

SUBJECT: 3RD QUARTER STATUS  
FLAVOR DIVISION

DATE: SEPTEMBER 25, 1987

TO: MARY E. STOWE

FROM: BRIAN M. LAWRENCE

1. Provide technical support for technologically differentiated products

#### ALPHA

*initiated* ~~With the completion of~~ the ARTAP flavor data base, which was specifically <sup>has been completed. Efforts have been</sup> designed for supporting the alpha development, ~~efforts were initiated in~~ <sup>towards the creation of a formulation</sup> the formulation of flavor systems for the alpha prototype. ~~Based on the~~ threshold/attribute of 199 aroma chemicals, preliminary endeavors had generated a simple formula in delivering a cigarette-like taste. The Flavor Division expert panel evaluated the formulation and found it to be effective in generating a comparable taste characteristic as an alpha prototype that has been top dressed with commercial flavors. ~~Using this~~ approach of flavor development, we can demonstrate the effectiveness of a ~~simple formula with five aroma chemicals versus the complex formulas as~~ submitted by commercial suppliers.

#### VA

Two FFLT 85 and FFLT 100 VA prototypes were designed with the low sidestream cigarette paper and the two current FFLT blends that perform best among the 18+ female smokers; namely, the CAMEL Light 85 and the CAMEL Light 100 blends. Due to the fact that the low sidestream paper does contribute some adverse taste characteristics, the current top dressings on the CAMEL Light blends were deemed insufficient. With the SPAT data base and other threshold information, the Flavor Division had completed the development of eight top dressings, two for each of the four prototypes, in an effort to ameliorate the predominant bitter taste and to increase the delivery of more tobacco taste. Products made with the four selected most improved top dressings will be submitted to SED for QDA evaluation.

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2. Provide flavor support for product improvements/line extensions as specified in Brand R&D program plans

#### WINSTON KS

Two WINSTON KS tobacco blends have already received favorable NFO acceptance. These prototypes were developed without the use of top dressing. On smoking, the Flavor Division expert panel found that the A and C prototypes possessed the following deficiencies:

A: Had a drying, strong lingering aftertaste and a bitter taste

C: Had a bitter taste and harsher taste, also a drying, lasting aftertaste

To address these deficiencies, top dressings were developed for both A and C, using the SPAT data base and other threshold information. The top dressed prototypes A and C are scheduled for QDA evaluation.

#### SALEM LIGHT 100

In the recent NFO results, a SALEM Light 100 prototype was rated superior to the current SALEM Light 100, attaining a 55.5% 70+ rating over the current 47.4%. The prototype is made up of the current SALEM Light blend, replacing mechanical perforations with on-line laser, removing the use of filter flavors and incorporating a simplified and improved top dressing. This new top dressing, which was based on SPAT, was designed to deliver a cooler menthol taste, increased smoothness and a cleaner aftertaste. Based on the NFO attribute performance, the new top dressing caused significant movements in the following attributes: increased smoothness, fresher aftertaste, less drying aftertaste and less bitter taste.

#### MENTHOLATED POLYMER BEADS

Products, in the SALEM KS and SALEM Light 85 styles, were made by Brand R&D using cavity filters containing various levels of menthol laden polymer beads. At their request, menthol formulations of cut filler application were designed to simulate the same menthol deliveries as the above prototypes. Calculations for these top dressings were based on the analyses obtained from the menthol content in the tobacco and the polymer beads. An aging study has been initiated by Brand R&D on the comparison

of these two menthol products: mentholated beads in filter versus mentholated cut filler. Based on our recommendation, Brand R&D has also requested for the puff-by-puff smoke menthol profiles which are essential data for a comparison of the true delivery of menthol against a time basis.

## ET

A series of natural flavors were screened for the ET prototypes, which are designed to deliver an exotic taste that blends in well with the natural tobacco taste. The flavor spectrum covers a variety of spicy, citrusy, floral, woody and herbal notes. Three flavors of very different aroma character were selected by Brand R&D for a quantitative concept/product test. Prototypes were top dressed, each at a low and a high flavor level. All of these flavor levels had been scrutinized and approved by Scientific Affairs, based on the internal Flavor Protocol and results of Ames test evaluations.

3. Build a foundation of basic aroma/flavor data that can be used in the development of technologically differentiated products

## TOP DRESSING FLAVOR DATA BASE

The smoke thresholds and attribute profiles of 17 selected flavor raw materials were determined on cigarettes made with 100% Burley, Flue-cured, Turkish, G-7 and G-13. Once the data was collated it was entered into the SPAT data base. This increases the number of flavor raw materials in this base to 76.

## FILTER FLAVOR DATA BASE

The action plan for the development of an equivalent data base for filter flavors as developed for top dressings was initiated. Because of the potential number of variables encountered, the study will be brand specific and will cover a range of dilutions from 0% to 94%. The brands that will be used in this study are: DORAL 85, CENTURY Light 85, WINSTON Ultra Light 85, NOW 85 and NOW 79 CPB. The initial aroma materials being screened are those constituents that are used in our current filter flavors. The main objective of the study is to develop an understanding

of the importance of filter flavors as they relate to the attributes of the cigarette.

#### NPT DATA BASE

To support the flavor development of new generation product, ~~199~~ raw materials have been evaluated for their aroma/attribute profile. ~~The descriptive profile encompasses the following characteristics: cigarette-like taste, artificial, fresh tobacco taste, smoke like taste, dry puff character, aftertaste, trigeminal sensation and flavor categorization. In addition, the ability to mask the background base of a generic alpha style product was also determined.~~

All of the information obtained from the many evaluations has been entered in an ARTAP (Alpha Recognition Threshold Attribute Profile) data base. The information obtained during the ARTAP evaluations supercedes the planned classification of all flavor raw materials against the descriptive terms of a cigarette taste.

#### PHYSICO-CHEMICAL DATA COLLECTION

Instrumentation to perform the collection of retention index data has been demonstrated to function as planned. Basically, a modified parallel dual column GC system using polar and non-polar column chromatographic separations from a single component injection is used. The retention time of each compound is compared with the retention times of the standard chemicals including n-hydrocarbons and ethyl n-carboxylic esters, so that the Kovats and ester indices can be obtained from the calculations.

Initial data compilation is focused on the chemicals in SPAT. To date, a total of 22 chemicals have been analyzed.

#### FLAVOR DEVELOPMENT ON AN ULT BASE

The NOW 85 with no top dressing or filter flavor was chosen as the base for flavor development. Initial evaluation showed the product to be ashy, bland, drying, bitter with low tobacco taste and impact. To address these attribute deficiencies, compounds were selected from several resources, e.g.:

- a. SPAT data base - compounds were chosen which addressed the attributes of: increased harshness, tobacco taste, mouthfeel and impact
- b. ARTAP data base - compounds were chosen which addressed the attributes of: increased harshness, smoke-like taste, tobacco-like taste, cigarette-like taste and trigeminal sensation.
- c. From the duplication work on commercial flavors, analytical studies identified certain new compounds which had not been previously evaluated.

Thresholds were determined on more than 150 individual raw materials to define effective levels and individual attribute specifically for the NOW 85 Regular blend. From these data, thresholds were then determined on raw material combinations formulated according to: 1) chemical class, 2) compounds addressing one specific attribute and 3) compounds addressing several attributes. Approximately 50 combinations were evaluated.

#### Results:

- o Several top dressings have been formulated which address increased impact, mouthfeel and overall tobacco taste on the NOW 85 product. As one might expect, owing to the high dilution of this product, higher levels of raw materials were used to achieve effective taste delivery. In most cases, however, this produced an artificial, lingering aftertaste. Also, due to the volatility of certain compounds and their higher levels of use, strong, artificial pack and rod aromas were produced.

#### FLAVOR SYSTEM DEVELOPMENT FOR NEW GENERATION PRODUCT

Using the information found in ARTAP, the first prototype for a new generation product using less than 10 components has been developed.

#### OTHER

Other studies such as (a) the building of an aroma profile base, (b) the identification and evaluation of different aroma carriers, (c) characterization of the aftertaste of selected aroma materials and (d)

examination of the effect of temperature on the perception of selected aroma have been deferred because of NPT responsibilities.

4. Develop one or more quantitative methods to screen aromas

Because of head count pressures and personnel reassignment to NPT projects, no activity has been directed in this area.

5. Identify and evaluate cost reduction opportunities and processing operations

FLAVOR SIMPLIFICATION

Our flavor simplification program for 1987 is completed. With the sale of STP products, seven formulations were eliminated. Usage of commercial flavors in all the top dressings for current domestic and international cigarette products has been reduced from a number of more than 50 previously purchased to 30. All the pertinent information has been conveyed to Scientific Affairs for their preparation of the HHS list to be submitted later this year. All changes were phased in by September 1 with no financial loss.

In addition, the "where used" files for top dressings and filter flavors have been updated. The most recent tobacco rod weights from the MSS are used in generating the amount per cigarette for each flavor component (in ppm). This information in combination with the filter flavor data can be used to calculate the exact level of any flavor additive in any domestic brand. This information has been conveyed to Scientific Affairs so that they can both prepare the HHS list of flavor additives and be in a position to know what level of any component is found in any of our domestic brands.

RESOLUTION OF MANUFACTURING FAUX-PAS

A HPLC procedure to determine the individual component composition of blended casings, which was developed in R&D and established as a troubleshooting method in QA, has been recently put to use to solve a problem with a casing mixture. A casing mixture was found to be overweight but the reason for this was not known. The carbohydrate analysis of the specific mixture by QA established that the mixture

contained an excess of invert sugar. From this information, a component mixture could be calculated which, when added to the flawed mixture, re-established the correct casing composition thereby enabling the casing mixture to be used in the normal way rather than be discarded.

#### FLAVOR DUPLICATION

A further four commercial flavors were duplicated during the second quarter. This made 21/56 flavors duplicated thus far of the original flavors used by the company prior to the sale of the STP products, or 14/30 currently used commercial flavors. Only one of these duplications has been incorporated in current top dressing formulations.

6. Build a foundation of basic data that can be used to develop casing formulations that address the attributes of a cigarette

#### SPECIFICATION FOR CASING MIXTURES

The specification for casing mixtures in MSS Release 3.2 are now in effect, which makes these formulations available for Manufacturing use. The ripple effect on processing moistures from total casing mixtures was avoided by making a slight modification of formulation moisture.

#### CASING SHELF LIFE

- o The extended shelf-life of total casing mixtures has been confirmed. A procedure note is being sent to Manufacturing to update their practice. The shelf-life of total casing mixtures has been set at 20 days. The holding time for Burley casing is still set at one day, due to its dilute nature.
- o Total casing mixtures have been shown to have a long shelf life under proper storage conditions. A test casing was held for 25 days without loss of integrity. The necessary storage conditions include heating to prevent microbial build-up and stirring to prevent stratification. However, mixtures must be adjusted for evaporative moisture loss after extended storage. This finding will allow Manufacturing to avoid

discarding unused total casing materials if proper storage and usage conditions can be achieved.

7. Develop a HPLC method to differentiate between flavor concentrates, top dressings and filter flavors

All project work was deferred to enable the Division to devote its time to complete higher priority projects.

8. Develop a fully integrated flavor team whose ultimate goal is technical leadership

Dr. Ken Shu began work with the Flavor Division on June 30. The additional head count originally approved for a biophysicist is on hold pending the outcome of the effect of the VSIP program on the hiring practices within R&D.

9. Through productivity and synergy, interdepartmental support and working relationships will be improved

Two of three members of the Flavor Division resumed regular responsibilities after successfully completing an assignment in excess of three months with NPT. Through regular meetings with Brand R&D and NPT, their goals and opportunities are identified and kept pertinent and current.