-.16126	.81485	.10465	-.14943	15257	.32839
LIPEMBOP	-.20824	.08158	-.09459	.01161	- 04550	-.07892	.04659
LLDISTAN	-.08686	.07597	.07631	.02044	11682	-.19167	.22875
LO1FACPL	-.10081	-.12434	.24762	.06677	-.07060	-.37892	.32967
LO1GOGN_	.30998	-.16324	.84710	.05827	-.15187	.07248	.33007
LO1PALPL	-.07676	-.06470	.20073	-.19409	-.05925	-.38418	.16569
LOANDNHT	-.32408	.15689	-.81445	-.01857	.11600	-.07546	-.29188
LOANFCHT	.24548	-.16126	.81485	.10465	-.14943	.15257	.32839
LOGONIAL	-.03245	.07779	-.00649	.09862	-.16953	.47957	-.08772
LOLIPLTH	.05325	-.18346	.78967	.01348	-.11105	-.08568	.44017
LOLIPTHK	-.08424	-.14515	.06143	.02593	-.09975	-.16522	.19901
LOLPHLIN	-.28126	-.04106	-.23060	-.00859	-.08902	-.25271	.09804
LOPSDSHT	-.24878	.13633	-.66312	.03495	.15216	-.11488	-.19472
LOSTFCHT	.05529	-.17335	.77800	.08977	-.17290	.02343	.42674

LOW1APO	-.12531	-.18391	-.06063	.11804	.00889	-.23361	.18414
LOW1GOGN	.17976	01697	.05371	.11412	-.00377	.17724	- 00071
LOW1OCPL	.18516	04005	17414	.10281	-.05998	.24466	04507
LOWER1NB	.11391	.07219	.07228	.10519	-.03588	.27167	03523
LOWFACHT	.24414	-.16212	.81721	.13043	-.17111	.17092	.33693
LOWFHAGL	-.00263	.08018	-.24023	03701	- 15951	.46349	-.31985
LOWR1APO	.14316	.04687	.42869	.11521	-.11357	.08891	25889
LOWR1MPL	.17877	.00919	.08633	.13990	-.02030	17246	.02822
LOWR1NB	-.25593	-.01297	-.22848	-.07850	.03516	- 36359	.02890
LOWRLIPE	.02228	-.16420	.45378	-.03840	-.13342	- 23720	35789
MANDARC	-.10226	.01741	-.31846	-.17439	.17171	-.08513	- 25318

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	BPONTSTB	CANINREL	CORPLGTH	CRANDEFL	CRBASAGL	FACAXAGL	FACDEPTH
MANDLGTH	.26409	-.23941	.96670	01223	-.11540	-.12782	.47529
MANPLAGL	-.04976	.22267	-.29825	-.45578	-.05836	.39157	-.69427
MANPROGN	-.11017	-.14846	.38450	.23446	.03744	-.23850	60926
MAXDEPTH	-.05589	-.21021	.11395	.52194	.07400	-.13787	.71565
MAXPROGN	.07576	-.19562	.54030	.26782	.01628	-.03515	.53709
MIDFCLTH	.30209	-.28917	.88238	-.01369	-.01199	-.17728	.40209
MLSHLINE	-.69158	-.10123	.13219	.01490	-.05044	-.20755	.26487
MLSULCUS	-.46525	-.09609	.42348	.08180	-.01301	-.08179	33527
MNARCLTH	.24792	-.03863	.43765	.09403	.07301	.03672	12536
MNUNTLTH	.26011	-.24082	.96704	.01359	-.10880	-.14345	.48256
MOLRRELN	.12823	.08788	.25345	-.15131	-.14184	.00021	.07483
MXARCLTH	.29107	-.06088	.53225	.07551	.01799	.00378	.17485
MXHEIGHT	.23162	.02188	.38183	.20824	-.27977	.57286	-.00091
MXMNDIFF	.14164	-.10843	.83231	.04536	-.23011	-.02547	45371
MXUNTLTH	.31424	-.27238	.88807	.01208	-.01027	-.16798	.41791
NASLBANG	.13743	-.06501	.01041	.06466	.03506	.03440	.03849
NASOFACL	-.02828	.07747	-.20822	-.13074	.00939	-.11470	- 04880
NASOFNTL	-.04088	-.07622	.19279	.14752	.02368	.02041	11934
NASOMNTL	.24232	.02190	.01701	-.08152	.00119	-.05896	00059
NOSELGTH	.33975	-.17227	.79352	.06699	- 11381	.11494	.27901
NOSEPROM	.30708	-.08892	.58297	- 10321	-.13663	-.02020	14021
NSCHNLTH	.15937	-.17811	79570	.03527	- 09960	.12238	.28635
NSTNASON	-.03361	-.05820	.42618	.03164	-.16015	- 25178	40886
OCCLPLAN	-.07542	.15300	-.41676	- 37600	00970	22221	- 66154
OCCLPLXI	-.08159	.05340	-.52471	-.02215	.07201	.02284	-.32033
OPGOGN	.03102	.04422	.22418	- 00696	-.10243	.14408	.08265
OPINCLIN	.08546	.01622	.29519	.00479	-.14660	16605	.09032
PALPLANE	.10362	.13637	.18451	-.58577	-.20598	.00561	-.38032
PFH_AFH	.08633	-.06758	.31627	- 09826	-.51448	-.17403	.25994
PNSANS	.34695	-.19821	.84104	.05622	-.07004	-.07932	38806
PNSAPONT	.32508	-.22941	.84254	-.00874	-.07295	- 12640	36665
POGNPERP	-.18052	-.11400	.46074	.19393	-.01224	-.31495	65377
POGONNB	-.18893	.19701	-.73805	-.21741	.17027	.15117	-.52037
POGSTPOG	.17247	-.06036	-.15189	.01101	.03927	.07106	-.06779
POL1NB	-.04420	-.15038	.37603	.10258	-.09709	-.36519	39756
PORIONLC	.16340	-.25393	.73897	-.06049	.03606	-.31819	.38556
POSCRNBS	.37804	-.13577	.73318	.12481	-.16605	.10995	.24688
POSFACHT	.27629	-.18704	.85337	.04801	-.34519	.04544	.38071
POSTCRBS	.30591	-.13492	.75627	.10908	-.36944	.07800	.28637
POSTFCHT	.29469	-.19744	.86117	.15240	-.15938	.04923	.43634
RAMPOSTN	.03858	.16458	-.03779	-.37880	-.06994	.36182	-.60094
RAMUSHGT	.21678	-.21936	82266	-.03589	-.18242	-.07867	.41262

SADANGLE	.03592	-.12255	.18701	.01202	.78339	-.26803	.12081
SE	.24146	-.17258	.67526	.08463	.29133	-.13194	29984
SELLANAS	.32620	- 28441	.79051	-.01703	-.00948	- 11599	20967
SKPRFCON	.01237	.02489	.46910	-.04101	-.10657	-.30539	.28973
SL	11188	-.22088	.76629	- 18649	- 38555	- 43735	51264

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	BPONTSTB	CANINREL	CORPLGTH	CRANDEFL	CRBASAGL	FACAXAGL	FACDEPTH
SLSDISTC	-.16831	.05746	-.15816	.01647	23010	-.14430	03878
SNA	-.04293	-.08954	.19049	- 16040	-.44132	-.18697	33857
SNB	-.06181	-.02689	.40297	-.25852	-.49969	-.36073	.43341
SNFACPLN	-.00901	-.08204	.56740	-.17035	-.49842	-.37999	.54597
SNFH	-.01180	-.12638	-.07892	.72383	.54146	05171	.40318
SNGOGN	-.06528	.10254	-.31250	.18606	.36519	.41618	-.30738
SNHLINE	-.03163	-.04757	.17958	-.02773	-.02702	-.24331	.29530
SNLOWER1	-.13279	-.07840	.13810	-.22330	-.21786	-.42260	.18655
SNMANDPL	-.05829	.11289	-.35712	.14781	.38423	.42287	-.34715
SNOCCPLN	-.07834	.05404	-.44274	.16528	.39018	.24330	-.32707
SNPALPLN	.12054	.02767	.15228	.05323	.35699	.06254	-.03645
SNPG	-.00901	-.08204	.56740	-.17035	-.49842	- 37999	.54597
SPDISTNC	.26193	.02277	-.02166	-.08158	-.04240	.34617	-.38819
STCONVEX	.29076	-.00890	.03683	-.07248	.06333	.02880	-.09440
STFACAGL	-.01207	-.05737	.33562	-.19826	-.46779	-.38467	.45528
STOINLTH	.14955	.03250	-.11696	.01463	-.01662	.16497	-.19057
TFH	.30811	-.19874	.90989	.11563	-.15505	.14811	.34501
U1FACPLN	.17657	.03483	-.10625	-.01446	.04860	.31788	-.24864
UFH	.32901	-.20884	.86728	.10895	-.13552	11806	.30634
UFH_LFH	.24956	.01605	-.15396	-.00418	.15719	05871	-.20634
UFH_LFH1	11887	-.06723	.09331	.00268	.00693	-.03368	- 02478
ULDISTAN	-.14079	.03584	-.11935	.04544	.10629	-.01000	-.01518
UNITDIFF	.09379	-.11576	79338	01167	-.23116	-.06056	43606
UP1PALPL	.10906	-.04609	.28109	- 04408	- 04770	- 14994	13128
UPANDNHT	-.24354	.18501	- 58771	- 16940	.10009	- 18894	-.20879
UPERLIPE	.01930	-.08128	.57460	- 07493	- 12014	- 26030	41148
UPGONIAL	-.19851	-.04245	- 34278	- 22159	.29782	-.49959	- 10396
UPLIPLTH	.08882	-.13750	.44736	.08314	-.23673	20893	11552
UPLIPTHK	-.02881	-.04517	.17397	-.01493	-.05869	-.22563	.28843
UPLPCURL	.04019	.00410	.01890	-.05008	.07067	-.12690	.06015
UPLPLGTH	.12147	-.09258	.48329	.17326	-.14111	.29135	.14660
UPPER1AV	.08755	.00742	.55572	.05127	-.05846	-.12985	35862
UPPER1FH	.09130	-.07043	.24870	.06320	-.01185	-.15113	.20110
UPPER1NA	.06065	.10917	.04289	-.04385	-.02735	.06184	-.03984
UPPER1S1	.09196	-.04971	.25893	-.05128	-.09685	-.15799	.13594
UPPER1SN	.09196	-.04971	.25893	-.05128	-.09685	-.15799	.13594
UPPR1APO	.09541	-.04123	.09155	-.01745	.00577	-.05587	-.00032
UPPR1NA_	-.17250	-.06159	-.44408	.05779	.07924	.06918	-.11547
UPPR6PTV	-.05876	-.19864	.46885	.03562	.01319	-.30962	.45233
UPPSDNHT	-.23275	.12827	-.70295	-.03644	.20972	-.13527	-.27106
UPR1APO_	-.21441	-.04176	-.18932	.04005	.00845	-.16057	.09426
UPSTFCHT	.29457	-.16504	.70403	.10196	-.00366	.08988	.25642
VERLPCHN	.09487	.03951	-.34178	.07146	-.09568	.23882	-.29237
WITSANAL	.00641	.22650	-.10330	-.03421	-.15307	.08467	-.05389
YAXIS	.12725	.22096	.00692	-.47121	-.31023	.54513	-.67792
YAXISSN	.13488	.10274	-.09444	.35331	.31511	.71823	-.30072
YAXSLGTH	.28182	-.21673	.94073	.03163	-.27388	-.00375	.41670

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	BPONTSTB	CANINREL	CORPLGTH	CRANDEFL	CRBASAGL	FACAXAGL	FACDEPTH
ZANGLE	-.16796	-.11129	.37365	19822	- 04960	- 33167	65520
ZEROMRDN	-.13177	-.13006	33732	.20932	04523	- 25292	.58431

	FACEANGL	FACLCNVX	FACLDPTH	FACLLGTH	FACTAPER	FCCONAGL	FHNA
FACEANGL	1.00000						
FACLCNVX	1.00000	1.00000					
FACLDPTH	.30101	.30101	1.00000				
FACLLGTH	.41670	.41670	.92749	1.00000			
FACTAPER	-.20032	-.20032	.06970	-.21170	1.00000		
FCCONAGL	-.05901	-.05901	.23875	.13911	.05634	1.00000	
FHNA	.71565	.71565	-.00649	.05635	-.16781	.21363	1.00000
FMIA	.39976	.39976	-.06107	.01160	.03153	-.18507	.18773
GONANGLE	-.14007	-.14007	-.45247	-.29537	-.38765	-.16968	-.00590
HANGLE	-.34053	-.34053	-.16554	-.29282	.15021	.60738	.05267
HLINE	.43758	.43758	.19217	.39637	-.21978	-.55057	.04428
ILSDISTN	.14573	.14573	-.27910	-.23862	.02183	-.53233	.04079
INCISROB	.30474	.30474	.43374	.39831	.15188	.08694	.07985
INCISROJ	.21570	.21570	.37326	.30943	23217	.25284	.08467
INTERINC	.04077	.04077	- 06933	-.06209	.08870	-.08378	-.00727
INTLABGP	-.14276	-.14276	-.27419	-.28727	.02123	-.06616	00269
L1EXTRSN	-.34540	-.34540	-.45394	- 42417	-.14818	-.04153	-.10061
LFH	.32839	.32839	.86700	.88928	-.23973	.08810	.08065
LIPEMBOP	.04659	.04659	-.18634	-.15185	-.04365	-.04291	.09984
LLDISTAN	.22875	.22875	-.01086	01149	-.04686	-.54914	.08145
LO1FACPL	.32967	.32967	.09867	.12565	.20606	-.22326	-.11521
LO1GOGN_	.33007	.33007	.86878	.88696	-.17640	.16570	.11047
LO1PALPL	.16569	.16569	.04568	.15236	- 01861	-.09160	-.10392
LOANDNHT	-.29188	- 29188	-.87556	- 87464	18088	-.21591	-.10929
LOANFCHT	.32839	32839	86700	.88928	-.23973	.08810	08065
LOGONIAL	-.08772	-.08772	-.06762	.11838	- 77465	04572	01215
LOLIPLTH	44017	.44017	.73831	.80995	- 20288	- 03316	07878
LOLIPTHK	.19901	.19901	-.07769	.02485	- 03698	-.06643	.05462
LOLPHLIN	.09804	.09804	-.40971	-.29182	-.00230	-.52729	-.05686
LOPSDSHT	-.19472	-.19472	-.79293	-.76484	.03992	-.29490	-.10407
LOSTFCHT	.42674	.42674	.74426	.82119	- 27671	-.05237	.11464
LOW1APO_	.18414	.18414	-.12050	-.14917	.28271	.07513	.23472
LOW1GOGN	-.00071	-.00071	.24419	.09375	.31202	.20865	.10726
LOW1OCPL	.04507	.04507	.28904	.22371	.02026	.07855	.12225
LOWER1NB	.03523	.03523	.13062	.11725	-.16701	.16874	.19735
LOWFACHT	.33693	.33693	.85612	.88878	-.25660	.05835	.08275
LOWFHAGL	-.31985	-.31985	-.08927	-.04095	-.28596	-.17709	-.14724
LOWR1APO	.25889	.25889	.39423	.41892	- 16724	-.04319	-.03771
LOWR1MPL	.02822	.02822	.25603	11126	.32820	.18521	.11123
LOWR1NB_	.02890	.02890	-.35493	-.32112	19940	-.29263	-.16077
LOWRLIPE	.35789	.35789	.32066	.43353	-.08546	-.23008	-.01962

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	FACEANGL	FACLCNVX	FACLDPTH	FACLLGTH	FACTAPER	FCCONAGL	FHNA

MANDARC	-.25318	-.25318	- 45253	-.31671	- 35978	- 13814	- 10125
MANDLGTH	.47529	.47529	.92177	.97611	-.18443	.12007	09064
MANPLAGL	-.69427	-.69427	- 30326	-.19449	- 56588	.00887	- 47910
MANPROGN	.60926	.60926	.19915	.28689	-.13272	-.17394	.39893
MAXDEPTH	.71565	.71565	-.00649	.05635	-.16781	.21363	1 00000
MAXPROGN	.53709	53709	.47373	50018	-.12922	.41548	.45266
MIDFCLTH	.40209	.40209	.89225	88287	- 02068	26857	.19759
MLSHLINE	.26487	.26487	-.01531	.08681	-.09992	- 44696	.05493
MLSULCUS	.33527	.33527	36769	40131	-.10074	-.13378	13358
MNARCLTH	.12536	.12536	.48407	.40652	.02686	.21518	00203
MNUNTLTH	.48256	.48256	.91455	.97060	-.17777	.11147	.09714
MOLRRELN	.07483	.07483	.19346	.26945	-.17295	-.21593	-.17672
MXARCLTH	.17485	.17485	.57014	.50432	.03883	.20370	-.03084
MXHEIGHT	-.00091	-.00091	.46465	.45794	-.22350	27881	-.20620
MXMNDIFF	.45371	.45371	.72272	.85174	-.36457	-.11842	-.08185
MXUNTLTH	.41791	.41791	.89628	.88363	-.00458	.29612	.17866
NASLBANG	.03849	.03849	.07444	.00847	.19900	.50104	.16509
NASOFACL	-.04880	-.04880	-.23857	-.18956	-.01159	.00581	.08824
NASOFNTL	.11934	.11934	.23359	.20448	-.02479	.15067	.01849
NASOMNTL	.00059	.00059	.05060	.03980	.07020	.44658	.11160
NOSELGTH	.27901	.27901	.85745	.82769	-.05513	.35490	.03060
NOSEPROM	.14021	.14021	.62272	.62396	-.00585	.19970	-.17008
NSCHNLTH	.28635	.28635	.84152	.86010	-.21808	.17844	.03397
NSTNASON	.40886	.40886	.28054	.38306	-.12008	-.05308	.22050
OCCLPLAN	-.66154	-.66154	-.35719	-.36336	-.07779	.15329	-.46709
OCCLPLXI	-.32033	-.32033	-.35529	-.46500	.32847	.15815	-.06474
OPGOGN	.08265	.08265	.10780	.24632	-.49759	- 21465	.03917
OPINCLIN	.09032	.09032	.22426	.34397	-.37449	-.16791	.00165
PALPLANE	-.38032	-.38032	.18167	.24662	-.07871	.15476	-.49716
PFH_AFH	.25994	.25994	.39763	.42602	.39285	-.01033	.05020
PNSANS	.38806	.38806	.86888	.85013	.00751	.31918	.13035
PNSAPONT	.36665	.36665	.86856	.85821	-.00630	27116	17097
POGNPERP	.65377	.65377	.23494	.33591	-.12457	-.17851	.39360
POGONNB	-.52037	-.52037	-.65439	- 65762	- 07194	-.01657	-.02553
POGSTPOG	-.06779	-.06779	-.14215	- 09060	-.08946	- 29710	01772
POLINB	.39756	.39756	.22753	.25280	.19262	-.18823	-.09231
PORIONLC	.38556	.38556	.66412	73024	-.18972	.27412	.11071
POSCRNBS	.24688	.24688	.79807	.78113	.02547	.22988	-.03908
POSFACHT	.38071	.38071	.92253	.94545	00066	.16021	.04587
POSTCRBS	.28637	.28637	83360	.83149	07453	.18778	-.01588
POSTFCHT	.43634	.43634	.95217	.90104	.08266	.24464	.15787
RAMPOSTN	-.60094	-.60094	.09424	-.04467	.26923	.10194	-.49479
RAMUSHGT	.41262	.41262	.86605	.89467	-.02380	.11705	.08859
SADANGLE	.12081	.12081	.22097	.03483	.19766	.03114	.05326
SE	.29984	.29984	.74300	.61956	.15928	.16263	.04812
SELLANAS	.20967	.20967	.87032	.81101	.09828	.16759	-.06127
SKPRFCON	.28973	.28973	.31496	.38918	-.02954	-.41874	-.45453

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	FACEANGL	FACLCNVX	FACLDPTH	FACLLGTH	FACTAPER	FCCONAGL	FHNA
SL	.51264	.51264	.62846	.78665	-.08527	-.04812	.13719
SLSDISTC	.03878	.03878	-.25501	-.24796	-.06810	-.38288	.12174
SNA	.33857	.33857	.07247	.27502	-.23361	.14453	.55194
SNB	.43341	.43341	.19865	.46215	-.29921	-.13537	.22988
SNFACPLN	.54597	.54597	.35349	.59302	- 24367	-.12146	.21618
SNFH	.40318	.40318	-.08302	-.22869	.06600	.07391	.48012

SNGOGN	-.30738	-.30738	- 35779	-.35831	-.48675	.02898	-.07384
SNHLINE	.29530	.29530	.04589	12847	-.03282	-.07009	09172
SNLOWER1	.18655	.18655	-.01650	.12779	- 00295	- 21802	- 05872
SNMANDPL	-.34715	-.34715	-.36504	-.37828	- 49618	06878	- 07547
SNOCCPLN	-.32707	-.32707	- 39007	-.49914	- 02470	19324	-.09347
SNPALPLN	-.03645	-.03645	.14171	.06342	-.03870	27727	- 10528
SNPG	.54597	.54597	.35349	.59302	- 24367	-.12146	21618
SPDISTNC	-.38819	-.38819	.20382	.09145	.07100	.74170	-.14218
STCONVEX	-.09440	-.09440	.11520	.05716	.09583	.60433	.02192
STFACAGL	.45528	.45528	.11898	.37557	-.23633	-.26074	.21899
STOINLTH	-.19057	-.19057	-.03406	-.07575	.08107	.26798	-.01430
TFH	.34501	.34501	.94998	.96530	-.21863	.20902	.03417
U1FACPLN	-.24864	-.24864	.06941	.00630	-.06734	.32129	.12039
UFH	.30634	.30634	.88665	.89132	-.15742	.31418	-.02548
UFH_LFH	-.20634	-.20634	-.06905	-.17385	.21586	.35360	-.07960
UFH_LFH1	-.02478	-.02478	.05273	.03235	.09762	.30081	-.14651
ULDISTAN	-.01518	-.01518	-.13244	-.14985	-.01746	-.40414	.01093
UNITDIFF	.43606	.43606	.66040	.80848	-.39878	-.21656	-.06325
UP1PALPL	.13128	.13128	.25156	.25854	.02306	-.01162	-.11688
UPANDNHT	-.20879	-.20879	-.70480	-.66725	.07500	-.08450	-.05205
UPERLIPE	.41148	41148	.45564	.55446	-.10390	-.31225	- 03893
UPGONIAL	-.10396	-.10396	-.46871	-.41977	.09079	-.22218	-.02372
UPLIPLTH	.11552	.11552	.49318	.54795	-.28926	.04660	-.00849
UPLIPTHK	.28843	.28843	.04165	.12904	-.03327	-.05022	.08671
UPLPCURL	.06015	.06015	-.05698	-.02468	-.04132	.21370	.10343
UPLPLGTH	.14660	.14660	.59235	.57395	-.17538	.07326	.08400
UPPER1AV	.35862	.35862	.46364	.52268	-.15838	-.14652	-.09300
UPPER1FH	.20110	.20110	.21988	.21471	.03886	-.03860	-.02645
UPPER1NA	-.03984	-.03984	.05124	.05760	-.04694	-.02348	-.12467
UPPER1S1	.13594	.13594	.23097	.24880	02816	-.05006	- 10165
UPPER1SN	.13594	.13594	.23097	.24880	02816	-.05006	-.10165
UPPR1APO	-.00032	-.00032	.12376	.08730	.08346	.03268	-.07602
UPPR1NA	-.11547	- 11547	- 42568	- 45195	.08528	18252	40698
UPPR6PTV	.45233	.45233	34489	44254	- 15877	- 05504	.31687
UPPSDNHT	-.27106	-.27106	-.79632	- 81208	10858	- 02390	- 04204
UPR1APO	.09426	.09426	-.29461	- 26485	08217	- 10068	15323
UPSTFCHT	.25642	.25642	.76881	.72633	-.04591	.30350	.04534
VERLPCHN	-.29237	-.29237	-.25382	-.27830	-.03127	.08769	-.05609
WITSANAL	-.05389	-.05389	-.10771	-.05397	-.10954	- 05578	-.09152
YAXIS	-.67792	-.67792	.16661	.17296	-.18279	.13667	-.60470
YAXISSN	-.30072	-.30072	.09259	-.08515	-.13380	.25599	-.11504

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	FACEANGL	FACLCNVX	FACLDPTH	FACLLGTH	FACTAPER	FCCONAGL	FHNA
YAXSLGTH	.41670	.41670	.92749	1.00000	-.21170	.13911	05635
ZANGLE	.65520	.65520	.16282	.30994	-.20132	-.54899	.27517
ZEROMRDN	.58431	.58431	.13214	.23221	-.13404	-.28309	.37890

	FMIA	GONANGLE	HANGLE	HLINE	ILSDISTN	INCISROB	INCISROJ
FMIA	1.00000						
GONANGLE	.10351	1.00000					
HANGLE	-.18713	.05942	1.00000				
HLINE	.18388	-.07089	-.90631	1.00000			
ILSDISTN	.20923	.07159	-.20724	.19453	1.00000		

INCISROB	.00983	-.13362	.01924	.07182	-.14522	1.00000	
INCISROJ	.05063	-.14529	.16062	- 08915	-.24476	60135	1 00000
INTERINC	.28967	.09342	.00998	-.00422	04344	44217	-.12340
INTLABGP	.00151	.10381	06344	- 16121	.01520	- 18123	- 12558
L1EXTRSN	-.02181	.14843	.03428	- 12425	09695	- 99167	- 54155
LFH	-.07003	-.24199	-.26113	.27365	-.14557	28343	.20987
LIPEMBOP	.03302	.01479	.00052	-.05011	-.05003	-.25747	-.06769
LLDISTAN	.08885	-.03635	-.19514	.20384	.63200	.06254	-.08126
LO1FACPL	.70183	-.15742	-.32427	.29700	.09902	.21055	17950
LO1GOGN	-.13240	-.20784	-.15724	.23317	-.23885	.41948	34615
LO1PALPL	.83414	.04590	-.19706	.24159	.08010	-.03046	.02727
LOANDNHT	.18208	.21832	.11662	-.19269	.24724	-.39790	-.32018
LOANFCHT	-.07003	-.24199	-.26113	27365	-.14557	.28343	.20987
LOGONIAL	-.17796	.47799	-.02506	.01361	-.14538	-.28569	-.28340
LOLIPLTH	.13310	-.29766	-.49867	.53485	-.17102	.23759	.13322
LOLIPTHK	.20728	.06334	-.44181	.44911	-.04629	-.07617	-.09520
LOLPHLIN	.22931	.21585	-.50173	.46751	.26125	-.14869	-.20162
LOPSDSHT	.07683	.28699	.10408	-.14320	.24336	-.11476	-.11620
LOSTFCHT	.07541	-.24030	-.43420	.45472	-.13367	.25895	.16547
LOW1APO	.64305	-.09171	.01962	-.04439	-.02076	.07997	.13558
LOW1GOGN	-.81678	-.34646	.10589	-.08340	-.13137	.19914	.14631
LOW1OCPL	-.78293	-.24648	.00148	.03913	-.09755	.02252	.08841
LOWER1NB	-.89086	-.11552	.06988	-.01372	-.12788	.07435	-.00760
LOWFACHT	-.05760	-.22717	-.27451	.28900	-.14337	.28742	.22200
LOWFHAGL	-.14752	.25202	-.02809	-.04881	.00891	-.31772	-.27750
LOWR1APO	-.67493	-.23717	-.24206	.29176	-.06141	.27084	.11893
LOWR1MPL	-.80453	-.36258	.08202	-.05895	-.12854	.22413	.17085
LOWR1NB	.76869	.12584	-.16563	.12150	.22030	-.08199	-.05535
LOWRLIPE	.23051	-.10486	-.67659	.69557	.03250	.07599	-.02935
MANDARC	.12733	.75652	.10359	-.10970	03286	-.15772	-.18553
MANDLGTH	.06150	-.27295	-.30592	.39287	-.20335	.42382	.32269
MANPLAGL	-.35950	.40162	.17572	- 20721	-.13775	-.36887	-.35210
MANPROGN	.17747	- 11664	-.40183	44777	39949	.14272	-.00547
MAXDEPTH	.18773	-.00590	.05267	04428	.04079	07985	.08467
MAXPROGN	.04112	-.24712	-.10211	.16284	-.05197	21141	.15277

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	FMIA	GONANGLE	HANGLE	HLINE	ILSDISTN	INCISROB	INCISROJ
MIDFCLTH	.00758	-.19633	-.11233	.20520	-.25940	.49444	.41357
MLSHLINE	.08203	.06175	-.49603	.50190	-.28124	.13725	.03203
MLSULCUS	-.01143	-.15651	-.31925	.33404	-.44548	.28834	.18433
MNARCLTH	-.34826	-.11840	.10333	-.07169	-.21494	.50010	.44996
MNUNTLTH	.07953	-.25461	-.30707	.39489	-.19439	.42692	.31996
MOLRRELN	.04254	-.14205	-.35142	.37263	.22409	- 20415	- 30680
MXARCLTH	-.29224	-.17557	.04030	.00990	-.20533	.54196	.57198
MXHEIGHT	-.17642	-.31532	-.03508	.03151	- 31512	.10903	08840
MXMNDIFF	.12000	-.30919	-.49664	.55289	-.07210	.21567	.11238
MXUNTLTH	.03113	-.20536	-.11957	.20727	-.27086	.49305	.42339
NASLBANG	.00181	-.19434	.03735	-.03180	-.31075	-.02725	.14067
NASOFACL	.07380	.10532	.08889	-.05300	.03637	-.12347	.03382
NASOFNTL	.05202	-.08596	-.12417	.00865	-.11336	.13145	.09664
NASOMNTL	-.02944	-.08617	.31345	-.22254	-.14599	.05549	.24404
NOSELGTH	-.13140	-.38623	-.09036	.16369	-.36248	.33162	.28321
NOSEPROM	-.03215	-.29110	-.39383	.38873	-.32913	.20527	.20450
NSCHNLTH	-.02107	-.32903	-.32022	.30962	-.36526	.23987	.16950
NSTNASON	.09159	-.12332	-.32537	.31193	.02206	.16921	.15371

OCCLPLAN	-.26295	.22831	27549	- 33304	-.15882	- 04957	-.21229
OCCLPLXI	-.07000	.20568	.31614	-.39535	-.00842	-.03137	-.03413
OPGOGN	-.02764	.14416	-.17836	.21325	.04783	-.30128	- 09079
OPINCLIN	.03895	.01059	-.23056	.26959	-.00915	-.27824	-.11319
PALPLANE	-.20378	-.09334	-.02990	.11508	-.21466	-.07752	-.04601
PFH_AFH	.07230	-.34638	-.26324	.47693	-.04691	.21987	.25534
PNSANS	.02632	-.31689	-.18639	.25517	-.30030	.45863	.36979
PNSAPONT	-.01201	-.29418	-.17875	.26364	-.27817	.46369	.35497
POGNPERP	.23972	-.16147	-.40551	.43261	.37292	.14203	.02124
POGONNB	-.13756	.43200	.32365	-.34024	.12623	-.47428	-.38395
POGSTPOG	-.17436	.24861	-.13669	.24256	.13450	.04370	-.09792
POL1NB	.63458	-.22320	-.34803	.32941	.05836	.28905	.24204
PORIONLC	.07042	-.10836	-.10394	.18657	-.25045	.42640	.41099
POSCRNBS	-.10810	-.32090	-.10552	.22862	-.22623	.44093	.37996
POSFACHT	-.01677	-.39272	-.28538	.40059	- 23283	.37145	.31806
POSTCRBS	.00645	-.24391	-.13842	.26692	-.23927	.45710	.42728
POSTFCHT	-.02568	-.47917	-.19265	.25413	-.24155	.37499	.32076
RAMPOSTN	-.30374	-.25439	.20201	-.25456	-.11200	-.04236	-.00425
RAMUSHGT	.01446	-.33274	-.33983	.43455	-.21157	.31994	.25687
SADANGLE	.10251	.09683	.02635	-.17684	-.01509	.20603	.17181
SE	.07768	-.09253	-.08868	.07627	-.17409	.45515	42564
SELLANAS	-.00523	-.17167	-.10507	09030	-.22693	.46964	.38007
SKPRFCON	.28886	-.13586	-.51368	.50617	.17028	.24026	.11805
SL	.16642	-.20028	-.37278	.59571	-.04440	.41239	30267
SLSDISTC	.03637	.13122	.12507	-.13966	.47102	-.02147	- 10760
SNA	-.00442	-.06935	-.06824	.37447	-.05678	.03652	.04851
SNB	.15597	-.07440	-.36902	.68306	.07471	.10587	.05100
SNFACPLN	18147	-.18865	- 42924	71863	.03626	23559	.16294
SNFH	.20221	.06766	.12686	-.34607	.10401	.04666	.03757

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	FMIA	GONANGLE	HANGLE	HLINE	ILSDISTN	INCISROB	INCISROJ
SNGOGN	-.14340	.43567	.23913	-.45177	-.04239	-.29316	-.28260
SNHLINE	.14607	-.06537	-.70975	.66360	.04885	-.06909	-.10518
SNLOWER1	.86977	.06603	-.24724	.35467	.15113	- 01302	.03089
SNMANDPL	-.18430	.44650	.27535	-.48515	-.04823	-.32100	-.31163
SNOCCPLN	-.10160	.25781	.34498	-.55358	- 07223	-.01363	-.17039
SNPALPLN	-.03672	-.04308	.10104	-.23978	-.15232	-.04173	-.00942
SNPG	.18147	-.18865	-.42924	.71863	.03626	.23559	.16294
SPDISTNC	-.24099	-.08572	.53565	-.54248	-.70276	.00401	.17827
STCONVEX	-.06864	-.12746	.41668	-.33325	-.24081	.11309	.18658
STFACAGL	.12872	-.04739	-.43177	.75679	.12646	.18205	.07562
STOINLTH	.16526	.05843	.39467	-.36034	-.13270	.01933	-.14926
TFH	-.05864	-.30473	-.22038	25162	-.26765	.35437	.27447
U1FACPLN	-.67943	.08700	38625	-.33393	-.20236	05136	.26870
UFH	-.03558	-.32632	-.13610	.18380	-.36431	.37714	.30331
UFH_LFH	-.12351	-.01412	.38678	-.37775	-.14573	.02394	.09288
UFH_LFH1	.02927	-.12113	.16254	-.10848	-.29366	.13660	.14166
ULDISTAN	.03598	.03195	.25726	-.22715	.40077	.03227	-.06204
UNITDIFF	.13216	-.25389	-.51145	.57186	- 01288	18882	.05608
UP1PALPL	-.24184	-.05294	-.06858	.14059	-.04530	.60001	.17205
UPANDNHT	.16425	.21978	.10789	-.12109	.16401	-.57273	-.33846
UPERLIPE	.14439	-.22276	-.84666	82974	.09525	.12588	-.00824
UPGONIAL	.23898	.79995	.08530	-.09335	.17808	.04593	.02936
UPLIPLTH	-.17635	-.06361	-.09870	.11867	-.19113	.24179	.14139
UPLIPTHK	.13829	-.04234	-.68888	.64931	.02375	- 06184	-.08662

UPLPCURL	-.01679	.08209	-.25238	19417	-.12237	-.06810	-.01507
UPLPLGTH	-.19464	-.19717	-.09731	.04782	-.19345	21936	.16557
UPPER1AV	-.23646	-.12969	-.30313	.35497	.14750	.29510	.35388
UPPER1FH	-.20552	-.03633	-.06285	.11982	-.00731	.61613	.18011
UPPER1NA	.02653	-.05817	-.08923	.06257	.02334	-.47094	.12969
UPPER1S1	-.23586	-.04657	-.08241	.17342	-.02388	.60337	.17294
UPPER1SN	-.23586	-.04657	-.08241	.17342	-.02388	.60337	.17294
UPPR1APO	-.32031	.00433	.07120	-.02638	-.05527	55446	.13395
UPPR1NA	.25600	.09603	.24714	-.28416	-.00948	-.28968	-.37129
UPPR6PTV	.23096	-.04512	-.30233	.32273	.17393	.03148	-.06143
UPPSDNHT	.07732	.34086	.28342	-.33979	.11555	-.22492	-.17915
UPR1APO	.61338	-.01012	-.12152	.06317	.12651	-.27422	-.40405
UPSTFCHT	-.05641	-.30795	-.09841	.11669	-.34754	.32782	.29198
VERLPCHN	-.24260	.23613	.43189	-.44173	.06506	-.01426	.01296
WITSANAL	-.02961	-.03357	-.15813	.15399	.10456	-.33494	-.04659
YAXIS	-.46383	-.09977	.08921	-.05093	-.29577	-.19591	- 13009
YAXISSN	-.29928	-.03403	.27000	-.50151	-.22176	-.17561	-.10945
YAXSLGTH	.01160	-.29537	-.29282	.39637	-.23862	.39831	30943
ZANGLE	.29246	-.04336	-.89987	.89510	25634	.09800	-.07792
ZEROMRDN	.18016	-.05942	-.40261	.47228	.45192	.12391	-.05332

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	INTERINC	INTLABGP	L1EXTRSN	LFH	LIPEMBOP	LLDISTAN	LO1FACPL
INTERINC	1.00000						
INTLABGP	-.01437	1.00000					
L1EXTRSN	-.44703	.19732	1.00000				
LFH	-.05005	-.20015	-.31764	1.00000			
LIPEMBOP	-.40311	.26007	.23791	- 21154	1.00000		
LLDISTAN	.06299	-.05508	-.12214	.15653	-.09867	1.00000	
LO1FACPL	.30711	-.13294	-.22346	-.04896	00227	.03251	1.00000
LO1GOGN	-.14936	-.20591	-.44731	85934	-.06417	.04128	- 12967
LO1PALPL	.20369	-.05950	.02635	-.07042	.04525	-.05611	.67437
LOANDNHT	.14604	.23187	.42554	-.87888	.09403	-.07026	.18549
LOANFCHT	-.05005	-.20015	-.31764	1.00000	-.21154	.15653	-.04896
LOGONIAL	-.11592	.02949	.29114	.27625	-.04323	-.07309	-.35479
LOLIPLTH	-.01158	-.40379	-.28814	.75656	- 17731	.16005	.23666
LOLIPTHK	-.00722	-.15843	.06532	-.16134	.08461	-.53864	.33591
LOLPHLIN	.05008	.03358	.13554	-.41488	.15091	-.20512	.33427
LOPSDSHT	.08127	.17904	.13891	-.77104	.13106	.00851	.11218
LOSTFCHT	-.00770	-.17491	-.30870	.85526	-.09488	20847	.12137
LOW1APO	.31849	-.05487	-.07369	-.25630	.04838	-.12790	75412
LOW1GOGN	-.22781	-.07839	-.20652	.14121	-.04264	02592	-.48051
LOW1OCPL	-.49084	-.13111	-.05139	.30474	.13421	.09262	-.56623
LOWER1NB	-.29295	-.03159	-.08018	.18826	-.01442	.01883	-.69041
LOWFACHT	-.06553	-.18158	-.31994	.99299	-.20321	.14540	-.04627
LOWFHAGL	-.02153	.21046	.32041	.27186	-.16663	.06141	-.37993
LOWR1APO	-.23783	-.14897	-.29342	.39143	-.04105	.12828	-.26565
LOWR1MPL	-.23583	-.06696	-.23177	.13509	-.02854	.00871	-.45208
LOWR1NB	.37825	.04336	.08479	-.41627	-.00543	-.00948	.80746
LOWRLIPE	-.00538	-.28692	-.11323	.24655	-.03588	-.23968	.45121
MANDARC	.11320	.18929	.18389	-.30753	-.00780	-.11245	-.11251
MANDLGTH	-.03456	-.28823	-.45368	.86667	-.14226	.04995	.16601
MANPLAGL	-.09933	.10198	.40019	- 09855	-.00826	-.15747	- 42955
MANPROGN	.04775	-.20501	-.21803	.28987	-.03914	.50828	.20387
MAXDEPTH	-.00727	.00269	-.10061	08065	.09984	.08145	-.11521

MAXPROGN	-.01556	-.23020	-.25750	.47749	-.06617	.12228	05540
MIDFCLTH	-.02641	-.25402	-.51317	.76554	-.13809	-.01630	.05757
MLSHLINE	.07517	-.08161	-.16580	.00745	.09389	.13738	.26477
MLSULCUS	.04576	-.15758	-.32138	.37676	.02272	.26868	17172
MNARCLTH	-.17949	.04750	-.47644	.37802	-.11904	-.06223	-.25278
MNUNTLTH	-.02653	-.27755	-.45756	.85778	-.14414	.05728	.17636
MOLRRELN	-.13269	-.05438	.15117	.24430	.04445	.16902	.08440
MXARCLTH	-.21744	-.01572	-.51731	.44552	-.12062	-.04733	- 15953
MXHEIGHT	-.11422	-.20243	-.09344	.39793	-.20165	-.16935	06826
MXMNDIFF	-.03722	-.26148	-.25326	.78194	-.11170	13025	27326
MXUNTLTH	-.03219	-.25294	-.51046	.76298	-.14690	-.03945	08666
NASLBANG	-.08097	-.08154	.04893	-.04649	.01348	-.47345	-.00164
NASOFACL	.03342	.13546	.13553	-.09966	.08033	.02794	- 10133
NASOFNTL	.01043	.06300	-.12255	.11910	.04913	-.11713	12512
NASOMNTL	-.00698	-.00555	-.02290	.01722	-.01033	-.20049	-.06887

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	INTERINC	INTLABGP	L1EXTRSN	LFH	LIPEMBOP	LLDISTAN	LO1FACPL
NOSELGTH	-.11954	-.32149	-.34282	69966	-.14360	- 16757	.07767
NOSEPROM	-.05314	-.28008	-.19690	.47596	-.13731	-.40887	.23234
NSCHNLTH	-.05448	-.17311	-.26693	.86448	-.08778	-.04828	.04133
NSTNASON	-.04137	-.01578	-.20910	26419	.24252	.13849	.18650
OCCLPLAN	.33181	.20149	.11207	-.36889	-.25619	- 27686	- 15843
OCCLPLXI	.23883	.27015	.08382	- 43537	-.15020	-.17748	- 15854
OPGOGN	-.50369	-.10420	.26150	.31297	.31819	.12509	-.20964
OPINCLIN	-.41490	-.11944	.23305	.39918	22800	.10526	-.08658
PALPLANE	-.12632	-.11508	.08947	-.01350	.02967	-.25937	.01440
PFH_AFH	-.03430	-.16265	-.24634	.26357	-.05041	.03274	.24428
PNSANS	-.03231	-.24859	-.47778	.76976	-.17313	-.11844	.12155
PNSAPONT	-.02670	-.25160	-.48668	.76302	-.13644	-.08804	.07091
POGNPERP	.04755	-.16895	-.22184	.32540	.08522	49258	.30705
POGONNB	-.00288	.28146	.50058	-.49076	-.01434	-.07372	-.58470
POGSTPOG	.02313	-.11884	-.05646	-.08756	-.19711	.08552	-.28114
POL1NB	.26449	-.17735	-.30590	.06480	.00622	.04437	.98387
PORIONLC	-.03948	-.19044	-.43228	.59010	-.07211	-.06325	.10831
POSCRNBS	-.11307	-.22977	-.45261	.63447	-.19774	-.03219	.03421
POSFACHT	-.07477	-.28528	-.40224	.85105	-.16097	.02106	.14024
POSTCRBS	-.05026	-.22616	-.46583	.67958	-.17273	-.05911	.15131
POSTFCHT	-.06755	-.28277	-.40653	.84220	-.15548	.03990	.12043
RAMPOSTN	-.01473	-.02857	.05874	-.02575	-.07936	-.07024	-.07334
RAMUSHGT	-.05647	-.29865	-.35724	.83600	- 14763	.05684	12971
SADANGLE	.04792	-.08872	-.20768	.11750	- 07360	08050	02427
SE	-.01706	-.22132	-.46300	57365	- 16844	02231	11414
SELLANAS	.01480	-.21857	-.48519	.73980	-.16332	-.02750	.11246
SKPRFCON	.08201	-.14925	-.26643	.24687	-.05942	19783	.60191
SL	.01819	-.26017	-.44770	.55192	-.04348	09557	29330
SLSDISTC	.01247	.13490	-.00566	-.16943	.14192	.61370	-.13508
SNA	-.07091	-.08229	-.05451	.13529	.07583	-.00030	- 15019
SNB	-.02542	-.14421	-.13610	.25509	.01155	.11852	.10559
SNFACPLN	-.02499	-.21365	-.26988	.35314	.02013	.12752	.27093
SNFH	.06591	.09070	-.04978	-.05593	.02414	.08691	.03371
SNGOGN	-.04803	.19617	.32163	-.15897	.03584	-.11255	- 33705
SNHLINE	-.03028	-.16820	.04360	.02712	-.05762	-.25653	26372
SNLOWER1	.24804	-.04314	.00286	-.03887	.01918	.04329	.66506
SNMANDPL	-.04268	.17413	.34912	-.14436	.01232	-.08294	-.38935
SNOCCPLN	.35391	.24995	.06897	-.38154	-.21855	-.19321	-.12349

SNPALPLN	- 08932	-.03843	.05461	-.07393	.06105	-.22377	.05386
SNPG	-.02499	-.21365	-.26988	.35314	.02013	.12752	.27093
SPDISTNC	-.09437	.07575	.06650	.06149	-.01017	-.68520	-.26778
STCONVEX	.09929	-.05621	-.07962	.02213	-.11479	-.33643	-.03187
STFACAGL	.00098	-.20551	-.21599	.14421	-.02193	.15851	.16356
STOINLTH	.30109	.06679	-.01810	-.09304	-.17232	-.12295	.07602
TFH	-.07878	-.27345	-.37805	.93341	-.17589	.01044	.04483
U1FACPLN	-.32653	.07078	-.01220	.14410	-.03990	-.07002	- 89215
UFH	-.09887	-.31255	-.38462	69936	-.10500	-.16078	.14611

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	INTERINC	INTLABGP	L1EXTRSN	LFH	LIPEMBOP	LLDISTAN	LO1FACPL
UFH_LFH	-.05628	-.06644	.02616	-.30991	.01614	-.43338	-.06396
UFH_LFH1	-.08022	-.16393	-.10173	-.35944	.12981	-.40694	.24957
ULDISTAN	.05873	.19940	-.05773	-.03489	.03430	.70320	-.08467
UNITDIFF	-.00936	-.23138	-.23103	.74306	-.09535	.19188	.26512
UP1PALPL	.57345	-.09882	-.59118	.18319	-.30132	.03704	-.02022
UPANDNHT	-.21979	.12427	.57812	-.82430	.42534	-.13593	09072
UPERLIPE	-.01133	-.21885	-.17218	44632	-.12674	.04865	37802
UPGONIAL	.19051	.09838	-.03188	-.46756	.04468	.00373	.06883
UPLIPLTH	-.02160	-.27053	- 25873	65489	01365	.07683	-.14531
UPLIPTHK	-.02282	-.20388	.03848	02286	-.04729	- 28646	27206
UPLPCURL	-.07339	-.15839	07860	- 11527	08915	-.42331	-.00902
UPLPLGTH	-.07343	.07295	-.23630	.78640	.11856	08221	-.20123
UPPER1AV	-.24388	-.16118	-.32306	.50996	-.01753	.34901	-.12277
UPPER1FH	.59947	-.07938	-.60956	.18579	-.30781	.08242	-.02255
UPPER1NA	-.93039	.01542	.47578	.01046	41041	-.04906	-.03961
UPPER1S1	.58334	-.09277	-.59634	.19292	-.30897	.06809	-.02789
UPPER1SN	.58334	-.09277	-.59634	.19292	-.30897	.06809	-.02789
UPPR1APO	.60940	-.03615	-.53660	.09200	-.31896	.01698	-.16377
UPPR1NA_	.23517	.11918	.28482	-.40422	.07992	-.15018	.08875
UPPR6PTV	.08151	-.25867	-.10169	.43230	.07673	.30350	.13664
UPPSDNHT	.04884	.23894	.26450	-.89829	23186	-.15818	.02851
UPR1APO_	.26682	.01779	.24552	- 33272	.11448	-.05798	.63892
UPSTFCHT	-.08283	-.24461	-.32906	.60474	-.07426	-.23853	.06323
VERLPCHN	-.00236	.19031	.04976	-.14778	.17528	-.09781	-.34301
WITSANAL	-.44832	.12268	.33556	-.08014	.14281	-.02323	-.03077
YAXIS	-.19902	-.01298	.21932	.19513	-.08945	-.21785	-.33276
YAXISSN	-.15123	.09882	.19975	.16067	-.07867	-.14950	-.35486
YAXSLGTH	-.06209	-.28727	-.42417	.88928	- 15185	.01149	.12565
ZANGLE	.02809	-.12781	-.15521	.26180	- 04081	.25800	.33207
ZEROMRDN	.07219	-.22271	-.20522	.25536	-.04135	.53467	.19153

	LO1GOGN_	LO1PALPL	LOANDNHT	LOANFCHT	LOGONIAL	LOLIPLTH	LOLIPTHK
LO1GOGN_	1.00000						
LO1PALPL	-.04694	1.00000					
LOANDNHT	-.97377	.09654	1.00000				
LOANFCHT	.85934	-.07042	-.87888	1.00000			
LOGONIAL	.13043	-.15011	-.15661	.27625	1.00000		
LOLIPLTH	.69103	.22293	-.68378	.75656	11319	1.00000	
LOLIPTHK	-.12181	.28991	.19553	-.16134	-.03610	.12820	1.00000
LOLPHLIN	-.40099	.22060	.48848	-.41488	-.10807	-.18349	.79661
LOPSDSHT	-.78456	-.05923	.83475	-.77104	-.11787	-.64559	.13059
LOSTFCHT	.74983	.10050	-.74479	.85526	.22844	.87860	-.01421

LOW1APO_	-.31987	.53807	.35008	-.25630	-.34717	-.03133	.26683
LOW1GOGN	.20664	-.79700	-.26703	.14121	-.18720	-.00648	-.16803
LOW1OCPL	.40189	-.76640	-.43237	.30474	.04420	.14822	-.16615

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	LO1GOGN_	LO1PALPL	LOANDNHT	LOANFCHT	LOGONIAL	LOLIPLTH	LOLIPTHK
LOWER1NB	.25566	-.85038	-.29542	.18826	.19215	00432	-.14633
LOWFACHT	.87578	-.06700	-.87320	99299	28768	.75042	-.14031
LOWFHAGL	.04833	-.26628	-.06349	.27186	.64131	-.02405	-.24609
LOWR1APO	.43731	-.58406	-.44300	.39143	.09445	31131	-.02181
LOWR1MPL	.23056	-.78228	-.25928	.13509	-.22555	00221	- 12507
LOWR1NB_	-.51006	.69653	.55354	-.41627	-.28487	-.14893	.30067
LOWRLIPE	.23565	.35309	-.17349	.24655	-.03820	.54909	.82193
MANDARC	-.24571	.12343	.27510	-.30753	.36044	- 32329	.05496
MANDLGTH	.88151	.18237	-.87141	.86667	.04210	.81589	.03319
MANPLAGL	-.14746	-.12559	.11199	-.09855	64325	-.21987	-.14032
MANPROGN	.18778	.10286	-.17362	.28987	-.03622	.45371	.21160
MAXDEPTH	.11047	-.10392	-.10929	.08065	.01215	.07878	.05462
MAXPROGN	.41469	.04992	-.43076	.47749	.05525	.55637	.13451
MIDFCLTH	.85812	.10322	-.85909	76554	-.10374	.66542	-.03443
MLSHLINE	.00069	.06359	.04709	.00745	-.00234	29149	.30341
MLSULCUS	.35470	-.01737	-.35001	.37676	.03866	.57834	-.11182
MNARCLTH	.53501	-.33284	-.51770	.37802	-.06543	11916	-.16664
MNUNTLTH	.88059	.19629	-.86516	.85778	.03567	.80964	.03263
MOLRRELN	.21807	.20708	-.20855	.24430	.13061	.28780	11101
MXARCLTH	.61380	-.24184	-.58921	.44552	-.09629	21266	- 13239
MXHEIGHT	.28217	-.00704	-.29638	.39793	.35627	.35136	.02293
MXMNDIFF	.68431	.24455	-.66164	.78194	.23436	.81373	.11840
MXUNTLTH	.85546	.12144	-.84890	.76298	-.09678	67067	-.01154
NASLBANG	.00651	.07051	-.03069	-.04649	-.14160	03524	.32841
NASOFACL	-.09226	-.00615	.10241	-.09966	.02836	-.12890	-.16474
NASOFNTL	.09741	.11308	-.10538	.11910	.00134	.12914	15159
NASOMNTL	.08187	.00035	-.08862	.01722	-.06806	-.07100	- 13253
NOSELGTH	.72984	.04183	-.73109	.69966	.03730	.67572	.06252
NOSEPROM	.48167	.15854	-.47784	.47596	-.02119	.50746	.34295
NSCHNLTH	.77650	.08387	-.78645	.86448	.22032	.84457	-.00203
NSTNASON	.31890	.17190	-.29054	.26419	-.06653	.33883	.14098
OCCLPLAN	-.42711	-.04296	.40107	-.36889	.19346	-.42643	-.04774
OCCLPLXI	-.39745	-.09540	.37961	-.43537	-.14845	- 53490	-.09648
OPGOGN	.37760	-.03106	-.32983	31297	.40242	28085	- 01605
OPINCLIN	.40559	.07029	-.37217	.39918	.39547	.40479	.01394
PALPLANE	.13684	.36882	-.13158	-.01350	.02635	.16808	.17239
PFH_AFH	.31764	.16870	-.31619	.26357	-.28622	.35486	.14098
PNSANS	.80735	.10546	-.79572	.76976	-.05118	.69346	.06788
PNSAPONT	.82599	.10244	-.82414	.76302	-.09096	68883	.04865
POGNPERP	.22733	.17538	-.20839	.32540	-.08642	.48112	.17909
POGONNB	-.48956	-.18940	.45178	-.49076	21274	-.60679	-.15328
POGSTPOG	-.01446	-.18466	.04019	-.08756	.15090	- 05405	.20640
POL1NB	.00054	.62270	.05680	.06480	-.35297	.33610	.32140
PORIONLC	.66976	.22057	-.66278	.59010	.00747	.57829	.05187
POSCRNBS	.71655	.03462	-.71123	.63447	-.05784	.57098	-.00024
POSFACHT	.83411	.11511	-.83653	85105	.04057	.77964	.02163
POSTCRBS	.74381	.11806	-.72981	67958	-.07707	.57635	-.00020

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	LO1GOGN_	LO1PALPL	LOANDNHT	LOANFCHT	LOGONIAL	LOLIPLTH	LOLIPTHK
POSTFCHT	.83216	.04863	-.84879	.84220	-.06709	.75290	-.04744
RAMPOSTN	-.06510	-.08473	.04247	-.02575	-.17650	-.12669	-.16765
RAMUSHGT	.80315	.13432	-.81382	.83600	.07514	.79778	.03950
SADANGLE	.16677	.00458	-.17307	.11750	-.23789	.08230	-.08186
SE	.65118	.08855	-.64879	.57365	-.19765	.47496	-.05876
SELLANAS	.78739	.07825	-.78495	.73980	-.13259	.59919	- 07290
SKPRFCON	.20751	.37538	-.15797	24687	-.13071	.40683	.18974
SL	.63573	.30531	-.61612	.55192	-.18865	.63618	.16055
SLSDISTC	-.12457	-.07912	.14228	- 16943	- 05841	-.16162	-.34477
SNA	.22543	.06941	-.23430	.13529	.03493	.19608	10338
SNB	.31675	.29524	-.30173	.25509	01532	39136	19576
SNFACPLN	.41293	.32138	-.38736	.35314	-.05942	.51767	.23221
SNFH	-.11915	-.18420	.13019	-.05593	-.02214	-.12330	-.05140
SNGOGN	-.21536	-.22907	.23975	-.15897	.56157	-.30659	-.10996
SNHLINE	.00672	.19625	.01835	.02712	-.06895	.26411	68398
SNLOWER1	-.06753	.90352	.11040	-.03887	-.16214	.19259	22770
SNMANDPL	-.24323	-.27256	.21747	-.14436	.60690	-.31752	-.17853
SNOCCPLN	-.47965	-.17176	.46322	-.38154	.16299	-.48231	-.08189
SNPALPLN	.04425	.26862	-.02634	-.07393	.01784	.08095	.15521
SNPG	.41293	.32138	-.38736	.35314	-.05942	.51767	.23221
SPDISTNC	.15670	-.11074	-.19738	.06149	.11977	-.11562	- 19252
STCONVEX	.04898	.01119	-.08612	.02213	-.07662	-.08226	-.05874
STFACAGL	.23764	.24070	-.20726	.14421	-.04591	.34394	.29705
STOINLTH	-.11406	.17631	.10126	-.09304	.01050	-.14597	-.15933
TFH	.88455	.05450	-.88830	.93341	.20539	.79293	-.05032
U1FACPLN	.27746	-.66547	-.32045	.14410	.20661	-.17686	-.37628
UFH	.76519	.19025	-.75001	.69936	.08869	.70191	.08694
UFH_LFH	-.16875	-.02258	.16678	-.30991	-.18325	-.39363	.14521
UFH_LFH1	-.09597	.32591	.13976	-.35944	-.23291	-.04566	.32050
ULDISTAN	-.06959	-.08345	.07162	-.03489	-.04544	-.11423	-.55307
UNITDIFF	.64755	.25457	-.62296	.74306	.23571	.78080	.09469
UP1PALPL	.26256	-.16273	-.26349	.18319	-.12533	.12393	-.05239
UPANDNHT	-.63733	.27265	.66477	-.82430	-.17215	-.49726	.25757
UPERLIPE	.37415	.24153	-.34118	.44632	-.04898	.63845	.46103
UPGONIAL	-.33149	.15575	.36072	-.46756	- 14275	-.41876	.09602
UPLIPLTH	.50402	-.18951	-.53175	.65489	.35944	.39988	-.19182
UPLIPTHK	.00006	.19307	.02479	.02286	- 04860	.25399	.70386
UPLPCURL	-.02070	.04406	.03509	-.11527	00896	.00805	.46816
UPLPLGTH	.58084	-.31472	-.60740	.78640	.30539	.39659	-.27571
UPPER1AV	.55309	-.16846	-.53938	.50996	.03546	.44690	-.07776
UPPER1FH	.23887	-.23027	-.24055	.18579	-.13194	.09360	- 08266
UPPER1NA	.08495	.11379	-.06358	.01046	.05274	.04482	.07199
UPPER1S1	.25551	-.19956	-.25893	.19292	-.12724	.11220	-.07384
UPPER1SN	.25551	-.19956	-.25893	.19292	-.12724	.11220	-.07384
UPPR1APO	.15282	-.32191	-.16877	.09200	-.11065	- 04380	-.14612
UPPR1NA_	-.47771	.14078	45938	- 40422	-.02281	-.31396	.10088
UPPR6PTV	.35799	.23799	-.36406	.43230	.00969	.57612	.09487

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	LO1GOGN_	LO1PALPL	LOANDNHT	LOANFCHT	LOGONIAL	LOLIPLTH	LOLIPTHK
UPPSDNHT	-.73094	.02039	.75602	-.89829	-.17399	-.73521	.12011
UPR1APO_	-.46118	.54572	.48078	-.33272	-.13824	-.05767	.32595

UPSTFCHT	.65880	.08563	-.65387	.60474	.02941	.57538	.14285
VERLPCHN	- 19356	-.33415	.17197	- 14778	.16717	-.64011	-.27829
WITSANAL	-.09582	.08073	.10092	-.08014	.14313	-.01748	.13048
YAXIS	.18723	-.11463	-.20548	.19513	.38888	.06924	-.13039
YAXISSN	.07060	-.37218	-.07895	.16067	43636	-.07547	-.22315
YAXSLGTH	.88696	.15236	-.87464	.88928	.11838	.80995	02485
ZANGLE	.18898	.16952	-.14094	.26180	.00269	.50737	.45115
ZEROMRDN	.15609	.08268	-.13447	.25536	-.02561	.41782	.22805

	LOLPHLIN	LOPSDSHT	LOSTFCHT	LOW1APO_	LOW1GOGN	LOW1OCPL	LOWER1NB
LOLPHLIN	1.00000						
LOPSDSHT	.47366	1.00000					
LOSTFCHT	-.24254	-.66773	1.00000				
LOW1APO_	.20793	.17758	-.13088	1.00000			
LOW1GOGN	-.23229	- 19034	.01466	-.44403	1.00000		
LOW1OCPL	-.22062	-.23133	.20429	- 59058	.84141	1.00000	
LOWER1NB	-.19783	-.14603	.07659	-.64734	.86489	.86235	1 00000
LOWFACHT	-.38125	-.74725	.85419	-.26080	.11239	.29967	.18041
LOWFHAGL	-.14105	-.08625	.14979	- 33131	-.12406	05340	.06065
LOWR1APO	-.07454	-.23012	33997	-.61156	73914	.75922	.80712
LOWR1MPL	-.18468	-.16464	.02010	- 43236	.98958	.84257	.86114
LOWR1NB_	.43911	.39369	-.23270	.74412	-.69533	-.77860	-.82843
LOWRLIPE	.59030	-.18434	.38777	.18077	-.12751	-.06191	-.13414
MANDARC	.18684	.32029	-.30133	-.02442	-.43233	-.32587	-.20347
MANDLGTH	-.28005	-.74870	.80899	-.12172	.08629	.20512	.09118
MANPLAGL	-.08171	.13353	-.15430	-.36345	-.22869	-.05237	.09292
MANPROGN	.17063	-.15289	.45816	.07195	.06595	.10155	.08556
MAXDEPTH	-.05686	-.10407	.11464	.23472	.10726	.12225	.19735
MAXPROGN	-.22488	-.45119	.55741	.06027	.18372	.17618	.18850
MIDFCLTH	-.35961	-.73529	.66175	-.05098	.18289	.23418	.12794
MLSHLINE	.44870	.12956	.24243	.10005	-.01617	.03453	.00880
MLSULCUS	-.14980	-.25418	.54929	.02814	.13788	.20776	.12380
MNARCLTH	-.26831	-.16790	.18229	-.37365	.41138	.34712	40027
MNUNTLTH	-.27490	-.74210	.80208	-.10975	.07185	.18935	.07579
MOLRRELN	.09747	-.27677	.25164	-.17193	-.08837	.04860	-.02857
MXARCLTH	-.25971	-.24643	.25857	-.34338	.38115	.34285	.34884
MXHEIGHT	-.22591	-.26222	.31985	-.09913	.08032	.09785	.12506
MXMNDIFF	-.09663	-.57197	.80398	-.18939	-.06992	.11190	.01700
MXUNTLTH	-.35882	-.72504	.65078	-.05112	.17070	.21306	.10527
NASLBANG	-.00140	-.14829	-.08973	.17266	12375	.00864	.01674
NASOFACL	-.12981	.07863	-.06318	-.00561	-.10529	-.05340	- 06717
NASOFNTL	.10403	-.12922	.10451	.07846	-.00237	-.09709	-.02403
NASOMNTL	-.31955	-.09957	-.06237	.05545	06534	.02199	.03244

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	LOLPHLIN	LOPSDSHT	LOSTFCHT	LOW1APO_	LOW1GOGN	LOW1OCPL	LOWER1NB
NOSELGTH	-.35742	-.65419	.58822	-.07809	.24409	28754	.19725
NOSEPROM	.00022	-.46820	.39820	.00797	.09259	.09966	02687
NSCHNLTH	-.36134	-.74551	.86054	-.15293	.07122	21205	10484
NSTNASON	.12293	-.25237	.37097	.05131	.04512	.10257	.06188
OCCLPLAN	.00321	.24478	-.42833	-.03284	-.09892	-.39429	-.02201
OCCLPLXI	.02411	.14906	-.50203	.05549	.06667	-.31566	-.03917
OPGOGN	-.00498	-.09636	.34673	-.31562	-.17987	.38017	.08973
OPINCLIN	-.06052	-.22668	.42427	-.20974	-.17579	.31276	.00098

PALPLANE	.00954	-.23462	.04352	-.12402	-.03673	-.03863	-.00907
PFH_AFH	.00129	-.38515	.29286	.09480	.24286	.15063	-.00018
PNSANS	-.32252	-.67780	.65323	-.03649	.16429	.20030	.09051
PNSAPONT	-.30561	-.71436	.67220	-.03339	19027	.23981	.13064
POGNPERP	.12252	-.20961	.49272	.13838	.02627	.06251	.02438
POGONNB	.03579	.34985	-.52567	-.25252	-.13424	-.11174	.03584
POGSTPOG	.34861	.17624	-.02940	-.26123	.08989	19635	.20233
POL1NB	.27880	.01899	.21843	.70002	-.38540	-.46229	-.60195
PORIONLC	-.25329	-.57557	.57742	-.09272	.03043	.08096	05822
POSCRNBS	-.29917	-.58046	.54709	- 19316	.23641	.27787	.17291
POSFACHT	-.30605	-.78706	.77886	-.11149	.21239	.27216	.12681
POSTCRBS	-.26335	-.61945	.58053	-.06649	.16083	.19476	.06117
POSTFCHT	-.39712	-.82973	.73759	-.05935	.29381	31155	16376
RAMPOSTN	-.16366	-.00747	-.12592	.00239	12169	.04447	00494
RAMUSHGT	-.28625	-.78155	.77813	-.11594	.19359	.25778	.11798
SADANGLE	-.12813	-.05442	.02971	00439	.04554	00735	- 06010
SE	-.28465	-.49263	.44262	-.04663	.13869	.14799	.00929
SELLANAS	-.31396	-.69261	.62791	-.07880	.14845	18044	.03591
SKPRFCON	.25035	-.05521	.34715	-.06781	- 18905	-.14519	- 26155
SL	-.01974	-.53699	.60017	.01542	04088	09921	.00725
SLSDISTC	-.03004	.22068	-.16467	- 09785	-.05824	-.00229	.01057
SNA	-.04254	-.25871	.18701	.07671	.08053	.14268	.20027
SNB	.11114	-.27207	.35893	-.06641	-.07858	.03106	.04518
SNFACPLN	.10570	-.32745	.46041	.01816	-.02901	.05851	.03077
SNFH	-.01577	.16169	-.07569	.16561	.02967	-.01936	.00050
SNGOGN	-.01340	.31181	-.20774	-.19052	-.24719	-.09222	.05958
SNHLINE	.48399	-.06398	.11668	.12806	-.02646	-.05473	-.03489
SNLOWER1	.23095	-.00722	.11245	.54105	-.80823	-.75056	-.86536
SNMANDPL	-.09109	.26391	-.21422	-.21810	-.19869	-.06786	.09017
SNOCCPLN	-.00819	.34106	-.44970	.08485	-.06889	-.37636	-.01861
SNPALPLN	-.01060	-.11948	-.02006	.01840	-.01665	-.07470	-.00911
SNPG	.10570	-.32745	.46041	.01816	-.02901	.05851	.03077
SPDISTNC	-.52497	-.25352	-.12164	-.04934	.09726	.03141	07089
STCONVEX	-.32498	-.14711	-.05934	.10608	.08191	-.02979	.02169
STFACAGL	.28382	-.12192	.28798	-.03496	-.01907	.08027	.07354
STOINLTH	-.20264	-.00518	-.09454	26621	-.22222	-.28605	-.25694
TFH	-.38795	-.78343	.82614	-.19283	.13431	.26361	.16103
U1FACPLN	-.41681	-.15992	-.05131	- 68200	.55369	.61353	67595
UFH	-.29154	-.66620	.65357	-.08681	.10373	.17161	10239

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	LOLPHLIN	LOPSDSHT	LOSTFCHT	LOW1APO_	LOW1GOGN	LOW1OCPL	LOWER1NB
UFH_LFH	.04035	.15244	-.59957	07702	.11122	-.05438	.02666
UFH_LFH1	.14590	.12135	-.23926	.20591	-.03467	-.15357	-.09681
ULDISTAN	-.17879	.17638	-.00183	- 10223	-.05256	.02055	- 02590
UNITDIFF	-.05500	-.53913	.79490	- 16898	- 10802	09261	00524
UP1PALPL	-.05238	-.12180	.12215	- 25021	.32103	10954	.29423
UPANDNHT	.40599	.48327	-.63015	.21380	-.25303	-.23011	- 24169
UPERLIPE	.32110	-.32091	.53325	.02094	-.00537	.06190	- 01970
UPGONIAL	.31947	.41252	-.43348	.13594	-.26687	-.31570	-.26575
UPLIPLTH	-.28263	-.40290	.64241	-.27779	.12242	.27333	.22627
UPLIPTHK	.49634	-.06028	.11309	.13904	-.02145	-.05167	-.03122
UPLPCURL	.23116	-.04072	-.15878	.05308	.01952	-.03219	.04812
UPLPLGTH	-.38863	-.46869	.61708	-.26468	.20868	.32581	.26015
UPPER1AV	-.10329	-.30992	.50357	-.60432	.34040	.46570	.38854
UPPER1FH	-.05372	-.08003	.11380	-.22775	.32931	.11728	.29684

UPPER1NA	04286	-.03551	.01269	-.14336	-.08302	.19928	- 06050
UPPER1S1	-.05073	-.10469	.12456	-.25205	.32212	.11965	.29451
UPPER1SN	-.05073	-.10469	.12456	-.25205	.32212	.11965	.29451
UPPR1APO	-.10607	-.03505	-.01337	-.24956	.37048	.13171	.33869
UPPR1NA_	.07615	.20910	-.34577	.65834	-.26444	-.37534	-.28357
UPPR6PTV	-.05632	-.49226	.57815	.05397	-.06910	.07100	-.03887
UPPSDNHT	.34485	.70051	-.80239	.22800	-.18126	-.35710	- 17506
UPR1APO_	.32955	.21843	-.16972	.83229	-.54348	-.61630	-.62901
UPSTFCHT	-.22883	-.58525	.47170	-.06404	15782	.17559	12191
VERLPCHN	-.05936	.23981	-.31462	- 19907	.09441	.06962	16709
WITSANAL	.12805	-.00057	.03971	- 11368	-.05009	.02588	01850
YAXIS	-.24341	-.20393	.08830	-.36797	04461	15671	.15911
YAXISSN	-.31151	-.03820	.00938	-.22941	09218	.16279	.19171
YAXSLGTH	-.29182	-.76484	.82119	-.14917	09375	22371	11725
ZANGLE	.48823	-.07356	.44521	.03332	-.07573	.03086	-.01588
ZEROMRDN	.21877	-.10056	.42988	.05004	.04670	.10656	.07796

	LOWFACHT	LOWFHAGL	LOWR1APO	LOWR1MPL	LOWR1NB_	LOWRLIPE	MANDARC
LOWFACHT	1.00000						
LOWFHAGL	.29770	1.00000					
LOWR1APO	.38889	-.09022	1.00000				
LOWR1MPL	.11898	-.15269	.75706	1.00000			
LOWR1NB_	-.40908	-.18448	-.63429	-.68517	1.00000		
LOWRLIPE	.26042	-.21911	.18390	-.08694	.20960	1.00000	
MANDARC	-.27885	.32308	-.32809	-.43435	.18428	-.11913	1.00000
MANDLGTH	.86194	-.12569	.41243	.10364	-.28477	.45050	-.29695
MANPLAGL	-.09345	.47960	-.09506	-.26491	-.17199	-.23769	.47549
MANPROGN	.27628	-.25447	.25323	.07995	-.00902	.37525	-.28150
MAXDEPTH	.08275	-.14724	-.03771	.11123	-.16077	-.01962	-.10125
MAXPROGN	.44864	-.27248	.26173	.18321	-.23645	.26904	-.38367
MIDFCLTH	.75471	-.23718	.30762	.19750	-.33762	.30803	-.24229

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	LOWFACHT	LOWFHAGL	LOWR1APO	LOWR1MPL	LOWR1NB_	LOWRLIPE	MANDARC
MLSHLINE	.02396	-.12119	.18906	.01171	.13022	34791	-.03013
MLSULCUS	.37245	-.08729	.30552	.14484	-.12297	.13316	- 23026
MNARCLTH	.39270	-.11343	.47921	.43908	- 51187	-.04382	-.16514
MNUNTLTH	.85553	-.11931	.39917	.09207	-.27082	.44766	- 27349
MOLRRELN	.24897	.07641	.16471	-.08554	-.01553	.27419	- 08563
MXARCLTH	.46277	-.15159	.49915	.41286	- 47012	03168	-.21056
MXHEIGHT	.39091	.04808	30128	.07672	- 21687	19247	- 28041
MXMNDIFF	.78684	.06200	45186	-.05338	- 13770	.53135	-.29684
MXUNTLTH	.75524	-.23968	.31437	.18891	- 32344	.33114	-.24713
NASLBANG	-.05984	-.17393	-.08279	.11178	-.01338	.11349	-.10439
NASOFACL	-.08978	.17777	-.17916	-.10831	.03964	-.20278	.11711
NASOFNTL	.10631	-.15857	.06469	-.00116	00610	.16735	-.15521
NASOMNTL	.00989	-.07829	-.05255	.06292	-.09125	-.11345	-.05074
NOSELGTH	.68779	-.18605	.41141	.25881	-.36500	.41130	-.38406
NOSEPROM	.46835	-.12304	.28856	.10467	-.09118	.61404	-.20613
NSCHNLTH	.85562	.12172	.32182	.07190	-.32957	.37181	-.32074
NSTNASON	.26277	-.26369	.23106	.06684	-.05703	.25910	-.25756
OCCLPLAN	-.37937	.13393	-.18159	-.11874	.07217	-.24383	.31642
OCCLPLXI	-.44023	.02391	-.25401	.05478	.08874	-.33937	.02847
OPGOGN	.35309	.31115	.11644	-.16007	-.22818	.10412	.14749

OPINCLIN	.42762	.40517	.08304	-.16711	-.17032	.19013	19278
PALPLANE	-.02824	-.22920	.09676	-.03046	-.05759	.24075	.00514
PFH_AFH	.25485	-.16391	.18610	.24839	01617	.32884	-.43903
PNSANS	.76685	-.13097	.31457	.18323	-.29466	.38669	-.30130
PNSAPONT	.75450	-.16047	.30166	.20541	-.31795	.36206	-.28354
POGNPERP	.30869	-.31100	.24648	.04324	.04282	.37059	-.33455
POGONNB	-.48659	.38687	-.41895	-.16997	.00546	-.47616	.43251
POGSTPOG	-.05880	.19748	.09711	.10181	-.14131	13266	24143
POL1NB	.06681	-.41194	-.13822	-.35261	.69083	.49050	-.18623
PORIONLC	.58258	-.22849	.29035	.04303	- 22569	.30361	- 13754
POSCRNBS	.63655	-.14690	.40329	.25513	-.33108	29422	-.26939
POSFACHT	.84147	-.03548	.41240	.22080	-.30595	.41970	- 45459
POSTCRBS	.68147	-.14208	.31941	.18142	- 22512	31617	- 31038
POSTFCHT	.82353	-.12864	.40662	.29831	-.34641	.34049	- 52253
RAMPOSTN	-.04696	-.11050	-.06419	11859	- 04005	- 17902	-.24805
RAMUSHGT	.82000	-.01173	39159	.19395	- 29012	44089	-.41946
SADANGLE	.10519	-.20406	-.01109	.05019	- 03154	01395	01292
SE	.56593	-.23892	.21772	.15403	-.18557	.23314	-.19856
SELLANAS	.73073	-.12736	.27317	.16320	-.25412	.25992	-.20673
SKPRFCON	.25717	-.18887	.34303	-.15832	.31317	.47522	-.14472
SL	.54683	-.32399	.32051	.06245	-.06398	.48304	-.26470
SLSDISTC	-.15809	-.00826	-.05851	-.04846	-.03240	-.29540	.11582
SNA	.13223	-.11762	.02742	.07725	-.18848	.12874	-.10769
SNB	.25967	-.14972	.19174	-.06924	-.00286	.36861	-.12391
SNFACPLN	.35611	-.26413	.29693	-.00938	.00266	.47386	-.23613
SNFH	-.05031	-.03103	-.06696	.03765	.02506	-.15614	.00755
SNGOGN	-.12900	.40669	-.14422	-.24418	-.11070	-.29910	.48373

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	LOWFACHT	LOWFHAGL	LOWR1APO	LOWR1MPL	LOWR1NB_	LOWRLIPE	MANDARC
SNHLINE	.02669	-.19679	.12380	- 00932	.16827	.67249	-.06282
SNLOWER1	-.02956	-.12811	-.62113	-.80020	.73363	.30375	.11983
SNMANDPL	-.13482	.44080	-.14749	-.22760	-.14443	-.36005	.46892
SNOCCPLN	-.38730	.10292	-.21357	-.08169	.08384	-.33767	.29706
SNPALPLN	-.08697	-.32487	.05405	-.00059	-.04831	.13021	.01428
SNPG	.35611	-.26413	.29693	-.00938	.00266	.47386	-.23613
SPDISTNC	.05143	.10872	-.11865	.07410	-.24768	-.30759	.02905
STCONVEX	-.00338	-.12276	-.06337	06462	- 04928	-.06857	-.03696
STFACAGL	.15680	-.20595	.25013	.00013	02830	.43943	- 09515
STOINLTH	-.09816	.06856	-.37016	- 23518	19907	- 24446	10724
TFH	.92650	.04229	.42174	14204	- 39519	35084	- 33196
U1FACPLN	.14549	.26049	.32281	53673	- 80680	- 45541	.02465
UFH	.69371	-.23113	.38606	12625	- 30433	41290	-.30454
UFH_LFH	-.31497	-.27153	-.07528	.11901	- 02972	- 03717	06722
UFH_LFH1	-.35809	-.64613	.01752	00223	.12315	.22744	-.00079
ULDISTAN	-.02602	.11031	-.04790	- 05227	- 01465	-.42257	- 00271
UNITDIFF	.75020	.10886	.41067	-.09098	- 10207	.49593	-.23118
UP1PALPL	.17274	-.17197	.46109	.33067	-.19218	.08573	-.08166
UPANDNHT	-.82120	-.31644	-.36282	-.24575	.38059	-.05194	.27145
UPERLIPE	.44822	-.13048	.34541	.02168	.07171	.81126	-.23413
UPGONIAL	-.45910	-.15509	-.33432	-.25924	.34141	-.09416	.60516
UPLIPLTH	.64704	.30717	.31813	.10718	-.35204	-.00529	-.19732
UPLIPTHK	.02133	-.19255	.12701	-.00526	.17483	.67395	-.04981
UPLPCURL	-.11708	-.16888	.01246	.02868	-.01042	.32633	.11750
UPLPLGTH	.78557	.43268	.30817	.19712	-.44287	-.03192	-.26571
UPPER1AV	.51141	-.10001	.71313	.36019	-.43787	.19994	-.28007

UPPER1FH	.17801	-.13198	.44494	33802	-.18223	.04298	-.08257
UPPER1NA	.03066	-.00209	.00845	-.07099	-.08005	.09341	-.05090
UPPER1S1	.18432	-.12616	.45187	.32951	-.18493	.06724	-.08323
UPPER1SN	.18432	-.12616	.45187	.32951	-.18493	.06724	-.08323
UPPR1APO	.08065	-.06210	.36307	.36989	-.23481	-.08759	-.02283
UPPR1NA_	-.41702	.00064	-.66043	-.28457	.34679	-.15315	.15873
UPPR6PTV	.40849	-.12731	.08098	-.07152	- 03555	.32113	- 15868
UPPSDNHT	-.88619	-.26251	-.35793	-.17315	.34546	-.27086	.37894
UPR1APO_	-.33914	-.16577	-.61523	-.54337	.73616	22781	.07239
UPSTFCHT	.59837	-.15918	.30689	.17423	-.30305	.40186	-.29120
VERLPCHN	-.14492	.27300	-.04416	.07927	-.15296	-.50841	15052
WITSANAL	-.07198	.08810	.03942	-.05034	02860	.12100	-.06369
YAXIS	.20075	.38073	.10047	.03058	-.29809	-.05927	.00463
YAXISSN	.17441	.41743	.03544	.08517	-.32267	-.27075	.01530
YAXSLGTH	.88878	-.04095	.41892	.11126	- 32112	.43353	-.31671
ZANGLE	.28069	-.06737	.27568	-.04610	.14293	66245	-.11295
ZEROMRDN	.24701	-.20233	.24001	.06335	.01570	.38142	-.21524

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	MANDLGTH	MANPLAGL	MANPROGN	MAXDEPTH	MAXPROGN	MIDFCLTH	MLSHLINE
MANDLGTH	1.00000						
MANPLAGL	-.26349	1.00000					
MANPROGN	.32985	-.41350	1.00000				
MAXDEPTH	.09064	-.47910	.39893	1.00000			
MAXPROGN	.52035	-.35491	.79225	.45266	1.00000		
MIDFCLTH	.92378	-.32278	.24858	.19759	.50452	1.00000	
MLSHLINE	.10251	-.15045	.36814	.05493	11450	.01131	1.00000
MLSULCUS	.41664	-.20818	.36885	.13358	.37092	.34396	.77181
MNARCLTH	.42688	-.12581	-.04682	.00203	.12245	.50920	-.06060
MNUNTLTH	.99734	-.27462	.33236	.09714	.51505	.92682	.10450
MOLRRELN	.26747	.06491	.20153	-.17672	09957	.10651	.01521
MXARCLTH	.52391	-.17594	-.00201	-.03084	.16596	.57834	-.04193
MXHEIGHT	.37699	.16611	.02822	-.20620	.27531	.24425	.00185
MXMNDIFF	.84556	-.11245	.35810	-.08185	.40764	57670	.20347
MXUNTLTH	.92343	-.34767	.25230	.17866	.52206	.98637	.00289
NASLBANG	.01729	-.17926	-.06708	.16509	.20739	.08519	-.11762
NASOFACL	-.18194	.05023	-.16242	.08824	-.15080	-.18100	-.15963
NASOFNTL	.20058	-.08292	.18164	.01849	.27415	.20284	.12167
NASOMNTL	.05010	-.05076	-.15886	.11160	09944	.11013	-.35677
NOSELGTH	.81808	-.19294	.16206	03060	48657	78583	- 02660
NOSEPROM	.62062	-.11254	-.07771	-.17008	15967	54388	-.02382
NSCHNLTH	.84506	-.07928	.22821	03397	.50714	.73034	.10728
NSTNASON	.38462	-.25448	.43749	.22050	40142	.33822	29466
OCCLPLAN	-.40954	.61301	-.42077	-.46709	- 33389	-.37328	-.17593
OCCLPLXI	-.48131	.02757	-.30226	-.06474	-.26067	-.32959	-.21608
OPGOGN	.22499	.29692	.07130	.03917	.00548	.11226	.08963
OPINCLIN	.32482	.19951	.08504	.00165	.06257	.17929	.08880
PALPLANE	.21551	.37801	-.12144	-.49716	.01699	.16924	-.02719
PFH_AFH	.38124	-.50867	.21184	.05020	.23630	.35938	.13721
PNSANS	.86452	-.33147	.21775	.13035	.51071	.86488	-.01604
PNSAPONT	.87578	-.30390	.22072	.17097	.48640	.90820	.00423
POGNPERP	.38172	-.45717	.93247	.39360	.74451	.28310	.33057
POGONNB	-.67759	.49043	-.35698	-.02553	-.41328	-.56683	-.26606
POGSTPOG	-.09987	.12359	.16701	.01772	-.06034	-.08375	.29240
POL1NB	.29263	-.47664	.25246	-.09231	.13682	.17698	.28439

PORIONLC	.75862	-.18356	.26270	11071	.49474	.73907	.04966
POSCRNBS	.75729	-.22687	.18610	-.03908	40397	.73683	- 00151
POSFACHT	.90958	-.32030	.30185	.04587	.51986	.82890	.07968
POSTCRBS	.78963	-.29652	.14700	-.01588	.35903	.79733	.01505
POSTFCHT	.89937	-.42688	.30504	.15787	.56128	.86547	.02311
RAMPOSTN	-.08041	.30829	-.22335	-.49479	-.13986	-.01714	- 12877
RAMUSHGT	.89315	-.32844	.34026	.08859	.53162	.80066	11836
SADANGLE	.18845	-.24425	.06532	05326	.09094	.29900	-.00352
SE	.69933	-.36815	.16468	04812	33665	.78143	00250
SELLANAS	.82698	-.24805	.11911	-.06127	33419	.87494	-.02154
SKPRFCON	.41974	-.22211	.22428	-.45453	01984	.17226	.27572
SL	.78035	-.36990	.35939	.13719	.38839	73152	20422

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	MANDLGTH	MANPLAGL	MANPROGN	MAXDEPTH	MAXPROGN	MIDFCLTH	MLSHLINE
SLSDISTC	-.20044	.01817	.23661	.12174	-.07137	-.16496	05005
SNA	.22708	-.11493	.23696	.55194	.30617	.27880	.07382
SNB	.42595	-.14657	.32255	.22988	.25593	.32710	.19696
SNFACPLN	.56760	-.28185	.39892	.21618	.34787	.44776	.26300
SNFH	-.14213	-.38619	.17367	.48012	.15776	-.08344	-.02074
SNGOGN	-.35510	.61752	-.24672	-.07384	-.22702	-.37282	-.12369
SNHLINE	.15311	-.22393	.27497	.09172	.21799	.06783	.18713
SNLOWER1	.13295	-.15554	.08608	-.05872	-.03879	.05085	.09104
SNMANDPL	-.37514	.65789	-.26220	-.07547	-.21858	-.38488	-.16435
SNOCCPLN	-.48006	.29375	-.26608	-.09347	-.19776	-.40667	-.17732
SNPALPLN	.12139	.06111	.04675	-.10528	.20402	.12371	-.05781
SNPG	.56760	-.28185	.39892	.21618	.34787	.44776	.26300
SPDISTNC	.04445	.27412	-.73619	-.14218	- 17028	.15814	-.46750
STCONVEX	.07459	.01011	-.15006	.02192	.18962	14802	- 38200
STFACAGL	.34945	-.21092	.38905	.21899	.21514	.25214	.35351
STOINLTH	-.10394	.10120	-.16736	-.01430	-.01589	-.01920	-.18590
TFH	.94568	-.12827	.26844	.03417	.53050	.85571	.02618
U1FACPLN	-.02580	.25955	-.21779	.12039	-.00537	.11867	-.25232
UFH	.87846	-.14119	.19849	-.02548	.50288	.81656	04351
UFH_LFH	-.15854	.01414	-.38262	-.07960	-.22622	-.02962	-.30384
UFH_LFH1	.04143	-.05169	-.11025	-.14651	.04642	.08703	05252
ULDISTAN	-.13265	.02532	.20460	.01093	-.08230	-.13358	.09135
UNITDIFF	.80621	-.07304	.35656	-.06325	34443	.54477	23369
UP1PALPL	.28851	-.12711	.05833	- 11688	06877	27275	06116
UPANDNHT	-.63182	.11955	-.13840	- 05205	- 30041	- 59538	00805
UPERLIPE	.57506	-.26881	.41106	- 03893	.28952	.40532	31728
UPGONIAL	-.34151	.01934	-.11428	- 02372	- 32361	- 15672	.06907
UPLIPLTH	.48072	.11739	.17382	-.00849	.30886	.38446	.08869
UPLIPTHK	.14744	-.21772	.26935	.08671	.22193	.06276	.19860
UPLPCURL	-.00316	-.01909	-.06625	.10343	.05000	.03298	-.08409
UPLPLGTH	.52297	.00662	.07563	.08400	.25031	46032	-.02413
UPPER1AV	.54408	-.18380	.46830	-.09300	.39715	.40765	.17039
UPPER1FH	.25046	-.19750	.07983	-.02645	.06581	.24368	.06583
UPPER1NA	.04052	.06790	-.06471	-.12467	-.05953	-.00918	-.05938
UPPER1S1	.27062	-.13507	.05185	-.10165	.04039	.25470	.06899
UPPER1SN	.27062	-.13507	.05185	-.10165	.04039	.25470	.06899
UPPR1APO	.11069	-.06076	-.05412	-.07602	-.02779	.15408	-.01752
UPPR1NA_	-.45785	.03367	-.06172	.40698	-.02156	-.30316	-.09020
UPPR6PTV	.47401	-.26221	.64743	.31687	.61698	.41921	.16317
UPPSDNHT	-.77340	.14634	-.27846	-.04204	-.42348	-.65860	-.03960
UPR1APO_	-.24928	-.14057	.10052	.15323	-.01230	-.26203	.10628

UPSTFCHT	.73356	-.18187	.08764	.04534	.37316	.71693	-.01365
VERLPCHN	-.33648	.26929	-.29097	-.05609	-.27476	-.25893	- 29152
WITSANAL	-.09889	.12529	.03435	-.09152	.00045	-.17601	-.03987
YAXIS	.06901	.70507	-.37560	-.60470	-.18267	-.00591	-.16032
YAXISSN	-.09988	.35372	-.23017	-.11504	-.02024	-.11483	-.21791
YAXSLGTH	.97611	-.19449	.28689	05635	50018	.88287	08681

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	MANDLGTH	MANPLAGL	MANPROGN	MAXDEPTH	MAXPROGN	MIDFCLTH	MLSHLINE
ZANGLE	.34737	-.40318	.55684	27517	.24676	.17641	.52199
ZEROMRDN	.27931	-.39172	.96410	37890	68934	.18884	.38116

	MLSULCUS	MNARCLTH	MNUNTLTH	MOLRRELN	MXARCLTH	MXHEIGHT	MXMNDIFF
MLSULCUS	1.00000						
MNARCLTH	.08924	1.00000					
MNUNTLTH	.41332	.43249	1.00000				
MOLRRELN	.02420	-.13679	.25955	1.00000			
MXARCLTH	.12909	.96345	.52591	.01996	1.00000		
MXHEIGHT	.20818	.18871	.35768	.14572	.22383	1.00000	
MXMNDIFF	.41014	.20164	.83559	.42049	.31204	.46400	1.00000
MXUNTLTH	.33361	.52570	.92807	.11673	.59821	.27974	.59483
NASLBANG	-.11041	.04253	.01554	-.02306	.07295	00212	-.08145
NASOFACL	-.11922	-.16523	-.18146	-.06724	-.15519	-.29388	-.13626
NASOFNTL	.09899	.14839	.19605	.05855	17127	.24861	.14497
NASOMNTL	-.17720	.06655	.04417	-.11810	.09307	-.01510	-.04752
NOSELGTH	.32235	.41686	.80935	.15521	.48347	.55799	.64952
NOSEPROM	.10334	.22294	.60873	19216	.31019	.43059	.56527
NSCHNLTH	.48151	.25748	.83328	.24270	33130	.46297	.78503
NSTNASON	.30667	.06480	.38900	.12264	.12174	.00719	.34894
OCCLPLAN	-.30644	-.02375	-.41086	-.13795	-.10007	.10978	-.35143
OCCLPLXI	-.35189	.03840	-.47343	-.27173	- 03899	-.25526	-.56789
OPGOGN	.14221	-.07388	.22098	.23982	-.02992	.04154	.32325
OPINCLIN	.19604	-.12240	.33118	.31185	-.06284	14727	.44264
PALPLANE	-.01786	-.01004	.21009	29373	.05526	28194	22380
PFH_AFH	.20065	.09537	.38765	16990	.18879	06900	31311
PNSANS	.29871	.48775	.86650	18983	.57136	.32906	63872
PNSAPONT	.31353	.45762	.87605	.18657	.53979	22112	.60252
POGNPERP	.37043	-.05935	.38620	.19207	-.00870	-.01655	.42039
POGONNB	-.45668	-.27503	-.67687	-.16523	- 37683	-.40057	-.65537
POGSTPOG	.06402	-.00657	-.09638	.05773	-.01566	-.08927	- 09639
POL1NB	.24573	-.15293	.30189	.10568	-.05072	.13705	.37700
PORIONLC	.29517	.35210	.75553	11427	.44416	.14483	58833
POSCRNBS	.26208	.47048	.75850	.11725	.54453	.39823	.58883
POSFACHT	.39966	.37810	.90508	.26638	.47948	.46188	.78538
POSTCRBS	.27187	.45302	.79025	.10445	.53635	.42276	.57325
POSTFCHT	.40310	.40030	.89388	.20981	.48541	.43185	.71244
RAMPOSTN	-.07067	.05373	-.09021	-.04194	.03873	.30944	-.14780
RAMUSHGT	.42993	.32582	.89008	.30560	.42602	.36616	.78970
SADANGLE	.10662	.31194	.19655	-.10867	.29052	-.11531	-.01491
SE	.26987	.51746	.70485	.01212	.56851	.21589	.40261
SELLANAS	.27357	.45198	.82684	.10863	.52230	.20144	.54400
SKPRFCON	.22405	.09151	.42143	.33975	.19699	.22228	.65524
SL	.32271	.24546	.78323	.23749	.35102	.06456	.64535
SLSDISTC	.01441	-.02326	-.18865	.02717	-.04900	-.27342	-.19773

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	MLSULCUS	MNARCLTH	MNUNTLTH	MOLRRELN	MXARCLTH	MXHEIGHT	MXMNDIFF
SNA	.10927	-.03680	.22951	.03886	-.01429	-.11486	09646
SNB	.17271	-.00545	.42927	26297	.07243	-.02167	45342
SNFACPLN	.28412	07822	57052	27579	.17692	08862	58740
SNFH	.02573	.04158	-.13787	- 22762	- 01723	- 09698	- 18737
SNGOGN	-.17882	-.06040	-.35784	- 11827	-.15147	.07574	- 23872
SNHLINE	-.01742	- 10188	15492	21668	-.05141	02568	.23242
SNLOWER1	-.02295	-.35822	.14835	.15679	- 27392	-.12285	.21236
SNMANDPL	-.18385	-.08947	-.38253	-.12414	-.18641	08167	- 26445
SNOCCPLN	-.26549	.00642	- 47919	-.28761	-.10551	03205	-.45779
SNPALPLN	.01209	.04006	.11890	.12330	.05907	.25661	.08593
SNPG	.28412	.07822	.57052	.27579	.17692	.08862	.58740
SPDISTNC	-.18427	.21141	.03453	-.21500	.18732	.25977	-.12616
STCONVEX	-.18717	.04853	.06290	-.16598	.05218	.11366	-.04786
STFACAGL	.23354	-.01345	.35378	.24908	.06777	-.04366	.39466
STOINLTH	-.08510	-.18985	-.09220	-.09442	-.23466	.06231	-.19641
TFH	.39772	.42839	.93642	.24369	.50825	.54396	.82468
U1FACPLN	-.09220	.42925	-.03816	-.21385	.39759	-.04313	-.21978
UFH	.35523	.41486	.87034	.20204	.49564	.62199	.73572
UFH_LFH	-.40289	.16819	-.15723	-.09298	.16209	.08876	-.29840
UFH_LFH1	-.01273	.07634	.04193	-.05397	.09588	.31336	-.03331
ULDISTAN	.14386	-.00514	-.12713	-.01671	-.04178	-.18099	-.09659
UNITDIFF	.41142	.15050	.80478	.40623	.24830	.37089	.96053
UP1PALPL	.10621	.37768	.28621	-.00069	.38661	.04850	23535
UPANDNHT	-.30410	-.48331	-.62448	.00844	-.50898	-.35951	-.51858
UPERLIPE	.28142	.05495	.57174	.34195	.13839	.21915	.66192
UPGONIAL	-.20735	-.08687	-.31663	- 25434	-.13233	-.59035	-.51074
UPLIPLTH	.33221	.17046	.46532	.04351	.19164	.29672	.49020
UPLIPTHK	-.01172	-.11776	.14883	.20300	-.06296	.04024	.22735
UPLPCURL	-.19557	-.01532	.00035	.05100	.01286	-.00425	-.05308
UPLPLGTH	.27665	.34715	.51161	.06560	.35779	.29113	.47409
UPPER1AV	.29654	.43269	.53655	.21626	.52566	17724	59334
UPPER1FH	.10871	.38057	.24921	- 05404	.37752	-.00241	19470
UPPER1NA	-.07868	.05960	.03751	18865	.12598	09528	09926
UPPER1S1	.10415	.37102	.26868	- 01791	.37726	.01284	.22242
UPPER1SN	.10415	.37102	.26868	- 01791	.37726	.01284	22242
UPPR1APO	.02032	.35654	.10779	- 12225	32911	- 04181	.02136
UPPR1NA_	-.17063	-.47443	-.44859	-.21290	-.57075	- 22154	- 55461
UPPR6PTV	.31735	-.35245	.47353	.14901	-.29250	- 11406	.42694
UPPSDNHT	-.38205	-.16144	-.76185	-.25260	-.24675	-.37193	- 73241
UPR1APO_	-.05148	-.57688	-.23593	.04661	-.60578	-.09209	-.16737
UPSTFCHT	.22483	.40883	.72762	.16924	.48442	46456	.56484
VERLPCHN	-.37064	.06534	-.33945	-.22712	-.00322	-.11354	-.35745
WITSANAL	-.09103	-.12444	-.10154	.23652	-.07661	.12358	.03484
YAXIS	-.06251	.10647	.05650	.17842	.11491	.45305	.15576
YAXISSN	-.04303	.17815	-.10927	-.07553	.11346	.41831	-.05325
YAXSLGTH	.40131	.40652	.97060	.26945	.50432	.45794	.85174
ZANGLE	.36573	-.05795	.35151	.28696	.00041	-.01344	.49578

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	MLSULCUS	MNARCLTH	MNUNTLTH	MOLRRELN	MXARCLTH	MXHEIGHT	MXMNDIFF

ZEROMRDN	.34448	-.08630	.28421	.19726	-.04950	-.05060	.33341

	MXUNTLTH	NASLBANG	NASOFACL	NASOFNTL	NASOMNTL	NOSELGTH	NOSEPROM
MXUNTLTH	1.00000						
NASLBANG	.11637	1.00000					
NASOFACL	-.15845	.11702	1.00000				
NASOFNTL	.20148	.06396	-.56206	1.00000			
NASOMNTL	.15644	.24190	.78439	-.32677	1 00000		
NOSELGTH	.80412	.06832	-.32667	.18172	.08976	1.00000	
NOSEPROM	.57700	.25032	-.09141	.14785	.25349	.67681	1.00000
NSCHNLTH	.72912	.09525	-.09617	.18900	.02178	.73093	.58732
NSTNASON	.33351	.05917	-.04811	.41242	-.02996	.16027	.11380
OCCLPLAN	-.37542	-.01615	-.02676	.07452	.00997	-.25038	-.10652
OCCLPLXI	-.32762	.06043	.02333	.15568	.03865	-.37417	-.27669
OPGOGN	.09472	-.19489	.08360	-.17321	- 07245	.10499	.02227
OPINCLIN	.18295	-.07304	.08104	-.19548	-.03721	.21216	.16251
PALPLANE	.16179	.12859	-.13411	.10609	.05246	.29572	33561
PFH_AFH	.38384	.17907	.02545	-.01561	.12488	.33308	.31501
PNSANS	.90273	.23441	-.11773	.18020	.18512	.79819	.64722
PNSAPONT	.89472	.20078	-.16805	.18519	.09498	.77159	.59126
POGNPERP	.28874	-.07445	-.08110	.12905	-.10147	.19330	-.04668
POGONNB	-.59563	-.00547	.21903	-.19411	-.01292	-.63086	-.51920
POGSTPOG	-.10808	-.03702	-.08481	-.09157	-.22116	-.16066	-.12220
POL1NB	.20811	-.00095	-.13297	.14527	-.05530	.20383	31222
PORIONLC	.73869	.06934	-.04434	.24777	.17489	.59114	.43043
POSCRNBS	.74486	.14784	-.21813	.20990	.05383	.71049	.48899
POSFACHT	.84183	.07610	-.16880	17751	.06731	.81487	.60599
POSTCRBS	.80457	.03875	-.24775	.22518	.03165	.72919	.53640
POSTFCHT	.87914	.12954	-.18788	.18179	.08315	.83197	.57582
RAMPOSTN	-.04005	.00398	-.14362	-.04852	-.05227	.08863	.03942
RAMUSHGT	.81706	.09004	-.09210	.12438	.09663	.77211	.58862
SADANGLE	.30821	-.01735	- 09859	.07720	00618	18522	09660
SE	.79067	.02444	-.23939	.21821	03073	.64686	45173
SELLANAS	.86067	.02379	- 21015	.22309	.00751	.67947	50983
SKPRFCON	.21759	-.20403	-.15180	09875	- 16094	23482	.36071
SL	.72116	.01909	- 06333	08725	.06369	.53643	45543
SLSDISTC	-.19102	-.55885	-.04162	.00467	- 22322	-.28354	-.57882
SNA	.24643	.15084	.15946	-.08740	.20081	14470	.04494
SNB	.31880	.01813	.09651	-.05168	09189	.21572	.21516
SNFACPLN	.44947	.02288	.02036	.00895	.08332	.36702	.33813
SNFH	-.06962	.01517	-.07232	.10874	-.09082	-.11866	-.22647
SNGOGN	-.37984	-.18533	-.01394	.01357	-.13355	-.27502	-.28352
SNHLINE	.10622	.43068	-.04862	.06030	-.02055	.12902	.54599
SNLOWER1	.06680	-.00604	.10848	-.00490	.01712	-.06702	.08328
SNMANDFL	-.39789	-.16222	-.01127	.01041	-.12480	-.28767	-.29535

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	MXUNTLTH	NASLBANG	NASOFACL	NASOFNTL	NASOMNTL	NOSELGTH	NOSEPROM
SNOCCPLN	-.39885	-.00427	-.07615	.14620	-.05601	-.31751	-.26024
SNPALPLN	.12959	.17339	-.25652	.27083	-.03743	.24612	.17564
SNPG	.44947	.02288	.02036	.00895	.08332	.36702	.33813
SPDISTNC	.17158	.33834	.09504	.01074	.36683	.27795	.30258
STCONVEX	.17922	.28169	.33884	-.12486	.72096	.13849	.38001

STFACAGL	.24364	.00480	.04188	-.07809	.00937	.14521	.18292
STOINLTH	-.02645	.02677	.02028	.01529	.08707	-.05570	-.15712
TFH	.85811	.00320	-.22819	.23668	.01926	.84995	60010
U1FACPLN	.09481	.06142	.12713	-.09841	18655	.04846	-.12395
UFH	.82431	.06031	-.33896	.33333	.01839	.88152	64331
UFH_LFH	-.00352	.26672	-.21333	.29115	.13030	15678	16927
UFH_LFH1	.10261	.14095	- 32022	27528	00047	.26255	.23155
ULDISTAN	-.16962	-.57786	-.01653	-.04700	-.20401	-.24244	-.66792
UNITDIFF	.52588	-.14956	-.16358	.12818	- 15012	56723	47113
UP1PALPL	.27763	-.05394	- 05952	.06689	.08701	.23865	.24407
UPANDNHT	-.59523	.07040	.08093	-.08955	-.01974	-.52177	-.33144
UPERLIPE	.43088	03611	-.12139	11311	-.03898	.47781	72831
UPGONIAL	-.17154	-.12052	.09625	-.09152	-.05303	-.46559	-.31288
UPLIPLTH	.34987	-.17565	-.01783	.01319	- 05376	.31809	17346
UPLIPTHK	.09935	.44046	-.04989	.06014	-.01874	.12205	.55241
UPLPCURL	.05996	.29440	-.01671	.07308	.07851	.07539	.40608
UPLPLGTH	.45260	-.07310	-.00513	.09899	.00362	.42278	.23297
UPPER1AV	.43084	-.14718	-.06424	.07280	-.01385	.36275	.19864
UPPER1FH	.24996	-.07616	-.03530	.04691	.07846	.18639	.18473
UPPER1NA	.00921	.05159	-.02572	.00451	-.02626	.07019	.07722
UPPER1S1	.25876	-.07784	-.02336	.02909	.09220	.20357	.21870
UPPER1SN	.25876	-.07784	-.02336	.02909	.09220	.20357	.21870
UPPR1APO	.15104	-.05357	-.00282	.01145	.10870	.10588	.11166
UPPR1NA_	-.33444	.15827	.06407	-.02897	.01238	-.32093	-.31601
UPPR6PTV	.39584	-.06679	.01251	.07536	-.01233	27551	10574
UPPSDNHT	-.64982	.00584	.07577	-.01876	-.00047	- 64616	-.45031
UPR1APO_	-.26200	.06987	-.03818	.04406	-.10741	-.21325	-.08910
UPSTFCHT	.73221	.19397	-.32481	.45288	03558	84507	.63361
VERLPCHN	-.29172	-.18328	.11774	-.08826	.07740	- 33668	-.31457
WITSANAL	-.16987	.00603	.05339	.01992	-.00469	-.10588	.02979
YAXIS	-.00474	-.03766	-.03660	-.03332	.04134	.23168	.22276
YAXISSN	-.09586	-.02898	-.13608	.09861	-.06632	.12600	-.02318
YAXSLGTH	.88363	.00847	-.18956	.20448	.03980	.82769	.62396
ZANGLE	.18518	-.02746	-.09115	.06122	- 27986	11564	.30342
ZEROMRDN	.18816	-.11172	-.10480	-.00534	-.17869	.11394	-.12536

	NSCHNLTH	NSTNASON	OCCLPLAN	OCCLPLXI	OPGOGN	OPINCLIN	PALPLANE
NSCHNLTH	1.00000						
NSTNASON	.29730	1.00000					
OCCLPLAN	-.29700	-.29535	1.00000				

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	NSCHNLTH	NSTNASON	OCCLPLAN	OCCLPLXI	OPGOGN	OPINCLIN	PALPLANE
OCCLPLXI	-.46196	-.18646	.59218	1.00000			
OPGOGN	.26451	.10991	-.54785	-.68833	1.00000		
OPINCLIN	.38270	.07955	-.54237	-.79705	.87103	1.00000	
PALPLANE	.17762	.14566	.36223	-.05088	-.00711	.06025	1.00000
PFH_AFH	.24944	.28651	-.33984	-.10792	-.14263	.03807	.17892
PNSANS	.75424	.29876	-.34864	-.36210	08286	.22583	14269
PNSAPONT	.75255	.33022	-.35312	-.35629	.11024	.21418	.20235
POGNPERP	.26792	.55027	- 45204	-.32657	06789	.08607	-.09737
POGONNB	-.52105	-.39882	.37649	39943	02725	-.10205	-.10220
POGSTPOG	-.12493	-.03485	-.04858	-.07509	.20517	17547	-.03638
POL1NB	.14779	.24866	-.22033	-.22209	-.18320	-.05009	.03549

PORIONLC	.63231	.41032	-.22904	-.26472	.09419	.12314	26717
POSCRNBS	62941	27578	- 27033	-.34197	.10092	20671	.23807
POSFACHT	.81585	.36351	-.39657	-.39616	.13132	28851	22938
POSTCRBS	.62476	.28485	- 30993	- 24663	.07804	.13895	.19790
POSTFCHT	80676	32187	- 44464	-.35593	.06407	22070	12785
RAMPOSTN	-.01511	- 14089	38128	.04761	- 12783	-.14504	35836
RAMUSHGT	81273	34650	-.42100	-.41955	.13746	.32040	21024
SADANGLE	.10337	-.12816	-.16291	02263	-.06578	-.10759	-.16347
SE	.52383	.12432	-.34319	-.17988	.03042	.04466	02617
SELLANAS	.69814	.27931	-.27194	-.22569	.07412	.13292	.14646
SKPRFCON	.25790	.21734	-.20276	-.30615	.05804	.11573	.17421
SL	.53060	.49867	-.39899	-.36637	.10903	.15859	.25990
SLSDISTC	-.26266	.03136	-.05130	.03151	.09642	-.00320	-.20852
SNA	.12575	.31629	-.21299	-.16495	.12098	.12473	.13263
SNB	.24242	.38711	-.27764	-.31149	.18963	.20604	.25894
SNFACPLN	.35164	.46396	-.35796	-.39058	.15452	20311	.26240
SNFH	-.09581	-.09993	-.27068	.10429	-.08487	-.12855	-.66580
SNGOGN	-.15910	-.30122	.35408	.09472	.25680	.10736	-.16710
SNHLINE	.11302	.15612	-.13173	-.13165	-.05508	.03363	.10553
SNLOWER1	.02900	.14003	-.11981	-.12168	.01609	.10322	.13776
SNMANDPL	-.15789	-.32874	.37658	.11466	.21828	.08664	-.17645
SNOCCPLN	-.34376	-.34197	.73235	.62190	-.56585	- 59215	-.13665
SNPALPLN	.12830	.08209	.16933	.05346	-.10546	-.07009	.53820
SNPG	.35164	.46396	-.35796	-.39058	.15452	.20311	26240
SPDISTNC	.19394	-.26127	.30916	.19901	-.10906	-.06794	.21496
STCONVEX	.09795	-.17536	.14832	.07615	-.19565	-.11990	.13492
STFACAGL	.13152	.38980	-.31443	-.33389	.17762	.19397	.20835
STOINLTH	-.02265	-.03194	.20114	.16173	-.14121	-.10193	.03554
TFH	.89635	.30660	-.32162	-.44560	.24993	.34709	.19071
U1FACPLN	.02973	-.12745	.05160	13130	.16977	04219	- 04035
UFH	.78273	.30429	-.21275	-.38261	.13482	.22836	.39557
UFH_LFH	-.27011	-.17688	.26828	.27208	-.28947	- 28116	.17112
UFH_LFH1	-.08096	.05037	.19564	.04460	-.22020	-.20493	.53403
ULDISTAN	-.16198	.01433	-.08519	-.01865	.12789	02826	-.21759
UNITDIFF	.74152	35744	- 33979	- 55858	.35334	46381	22148
UP1PALPL	12572	07871	.18486	.11302	- 35060	-.32784	11157

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	NSCHNLTH	NSTNASON	OCCLPLAN	OCCLPLXI	OPGOGN	OPINCLIN	PALPLANE
UPANDNHT	-.65380	-.07925	.11408	.19508	.01473	-.06304	.21639
UPERLIPE	.49157	.28312	-.30969	-.39206	.12063	.22424	.18259
UPGONIAL	-.52389	-.10012	.13601	.34011	-.11919	-.26668	-.12207
UPLIPLTH	.58418	.16873	-.16344	-.29528	.28779	.26144	-.04376
UPLIPTHK	.10433	.16010	-.12510	-.13122	-.05809	.03534	.11425
UPLPCURL	-.02141	.00985	.07387	.05808	-.09189	-.04432	.11272
UPLPLGTH	.66407	.16426	-.21724	-.27138	.23628	.26657	-.23727
UPPER1AV	.39374	.36255	-.37499	-.33049	.26434	.20994	.08923
UPPER1FH	.09314	.05196	.11899	.12268	-.35079	-.33992	-.06918
UPPER1NA	.04207	.03257	-.34663	-.26047	.50477	.44448	.15858
UPPER1S1	.10742	.06709	.16047	.10511	-.33435	-.31678	.03621
UPPER1SN	.10742	.06709	.16047	.10511	-.33435	-.31678	.03621
UPPR1APO	.00183	-.04860	.26642	.23119	-.39474	-.39413	-.03773
UPPR1NA_	-.32248	-.13517	.20575	.24558	-.22987	-.18428	-.17221
UPPR6PTV	.45259	.47090	-.45152	-.36686	.24790	.28051	.03537
UPPSDNHT	-.81448	-.22960	.43907	.52518	-.33994	-.45750	-.08941
UPR1APO_	-.20160	.00653	.05124	.02961	-.19153	-.08354	-.05621

UPSTFCHT	.68514	.22791	-.18775	-.24495	.04968	14593	24175
VERLPCHN	-.32584	-.14489	.25045	.29084	-.03483	-.17689	-.18503
WITSANAL	-.02509	.06139	.00406	.04263	.13323	.10262	19129
YAXIS	.23275	-.16856	.44422	- 07391	.20895	.23687	57496
YAXISSN	.15441	-.32985	.18954	.04679	14006	11809	- 15781
YAXSLGTH	.86010	.38306	-.36336	-.46500	.24632	.34397	.24662
ZANGLE	.28134	.28291	-.48160	-.36908	.18554	.22396	-.19514
ZEROMRDN	.16971	.31311	-.43276	-.33383	.11342	13209	-.16141

	PFH_AFH	PNSANS	PNSAPONT	POGNPERP	POGONNB	POGSTPOG	POL1NB
PFH_AFH	1.00000						
PNSANS	.41898	1.00000					
PNSAPONT	.39466	.94599	1.00000				
POGNPERP	.26948	.24991	.25249	1.00000			
POGONNB	-.38914	-.61304	-.56182	- 46142	1.00000		
POGSTPOG	-.04786	-.11577	-.06250	-.10750	.27662	1.00000	
POL1NB	.29488	.24080	.18720	.36456	-.71885	-.30009	1.00000
PORIONLC	.23064	.67396	.69647	.32749	- 49561	-.15697	.20545
POSCRNBS	.45726	.72485	.72428	.18359	-.51522	.03849	.14384
POSFACHT	.65007	.84059	.82621	.35168	-.65720	-.11106	.26373
POSTCRBS	.57702	.74358	.74322	.18201	-.56808	-.09524	25578
POSTFCHT	.52241	.85040	.83416	.36182	-.67701	- 18555	.25033
RAMPOSTN	-.03328	-.07974	-.04849	-.20197	.07282	- 11048	-.08197
RAMUSHGT	.60937	.82699	.80729	.38648	-.61719	-.08686	24608
SADANGLE	-.27267	.23328	.22192	.01996	-.08335	.01318	.04073
SE	.21234	.69355	.68975	.15696	-.44983	-.05810	19883
SELLANAS	.21178	.76182	.80713	15933	-.54544	-.08590	.21967
SKPRFCON	.25429	.24947	.16789	.29703	-.59255	- 10665	64593

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	PFH_AFH	PNSANS	PNSAPONT	POGNPERP	POGONNB	POGSTPOG	POL1NB
SL	.65283	.65030	.69919	.45628	-.59232	-.09286	.38533
SLSDISTC	-.25212	-.30700	-.26665	.22301	.17316	.06023	- 15035
SNA	.52667	.21508	.29498	27707	-.00787	.03039	-.12513
SNB	.64709	.30188	.33941	.38271	-.18789	.03375	.13420
SNFACPLN	.69749	.43778	.45573	.48315	-.46022	-.04990	.33496
SNFH	-.50196	-.08760	-.12831	.12557	-.01906	-.01199	.03201
SNGOGN	-.91597	-.37638	-.38973	-.32387	.41848	.12689	-.38148
SNHLINE	.24618	.22094	.16872	.26974	-.21470	.04622	.27363
SNLOWER1	.32361	.07111	.05440	17084	-.12521	-.16274	.60083
SNMANDPL	-.90503	-.39703	-.40332	-.34385	.46326	.10972	-.43709
SNOCCPLN	-.66917	-.38655	-.41943	-.32879	.33532	-.05299	-.18201
SNPALPLN	-.34201	.08285	.11391	.02299	-.15219	-.05755	.07930
SNPG	.69749	.43778	.45573	.48315	- 46022	-.04990	.33496
SPDISTNC	-.08001	.21479	.18303	-.68009	.11811	-.33663	-.25595
STCONVEX	.01493	.19397	.13078	-.15337	- 01375	-.16545	- 02459
STFACAGL	.63697	.23396	.27155	.37900	- 24499	.29630	.19627
STOINLTH	-.08424	-.07333	-.06284	- 18996	.14421	.05419	.03243
TFH	.27521	.83549	.83148	.29724	-.61962	-.10637	.17354
U1FACPLN	-.11482	.03919	.08171	-.30312	.40078	.22720	-.84958
UFH	.24248	.77139	.77122	21464	- 66501	-.11033	.27054
UFH_LFH	-.09437	-.00501	-.04427	-.38818	.07132	-.06211	-.07140
UFH_LFH1	-.01266	.02858	.03211	-.13604	-.25014	-.02738	.26887
ULDISTAN	- 17395	-.29027	-.23710	18010	.11920	.10405	-.09968

UNITDIFF	.27335	.54044	.57508	.42144	-.59595	- 04757	35805
UP1PALPL	14475	.24406	.24636	04752	- 23219	06764	.03526
UPANDNHT	-.20440	-.63803	-.60917	-.12602	36638	-.00167	-.00064
UPERLIPE	.38610	.48911	.45306	.42789	-.54397	.02453	.44249
UPGONIAL	-.20353	-.32921	-.27799	-.13105	.34211	.17433	-.00737
UPLIPLTH	.07466	.33737	.38578	.18865	-.23284	.05133	- 07523
UPLIPTHK	.25365	.21487	.16653	.26261	-.21951	06230	.28203
UPLPCURL	.00637	.12211	.08417	-.04387	-.00397	-.09261	- 00212
UPLPLGTH	.10947	.50311	.49006	.12666	-.26378	-.12067	-.11817
UPPER1AV	.25207	.38883	.35193	.49134	-.39809	.04375	-.01520
UPPER1FH	.11337	.21986	.21132	.06448	-.21475	07444	.02929
UPPER1NA	.05192	.01717	-.01074	-.04053	-.04230	-.09143	-.02444
UPPER1S1	.19152	.23167	.22957	.04424	-.20996	.07572	.02382
UPPER1SN	.19152	.23167	.22957	.04424	-.20996	.07572	.02382
UPPR1APO	.03624	.12119	.12848	-.08781	-.04713	.10241	-.12860
UPPR1NA_	-.19530	-.32471	-.26910	-.06951	.33121	-.06903	.00078
UPPR6PTV	.17086	.33025	.39692	.70727	-.28683	-.04679	.18308
UPPSDNHT	-.39756	-.68661	-.69952	-.29814	42634	.00332	-.06660
UPR1APO_	-.03690	-.21765	-.21716	15373	-.06630	-.19730	.55853
UPSTFCHT	.23382	.73404	.71473	.12051	-.51810	-.10622	16563
VERLPCHN	-.24952	-.32990	-.28121	-.29269	37472	.06827	-.37716
WITSANAL	.07143	-.11668	-.13071	.01593	.09690	02410	-.05189
YAXIS	.07263	.07255	.05741	-.39845	.15812	02797	-.32342
YAXISSN	-.54858	-.02709	-.09699	-.31855	.16738	01802	-.34653

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	PFH_AFH	PNSANS	PNSAPONT	POGNPERP	POGONNB	POGSTPOG	POL1NB
YAXSLGTH	.42602	85013	.85821	.33591	-.65762	-.09060	.25280
ZANGLE	.26635	22735	.21699	.51792	-.36869	.25144	.36521
ZEROMRDN	.20060	.15246	.16443	.91379	-.30359	.22975	.23110

	PORIONLC	POSCRNBS	POSFACHT	POSTCRBS	POSTFCHT	RAMPOSTN	RAMUSHGT
PORIONLC	1.00000						
POSCRNBS	.61894	1.00000					
POSFACHT	.64126	.79109	1.00000				
POSTCRBS	.56375	.85049	.86359	1.00000			
POSTFCHT	.62671	.74760	.94296	.79595	1.00000		
RAMPOSTN	-.26916	.04125	-.00111	.08307	.01166	1.00000	
RAMUSHGT	.64472	.66240	.95044	.69919	.91177	-.08410	1.00000
SADANGLE	.17076	.03429	-.00521	.02382	.15403	-.01786	.12644
SE	.52881	.63275	.60950	.72358	.67317	.03870	.58658
SELLANAS	.66804	.65545	.73325	.69146	.78138	.05169	.69467
SKPRFCON	.29449	.30479	.36006	.32337	.27023	-.12101	.34995
SL	.64901	.59827	.76423	.68787	.67004	-.15339	.72766
SLSDISTC	-.08476	-.22945	-.29352	- 26317	-.24018	-.07817	-.26738
SNA	.21527	.18435	.31369	.25196	.21594	-.16085	.29522
SNB	.35087	.33580	.47723	.40665	.30271	-.22008	.45682
SNFACPLN	.45314	.44226	.60763	52214	.45573	-.22224	.57781
SNFH	-.10819	-.23392	-.28118	-.28186	-.05973	-.35680	-.21660
SNGOGN	-.25243	-.39624	-.54322	- 49932	- 47381	-.00024	-.51017
SNHLINE	.07934	.06228	.15104	.05674	11143	-.17191	.20269
SNLOWER1	.12421	.01410	.12642	.14877	.00631	-.11580	.12452
SNMANDPL	-.26775	-.41326	-.54338	-.51918	-.46666	.00800	-.49945
SNOCCPLN	-.29020	-.41688	-.56659	-.48689	-.45450	.10009	-.54400

SNPALPLN	22834	04706	-.02050	- 06435	09677	06485	02849
SNPG	.45314	.44226	.60763	52214	.45573	- 22224	57781
SPDISTNC	.12449	.14751	.08914	16082	.12991	20556	04014
STCONVEX	.15107	.10372	.06447	.06947	.11207	.08518	.05590
STFACAGL	.26130	.30354	.39602	.33852	.21906	- 26205	38292
STOINLTH	-.09813	.01361	-.08099	.03778	-.06389	17782	-.15330
TFH	.68823	.75502	.90862	.78152	.90509	.01310	.86629
U1FACPLN	.06149	.12605	.00381	.04135	.02487	.08186	- 01168
UFH	.68645	.76803	.82276	.76849	.82600	.05596	.75589
UFH_LFH	-.05617	.05006	-.16633	-.00907	-.10334	.14146	-.20242
UFH_LFH1	.14860	.20441	-.00727	.13918	.00517	.10605	-.07777
ULDISTAN	-.16216	-.12423	-.17093	-.14955	-.14489	.03048	-.17800
UNITDIFF	.54963	.54578	.72537	.52273	.64039	-.14268	.73065
UP1PALPL	.23693	.25327	.23687	.25684	.23192	-.03662	.22782
UPANDNHT	-.42227	-.54415	-.65787	-.57828	-.64637	-.04226	-.61767
UPERLIPE	.32629	.35867	.54521	.39394	.47744	-.14149	57882
UPGONIAL	-.13426	-.32777	-.47754	- 22566	-.50169	-.16005	-.43450
UPLIPLTH	.37386	.34321	.49948	.37823	.42657	.02578	.47195

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	PORIONLC	POSCRNBS	POSFACHT	POSTCRBS	POSTFCHT	RAMPOSTN	RAMUSHGT
UPLIPTHK	.08887	.06091	.15395	.06426	10755	- 17103	.20105
UPLPCURL	.15326	-.04389	-.03864	- 04004	-.02429	- 12108	- 00269
UPLPLGTH	.31428	.38326	.56145	.43344	.54845	.03983	53461
UPPER1AV	.48415	.47957	.50172	.41942	44974	- 12931	49338
UPPER1FH	.18885	21073	.19625	.22255	21000	- 10248	.19044
UPPER1NA	04471	.08602	.06249	.05776	02930	00402	04641
UPPER1S1	.20439	.24582	.23881	.26487	21762	- 04536	22299
UPPER1SN	.20439	.24582	.23881	.26487	.21762	- 04536	.22299
UPPR1APO	.08238	.12654	.07923	12871	09824	01059	.06985
UPPR1NA_	-.38639	-.46084	-.41846	-.40731	-.33653	.06092	-.39281
UPPR6PTV	.49049	.25511	.40018	.23482	.41298	-.26998	.44541
UPPSDNHT	-.50554	-.61128	-.82805	-.63972	- 79094	-.02483	-.81697
UPR1APO_	-.26864	-.35100	-.24435	-.26725	-.21286	-.02115	-.21955
UPSTFCHT	.56991	.66896	.69477	.64440	.72775	.02119	.65678
VERLPCHN	-.18930	-.21888	-.29160	-.17927	-.32508	.11386	-.34097
WITSANAL	.04260	-.04602	-.02096	-.07169	-.10055	-.07062	-.03101
YAXIS	-.02753	.22520	.20597	.20743	06006	.54546	.13339
YAXISSN	-.17316	-.02937	-.11136	-.10975	-.00487	.20029	-.11649
YAXSLGTH	.73024	.78113	.94545	.83149	.90104	-.04467	.89467
ZANGLE	.14478	.12940	.28939	.14788	.23959	-.43867	.35592
ZEROMRDN	.19268	.13787	.24827	.08825	.24608	-.22090	.29981

	SADANGLE	SE	SELLANAS	SKPRFCON	SL	SLSDISTC	SNA
SADANGLE	1.00000						
SE	.69921	1.00000					
SELLANAS	.23948	.65440	1.00000				
SKPRFCON	.05111	.25155	.28657	1.00000			
SL	-.16607	.37518	.62619	44069	1.00000		
SLSDISTC	.12153	-.10157	-.18487	-.09288	-.16804	1 00000	
SNA	-.41771	-.09057	-.04693	- 32027	.56128	-.05424	1.00000
SNB	-.40487	.02245	.07033	.24519	.78491	- 09856	.81490
SNFACPLN	-.34025	.14404	.20811	39657	87729	- 13648	73758
SNFH	.49448	.14528	- 01498	-.14501	-.44473	18641	- 46634

SNGOGN	.17273	-.22472	-.24000	-.28494	-.70207	.18704	-.50844
SNHLINE	-.01264	.04560	-.02113	24919	.24642	-.45100	.15931
SNLOWER1	-.14873	.00312	.00351	.35429	.38715	-.05799	23145
SNMANDPL	.16427	-.24120	-.25525	-.33347	-.72392	.16897	-.49377
SNOCCPLN	.19676	-.21687	-.26309	-.28898	-.68443	.08516	-.52816
SNPALPLN	.34731	.19717	.17201	.06732	-.16681	-.04862	-.35918
SNPG	-.34025	.14404	.20811	.39657	.87729	-.13648	.73758
SPDISTNC	-.00463	.10744	.17830	-.34018	-.14960	-.46126	-.04310
STCONVEX	.04956	.08716	.08728	-.16461	-.00658	-.33445	.06507
STFACAGL	-.37700	-.01202	.01626	.29486	.73482	-.07651	.74236
STOINLTH	-.10587	-.05666	.03556	- 21786	-.12239	-.06249	-.02110
TFH	.14548	.66147	.81260	.31824	61246	-.23417	.11286

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	SADANGLE	SE	SELLANAS	SKPRFCON	SL	SLSDISTC	SNA
U1FACPLN	.05587	.07883	.06147	-.52229	-.16068	.07311	.14494
UFH	.15350	.65223	.76054	34758	.57980	-.26994	.06788
UFH_LFH	.16059	.09820	-.05779	-.17614	- 20889	-.04232	-.12007
UFH_LFH1	.03811	.11146	.04940	.14368	.05934	-.12874	-.08118
ULDISTAN	.06273	-.07479	-.09030	-.00960	-.12396	.72981	-.10621
UNITDIFF	-.04178	.35025	.51715	.61619	.63951	-.12705	13076
UP1PALPL	.11248	.24452	.26255	29780	28453	- 05067	- 02344
UPANDNHT	-.12964	-.49875	-.60060	-.13374	-.35801	.14558	-.03299
UPERLIFE	.06283	.33060	.33973	.55947	56023	- 30389	.13875
UPGONIAL	.27411	.02810	-.10880	- 06004	- 10582	18409	- 11274
UPLIPLTH	-.07883	.21572	.44140	.12055	29995	-.23274	.06824
UPLIPTHK	-.04000	.03304	-.01738	24689	.24692	- 48061	.15863
UPLPCURL	.02772	.00943	-.04963	-.07707	.01594	-.08335	10164
UPLPLGTH	.04027	.34000	.47623	.02088	.23736	-.09353	.04899
UPPER1AV	.10386	.37590	.38573	.55423	.46896	.09389	-.00977
UPPER1FH	.14314	.24144	.23752	.26681	.23866	-.01453	-.04740
UPPER1NA	-.02244	.03680	-.00479	.11182	.01453	-.02391	-.03887
UPPER1S1	.06413	.21645	.23775	.28719	.30661	-.04373	.02655
UPPER1SN	.06413	.21645	.23775	.28719	.30661	-.04373	.02655
UPPR1APO	.11990	.15782	.16271	.07745	.09420	-.00878	-.05681
UPPR1NA	-.10814	-.35846	-.38041	-.67509	-.36297	.05538	.23251
UPPR6PTV	.02063	.20830	.37010	.14303	.47372	.08400	.28318
UPPSDNHT	-.02574	-.48124	-.62238	-.23779	-.54343	.22601	-.20606
UPR1APO	-.10969	-.26799	-.27145	-.04739	-.10847	-.02941	.04344
UPSTFCHT	.23501	.62506	.64232	.19436	.43507	-.21774	.06784
VERLPCHN	-.12300	-.21939	-.15711	-.28452	-.31660	-.02076	-.10959
WITSANAL	-.22678	-.20069	-.17932	.06807	-.02438	-.05895	.05182
YAXIS	-.24101	-.02302	-.02427	-.06599	-.08171	-.19310	.02912
YAXISSN	.33796	.15581	-.04990	-.26310	-.66281	.00576	-.55650
YAXSLGTH	.03483	.61956	.81101	.38918	.78665	-.24796	.27502
ZANGLE	.04730	.14898	.08734	.46743	.41944	-.05863	.17528
ZEROMRDN	.06294	.11868	.06789	.23081	.33181	.25825	.22705

	SNB	SNFACPLN	SNFH	SNGOGN	SNHLINE	SNLOWER1	SNMANDPL
SNB	1.00000						
SNFACPLN	.95767	1.00000					
SNFH	-.61323	-.54642	1.00000				
SNGOGN	-.63588	-.70004	.45813	1 00000			
SNHLINE	.29375	.33649	-.06983	-.25162	1.00000		

SNLOWER1	.46147	45280	-.30733	- 37075	.17788	1.00000	
SNMANDPL	-.64357	-.72101	.44049	.97479	-.27539	- 40181	1.00000
SNOCCPLN	-.69107	-.71820	.45715	.65146	-.17231	-.32969	.66002
SNPALPLN	-.35613	-.27731	.26753	.30752	.05150	-.17001	.27693
SNPG	.95767	1.00000	-.54642	-.70004	.33649	.45280	-.72101
SPDISTNC	-.23703	-.25839	-.10550	.14663	-.20226	-.18202	.18099

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	SNB	SNFACPLN	SNFH	SNGOGN	SNHLINE	SNLOWER1	SNMANDPL
STCONVEX	-.05020	-.04617	-.04427	-.05721	-.01472	-.04486	-.02609
STFACAGL	.93309	.91840	-.54830	- 63262	.33968	.40247	-.65325
STOINLTH	-.14540	-.18172	.00732	.09493	-.30127	.15618	.10606
TFH	.25523	.39272	-.08165	-.18757	06169	-.01478	- 19402
U1FACPLN	-.09593	-.20645	-.02353	19353	-.30253	-.64828	.23247
UFH	.21251	.37265	-.09777	-.18924	.09143	.01565	-.21904
UFH_LFH	-.23570	-.22642	.04253	.05856	.00079	-.14226	.04916
UFH_LFH1	-.04310	.04345	-.07022	- 04987	.08047	.06383	- 10671
ULDISTAN	-.10044	-.12838	.12310	.12717	-.74725	-.02650	.12487
UNITDIFF	.47214	.58636	-.20362	- 21173	.18592	.23232	-.23921
UP1PALPL	.15268	.20781	-.09864	-.20165	.03726	-.18506	-.20455
UPANDNHT	-.08977	-.17162	-.02165	.12001	.10555	.16957	10062
UPERLIPE	.43478	.54924	-.18572	- 37906	74660	.23537	- 41489
UPGONIAL	-.10246	-.17944	.09348	11481	-.02744	.18485	09629
UPLIPLTH	.13869	.17850	-.08032	02296	-.15619	-.13109	04809
UPLIPTHK	.28957	.33424	-.07444	- 25068	99233	.17241	-.27296
UPLPCURL	.04977	.05332	.00332	- 00198	.64704	-.01823	-.01635
UPLPLGTH	.04536	.09981	.03767	01320	-.17584	-.20785	.03538
UPPER1AV	.32073	.40659	-.08738	- 23374	.09224	-.18469	- 25092
UPPER1FH	.10595	.16083	.02230	- 17273	.01917	-.21078	-.17418
UPPER1NA	.03727	.04894	-.09093	.01227	.06636	.07167	-.00793
UPPER1S1	.20158	.24549	-.13527	-.24342	.03002	-.16086	-.24206
UPPER1SN	.20158	.24549	-.13527	-.24342	.03002	-.16086	-.24206
UPPR1APO	-.00002	.01569	-.02045	-.08882	-.06615	-.30106	-.07608
UPPR1NA_	-.19632	-.27402	.18584	.16298	-.02974	.15447	.18422
UPPR6PTV	.33903	.37928	.03874	-.22927	.17238	.20544	-.22509
UPPSDNHT	-.33385	-.40513	.17074	.30481	-.03719	-.01204	.28448
UPR1APO_	-.04310	-.01778	.11534	-.02717	.19928	.53743	-.04232
UPSTFCHT	.13057	.25825	-.02331	-.17854	.13899	-.04263	-.19765
VERLPCHN	-.23425	-.32216	.05698	.28811	-.39929	-.26566	.31095
WITSANAL	.13073	.08861	-.15199	.00049	.15130	.04746	.00004
YAXIS	.05768	-.00470	-.67190	.11641	-.13818	-.11277	.13692
YAXISSN	-.70832	-.69896	.46364	.71914	-.25754	-.52510	.72189
YAXSLGTH	.46215	.59302	-.22869	-.35831	.12847	.12779	-.37828
ZANGLE	.43255	.50174	.10847	-.26116	.66966	.23126	-.30483
ZEROMRDN	.32498	.38594	.16325	-.22984	.26979	.09413	-.24995

	SNOCCPLN	SNPALPLN	SNPG	SPDISTNC	STCONVEX	STFACAGL	STOINLTH
SNOCCPLN	1.00000						
SNPALPLN	.34519	1.00000					
SNPG	-.71820	-.27731	1.00000				
SPDISTNC	.21036	.15079	-.25839	1.00000			
STCONVEX	.10529	.12633	-.04617	.45264	1 00000		
STFACAGL	-.67885	-.34940	.91840	- 38967	- 11394	1 00000	
STOINLTH	.19088	.05412	-.18172	25265	.21900	- 15819	1 00000

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	SNOCCPLN	SNPALPLN	SNPG	SPDISTNC	STCONVEX	STFACAGL	STOINLTH
TFH	-.35645	.15859	.39272	.15488	.07745	.16078	-.05514
U1FACPLN	.03203	-.07282	-.20645	.34574	.12149	-.13919	-.15445
UFH	-.26746	.40170	.37265	.23720	.12861	.15298	-.00190
UFH_LFH	.27686	.26568	-.22642	.36699	.19409	-.22634	.12708
UFH_LFH1	.13035	.60425	.04345	.22953	.14076	.02443	.10502
ULDISTAN	.00942	-.12924	-.12838	-.42169	-.27225	-.07463	.11946
UNITDIFF	-.45830	.06461	.58636	-.19380	-.14320	.41944	-.16878
UP1PALPL	.10335	.04171	.20781	-.01793	11417	19108	-.14155
UPANDNHT	.09138	.24585	-.17162	-.10968	-.05061	-.03403	.00177
UPERLIPE	-.41917	.02760	.54924	-.34270	-.04320	46226	-.32914
UPGONIAL	.19069	-.05660	-.17944	-.17438	-.08812	-.03003	.06395
UPLIPLTH	-.20749	-.14059	.17850	.06185	.00776	.08049	03354
UPLIPTHK	-.16926	.05594	.33424	-.18883	- 00382	.34303	- 29284
UPLPCURL	.06976	.14072	.05332	.16243	.06893	.03377	-.23540
UPLPLGTH	-.17456	-.25638	.09981	.15549	-.02423	-.07072	-.04274
UPPER1AV	-.40656	.03013	.40659	-.31576	- 10105	.31913	-.43306
UPPER1FH	.12812	-.05575	.16083	-.05592	.09021	.15389	- 14840
UPPER1NA	-.38564	.10049	.04894	.03848	-.13316	.00205	-.24970
UPPER1S1	.05496	-.09737	.24549	-.03894	09612	23894	- 14856
UPPER1SN	.05496	-.09737	.24549	- 03894	.09612	23894	- 14856
UPPR1APO	.23423	-.06391	01569	.05658	.13669	04015	-.09011
UPPR1NA	.31968	-.02424	-.27402	.07576	07568	-.21318	.39217
UPPR6PTV	-.39018	.08905	.37928	-.36123	- 01680	.27641	-.03656
UPPSDNHT	.52749	.07297	-.40513	-.02001	-.01100	-.24541	04830
UPR1APO	.12714	.04628	-.01778	-.17596	-.04059	-.03065	31331
UPSTFCHT	-.19158	.29214	.25825	27234	10452	.06572	-.02981
VERLPCHN	.27288	-.17183	-.32216	.16515	.10403	-.25671	.21854
WITSANAL	-.10387	.07757	.08861	-.05497	-.04861	.10561	-.09806
YAXIS	-.06452	-.01157	-.00470	.40395	.09518	-.03307	.06357
YAXISSN	.50340	.32310	-.69896	.34924	.04440	-.73503	.08768
YAXSLGTH	-.49914	.06342	.59302	.09145	.05716	.37557	-.07575
ZANGLE	-.36940	-.12786	.50174	-.62554	-.37389	.54167	-.37667
ZEROMRDN	-.28465	-.01737	.38594	-.79235	-.17595	.40906	-.18275

	TFH	U1FACPLN	UFH	UFH_LFH	UFH_LFH1	ULDISTAN	UNITDIFF
TFH	1.00000						
U1FACPLN	.07180	1.00000					
UFH	.90925	-.02414	1.00000				
UFH_LFH	-.15516	.10592	.05042	1.00000			
UFH_LFH1	-.00219	-.20630	.41262	.46733	1.00000		
ULDISTAN	-.12524	.04547	-.20901	-.23179	-.22533	1.00000	
UNITDIFF	.77114	-.23850	.67417	-.35305	-.06756	-.02200	1 00000
UP1PALPL	.22405	.14097	.23380	.07372	.07014	-.04778	.21124
UPANDNHT	-.72080	-.24039	-.47965	.21481	.41677	-.03452	-.47746
UPERLIPE	.48259	-.36787	.44360	-.19350	.00644	-.39682	.61949

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	TFH	U1FACPLN	UFH	UFH_LFH	UFH_LFH1	ULDISTAN	UNITDIFF

UPGONIAL	-.48816	-.04694	-.43004	.11579	.02849	.06605	-.44937
UPLIPLTH	.59128	.19716	.41816	-.43147	-.29034	.00340	.50533
UPLIPTHK	.06158	-.30055	.09616	.00233	.09268	-.78473	.18305
UPLPCURL	-.04705	.00540	.04000	.29638	.20223	-.74210	-.09249
UPLPLGTH	.64968	.27060	.38193	-.25755	-.49919	06426	.44696
UPPER1AV	.50214	.28946	.40872	-.23653	-.10452	.10699	.53878
UPPER1FH	.19013	.14816	.16323	.04339	-.02550	-.01031	.17093
UPPER1NA	.05376	.06700	.09495	.02918	.12328	-.04984	.07121
UPPER1S1	.20127	.15092	.17713	.03653	-.01423	-.02958	20132
UPPER1SN	.20127	.15092	.17713	.03653	-.01423	-.02958	.20132
UPPR1APO	.08318	.26958	.05897	.10887	-.04176	-.00715	.00555
UPPR1NA	-.42819	-.27317	-.38407	.09514	.00011	- 01665	-.49186
UPPR6PTV	.41300	-.15953	.32123	-.38275	-.14646	05470	45021
UPPSDNHT	-.82967	-.11981	-.61069	.34024	.34664	.02440	-.70369
UPR1APO	-.29479	-.82415	-.20126	-.00655	.14875	-.05566	-.12122
UPSTFCHT	.75546	.06101	.80340	.40358	.27820	-.24925	.49554
VERLPCHN	-.23261	.34075	-.29194	.09299	-.19815	.12620	-.31094
WITSANAL	-.07071	-.02376	-.04789	-.16975	.04377	-.10141	.03882
YAXIS	.21794	.27427	.20779	.06083	.03388	- 09698	13639
YAXISSN	.15504	.29755	.12247	.12601	-.04911	.04310	-.09662
YAXSLGTH	.96530	.00630	.89132	-.17385	.03235	-.14985	80848
ZANGLE	.22623	-.36688	14697	-.38059	- 14806	- 18144	50818
ZEROMRDN	.20579	-.22222	.11371	-.40032	-.17410	23045	34869

	UP1PALPL	UPANDNHT	UPERLIPE	UPGONIAL	UPLIPLTH	UPLIPTHK	UPLPCURL
UP1PALPL	1.00000						
UPANDNHT	-.36381	1.00000					
UPERLIPE	.19575	-.24829	1.00000				
UPGONIAL	.03149	.36720	-.21972	1.00000			
UPLIPLTH	.09759	-.62424	.12080	-.31885	1.00000		
UPLIPTHK	.04182	.10664	.72377	-.01580	-.11526	1.00000	
UPLPCURL	.01996	.19305	.28047	.08421	-.23315	.67265	1.00000
UPLPLGTH	.07521	-.80460	.14319	-.43363	.71584	-.17187	-.18538
UPPER1AV	.38153	-.36946	.38016	-.17415	.36429	.08868	-.06390
UPPER1FH	.98359	-.40363	.16331	.05449	.10500	.02236	.00079
UPPER1NA	-.65932	.29828	.07213	-.10586	-.04034	.05669	.04921
UPPER1S1	.99032	-.39669	.19124	.03937	.11659	.03393	.00024
UPPER1SN	.99032	-.39669	.19124	.03937	.11659	.03393	.00024
UPPR1APO	.95866	-.35892	.01464	.08659	.06528	-.06131	.00180
UPPR1NA	-.42876	.34242	-.32215	.12284	-.30082	- 02804	.07857
UPPR6PTV	-.02923	-.14535	.36558	-.06759	.33725	.17601	.00262
UPPSDNHT	-.13181	.76000	-.45411	51061	-.62629	-.03755	.18603
UPR1APO	-.41318	.40018	.06640	.08501	-.31507	.19781	.05229
UPSTFCHT	.21904	-.45835	.39888	-.36855	.21150	.13143	.14984
VERLPCHN	-.01067	-.06024	-.50165	.15566	.40804	-.35832	- 20430

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	UP1PALPL	UPANDNHT	UPERLIPE	UPGONIAL	UPLIPLTH	UPLIPTHK	UPLPCURL
WITSANAL	-.42891	.21757	.09992	- 13601	- 02166	15337	09002
YAXIS	-.02939	-.15189	-.02282	-.37471	21082	- 13743	-.04797
YAXISSN	-.15752	-.20876	-.26541	- 32977	.15043	- 26245	- 05719
YAXSLGTH	.25854	-.66725	.55446	-.41977	.54795	.12904	-.02468
ZANGLE	.10141	-.13712	.79045	- 05415	.08687	65227	20700

ZEROMRDN	.05315	-.11750	.40137	-.05752	.17822	.26621	-.08271

	UPLPLGTH	UPPER1AV	UPPER1FH	UPPER1NA	UPPER1S1	UPPER1SN	UPPR1APO
UPLPLGTH	1.00000						
UPPER1AV	.31579	1.00000					
UPPER1FH	.11755	.36537	1.00000				
UPPER1NA	-.01151	.18606	-.69121	1.00000			
UPPER1S1	.11054	.37619	.98754	-.67046	1.00000		
UPPER1SN	.11054	.37619	.98754	-.67046	1.00000	1.00000	
UPPR1APO	.08723	.23080	.96930	-.73352	96384	96384	1.00000
UPPR1NA_	-.25583	-.87438	-.39800	-.23281	-.42397	-.42397	-.28800
UPPR6PTV	.19375	.34302	-.03566	- 06410	-.04162	- 04162	-.13699
UPPSDNHT	-.70847	-.46286	-.11565	-.01411	-.14152	-.14152	-.03176
UPR1APO_	-.33559	-.70041	-.40342	-.08430	-.41837	-.41837	-.42229
UPSTFCHT	.39437	.30260	.17554	.05645	.17773	.17773	.10381
VERLPCHN	.23098	-.10822	.02256	-.07484	01319	.01319	.11534
WITSANAL	-.07584	.07281	-.46597	.47258	-.43800	-.43800	-.48983
YAXIS	.21321	.00017	-.13458	.15867	-.02771	- 02771	-.02383
YAXISSN	.30142	-.11239	-.12973	.07090	-.20164	- 20164	- 05113
YAXSLGTH	.57395	.52268	.21471	.05760	24880	24880	08730
ZANGLE	.06744	.33281	.13700	.02234	.11891	11891	-.03823
ZEROMRDN	.05262	.45554	.08181	-.08506	.05555	05555	- 04866

	UPPR1NA_	UPPR6PTV	UPPSDNHT	UPR1APO_	UPSTFCHT	VERLPCHN	WITSANAL
UPPR1NA_	1.00000						
UPPR6PTV	-.02165	1.00000					
UPPSDNHT	.37574	-.49000	1.00000				
UPR1APO_	.75860	.09526	.29734	1.00000			
UPSTFCHT	-.28333	.21325	-.51011	-.20056	1.00000		
VERLPCHN	.03995	-.25106	.15886	-.21886	-.31605	1.00000	
WITSANAL	-.06927	-.00782	.04563	.01531	-.12751	-.00410	1 00000
YAXIS	-.16602	-.27810	-.22705	-.26208	.16023	.09028	.15507
YAXISSN	.03830	-.28509	-.05386	-.16645	.16138	.18274	-.00776
YAXSLGTH	-.45195	.44254	-.81208	-.26485	.72633	-.27830	-.05397
ZANGLE	-.21113	.36016	-.27744	.12387	.11145	-.44100	.09092
ZEROMRDN	-.06192	.63301	-.26356	.10139	.03264	-.25958	.00836

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	YAXIS	YAXISSN	YAXSLGTH	ZANGLE	ZEROMRDN
YAXIS	1.00000				
YAXISSN	.34451	1.00000			
YAXSLGTH	.17296	-.08515	1.00000		
ZANGLE	-.37389	-.31184	.30994	1.00000	
ZEROMRDN	-.38353	-.25271	.23221	.57791	1.00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

APPENDIX D

FINAL VARIMAX ROTATED FACTOR SOLUTION

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```
>Warning # 9431.  Text: UpperlSN   changed to UPPERlSl
>A long variable name was truncated to 8 characters.

>Warning # 9431.  Text: UFH:LFH    changed to UFH_LFHl
>A long variable name was truncated to 8 characters.

Data written to the active file.
162 variables and 150 cases written.
Variable: B_NO        Type: String   Format. A9
Variable: SEX         Type: Number   Format: F8.2
Variable: AGE         Type: Number   Format· F8 2
Variable: SADANGLE    Type: Number   Format  F8 2
Variable: ARTANGLE    Type: Number   Format  F8 2
Variable: GONANGLE    Type: Number   Format  F8 2
Variable: ANTCRBSE    Type: Number   Format: F8.2
Variable: POSTCRBS    Type: Number   Format: F8.2
Variable: UPGONIAL    Type: Number   Format: F8.2
Variable: LOGONIAL    Type: Number   Format· F8 2
Variable: RAMUSHGT    Type: Number   Format: F8.2
Variable: BODYLGTH    Type: Number   Format: F8.2
Variable: SNA         Type: Number   Format: F8.2
Variable: SNB         Type: Number   Format: F8.2
Variable: ANB         Type: Number   Format: F8.2
Variable: FACLDPTH    Type: Number   Format: F8.2
Variable: FACLLGTH    Type: Number   Format: F8.2
Variable: YAXISSN     Type: Number   Format: F8.2
Variable: POSFACHT    Type: Number   Format: F8.2
Variable: ANTFACHT    Type: Number   Format: F8.2
Variable: PFH_AFH     Type: Number   Format: F8.2
Variable: SNPG        Type: Number   Format: F8.2
Variable: FACLCNVX    Type: Number   Format: F8.2
Variable: OPGOGN      Type: Number   Format: F8.2
Variable: INTERINC    Type: Number   Format: F8.2
Variable: LOW1GOGN    Type: Number   Format: F8.2
Variable: LO1GOGN_    Type: Number   Format. F8.2
Variable: UPPER1SN    Type: Number   Format: F8.2
Variable: U1FACPLN    Type: Number   Format: F8.2
Variable: LO1FACPL    Type: Number   Format. F8 2
Variable: UPERLIPE    Type: Number   Format: F8.2
Variable: LOWRLIPE    Type: Number   Format: F8 2
Variable: MOLRRELN    Type: Number   Format: F8.2
Variable: CANINREL    Type: Number   Format  F8 2
Variable: INCISROJ    Type: Number   Format: F8 2
Variable: INCISROB    Type: Number   Format: F8 2
Variable: L1EXTRSN    Type: Number   Format: F8.2
Variable: APTCONVX    Type: Number   Format. F8.2
Variable: LOWFHAGL    Type: Number   Format: F8.2
Variable: UPPR6PTV    Type: Number   Format: F8.2
Variable: LOW1APO_    Type: Number   Format. F8.2

Variable: UPPR1APO    Type: Number   Format: F8.2
Variable: LOWR1APO    Type: Number   Format: F8.2
Variable: UPR1APO_    Type: Number   Format: F8.2
Variable: OCCLPLXI    Type: Number   Format: F8.2
```

```
Variable: OPINCLIN   Type: Number   Format: F8.2
Variable: UPLPLGTH   Type: Number   Format: F8.2
Variable: LIPEMBOP   Type: Number   Format: F8.2
Variable: FACDEPTH   Type: Number   Format: F8.2
Variable: FACAXAGL   Type: Number   Format: F8.2
Variable: FACTAPER   Type: Number   Format: F8.2
Variable: MANPLAGL   Type: Number   Format: F8.2
Variable: MAXDEPTH   Type: Number   Format: F8.2
Variable: MXHEIGHT   Type: Number   Format: F8.2
Variable: PALPLANE   Type: Number   Format. F8.2
Variable: CRANDEFL   Type: Number   Format: F8.2
Variable: ANTCRLGT   Type: Number   Format. F8.2
Variable: POSTFCHT   Type: Number   Format: F8.2
Variable: RAMPOSTN   Type: Number   Format: F8.2
Variable: PORIONLC   Type: Number   Format: F8.2
Variable: MANDARC    Type: Number   Format· F8 2
Variable: CORPLGTH   Type: Number   Format· F8.2
Variable: FACEANGL   Type: Number   Format: F8.2
Variable: ANGOFCON   Type: Number   Format: F8.2
Variable: ABPLANE    Type: Number   Format: F8.2
Variable: YAXIS      Type: Number   Format. F8.2
Variable: OCCLPLAN   Type. Number   Format. F8 2
Variable: LOW1OCPL   Type: Number   Format: F8.2
Variable: LOWR1MPL   Type: Number   Format: F8.2
Variable: MNUNTLTH   Type: Number   Format: F8.2
Variable: MXUNTLTH   Type: Number   Format: F8.2
Variable: UNITDIFF   Type: Number   Format: F8.2
Variable: LOWFACHT   Type: Number   Format: F8 2
Variable: UPPER1NA   Type: Number   Format: F8.2
Variable: UPPR1NA_   Type: Number   Format· F8.2
Variable: LOWER1NB   Type: Number   Format: F8.2
Variable: LOWR1NB_   Type: Number   Format: F8.2
Variable: POGONNB    Type: Number   Format: F8.2
Variable: POL1NB     Type: Number   Format: F8.2
Variable: SL         Type: Number   Format: F8.2
Variable: SE         Type: Number   Format: F8.2
Variable: SNOCCPLN   Type: Number   Format: F8.2
Variable: SNGOGN     Type: Number   Format: F8.2
Variable: UPPER1FH   Type: Number   Format: F8.2
Variable: FHNA       Type: Number   Format: F8.2
Variable: FMIA       Type: Number   Format. F8.2
Variable: APTNPERP   Type: Number   Format. F8.2
Variable: MANDLGTH   Type: Number   Format· F8 2
Variable: MIDFCLTH   Type: Number   Format: F8.2
Variable: MXMNDIFF   Type: Number   Format· F8 2
Variable: LOANFCHT   Type: Number   Format: F8.2
Variable: POGNPERP   Type: Number   Format. F8.2
Variable: UPPER1AV   Type: Number   Format: F8.2
Variable: SNMANDPL   Type: Number   Format: F8.2

Variable: UPPER1S1   Type: Number   Format· F8.2
Variable: WITSANAL   Type: Number   Format. F8 2
Variable: NASOFNTL   Type: Number   Format. F8.2
Variable: NASOFACL   Type: Number   Format: F8.2
Variable: NASOMNTL   Type: Number   Format: F8.2
Variable: HANGLE     Type: Number   Format: F8.2
Variable: HLINE      Type: Number   Format: F8.2
Variable: SLSDISTC   Type: Number   Format. F8.2
Variable: ULDISTAN   Type: Number   Format: F8.2
Variable: LLDISTAN   Type: Number   Format: F8.2
```

```
Variable: ILSDISTN    Type: Number   Format: F8.2
Variable: SPDISTNC    Type. Number   Format. F8 2
Variable: ZANGLE      Type: Number   Format: F8 2
Variable: INTLABGP    Type: Number   Format: F8.2
Variable: UPLIPLTH    Type: Number   Format: F8.2
Variable: LOLIPLTH    Type: Number   Format: F8.2
Variable: STOINLTH    Type: Number   Format: F8.2
Variable: UPLIPTHK    Type: Number   Format: F8.2
Variable: LOLIPTHK    Type: Number   Format: F8.2
Variable: NASLBANG    Type. Number   Format: F8.2
Variable: UPSTFCHT    Type: Number   Format: F8.2
Variable: LOSTFCHT    Type: Number   Format: F8.2
Variable: UFH_LFH     Type: Number   Format: F8.2
Variable: FCCONAGL    Type: Number   Format. F8.2
Variable: MAXPROGN    Type: Number   Format: F8.2
Variable: MANPROGN    Type. Number   Format. F8 2
Variable: VERLPCHN    Type: Number   Format: F8.2
Variable: MLSULCUS    Type: Number   Format: F8.2
Variable: STFACAGL    Type: Number   Format: F8.2
Variable: NOSEPROM    Type: Number   Format: F8.2
Variable: UPLPCURL    Type: Number   Format: F8.2
Variable: SNHLINE     Type: Number   Format: F8.2
Variable: SKPRFCON    Type: Number   Format: F8.2
Variable: LOLPHLIN    Type: Number   Format: F8.2
Variable: MLSHLINE    Type: Number   Format: F8.2
Variable: ZEROMRDN    Type: Number   Format: F8.2
Variable: SELLANAS    Type: Number   Format: F8.2
Variable: YAXSLGTH    Type: Number   Format: F8.2
Variable: POSCRNBS    Type: Number   Format: F8.2
Variable: BASNASON    Type: Number   Format: F8.2
Variable: PNSANS      Type: Number   Format: F8.2
Variable: PNSAPONT    Type: Number   Format: F8.2
Variable: MXARCLTH    Type: Number   Format: F8.2
Variable: MNARCLTH    Type. Number   Format: F8.2
Variable: BOLFACPL    Type: Number   Format: F8.2
Variable: NSTNASON    Type: Number   Format: F8.2
Variable: ANSNOSTP    Type: Number   Format: F8.2
Variable: APONTSTA    Type: Number   Format: F8.2
Variable: BPONTSTB    Type:. Number  Format: F8.2
Variable: POGSTPOG    Type: Number   Format. F8.2
Variable: NOSELGTH    Type: Number   Format: F8.2
Variable: NSCHNLTH    Type: Number   Format: F8 2
Variable: TFH         Type: Number   Format: F8.2

Variable: UFH         Type: Number   Format: F8.2
Variable: LFH         Type. Number   Format: F8 2
Variable: UFH_LFH1    Type. Number   Format: F8.2
Variable: SNFACPLN    Type: Number   Format: F8.2
Variable: CRBASAGL    Type: Number   Format: F8.2
Variable: SNFH        Type: Number   Format: F8.2
Variable: SNPALPLN    Type: Number   Format: F8.2
Variable: STCONVEX    Type: Number   Format: F8.2
Variable: SNLOWER1    Type: Number   Format: F8.2
Variable: UP1PALPL    Type: Number   Format: F8.2
Variable: LO1PALPL    Type: Number   Format: F8.2
Variable: UPANDNHT    Type: Number   Format: F8.2
Variable: UPPSDNHT    Type: Number   Format: F8.2
Variable: LOANDNHT    Type: Number   Format: F8.2
Variable: LOPSDSHT    Type: Number   Format: F8.2
```

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Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
ABPLANE	1.00000	*	1	31.48849	24.2	24.2
ANB	1.00000	*	2	15.07405	11.6	35.8
ANGOFCON	1.00000	*	3	9.61538	7.4	43.2
ANSNOSTP	1.00000	*	4	8.62081	6.6	49.8
ANTCRBSE	1.00000	*	5	6.94171	5.3	55.2
ANTFACHT	1.00000	*	6	6.81331	5.2	60.4
APONTSTA	1.00000	*	7	5.84692	4.5	64.9
APTNPERP	1.00000	*	8	4.71342	3.6	68.5
ARTANGLE	1.00000	*	9	4.63569	3.6	72.1
BASNASON	1.00000	*	10	3.80551	2.9	75.0
BOLFACPL	1.00000	*	11	3.07012	2.4	77.4
BPONTSTB	1.00000	*	12	2.98797	2.3	79.7
CANINREL	1.00000	*	13	2.53602	2.0	81.7
CORPLGTH	1.00000	*	14	2.30994	1.8	83.4
CRANDEFL	1.00000	*	15	1.94071	1.5	84.9
CRBASAGL	1.00000	*	16	1.73922	1.3	86.3
FACAXAGL	1.00000	*	17	1.58855	1.2	87.5
FACDEPTH	1.00000	*	18	1.28312	1.0	88.5
FACLCNVX	1.00000	*	19	1.22035	.9	89.4
FACLDPTH	1.00000	*	20	1.17802	.9	90.3
FACLLGTH	1.00000	*	21	1.04516	.8	91.1
FACTAPER	1.00000	*	22	.98755	.8	91.9
FCCONAGL	1.00000	*	23	.90313	.7	92.6
FMIA	1.00000	*	24	86465	7	93.2
GONANGLE	1.00000	*	25	.82012	6	93 9
HANGLE	1.00000	*	26	.76308	6	94 5
HLINE	1.00000	*	27	66098	5	95.0
ILSDISTN	1.00000	*	28	.62284	5	95.4
INCISROB	1.00000	*	29	.57770	4	95.9
INCISROJ	1.00000	*	30	.56134	.4	96.3
INTERINC	1.00000	*	31	.50044	.4	96.7
INTLABGP	1.00000	*	32	.44583	.3	97.0
LIPEMBOP	1.00000	*	33	.41847	.3	97.4
LLDISTAN	1.00000	*	34	.33708	.3	97.6

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Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct

LO1FACPL	1.00000	*	35	.32222	.2	97.9
LO1PALPL	1.00000	*	36	.31132	.2	98.1
LOANDNHT	1.00000	*	37	.27647	.2	98.3
LOANFCHT	1.00000	*	38	.23920	.2	98.5
LOGONIAL	1.00000	*	39	.21997	.2	98.7
LOLIPLTH	1.00000	*	40	.19440	.1	98.8
LOLIPTHK	1.00000	*	41	.18624	.1	99.0
LOLPHLIN	1.00000	*	42	.17255	.1	99.1
LOPSDSHT	1.00000	*	43	.14962	.1	99.2
LOSTFCHT	1.00000	*	44	.12011	.1	99 3
LOW1APO_	1.00000	*	45	.10386	.1	99 4
LOW1OCPL	1.00000	*	46	.08955	.1	99 5
LOWER1NB	1.00000	*	47	.08478	.1	99.5
LOWFHAGL	1.00000	*	48	.07474	1	99 6
LOWR1APO	1.00000	*	49	.06382	0	99 6
LOWR1MPL	1.00000	*	50	.05734	.0	99.7
LOWR1NB_	1.00000	*	51	.04694	.0	99.7
LOWRLIPE	1.00000	*	52	.04435	.0	99.8
MANDARC	1.00000	*	53	.03657	.0	99.8
MANDLGTH	1.00000	*	54	.03232	.0	99.8
MANPLAGL	1.00000	*	55	.02977	.0	99.8
MANPROGN	1.00000	*	56	.02532	.0	99.8
MAXDEPTH	1.00000	*	57	.02308	.0	99.9
MAXPROGN	1.00000	*	58	02100	.0	99.9
MIDFCLTH	1.00000	*	59	.01905	.0	99.9
MLSHLINE	1.00000	*	60	.01637	.0	99.9
MLSULCUS	1.00000	*	61	01406	.0	99.9
MNARCLTH	1.00000	*	62	.01212	.0	99.9
MOLRRELN	1.00000	*	63	.00994	.0	99.9
MXARCLTH	1.00000	*	64	.00957	.0	99.9
MXHEIGHT	1.00000	*	65	.00846	.0	99.9
MXMNDIFF	1.00000	*	66	.00812	.0	100.0
NASLBANG	1.00000	*	67	.00686	.0	100.0
NASOFACL	1.00000	*	68	.00648	.0	100.0
NASOFNTL	1.00000	*	69	.00582	.0	100.0
NASOMNTL	1.00000	*	70	.00427	.0	100.0
NOSELGTH	1.00000	*	71	.00343	.0	100.0
NOSEPROM	1.00000	*	72	.00318	.0	100.0
NSCHNLTH	1.00000	*	73	.00296	.0	100.0
NSTNASON	1.00000	*	74	.00267	.0	100.0
OCCLPLAN	1.00000	*	75	.00253	.0	100.0
OCCLPLXI	1.00000	*	76	.00238	.0	100 0
OPGOGN	1.00000	*	77	.00220	0	100.0
OPINCLIN	1.00000	*	78	.00172	.0	100.0
PALPLANE	1.00000	*	79	.00160	.0	100.0
PFH_AFH	1.00000	*	80	.00146	.0	100.0
PNSANS	1.00000	*	81	.00119	.0	100.0

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Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
POGNPERP	1.00000	*	82	.00116	.0	100.0
POGONNB	1.00000	*	83	.00112	.0	100.0
POGSTPOG	1.00000	*	84	.00101	.0	100.0
PORIONLC	1.00000	*	85	.00078	.0	100.0
POSCRNBS	1.00000	*	86	00076	.0	100.0
POSFACHT	1.00000	*	87	.00067	.0	100.0

FACLLGTH	.96033	.09787	.05573	-.10799	.09661
CORPLGTH	.94392	-.01430	.09199	.02881	.05157
POSFACHT	.93986	.08884	.06829	-.08027	.07730
ANTFACHT	.92102	.25213	.05001	-.07886	.18258
RAMUSHGT	.91699	.02769	.02827	-.04795	.08418
FACLDPTH	.90954	.26315	.18397	.02444	.07915
MIDFCLTH	.86279	.14838	.20508	.18776	.04949
PNSANS	.85858	.14021	.24460	.07471	.06556
MXMNDIFF	.85687	-.11106	- 10586	-.29449	.05285
LOLIPLTH	.85140	-.15141	- 05319	-.12042	.19828
LOANFCHT	.85096	.25028	-.17021	-.04284	.24102
LOANDNHT	-.85017	-.34707	08332	- 02480	-.08917
UFH	.84757	.21192	.29708	-.10740	.08412
NSCHNLTH	.84276	.18414	02349	-.15514	.28371
LOSTFCHT	.83300	-.03062	-.22459	-.08070	.27669
ANSNOSTP	.82486	.08249	.22573	-.18116	-.10944
NOSELGTH	.81623	.26295	.26964	-.04284	.07113
UPPSDNHT	-.80254	-.16829	.20015	.12088	-.23356
SL	.79922	-.31618	.03608	-.01895	-.13135
BASNASON	.78637	.24844	.23774	.14808	-.05212
POSCRNBS	.77961	.21710	.14909	-.03035	-.07822
ANTCRBSE	.76247	.21048	.23234	.09728	-.00525
PORIONLC	.73307	.04013	.17451	.08374	.00965
POGONNB	-.72681	.18845	-.22116	-.11426	.04016
APONTSTA	.72247	.11037	.13109	-.01401	-.08781
LOPSDSHT	-.71906	-.24305	-.07568	.05407	-.26752
UPSTFCHT	.71556	.24103	.34031	-.01287	.03508
SE	.65127	.16041	.26830	.25628	-.10393
UPERLIPE	.64770	-.42833	-.00544	-.24041	-.19248
UPPER1AV	.63481	.07229	-.42112	.05191	-.40384
UPANDNHT	-.63179	-.37613	.10895	-.15658	-.05065
NOSEPROM	.63097	.05297	.41620	-.31886	-.14200
BOLFACPL	.60606	-.50356	-.04914	.17798	-.12458
MAXPROGN	.58846	-.06866	-.02408	.34688	.32260
SNOCCPLN	-.56433	.30144	.28107	.19458	-.02172

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	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
FACDEPTH	.52816	-.46697	-.13751	.49286	.12764
FACLCNVX	.52816	-.46697	-.13751	.49286	.12764
UPLPLGTH	.52391	.40340	-.27836	.02464	.27969
LOWR1APO	.51945	.30574	-.39862	.06566	-.47577
ANGOFCON	-.51870	.35005	-.02662	.28316	.41177
MXARCLTH	.51633	.41845	.07126	.19998	-.40540
OCCLPLXI	-.51282	.15825	.28742	.23033	-.22844
LOWRLIPE	.50679	-.50329	.16005	-.26804	-.14067
UPPR6PTV	.50001	-.34757	-.20077	.15684	.34707
PFH_AFH	.49662	-.25919	.06606	-.03793	-.16304
UPLIPLTH	.49514	.28672	-.29622	-.09091	.22327
OCCLPLAN	-.48645	.30145	.31515	-.27622	-.21420
SNB	.47825	-.43224	-.19912	-.19186	-.09266
SNMANDPL	-.47506	.41489	-.17215	-.10860	.27386
NSTNASON	.44181	-.27723	-.10315	.11984	.03888
MXHEIGHT	.39898	.33186	.17100	-.34116	.14792
INCISROJ	.34679	.14774	.25208	.31351	-.18369

RAMPOSTN	1.00000	*	88	00059	.0	100.0
RAMUSHGT	1.00000	*	89	00048	.0	100 0
SADANGLE	1.00000	*	90	.00042	.0	100.0
SE	1.00000	*	91	.00039	0	100.0
SL	1.00000	*	92	.00036	0	100.0
SLSDISTC	1.00000	*	93	.00030	.0	100.0
SNA	1.00000	*	94	00028	.0	100 0
SNB	1 00000	*	95	00026	.0	100.0
SNFH	1.00000	*	96	.00022	.0	100.0
SNLOWER1	1.00000	*	97	00019	.0	100.0
SNMANDPL	1.00000	*	98	.00018	.0	100.0
SNOCCPLN	1.00000	*	99	.00016	.0	100.0
SNPALPLN	1.00000	*	100	00014	0	100 0
SPDISTNC	1.00000	*	101	.00012	.0	100.0
STCONVEX	1.00000	*	102	.00011	.0	100.0
STFACAGL	1.00000	*	103	.00008	.0	100.0
STOINLTH	1.00000	*	104	.00008	.0	100.0
U1FACPLN	1.00000	*	105	.00006	.0	100.0
UFH	1.00000	*	106	.00006	.0	100.0
UFH_LFH	1.00000	*	107	.00005	.0	100.0
UFH_LFH1	1.00000	*	108	.00004	.0	100.0
ULDISTAN	1.00000	*	109	.00004	.0	100.0
UPANDNHT	1.00000	*	110	.00004	.0	100.0
UPERLIPE	1.00000	*	111	.00003	.0	100.0
UPGONIAL	1.00000	*	112	.00002	.0	100.0
UPLIPLTH	1.00000	*	113	.00002	.0	100.0
UPLIPTHK	1.00000	*	114	.00002	.0	100.0
UPLPCURL	1.00000	*	115	.00001	.0	100.0
UPLPLGTH	1.00000	*	116	.00001	.0	100.0
UPPER1AV	1.00000	*	117	.00001	.0	100.0
UPPER1FH	1.00000	*	118	.00001	.0	100.0
UPPER1NA	1.00000	*	119	.00001	.0	100.0
UPPR1APO	1.00000	*	120	00000	.0	100.0
UPPR1NA_	1.00000	*	121	.00000	.0	100.0
UPPR6PTV	1.00000	*	122	.00000	.0	100.0
UPPSDNHT	1.00000	*	123	.00000	.0	100.0
UPR1APO_	1.00000	*	124	.00000	.0	100.0
UPSTFCHT	1.00000	*	125	.00000	.0	100.0
VERLPCHN	1.00000	*	126	.00000	.0	100.0
WITSANAL	1.00000	*	127	00000	.0	100.0
YAXIS	1.00000	*	128	00000	.0	100.0

- - - - - - - - - - - F A C T O R A N A L Y S I S - - - - - - - - - - -

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
YAXISSN	1.00000	*	129	.00000	.0	100.0
ZANGLE	1.00000	*	130	.00000	.0	100.0

PC extracted 14 factors.

Factor Matrix:

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
MANDLGTH	.96524	.04489	.08486	-.01555	.05732

U1FACPLN	-.01669	.74783	- 34081	.16806	-.15027
LOWR1NB_	-.31665	-.71672	.40294	-.12456	08026
FMIA	.00195	-.71591	.32504	.04580	.34214
SNLOWER1	.08425	-.71198	.32093	-.27559	.20545
LO1FACPL	.17088	-.68956	46039	-.03328	.04308
SPDISTNC	-.03906	.66087	.53447	-.17903	.16666
YAXISSN	-.14147	.65144	-.02009	-.05345	.30162
ZANGLE	.44335	-.63674	-.31853	.00346	-.13726
LO1PALPL	.11083	-.63573	48545	-.28180	.21019
LOLPHLIN	-.22427	-.62272	-.04418	-.18045	-.32285
UPR1APO_	-.28872	-.61694	36529	-.04744	47425
FACAXAGL	-.10861	.61500	-.10974	-.27913	.31912
HLINE	.49170	-.61345	-.29590	-.28205	-.24275
HANGLE	-.39732	.56565	26900	.27381	.19756
LOWER1NB	.17513	.55753	-.47460	.20263	-.28231
FCCONAGL	.08869	.51942	.51829	.18043	.29776
STFACAGL	.43163	-.50931	-.23885	-.13809	-.22291
POGNPERP	.47144	-.50566	-.29974	.33922	.15657
LOWR1MPL	.22087	.48496	-.22888	.36377	-.39847
MNARCLTH	.40669	.47631	.04599	.25494	-.39202
MANPROGN	.42835	-.45640	-.34751	.34910	.11836
VERLPCHN	-.37340	.38816	-.15679	.06885	- 00653
UFH_LFH1	.02494	-.03433	.59809	-.09170	-.20810
LLDISTAN	.08279	-.23840	-.59145	.26514	00140
LOW1APO_	-.15368	-.52928	.56355	.20324	.38851
UFH_LFH	-.20500	.25518	.53553	.06008	-.23263
OPGOGN	.22170	.01683	- 52608	-.36811	.29725
LOW1OCPL	.31196	.48788	-.51173	.13373	-.18672

- - - - - - - - - - - - FACTOR ANALYSIS - - - - - - - - - - - -

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
ULDISTAN	-.16743	.00437	-.45368	.26358	.09130
LOWFHAGL	-.15559	.31534	-.44172	-.36421	.29163
STCONVEX	.03805	.27604	43324	.06793	.09995
SLSDISTC	-.23003	-.09968	-.40587	.30514	-.00852
YAXIS	.05375	.51126	-.00437	-.71995	-.01336
MAXDEPTH	.10882	-.18606	-.17042	.65902	.42534
MANPLAGL	-.35108	.40077	-.16819	-.64507	.07224
SNFH	-.16058	.03126	-.01130	.63633	.25115
PALPLANE	.18867	.07588	.31956	-.57707	-.19990
APTNPERP	.16986	-.25883	-.34255	.50437	.41678
ABPLANE	-.04729	.23923	.21944	.49703	.41524
CRANDEFL	.07029	.04182	-.09077	.45840	.28796
INCISROB	.43945	.07437	.23052	.43994	-.33521
OPINCLIN	.32222	-.01972	-.40560	-.42996	.37144
MOLRRELN	.28119	-.17870	-.16567	-.39021	-.00203
WITSANAL	-.04298	-.09252	-.14928	-.35671	.06698
CANINREL	-.21247	.08432	-.13828	-.24253	-.09879
UPPR1NA_	-.51614	-.19368	.24995	.18864	.58836
UPPER1FH	.26576	.12671	.02144	.33669	-.57258
UPPR1APO	.11182	.26439	.04503	.31595	-.55655
STOINLTH	-.18180	.10428	.31671	00399	.35206

SNA	.26284	-.21609	-.16234	.05879	.18952
ANB	-.31581	.32036	.04743	.40333	.46786
SADANGLE	11542	10145	.20377	.40750	-.12945
NASLBANG	.05727	.04824	.40102	.03712	07598
CRBASAGL	-.18375	.06073	.11316	.38365	-.04666
LOLIPTHK	.08864	- 48115	.25072	-.21424	-.13522
SNPALPLN	.06617	.13669	.39163	-.02713	.02118
UPLIPTHK	.23990	-.45400	.14842	-.18835	-.18619
UPLPCURL	.01852	-.10411	.26337	- 08503	- 14144
UPPER1NA	06609	-.00826	- 12914	-.36968	.12838
INTERINC	-.08375	-.20765	27155	.24519	-.08609
ARTANGLE	-.07373	.24040	-.13936	-.30700	.30977
UPGONIAL	-.42190	-.29079	.09547	.21099	-.32094
LIPEMBOP	-.11994	-.12151	-.13297	-.04288	.14990
GONANGLE	-.36596	-.09330	-.14692	-.05784	-.07022
MANDARC	-.41832	-.05773	-.02503	-.20361	-.01701
LOGONIAL	.00386	.27588	-.37118	-.40935	.34710
FACTAPER	-.12562	-.00953	.38602	.31399	-.24311
RAMPOSTN	-.10753	.34269	.21133	-.26427	-.06116

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	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
MLSHLINE	.18199	-.42209	-.24436	.01138	-.14728
ILSDISTN	-.18208	-.40214	-.38542	.12552	-.11274
BPONTSTB	.24025	.34399	.21015	-.01285	-.02439
MLSULCUS	.48003	-.11303	-.20205	.12630	.09470
NASOFACL	-.18490	-.03129	-.11583	.00749	.10876
NASOMNTL	.03536	.18400	.25046	.09618	.07748
INTLABGP	-.32619	.06750	-.09388	.01709	.02879
NASOFNTL	.20086	.00401	.23015	.07159	-.00397
POGSTPOG	-.06210	-.01834	-.32660	-.04997	-.22248

	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
MANDLGTH	-.10733	-.06254	08615	.06782	.04224
FACLLGTH	-.04438	-.09693	.00345	.05955	.03673
CORPLGTH	-.13251	.00051	.06309	.00241	.06976
POSFACHT	.08318	-.14294	-.09174	-.04687	-.05689
ANTFACHT	-.16032	.01079	-.03225	.04203	.02455
RAMUSHGT	.04968	-.10131	-.02436	.03344	-.06077
FACLDPTH	-.10214	-.05295	-.03459	-.10389	-.07668
MIDFCLTH	-.01748	-.12182	.20310	.09909	.07456
PNSANS	.03307	-.02714	.07733	.10661	-.10919
MXMNDIFF	-.20399	.03629	-.09997	.00623	-.01373
LOLIPLTH	-.10518	.05609	-.08213	.04209	.05214
LOANFCHT	-.18402	-.10599	-.07200	.12581	-.12284
LOANDNHT	.02709	.12683	-.15953	-.09274	.01071
UFH	-.10590	.14444	.01928	-.06223	.19142
NSCHNLTH	-.11956	.02908	-.07652	.09690	-.00725
LOSTFCHT	-.17045	-.05656	-.11128	.08642	-.00047
ANSNOSTP	-.09998	.01751	.01334	-.03370	.09619

NOSELGTH	.03080	.12127	-.01753	-.05564	.06529
UPPSDNHT	.06002	.16537	.12292	-.02687	15733
SL	.22711	-.32394	.08705	.04491	.10265
BASNASON	-.23412	-.03005	.19418	-.00715	.01294
POSCRNBS	.03208	-.07913	.04180	-.08817	.01929
ANTCRBSE	-.22880	-.12324	.12201	.01962	-.01324
PORIONLC	-.04810	-.06859	.28172	.14169	.21688
POGONNB	.06965	-.12375	.17245	.26581	.05067
APONTSTA	-.19449	.04432	.11770	-.09549	.24432
LOPSDSHT	-.07788	.13170	-.02310	-.06287	- 04612
UPSTFCHT	-.03652	.20940	.03781	.00632	.07270
SE	-.29737	.03117	.26377	.00116	-.09505
UPERLIPE	.03386	.26265	-.14672	.13984	-.15404
UPPER1AV	-.11074	.04619	.15526	-.14417	.06214
UPANDNHT	.24054	.23749	.32260	-.22205	.22032
NOSEPROM	.12976	.21257	-.04522	.19101	-.24146
BOLFACPL	.19256	-.17571	.20709	.10488	.13202

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	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
MAXPROGN	.14790	.19477	-.08133	.00923	.32513
SNOCCPLN	-.36967	.24809	-.28086	.23321	.18263
FACDEPTH	.04364	.18844	.03754	.08762	-.09928
FACLCNVX	.04364	.18844	03754	.08762	-.09928
UPLPLGTH	-.15060	-.12847	-.16608	.09836	-.24820
LOWR1APO	.13518	.27393	-.14852	-.07758	.07868
ANGOFCON	.42664	-.02671	.06000	.21173	.10905
MXARCLTH	-.04795	.00534	.17177	-.05573	-.09608
OCCLPLXI	.02119	-.11099	-.17283	.10732	.07908
LOWRLIPE	.07964	.38704	-.08483	.16239	-.03607
UPPR6PTV	-.00884	-.02621	.09545	.07795	.27521
PFH_AFH	.48796	-.34933	-.14019	-.17736	-.18040
UPLIPLTH	-.14785	-.15921	-.16105	.15424	-.02423
OCCLPLAN	-.09574	-.11149	-.32157	.23355	.38120
SNB	.46211	-.35902	.06713	.15330	.15675
SNMANDPL	-.45424	.36141	.07805	.27583	.13360
NSTNASON	.14554	.02090	.02619	-.09151	.31415
MXHEIGHT	-.08548	.25645	-.35209	-.16059	.09035
INCISROJ	.03548	-.15908	.21190	-.12150	-.19059
U1FACPLN	.26055	-.04902	.25625	.15931	.02160
LOWR1NB_	-.26585	-.14147	-.08803	-.06719	-.13388
FMIA	-.32110	-.16522	14015	.02574	-.18023
SNLOWER1	-.11175	-.41070	.12367	.01167	-.05394
LO1FACPL	-.25517	-.03647	-.18128	-.21383	-.13733
SPDISTNC	.18812	-.08477	.11757	.13309	-.14060
YAXISSN	-.39189	.43558	-.10966	-.02608	-.11085
ZANGLE	-.03601	.33063	-.13864	.20653	-.19922
LO1PALPL	-.20348	-.18214	.19249	-.05089	.13075
LOLPHLIN	.05490	.37979	-.09694	.12908	-.03270
UPR1APO_	-.01648	.06979	-.21679	-.05878	.04043
FACAXAGL	.01343	.21108	-.37791	-.11221	-.08121
HLINE	.14464	.08996	-.14176	.18363	-.08062
HANGLE	.05896	-.28950	.19468	-.14759	.16199
LOWER1NB	.38610	.25952	-.10062	.07486	.15033
FCCONAGL	.35127	.06357	.10316	.08753	.12019

STFACAGL	.44401	-.25521	.01737	.13775	.14223
POGNPERP	.01272	10128	-.09892	-.13414	28264
LOWR1MPL	.41618	.19969	- 18307	-.19363	- 02950
MNARCLTH	-.05836	.02194	.13731	-.00571	-.07059
MANPROGN	-.01491	.18627	- 12866	-.07608	.31037
VERLPCHN	-.02382	-.22089	-.00230	.09048	-.07978
UFH_LFH1	.10408	.32218	.11872	-.24891	.40562
LLDISTAN	-.32576	-.29384	-.04305	-.31116	.12066
LOW1APO_	.02295	-.05590	-.16695	-.07640	-.07346
UFH_LFH	.14361	.21779	.15776	-.05754	.06074

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	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
OPGOGN	-.04318	.11718	.45985	-.02024	-.09560
LOW1OCPL	.36856	.22872	.07446	-.17583	-.07397
ULDISTAN	-.41182	-.37999	.02409	-.41676	.25965
LOWFHAGL	-.21965	-.13406	-.14644	.33099	-.30949
STCONVEX	.23438	-.15103	.08211	.15134	-.05945
SLSDISTC	-.29093	-.11852	.17305	-.26436	.33409
YAXIS	.09454	-.15997	-.11613	-.04988	.16129
MAXDEPTH	.34607	.15197	.08571	.24755	-.00947
MANFLAGL	-.13313	-.04503	.05918	.26198	.33925
SNFH	-.39764	.49680	02567	.02684	-.24015
FALFLANE	.18912	-.04049	.10819	-.13414	.53088
APTNPERP	.26028	.07550	-.04870	.01645	.34444
ABPLANE	.46607	.11149	-.09732	.01428	.10579
CRANDEFL	-.10614	.40739	-.22832	-.07015	-.30457
INCISROB	-.15998	-.24708	-.17886	.12481	.03005
OPINCLIN	-.02416	.09432	.34118	-.01734	-.17420
MOLARELN	-.03604	.07996	.00596	-.12879	.06650
WITSANAL	.18909	.18903	.14599	-.21441	-.02284
CANINREL	.03140	.00809	- 01978	-.17484	.01902
UPPR1NA_	.22900	.00882	-.17221	.13969	.12949
UPPER1FH	-.14958	-.17985	-.34485	.32300	.05101
UPPR1APO	-.09635	-.22246	-.35811	.35398	.08589
STOINLTH	-.10192	-.29213	-.11952	.01667	.16270
SNA	.72711	-.31857	.06230	.22549	.21852
ANB	.49343	.03256	-.00249	.12850	.11642
SADANGLE	-.47822	.23302	.35752	.04169	-.09343
NASLBANG	.44787	.22911	.02835	.14427	-.17953
CRBASAGL	-.41765	.28906	.36045	.06732	.04285
LOLIPTHK	.24780	.51921	-.05709	.25614	-.01079
SNPALPLN	-.21772	.50396	.16671	-.14258	.42452
UPLIPTHK	.32225	.47876	-.10338	.33224	-.19541
UPLPCURL	.31504	.43769	.13455	.34830	-.05092
UPPER1NA	.13793	.28215	.57938	-.46343	-.20480
INTERINC	-.31303	-.35948	-.52542	.40762	.13594
ARTANGLE	.28472	.06654	-.50226	-.31215	.00810
UPGONIAL	-.20354	-.14836	.45183	.33476	.09117
LIPEMBOP	.20169	.17977	.34505	-.26865	.03254

GONANGLE	-.26880	-.02963	.39117	.58043	.17811
MANDARC	-.25975	-.03025	.36806	.52493	11447
LOGONIAL	-.15660	.17252	-.02616	.46753	.16040
FACTAPER	.12934	-.15289	-.12344	-.45692	-.34793

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	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
RAMPOSTN	.01647	-.16267	-.23683	-.36229	.15916
MLSHLINE	-.07866	.20425	-.21375	.04349	.19808
ILSDISTN	-.16803	-.09406	.04154	-.19622	-.05283
BPONTSTB	.06302	-.04679	.12541	-.06733	-.19803
MLSULCUS	-.12413	.04788	-.18848	-.05845	.19293
NASOFACL	.20922	-.35480	.20388	.21332	-.29946
NASOMNTL	.33848	-.26874	.22550	.14529	-.19565
INTLABGP	-.05974	-.07004	.01260	-.02584	- 06403
NASOFNTL	-.14258	.29890	-.12839	-.08953	.31347
POGSTPOG	-.01612	.12805	.01066	.24908	07365

	Factor 11	Factor 12	Factor 13	Factor 14
MANDLGTH	-.01363	.00313	.03790	.00260
FACLLGTH	.03148	.05866	.08094	.02074
CORPLGTH	.05397	.01572	.00884	-.01383
POSFACHT	-.04070	.03167	.09353	.06571
ANTFACHT	-.00075	.00210	.06237	.02965
RAMUSHGT	-.11928	-.05979	.00006	.06732
FACLDPTH	-.11183	-.00594	.07476	.03650
MIDFCLTH	-.15369	.04958	.10634	.01731
PNSANS	-.06534	-.02500	.05817	.03726
MXMNDIFF	.18486	-.06206	- 06788	-.01826
LOLIPLTH	-.16057	-.06073	-.12199	-.07090
LOANFCHT	-.06749	-.06203	.05253	.11138
LOANDNHT	.07414	-.00222	-.06187	-.03234
UFH	.07680	.07614	.06331	-.07015
NSCHNLTH	-.09844	-.01426	-.13355	.06986
LOSTFCHT	-.06027	-.00629	-.13258	.06803
ANSNOSTP	.03666	-.02645	-.08545	-.16720
NOSELGTH	-.05598	.00437	.07426	-.11269
UPPSDNHT	.15610	.09250	-.03780	.03046
SL	.04496	.09518	.05939	.04291
BASNASON	-.16161	-.01965	.10154	-.00257
POSCRNBS	.03855	.08701	.20181	-.06816
ANTCRBSE	-.16819	.03319	.08614	.06451
PORIONLC	.14030	-.00806	-.10830	.15452
POGONNB	-.12446	-.11091	.12940	.10365
APONTSTA	.29767	-.01704	-.10205	-.12654
LOPSDSHT	.16762	.20488	-.05336	-.19855
UPSTFCHT	-.03925	.06486	.18111	.02076
SE	-.24753	.01652	.09506	.02101
UPERLIPE	-.14641	-.18862	-.02231	.03255
UPPER1AV	.22897	-.12662	-.12361	.10164
UPANDNHT	.04369	-.05219	-.08432	-.08518

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	Factor 11	Factor 12	Factor 13	Factor 14
NOSEPROM	-.04640	-.12837	-.06859	-.04800
BOLFACPL	.02084	-.10220	-.09531	00207
MAXPROGN	.09057	-.21611	-.05941	06763
SNOCCPLN	.11527	-.10023	-.03818	.17922
FACDEPTH	.33694	.06836	.01837	-.02385
FACLCNVX	.33694	.06836	.01837	-.02385
UPLPLGTH	-.03147	.12841	-.02793	.26119
LOWR1APO	.14642	-.03547	-.12063	-.06945
ANGOFCON	-.25472	.03848	.12683	.00583
MXARCLTH	.12426	.20613	.09882	.17301
OCCLPLXI	.01354	-.05721	.10269	.48403
LOWRLIPE	-.10931	-.03559	.10971	-.06831
UPPR6PTV	-.11070	-.29496	-.09320	-.00427
PFH_AFH	-.08562	.07388	.10666	.08954
UPLIPLTH	.06495	.13357	-.11621	.05064
OCCLPLAN	.02879	-.07997	-.02478	.21294
SNB	.16889	.06644	.08566	.03293
SNMANDPL	.10057	-.03161	-.05347	-.03448
NSTNASON	.11348	.11018	-.04485	.24555
MXHEIGHT	.23842	.08086	.03777	-.11317
INCISROJ	.16272	.32686	-.12022	.04281
U1FACPLN	-.04470	.03055	03698	.06166
LOWR1NB_	.03528	.03409	-.03853	-.01741
FMIA	.15266	.05193	.06774	.05607
SNLOWER1	.08604	.06862	.07613	.06669
LO1FACPL	.10147	.09377	- 11005	-.06900
SPDISTNC	.07595	.11558	-.15996	.04519
YAXISSN	-.02942	-.04529	.00076	-.01573
ZANGLE	-.05840	.00822	.03748	.01311
LO1FALPL	.10587	-.02145	.03430	.05390
LOLPHLIN	-.04178	.18389	16768	.00030
UPR1APO_	-.11677	-.00959	.04968	-.05241
FACAXAGL	.10658	.09029	.17593	-.07214
HLINE	-.11012	.02400	.04432	.02395
HANGLE	.21638	.04024	.03655	-.17941
LOWER1NB	-.00213	-.03979	-.03735	-.05646
FCCONAGL	.21389	-.08676	-.09851	.03265
STFACAGL	.13521	.14238	.13569	-.14611
FOGNPERP	.06029	-.21965	-.06501	.11872
LOWR1MPL	-.15805	-.05159	-.04553	-.04832
MNARCLTH	.09306	.22548	.10120	.17736
MANPROGN	.01517	-.21999	.05825	.01846
VERLPCHN	.24991	.12897	.11425	.13841
UFH_LFH1	.19170	.18992	.01647	-.24135
LLDISTAN	-.07457	-.23245	05772	-.04004

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	Factor 11	Factor 12	Factor 13	Factor 14

LOW1APO_	-.08827	.14932	-.01846	-.07915
UFH_LFH	.06438	.03543	.32741	-.07460
OPGOGN	-.00663	.14193	.00526	-.28722
LOW1OCPL	-.16478	.00273	-.04780	-.19064
ULDISTAN	.00417	.08818	.10097	-.10724
LOWFHAGL	-.04677	.00978	.11725	.11793
STCONVEX	.21748	-.35311	-.27215	-.19655
SLSDISTC	-.01612	-.03624	.16513	-.00348
YAXIS	-.15443	.00002	.02191	.01355
MAXDEPTH	.13041	.09263	.11155	-.01290
MANPLAGL	-.00214	-.00317	-.03845	-.01675
SNFH	.12266	-.03618	-.02043	-.02438
PALPLANE	-.07425	-.12540	-.05259	-.00478
APTNPERP	-.11326	-.19251	.02437	.13654
ABPLANE	-.19924	.16499	.03224	-.11164
CRANDEFL	.42803	.18211	.16996	-.07075
INCISROB	.11183	.23113	.00131	-.13972
OPINCLIN	-.05544	.07383	.00860	-.34276
MOLRRELN	.02077	-.30338	.17797	.04992
WITSANAL	.17740	-.09145	-.00131	.34808
CANINREL	.11503	-.16721	-.09580	.10286
UPPR1NA_	-.25335	.01885	.12547	-.03535
UPPER1FH	.16628	-.08561	-.05371	-.13870
UPPR1APO	.07859	-.09502	-.04015	-.14087
STOINLTH	.03433	.03188	.16305	-.18752
SNA	.01685	.12608	.13280	.00880
ANB	-.24192	.10857	.08870	-.03656
SADANGLE	-.36358	-.15536	-.09392	-.01790
NASLBANG	-.03532	-.09895	-.06906	.08047
CRBASAGL	-.30402	-.28949	-.18322	-.02603
LOLIPTHK	-.02877	.07976	.12756	-.02763
SNPALPLN	.04899	-.20645	-.09299	-.02565
UPLIPTHK	-.08482	-.20995	-.01439	.11303
UPLPCURL	-.02188	-.16407	.01472	.15291
UPPER1NA	.02361	.12029	.02470	.18425
INTERINC	.00581	-.11567	-.02139	-.15497
ARTANGLE	.30918	-.03594	-.02384	-.04680
UPGONIAL	-.15641	.13148	.06299	.03361
LIPEMBOP	.07781	.25169	-.22790	.17149
GONANGLE	.00833	.16593	.08028	.05110
MANDARC	.03805	.13674	.09401	-.13253

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	Factor 11	Factor 12	Factor 13	Factor 14
LOGONIAL	.25025	.08311	.03702	.03574
FACTAPER	-.38360	-.07871	.03032	.04904
RAMPOSTN	-.37440	-.06364	-.01117	-.01897
MLSHLINE	-.25683	.52960	-.35608	-.06841
ILSDISTN	.10849	-.50184	.46044	.00839

BPONTSTB	.23608	-.36158	.51500	-.25529
MLSULCUS	-.24197	.39647	- 49118	-.10450
NASOFACL	.15853	-.28505	- 45085	-.07020
NASOMNTL	.27724	-.35160	-.36725	-.14057
INTLABGP	.11893	.11573	-.05406	.44487
NASOFNTL	.05428	.21894	.25181	.41147
POGSTPOG	-.17181	.12663	35064	-.39744

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
ABPLANE	.85802	*	1	31.48849	24.2	24.2
ANB	.94030	*	2	15.07405	11.6	35.8
ANGOFCON	.96756	*	3	9.61538	7.4	43 2
ANSNOSTP	.84111	*	4	8.62081	6.6	49 8
ANTCRBSE	.81309	*	5	6.94171	5.3	55.2
ANTFACHT	.98791	*	6	6.81331	5.2	60.4
APONTSTA	.79702	*	7	5.84692	4.5	64 9
APTNPERP	.90513	*	8	4.71342	3.6	68.5
ARTANGLE	.80775	*	9	4.63569	3.6	72.1
BASNASON	.89173	*	10	3.80551	2.9	75.0
BOLFACPL	.82973	*	11	3.07012	2.4	77.4
BPONTSTB	.80348	*	12	2.98797	2.3	79.7
CANINREL	.23328	*	13	2.53602	2.0	81.7
CORPLGTH	.93299	*	14	2.30994	1.8	83 4
CRANDEFL	.88529	*				
CRBASAGL	.80438	*				
FACAXAGL	.84422	*				
FACDEPTH	.95058	*				
FACLCNVX	.95058	*				
FACLDPTH	.98779	*				
FACLLGTH	.98359	*				
FACTAPER	.86441	*				
FCCONAGL	.89173	*				
FMIA	.95427	*				
GONANGLE	.80392	*				
HANGLE	.91936	*				

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Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
HLINE	.94870	*				
ILSDISTN	.92768	*				
INCISROB	.77827	*				
INCISROJ	.60982	*				
INTERINC	.91719	*				
INTLABGP	.36266	*				
LIPEMBOP	.48718	*				
LLDISTAN	.85404	*				
LO1FACPL	.91946	*				
LO1PALPL	.92276	*				
LOANDNHT	.92011	*				
LOANFCHT	.98043	*				

LOGONIAL	.87342	*
LOLIPLTH	.87927	*
LOLIPTHK	.79060	*
LOLPHLIN	.81488	*
LOPSDSHT	.79871	*
LOSTFCHT	.90632	*
LOW1APO_	.89305	*
LOW1OCPL	.94583	*
LOWER1NB	.94844	*
LOWFHAGL	.85940	*
LOWR1APO	.92252	*
LOWR1MPL	.94448	*
LOWR1NB_	.92334	*
LOWRLIPE	.84831	*
MANDARC	.75976	*
MANDLGTH	.97530	*
MANPLAGL	.94226	*
MANPROGN	.85437	*
MAXDEPTH	.94050	*
MAXPROGN	.81121	*
MIDFCLTH	.95565	*
MLSHLINE	.90544	*
MLSULCUS	.87073	*
MNARCLTH	.74201	*
MOLRRELN	.44609	*
MXARCLTH	.79292	*
MXHEIGHT	.74543	*
MXMNDIFF	.94339	*
NASLBANG	.50279	*
NASOFACL	.72145	*
NASOFNTL	.61450	*
NASOMNTL	.76524	*
NOSELGTH	.85966	*
NOSEPROM	.88049	*
NSCHNLTH	.91231	*

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Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
NSTNASON	.51526	*				
OCCLPLAN	.92704	*				
OCCLPLXI	.78458	*				
OPGOGN	.88938	*				
OPINCLIN	.87417	*				
PALPLANE	.88941	*				
PFH_AFH	.82216	*				
PNSANS	.86730	*				
POGNPERP	.89566	*				
POGONNB	.80575	*				
POGSTPOG	.57355	*				
PORIONLC	.78542	*				
POSCRNBS	.75581	*				
POSFACHT	.96524	*				
RAMPOSTN	.63136	*				
RAMUSHGT	.89229	*				
SADANGLE	.83469	*				
SE	.83737	*				

SL	.95074	*
SLSDISTC	.65975	*
SNA	.94805	*
SNB	.93698	*
SNFH	.97624	*
SNLOWER1	.95702	*
SNMANDPL	.96638	*
SNOCCPLN	.94840	*
SNPALPLN	.76166	*
SPDISTNC	.92440	*
STCONVEX	.67556	*
STFACAGL	.95160	*
STOINLTH	.46890	*
U1FACPLN	.89641	*
UFH	.96375	*
UFH_LFH	.66976	*
UFH_LFH1	.89778	*
ULDISTAN	.89685	*
UPANDNHT	.91476	*
UPERLIPE	.89137	*
UPGONIAL	.85401	*
UPLIPLTH	.60889	*
UPLIPTHK	.91241	*
UPLPCURL	.59160	*
UPLPLGTH	.81806	*
UPPER1AV	.90854	*
UPPER1FH	.86602	*
UPPER1NA	.91488	*
UPPR1APO	.85036	*

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Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
UPPR1NA_	.94813	*				
UPPR6PTV	.75583	*				
UPPSDNHT	.88843	*				
UPR1APO_	.90074	*				
UPSTFCHT	.77825	*				
VERLPCHN	.49468	*				
WITSANAL	.46471	*				
YAXIS	.88383	*				
YAXISSN	.91008	*				
ZANGLE	.93954	*				

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 12 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5

ANTFACHT	.97223	.07261	-.01370	-.05165	.06253
FACLDPTH	.96751	.07451	-.01096	-.02162	- 01498
MANDLGTH	.95328	.00417	.15432	-.11373	.10894
FACLLGTH	.95199	.02050	.22034	-.08859	05135
MIDFCLTH	.91355	.06637	.13902	.13268	.03633
CORPLGTH	.90924	-.02321	.12714	-.15384	.14864
POSFACHT	.90876	.04387	.27722	-.04432	.04819
UFH	.90059	.00753	-.02230	-.03494	-.01648
LOANDNHT	-.89403	-.26931	-.10391	-.01514	-.02219
LOANFCHT	.89319	.11820	-.00431	-.05857	.12159
NSCHNLTH	.88567	.00815	-.04845	-.01076	.11293
PNSANS	.88478	.03689	.09202	.05388	-.02159
BASNASON	.87921	.08411	-.10252	-.03357	-.03021
RAMUSHGT	.87408	.03985	.21392	-.05616	.14683
ANTCRBSE	.86212	.00769	-.04051	-.01874	-.05955
NOSELGTH	.85669	.10683	-.01069	.06663	-.02357
ANSNOSTP	.80144	.00469	.08387	-.24278	-.00428
UPPSDNHT	-.79943	-.09439	-.09830	.04573	-.14173
LOPSDSHT	-.79063	-.06910	-.06184	-.16195	-.18922
UPSTFCHT	.79013	.06390	-.07540	.08330	- 08516
LOSTFCHT	.78940	-.02455	.08325	-.12461	28886
POSCRNBS	.78773	.13873	.19721	-.05591	- 10599
LOLIPLTH	.77988	-.09886	.08321	-.11075	31452

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	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
MXMNDIFF	.76019	-.08265	13606	-.42768	.18222
SE	.74840	.03699	-.19290	-.02972	- 07400
PORIONLC	.74034	.00909	.15822	-.07319	.12142
UPANDNHT	-.70476	-.19338	.04446	.01890	.09481
APONTSTA	.69902	.05669	.03193	-.29735	.08512
POGONNB	-.61921	.13180	-.07607	.21696	-.07885
UPLPLGTH	.60764	.22057	-.08249	.03663	-.06414
MXARCLTH	.54087	.43897	.04202	-.18587	-.31877
UPLIPLTH	.52839	.16485	.03568	-.04546	.00656
INCISROJ	.36714	.08834	.13270	-.02736	-.36560
CANINREL	-.23770	.10514	-.03358	-.22607	.02978
LOWER1NB	.06407	.94257	.04246	.09186	.10716
FMIA	.01880	-.88871	.06461	-.07262	.07196
SNLOWER1	.06750	-.86211	.40581	-.13212	.00933
LOW1OCPL	.19497	.86064	.04209	.04650	.05248
LO1PALPL	.13658	-.85907	.18317	-.13585	08275
LOWR1NB_	-.32670	-.85669	.02855	-.16864	-.02941
LOWR1MPL	.10621	.84430	.01371	.09602	.03157
U1FACPLN	.05826	.80504	-.01126	.22415	-.19467
UPR1APO_	-.27244	-.77719	-.04686	.29166	.21023
LO1FACPL	.09987	-.77155	.06346	-.26210	02333
LOW1APO_	-.11078	-.75035	.00336	.37352	.00518
LOWR1APO	.32358	.74225	.09114	-.36985	.12343
MNARCLTH	.45363	.48423	-.01844	-.11126	-.32766
STOINLTH	-.00021	-.35367	-.06231	.34722	-.11034
SNB	.24761	-.04953	.88504	-.10279	.20637
STFACAGL	.14954	-.00431	88210	-.14617	.17941
YAXISSN	.09142	.22467	-.80762	.11594	-.17328

SNA	.11645	.08413	80679	.44312	.20723
SNFH	-.09557	-.00201	-.67987	.12137	.12194
SNMANDPL	-.27293	.11049	-.67913	.06761	-.06342
PFH_AFH	.32825	-.02786	.67467	-.01212	-.00909
SL	.64382	-.08489	.66836	-.13062	.14273
CRBASAGL	-.07316	.03276	-.63911	.01744	.19849
SNOCCPLN	-.37376	-.02088	-.62840	.11830	-.08771
BOLFACPL	.39558	-.09623	.52633	-.14454	.39685
HLINE	.20335	-.07492	.50579	-.37242	.27378
ANB	-.19597	.21645	-.04528	.91111	.01951
ABPLANE	.03344	.14806	-.04460	.84767	.02448
ANGOFCON	-.37029	.22081	-.07610	.84132	-.02084
UPPR1NA	-.40183	-.40255	-.09139	.76139	.14786
UPPER1AV	.45562	.46144	.15928	-.59129	.24779
FCCONAGL	.26237	.12542	-.14661	.52751	-.18063
MOLRRELN	.19405	-.06658	.10733	-.31742	.29369

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	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
POGNPERP	.25462	-.07281	.19384	-.09897	.79269
MANPROGN	.21624	.00500	.13996	-.06447	.78688
APTNPERP	.05384	.08593	.14029	.42123	.77346
UPPR6PTV	.40227	-.14824	.13100	.07212	.69138
SPDISTNC	.21736	.07523	-.19224	.35236	-.61686
MAXPROGN	.51083	.07511	.03046	.22383	.58953
LLDISTAN	-.02867	.03526	.05973	-.29657	.56418
NSTNASON	.30796	-.00950	.34060	-.03201	.35902
UPLIPTHK	.03821	-.06912	.14137	-.11309	.16629
ULDISTAN	-.13755	.00071	-.02753	-.11693	.25513
LOLIPTHK	-.06125	-.19626	.14899	-.00366	.01770
UPLPCURL	-.03759	.06944	-.01059	.09257	-.00530
LOWRLIPE	.33184	-.21752	.18421	-.20683	16397
UPERLIPE	.44484	-.09390	.17529	-.35707	.26089
NOSEPROM	.60753	-.02834	.02134	-.14362	-.19821
HANGLE	-.16339	.10490	-.17348	.42085	-.30263
SLSDISTC	-.24285	.07188	-.05173	-.07942	.37389
LOLPHLIN	-.42153	-.19011	.18813	-.22978	.02489
ZANGLE	.16864	-.08219	.21317	-.33679	.34850
NASLBANG	.06139	.01589	.00612	.32034	-.12213
VERLPCHN	-.26430	.21366	-.02542	.07264	-.29926
CRANDEFL	.04484	.04923	-.27874	.10619	-.02399
FACLCNVX	.32410	-.08791	.22404	-.05749	.35077
FACDEPTH	.32410	-.08791	.22404	-.05749	.35077
YAXIS	.17943	.19022	.04490	-.03189	-.27385
PALPLANE	.20584	-.02903	.21635	-.10985	.02242
MAXDEPTH	.02520	.07991	.15909	.55504	.32036
RAMPOSTN	.02095	.04937	-.14232	.09977	-.12122
OCCLPLAN	-.32921	-.02298	-.15981	.03743	-.18884
FACTAPER	-.10027	-.05673	-.08573	.10706	-.17284
LOGONIAL	.08094	.12231	-.11468	.01496	-.00765
MANPLAGL	-.19780	.11605	-.12824	-.03082	-.16577

GONANGLE	-.28962	-.06924	-.01291	.00055	-.10865
MANDARC	-.31292	-.16423	-.05656	.00485	-.22669
ARTANGLE	-.10307	.09771	.03217	.06581	.02001
UPGONIAL	-.38644	-.16522	.05601	-.01513	-.12419
FACAXAGL	.03478	.25525	-.32353	.20247	-.25200
MXHEIGHT	.45517	.03575	-.17741	-.08549	-.13926
SADANGLE	.23869	.03204	-.58207	-.03348	.04359
UPPER1NA	.05352	.04286	.00385	-.16602	-.12703
INTERINC	-.04955	-.36895	-.01176	.02675	.08588

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	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
UPPR1APO	.07906	.35611	.04657	-.15039	-.09718
UPPER1FH	.18004	.29443	.09196	-.27844	-.03338
OPGOGN	.18458	.11831	.07262	-.11670	.01871
LIPEMBOP	-.17172	.02269	.08143	03445	.00844
INCISROB	.42762	.07035	.14387	-.06542	-.17917
WITSANAL	-.11024	.01451	.09840	-.19211	.09947
UFH_LFH1	.03742	-.12765	-.01339	.02320	-.18825
LOWFHAGL	-.03631	.08310	-.15654	-.01493	-.17692
SNPALPLN	.16220	-.03663	-.49062	-.01660	.17428
UFH_LFH	-.08914	.07079	-.13633	.20330	-.37310
NASOMNTL	.04859	.04375	.10060	.09316	-.09185
NASOFACL	-.22536	-.02060	.14162	-.04082	-.00095
STCONVEX	.11829	-.00887	-.06841	.17852	-.11128
MLSHLINE	.00375	-.02585	.16368	-.12057	.12585
MLSULCUS	.39251	.04963	.03582	-.00846	.18348
BPONTSTB	.31794	.12316	-.03437	.00320	-.15769
ILSDISTN	-.31556	-.09128	.08442	-.33579	.49166
OCCLPLXI	-.39850	.02129	-.11957	.15756	-.14105
OPINCLIN	.29214	.00085	.06645	-.08529	.01682
NASOFNTL	.25844	-.06563	-.10965	.06226	.05650
POGSTPOG	-.13312	.25298	.10929	.00516	-.03036
INTLABGP	-.26858	-.00184	-.05859	-.02726	-.10171

	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
ANTFACHT	.02251	.02194	.08607	.13930	-.00049
FACLDPTH	.00771	-.00195	-.19239	.07872	.01803
MANDLGTH	.06616	.07305	.01677	-.04657	.01793
FACLLGTH	.05493	.03424	.05891	.08793	.00472
MIDFCLTH	.00709	.06578	-.07990	-.24008	.05067
CORPLGTH	.05429	.14701	-.00743	-.00803	.01294
POSFACHT	.07964	.00496	-.13326	.15819	-.00550
UFH	.08335	-.00901	.04637	.15014	-.01000
LOANDNHT	.07043	-.01116	-.06738	06355	.04584
LOANFCHT	-.03320	.04544	.10783	.10978	.00779
NSCHNLTH	.11239	-.05314	.10280	.16284	-.05232

PNSANS	.18088	.09751	-.11265	-.05992	.03556
BASNASON	-.03442	.01500	-.12994	-.23915	.06387
RAMUSHGT	.14210	.00040	-.10945	.03814	-.01277
ANTCRBSE	-.05029	-.01751	-.11562	-.19450	.08009
NOSELGTH	.14088	-.02998	-.09267	.13931	.01198

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	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
ANSNOSTP	.12945	-.08412	-.03234	.06770	.07608
UPPSDNHT	.02181	.04439	.01041	-.17797	.01586
LOPSDSHT	-.06185	.17158	.01406	-.04993	.06836
UPSTFCHT	.19410	.01853	-.03772	.04202	-.00375
LOSTFCHT	.01055	.07289	.12522	.13458	-.03408
POSCRNBS	-.01084	.01899	- 09966	.06580	.02479
LOLIPLTH	.17221	.00318	.01263	.08353	- 02627
MXMNDIFF	.13112	.06429	.14662	23562	- 03229
SE	.00216	.10104	-.21590	-.39757	.04794
PORIONLC	.03209	.09128	.13154	-.21297	-.02108
UPANDNHT	.12564	-.11305	-.01154	-.12268	-.36882
APONTSTA	-.08326	.09941	.09612	.05592	.04541
POGONNB	-.10183	-.27783	.32023	-.19917	-.05285
UPLPLGTH	-.15881	.10414	.10648	.20217	-.03517
MXARCLTH	-.07461	.16963	-.13698	-.16579	.04047
UPLIPLTH	-.17830	.02963	.26927	.22171	.05178
INCISROJ	-.15645	.31262	-.26704	-.17689	-.00174
CANINREL	-.03892	-.20578	.02135	.16633	-.14392
LOWER1NB	.04752	.03369	.05777	.13624	.07409
FMIA	.00307	.33062	-.00800	-.17677	-.07001
SNLOWER1	.02297	-.01988	.00733	-.12378	-.08647
LOW1OCPL	-.02397	.04494	-.15224	.09510	-.20067
LO1PALPL	.08455	-.07836	.04401	-.13017	-.12544
LOWR1NB	.09431	.04713	-.15282	-.07253	.07436
LOWR1MPL	.05445	.04609	-.41650	.10731	.11748
U1FACPLN	-.19957	-.07286	.16742	-.14638	-.06431
UPR1APO	.18202	.02945	-.10257	.14759	-.02544
LO1FACPL	.14003	.20075	-.31587	.06578	.09214
LOW1APO	.10213	.19473	-.29821	.03551	.08402
LOWR1APO	.10475	.11235	-.04630	.17658	.09959
MNARCLTH	-.10020	.16705	-.10194	-.17760	.09049
STOINLTH	-.28810	-.13664	.09670	.14275	.20078
SNB	.13096	.01980	.11406	-.00356	-.04144
STFACAGL	.16875	.10282	.06275	-.02299	.03996
YAXISSN	-.08320	-.03699	.21753	.27664	-.08624
SNA	.08209	.05186	.10231	.01498	-.06334
SNFH	-.03916	.67794	-.03038	-.09692	.03666
SNMANDPL	-.12113	-.03929	.62361	.03704	-.03878
PFH_AFH	.14653	-.01716	-.46063	.10039	-.01194
SL	.08324	.06974	-.10088	-.11723	.03759
CRBASAGL	-.00701	.04653	-.06904	-.56562	.01770
SNOCCPLN	.00081	-.03768	.20672	.03906	.40811
BOLFACPL	.15004	.20048	-.10069	-.30711	.02672
HLINE	.48782	.06112	01290	-.02328	-.00607

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	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
ANB	-.07021	.05516	-.01696	.03348	-.04475
ABPLANE	-.00536	.18154	-.19629	.10328	.03153
ANGOFCON	-.09378	-.07097	.10534	-.04452	-.05009
UPPR1NA	.05481	-.02323	.00796	.07411	.04052
UPPER1AV	-.08541	.16048	-.00240	-.07520	-.07205
FCCONAGL	.06077	.00642	.03257	.16144	-.00475
MOLRRELN	.15196	-.19936	.07435	.14965	-.19805
POGNPERP	.00314	.32570	-.09796	.01994	- 02061
MANPROGN	.02767	.32643	-.04146	.01210	.04582
APTNPERP	-.06558	.27007	-.00862	-.02161	-.05848
UPPR6PTV	.01471	.09140	.09159	-.11369	-.06504
SPDISTNC	.04680	-.24368	.07693	.12864	-.05191
MAXPROGN	.08249	.25558	.00899	.13360	.01992
LLDISTAN	-.53617	.09112	-.13246	-.09143	.04476
NSTNASON	.01083	.16084	.00312	.00507	-.12433
UPLIPTHK	.91234	.09022	-.05381	-.02475	-.01175
ULDISTAN	-.85172	.03958	-.02579	-.04699	.01074
LOLIPTHK	.76158	.11553	05774	-.00720	-.03961
UPLPCURL	.69456	.02266	.07621	-.15305	-.06633
LOWRLIPE	.67581	.05674	-.02540	-.00206	-.01243
UPERLIPE	.61991	.02264	-.11388	.00657	.02328
NOSEPROM	.61366	-.10923	-.09409	.08450	.04456
HANGLE	-.55926	-.04209	.02638	.02967	.05783
SLSDISTC	-.55785	.08195	.03939	-.22596	- 05169
LOLPHLIN	.50087	.13454	.02821	-.09488	-.00756
ZANGLE	.49756	.38677	-.00126	-.07032	.01129
NASLBANG	.49467	.04250	-.16932	.04043	-.07622
VERLPCHN	-.32944	.04939	.20859	.06789	.06659
CRANDEFL	-.03189	.79717	-.00631	.36144	.01654
FACLCNVX	.12638	.79510	-.02887	-.04203	.01506
FACDEPTH	.12638	.79510	-.02887	-.04203	.01506
YAXIS	-.02578	-.74876	.21478	.33298	-.11386
FALPLANE	.15185	-.69560	.08650	.06649	-.10894
MAXDEPTH	.04400	.69018	.07085	-.07724	-.02890
RAMPOSTN	-.15990	-.63933	-.30473	.20716	.03880
OCCLPLAN	.03236	-.55965	.24722	.11394	.41285
FACTAPER	-.02014	-.08109	-.87411	-.11299	.07905
LOGONIAL	.03594	-.04912	.84695	.25827	-.08697
MANPLAGL	-.09118	-.60988	.66659	.11852	-.07053
GONANGLE	-.01449	.00805	.62875	-.53824	.05744
MANDARC	.00408	-.06844	.61718	-.41477	.04745
ARTANGLE	-.06342	-.10235	.02364	.86533	-.11030

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Factor 6 Factor 7 Factor 8 Factor 9 Factor 10

UPGONIAL	-.03988	.04056	.13125	-.77826	.13082
FACAXAGL	-.09255	- 13705	.19590	.66865	-.07155
MXHEIGHT	.07764	-.09443	.12380	.62055	.01446
SADANGLE	.00353	.10659	-.19592	-.61128	.05388
UPPERINA	.03694	-.00989	-.05067	-.01444	-.92055
INTERINC	-.04329	-.00760	.03220	-.03363	.86812
UPPRIAPO	-.02316	.00864	-.03540	-.10373	.81064
UPPERIFH	.01067	.14397	-.05050	-.09996	.78460
OPGOGN	-.11630	.05556	.40768	-.01561	- 57906
LIPEMBOP	-.04899	.12609	.00360	-.02780	-.57732
INCISROB	-.15660	.27781	-.18411	-.14959	.57313
WITSANAL	.16125	-.08567	.07630	.19163	-.51127
UFH_LFH1	.14622	-.07016	-.07778	.06186	-.02704
LOWFHAGL	-.08747	-.14323	.45984	.19774	-.04666
SNPALPLN	.14182	-.13576	.08586	-.02415	-.09425
UFH_LFW	.15307	-.05125	- 12817	-.08965	04514
NASOMNTL	.04673	.04042	-.05520	-.02181	.03990
NASOFACL	-.02698	.03706	.05463	-.10280	-.03522
STCONVEX	.09126	-.06341	-.03588	.06410	.17508
MLSHLINE	.12812	.10835	.00901	-.06379	.05474
MLSULCUS	-.10204	.08573	-.04963	.03794	.04339
BFONTSTB	-.01526	.04625	-.06535	.12252	.05924
ILSDISTN	-.15881	.14540	-.10243	-.09917	.00082
OCCLPLXI	-.00052	-.12715	-.11860	-.12494	.28970
OPINCLIN	-.02126	.00972	.32723	.08609	-.51952
NASOFNTL	.08705	.05895	.03197	.06916	-.01770
POGSTPOG	.06227	.01396	.23448	-.14704	.16781
INTLABGP	-.13588	.02451	.06917	-.00488	-.13893

	Factor 11	Factor 12	Factor 13	Factor 14
ANTFACHT	-.03392	.02926	.00260	.02878
FACLDPTH	-.01406	.02053	-.03118	.01239
MANDLGTH	.03209	-.00294	.02714	.06053
FACLLGTH	-.00617	.02581	.01584	.03848
MIDFCLTH	.08116	-.01216	-.02530	.00864
CORPLGTH	.11142	.01076	.06113	.05189
POSFACHT	-.07961	.02557	-.00236	.01244
UFH	.33905	.05325	.01369	.02899
LOANDNHT	.11661	.05955	.04063	-.04704

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	Factor 11	Factor 12	Factor 13	Factor 14
LOANFCHT	-.35052	.00435	-.00734	.02443
NSCHNLTH	-.14756	-.06518	.17315	.03664
PNSANS	.00186	-.09062	-.05723	.00345
BASNASON	.10945	.03311	-.07688	.02342
RAMUSHGT	-.12873	-.03862	.04425	.04901
ANTCRBSE	.01212	.04112	-.02996	-.03264

NOSELGTH	.22024	.00594	-.03008	.10433
ANSNOSTP	.25106	-.06892	.07440	15562
UPPSDNHT	.36870	.01119	-.00709	-.19492
LOPSDSHT	.16195	.12379	.10560	.09827
UPSTFCHT	.25436	.12174	-.08912	-.03608
LOSTFCHT	-.27216	.00696	.23538	.08219
POSCRNBS	.15461	.07383	-.12154	.05756
LOLIPLTH	-.08370	.02847	.22551	.21683
MXMNDIFF	-.04513	.01096	.09407	.11686
SE	.07350	.07978	-.05336	.02317
PORIONLC	.21745	-.18701	.05944	-.18396
UPANDNHT	.42679	-.05098	-.00499	.06929
APONTSTA	.40239	-.11123	.04662	.02822
POGONNB	-.24630	-.03270	-.21622	-.06949
UPLPLGTH	-.51415	.01524	.10597	-.15034
MXARCLTH	.14183	.06643	-.07106	-.24074
UPLIPLTH	-.31938	-.03391	.19741	.00075
INCISROJ	.16809	-.15715	.11386	-.15641
CANINREL	-.01001	-.09115	-.06085	-.08831
LOWER1NB	.03259	.00092	.04286	.02219
FMIA	-.04962	-.00621	-.03461	-.01587
SNLOWER1	-.04121	-.02616	-.02887	-.00319
LOW1OCPL	-.05589	.00694	.05908	.28050
LO1PALPL	.23462	-.03295	-.03997	-.04012
LOWR1NB	.03204	.04381	.06482	.01252
LOWR1MPL	.06651	.01318	.03819	.00410
U1FACPLN	-.11470	-.14435	-.12901	-.08535
UPR1APO	.04927	.10680	.06973	.07340
LO1FACPL	.17192	.05668	18365	.04389
LOW1APO	.12111	-.00452	.13324	.01222
LOWR1APO	.13090	.05650	.12894	.05249
MNARCLTH	.11792	.08846	-.05437	-.26253
STOINLTH	.08994	-.05385	-.14988	.04509
SNB	-.02349	-.05062	.01771	.03263
STFACAGL	.05294	.08245	.05555	.19943
YAXISSN	-.08354	.06917	-.06421	.00833
SNA	-.04283	-.10476	.00869	.01412
SNFH	-.01398	.04066	-.00881	-.02345
SNMANDPL	-.03446	.02421	-.01081	- 00097

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	Factor 11	Factor 12	Factor 13	Factor 14
PFH_AFH	-.11648	.00371	-.01463	-.01649
SL	.06111	-.01088	.06238	.00361
CRBASAGL	.10468	-.09557	.01196	.04842
SNOCCPLN	.13838	.02721	-.04412	-.39702
BOLFACPL	.08684	-.13551	.10583	.06003
HLINE	-.20262	.27505	.18210	.19989
ANB	-.03352	-.09484	-.01370	-.02844
ABPLANE	.13418	-.07722	.08188	.00031
ANGOFCON	-.12603	-.09758	-.10333	-.04625
UPPR1NA	-.05437	.03040	-.00668	.00439
UPPER1AV	.05388	-.02226	.04661	-.04648

FCCONAGL	.34563	-.48397	-.16059	-.25381
MOLRRELN	-.03396	.12282	-.22048	.10315
POGNPERP	.03950	.08166	.15241	-.04286
MANPROGN	.05711	.19927	.08510	.05623
APTNPERP	-.07106	.03101	.08313	-.07330
UPPR6PTV	-.05680	-.09700	.09300	.12752
SPDISTNC	.10903	-.43433	-.07006	-.19415
MAXPROGN	.18146	-.10147	.06073	-.09318
LLDISTAN	-.26244	.16543	-.01316	.14848
NSTNASON	.17225	.10217	.20120	-.22876
UPLIPTHK	-.01171	.02778	.00253	.02624
ULDISTAN	-.06796	.23348	.03779	.08871
LOLIPTHK	.24317	.24238	.04340	.08799
UPLPCURL	.15707	-.08754	-.11393	-.12159
LOWRLIPE	.13154	.25179	.05530	.20685
UPERLIPE	-.09922	.13018	.08473	.16141
NOSEPROM	.08039	-.16103	-.04403	.09691
HANGLE	.28891	-.33706	-.24047	-.09212
SLSDISTC	.05916	.25783	-.06002	.00787
LOLPHLIN	.09778	.45298	.10307	.08968
ZANGLE	-.22114	.31107	.18878	.20120
NASLBANG	.10395	-.26646	-.07717	-.10400
VERLPCHN	-.17092	-.05762	-.16894	-.24308
CRANDEFL	-.00780	.13545	-.07143	-.01873
FACLCNVX	.05430	.00266	08192	.02508
FACDEPTH	.05430	.00266	08192	.02508
YAXIS	-.05425	.01397	- 04464	.03177
PALPLANE	.50195	-.05053	- 01403	-.03768
MAXDEPTH	-.05569	-.06459	00239	-.00925
RAMPOSTN	.06796	.08482	01268	.00216
OCCLPLAN	.16047	-.00127	-.04113	-.41145

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	Factor 11	Factor 12	Factor 13	Factor 14
FACTAPER	-.02924	.00824	-.09120	-.05612
LOGONIAL	-.20209	.04150	.02260	.01029
MANPLAGL	-.02446	-.00974	-.00297	.02123
GONANGLE	-.05994	.09831	.00951	-.03625
MANDARC	.00341	.03255	-.06084	.12484
ARTANGLE	-.02484	-.06663	-.02322	-.01427
UPGONIAL	.07497	.08326	-.00380	-.05237
FACAXAGL	-.12056	.13554	-.12774	.03894
MXHEIGHT	.23048	.09518	.01294	.02976
SADANGLE	.06660	.00671	.01146	.06271
UPPER1NA	.07793	.04366	-.07430	.03617
INTERINC	-.08170	-.03161	.05878	-.03904
UPPR1APO	.02764	-.07912	-.00663	-.07899
UPPER1FH	.05123	-.05975	.02200	-.06450
OPGOGN	-.16296	.03236	.05771	.52228
LIPEMBOP	.13695	-.05086	.25550	- 10140

INCISROB	.16704	.02435	11993	-.06358
WITSANAL	-.00747	-.00528	-.09071	-.22420
UFH_LFH1	.89528	.06670	02976	.01290
LOWFHAGL	-.70548	.06838	-.09658	.05037
SNPALPLN	.63174	-.01736	-.02690	-.08453
UFH_LFH	.50084	.07472	-.37246	-.09986
NASOMNTL	.03727	-.83797	-.14482	.01531
NASOFACL	-.31517	-.72443	.02840	.08177
STCONVEX	.18500	-.70627	-.17586	.01394
MLSHLINE	.03972	.37613	.80520	.14454
MLSULCUS	-.00770	.10420	.78869	.15059
BPONTSTB	.12458	-.11713	-.75616	.18704
ILSDISTN	-.17757	.20531	-.55437	.10226
OCCLPLXI	.00292	.02802	-.16575	-.63896
OPINCLIN	-.20834	-.00685	.03373	.58934
NASOFNTL	.29462	.44785	.01606	-.46852
POGSTPOG	-.01837	.39326	-.09541	.45387
INTLABGP	-.18643	.01511	.03942	-.44305

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Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	.91674	.09190	.21732	-.15885	.16108
Factor 2	.22881	.61134	-.37463	.21429	-.38172
Factor 3	.18001	-.49168	-.16976	.23083	-.36997
Factor 4	-.02064	.19355	-.13283	.33713	.24134
Factor 5	.15834	-.40655	- 19913	.56413	.22078
Factor 6	-.16566	.33204	.59128	.44040	.01591
Factor 7	-.06701	.23118	-.49780	-.00600	.12313
Factor 8	.06277	.03580	.03553	-.02380	-.09955
Factor 9	.03229	.02198	.06936	.19679	-.08679
Factor 10	.01073	.05845	.12271	.16829	.45661
Factor 11	-.07371	-.04416	.16535	-.33979	-.10612
Factor 12	.03172	-.03319	.23485	.18060	-.56439
Factor 13	.05831	-.03623	.15892	.17715	-.05989
Factor 14	.04965	-.00869	.00237	-.05110	.09871

	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Factor 1	.13074	.12411	-.07408	.04495	-.00066
Factor 2	-.26119	-.24847	.11599	.17740	.04529
Factor 3	.25717	-.14190	-.27046	-.06077	.19614
Factor 4	-.25038	.60836	-.34088	-.30633	.31640
Factor 5	-.17466	.12280	.25236	.31817	-.33422
Factor 6	.34828	-.03141	-.20665	.19994	-.20072
Factor 7	.57160	.26688	.09159	.12900	-.27008

Factor 8	-.11735	.06106	.17934	-.67053	-.58556
Factor 9	.42089	.07996	.62150	-.31294	.43901
Factor 10	-.22895	-.35510	.34349	-.04154	.14743
Factor 11	-.13757	.49167	.34985	.39213	.02810
Factor 12	-.17517	.23901	.11893	.00302	-.11680
Factor 13	-.03361	.07016	.05695	.00210	.03616
Factor 14	.11510	-.07294	-.02717	-.08996	-.24768

	Factor 11	Factor 12	Factor 13	Factor 14
Factor 1	.01806	.01230	.07771	.07883
Factor 2	-.01061	-.16634	-.15398	-.11621
Factor 3	.45914	-.19357	-.12598	-.20279
Factor 4	.06109	-.05431	.02538	-.14934
Factor 5	-.23096	-.14619	.01609	.07634
Factor 6	.09441	-.24863	-.04952	-.00774
Factor 7	.30824	.27713	.08766	.06027

	Factor 11	Factor 12	Factor 13	Factor 14
Factor 8	.20558	-.23422	-.18348	.10053
Factor 9	-.26286	-.13087	.02124	-.01650
Factor 10	.58531	.17088	.16399	-.16108
Factor 11	.29944	-.31060	-.23240	-.24656
Factor 12	.09122	.42973	.52985	-.04740
Factor 13	-.00875	.61271	-.73989	.03912
Factor 14	-.27520	.11849	.01192	-.89802

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